Primary immunisations in Liverpool. I: Who withholds consent?

Maggie Pearson, Krystyna Makowiecka, Jacqueline Gregg, Jane Woollard, Michael Rogers, Chris West

Abstract

The association between parents in Liverpool consenting to their children being invited for primary immunisations and five sociodemographic factors, namely sex, position of child in the family, family type, migration into Liverpool since birth, and local deprivation was examined. Rates of consent to invitation were over 97% for each antigen except pertussis, which had a consent rate of 83%. Consent to invitation for pertussis vaccine was least likely to have been given for boys, children with older siblings, those recorded as living with a single parent, and those in the most deprived areas. Local deprivation also had an effect on consent to the measles, mumps, and rubella vaccine. Migration into Liverpool had a significant effect on consent to invitation for all antigens except pertussis. The child's sex, family type, and local deprivation had no effect on consent to diphtheria, tetanus, and polio immunisations.

Maximising pertussis vaccine uptake will require more attention to be paid to those parents who have been identified as being less likely to give consent. It is particularly important that consistent and clear advice about immunisations is made available to parents with two or more children, lone parents, and those living in materially deprived areas. Our findings challenge some of the assumptions underlying the principles of 'first parent visiting', at least so far as pertussis is concerned.

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The drive to maximise the rate of childhood immunisation has been given renewed emphasis with the introduction of target payments in the 1990 general practitioner contract¹ and the suggestion of targets of 95% uptake for England and Wales by 1995.² Despite much research on immunisation rates,³⁻⁷ scant attention has been paid to a key component of uptake, namely obtaining consent from parents. As targets are set ever higher, children whose parents decline all immunisations, or that of specific antigens, will become increasingly significant for target attainment. Moreover, defining more precisely the relative importance of consent should facilitate more effective immunisation strategies and the targeting of educational and information resources to maximise the protection of children's health.

The *Peckham Report* stands alone in reporting rates of consent to inclusion in a call and recall system for invitations to immunisation.⁴ In the 16 district health authorities studied, only 0.4%

of parents did not consent to their child's inclusion in the system. Antigen specific consent rates were not discussed, however. Professional advice against immunisation with measles and pertussis vaccines, and the association between parents' attitudes and their child's uptake of pertussis and measles immunisations were considered only in the context of completion rates.

Immunisation course completion rates have been shown to be associated with several factors, which fall into two broad categories: characteristics and circumstances of individual children and their families^{4 5 8-11} and the characteristics of the service arrangements under which immunisations are offered.^{3 4 7 9 12} The two sets of factors have been shown to have an independent effect on immunisation rates,⁴ but their impact on the two separate components of uptake has not been identified: on the one hand, consent to invitation for immunisation with specific antigens; and on the other, completion of courses among those who so consented. Furthermore, no previous studies have examined antigen specific consent rates.

In the course of a detailed study of primary immunisations in Liverpool, we became aware that the distinction between consent and completion could have important practical implications for effective strategies to improve uptake rates. In this paper, therefore, we identify and discuss the effect of children's social and family circumstances on consent. In other words, who is likely or unlikely to give consent, and for which antigens? In a second paper,¹³ we identify and discuss the effect of those factors on completion of immunisation courses: that is to say, once consent has been obtained, which factors influence completion?

Subjects and methods

The immunisation records of individual children born between 1 April and 1 October 1988 inclusive and resident within Liverpool District Health Authority in September 1991 were obtained from data on the vaccination and immunisation module of the National Child Health System. This cohort was selected for several reasons. Firstly, their primary immunisations should have been completed when the new general practitioner contract, with its target payments, was introduced in April 1990.¹ Secondly, all children in the cohort would have been offered the measles, mumps, and rubella (MMR) vaccine. Thirdly, at the time of data extraction, there should have been sufficient time for all data on the child's primary course and MMR immunisation history to be recorded on the regional computer.

Department of General Practice, University of Liverpool
M Pearson
K Makowiecka

Royal Liverpool Children's NHS Trust
J Gregg
J Woollard

Department of Child Health, University of Liverpool
M Rogers

Department of Public Health, University of Liverpool
C West

Correspondence to:
Dr Maggie Pearson,
Department of Nursing,
University of Liverpool, PO
Box 147, Liverpool L69 3BX.
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These children would have been invited to receive diphtheria, tetanus, polio, and pertussis immunisations at 3, 5, and 8 months, and the MMR vaccine at 1 year of age. In addition to details of a child's immunisation history (including the consent code which indicated the specific antigens for which consent was given), data on five sociodemographic variables were also extracted. These variables were: the child's sex, family position (inferred from mother's parity at child's birth), recorded family type (lone parent or two parent), migration into Liverpool since birth, and current electoral ward. Data on ethnic origin and parents' social class were not available on the computer records.

The overall deprivation index (ODI)¹⁴ of the child's electoral ward was derived from their postcode. The ODI, an indicator of material deprivation, combines four 1981 census variable indicators: unemployment, car ownership, home ownership, and overcrowding. It is a more accurate index of socioeconomic conditions than the Jarman underprivileged area score,¹⁵ which includes other demographic variables and is an indicator of general practitioners' workload.¹⁶ Electoral wards' ODI scores varied from -2.82 (least deprived) to 9.67 (most deprived). The national average score is 0. For descriptive purposes wards were divided on the basis of their scores into 'least deprived' with ODI scores between -2.82 and 3.12; 'deprived', with scores between 3.13 and 5.98; and 'most deprived', with scores between 5.99 and 9.67.

The data were downloaded onto a micro-computer and analysed using the Epi-Info statistical package¹⁷ to calculate antigen specific and 'composite' (all antigens) consent rates by the child's sex, family position, family type, migration, and local (ward) deprivation category. As preliminary data analysis confirmed that consent to invitation for diphtheria, tetanus, and polio (DTPol) were almost identical, these three antigens are reported together, whereas pertussis and MMR immunisation were considered separately. χ^2 Tests (including for trend) for significance of the simple association of individual factors with consent rates were undertaken using the Arcus package.¹⁸ The SAS statistical package¹⁹ was used to fit logistic regression models²⁰ to the data to assess the independent strength of association of each individual factor with consent, after controlling for the effect of the other factors. For each variable, odds ratios were calculated of consent being given to each antigen or antigen group. An odds ratio of unity indicates that there is no association between the variable and consent. Any variable for which the 95% confidence limits include a value of unity are thus considered not to have a significant effect on consent.

Results

RATES OF CONSENT TO INVITATION FOR IMMUNISATION

Of the cohort of 3585 children (1714 girls, 1871 boys), consent to invitation for immunisation was not given for 13 (0.4%) and was withdrawn for a further 15 (0.4%). The consent code was not recorded for 23 (0.6%). Consent was given to

invitation for all antigens for 2941 (82.0%) children, and for all antigens except pertussis for a further 521 (14.5%) children. Of the remaining 72 (2.0%) children, consent was given for single or other combinations of antigens.

Table 1 shows the consent rate for each individual antigen. The consent rate was over 97% for each antigen except pertussis, for which 17% of parents chose not to have their child invited.

VARIABLES ASSOCIATED WITH CONSENT

Each of the five sociodemographic variables was significantly associated with consent to be invited for the full set of antigens (table 2). Statistically, full consent was less likely to be given for boys, for children recorded as living with a lone parent, and for children who moved into the Liverpool health district after birth. Full consent decreased sharply with an increasing number of older siblings and with increasing material deprivation.

Consent to pertussis antigen also showed a significant association with each of the five variables. Consent to DTPol or MMR was affected by postnatal migration into Liverpool and by ward deprivation, but not by sex, family position, or family type.

INDEPENDENT EFFECT OF SOCIODEMOGRAPHIC VARIABLES

Table 3 shows the independent effect on consent to invitation for immunisation with the full set of antigens and to individual antigens of each of the five variables: the child's sex, family position, family type, migration after birth into the district, and deprivation category of ward of residence.

Migration into Liverpool was the only variable to have an independent effect on consent to DTPol (table 3). Children who had moved into Liverpool since birth were also highly unlikely to have had consent recorded for invitation for the MMR vaccine. Sex and family type had no independent effect on consent to DTPol or MMR. Family position had no independent effect on consent to DTPol, and was significant only for the fourth and later children on consent to MMR. Ward deprivation score had a significant effect on consent to MMR, but not for DTPol.

Pertussis was the only antigen for which sex had a significant independent effect on consent, consent being more likely to be given for girls than for boys (table 3). In contrast, pertussis was the only antigen for which migration into the Liverpool health district had no significant independent effect on consent. Family position,

Table 1 Composite and antigen specific initial consent rates

Antigen	No (%) consent rate recorded (n=3585)
Diphtheria	3511 (97.9)
Tetanus	3514 (98.0)
Polio	3517 (98.1)
Pertussis	2976 (83.0)
MMR	3481 (97.1)
All antigens	2941 (82.0)

Table 2 Sociodemographic factors and consent to invitation for primary immunisations

Factor	Consent rate (% (No))			
	DTPol	Pertussis	MMR	All antigens
Sex		***		**
Girls	97.3 (1667/1714)	84.8 (1453/1714)	97.0 (1663/1714)	83.6 (1433/1714)
Boys	98.0 (1833/1871)	81.9 (1532/1871)	97.2 (1818/1871)	80.6 (1508/1871)
Family position*		***		***
First child	98.2 (1382/1408)	88.3 (1243/1408)	97.9 (1379/1408)	87.5 (1232/1408)
Second child	99.1 (1149/1159)	83.7 (970/1159)	97.3 (1128/1159)	82.4 (955/1159)
Third child	98.8 (554/561)	76.3 (428/561)	97.7 (548/561)	75.9 (426/561)
Fourth child and above	97.2 (351/361)	74.0 (267/361)	96.7 (349/361)	74.0 (267/361)
Family type†		***		***
Lone parent	98.1 (1247/1271)	80.4 (1022/1271)	97.7 (1242/1271)	79.8 (1014/1271)
Two parents	98.5 (2156/2188)	85.0 (1860/2188)	97.4 (2131/2188)	84.1 (1840/2188)
Migration into Liverpool		**	***	***
Resident at birth	98.7 (3252/3294)	83.5 (2749/3294)	98.1 (3232/3294)	82.9 (2732/3294)
Moved in since birth	88.7 (258/291)	78.0 (227/291)	85.6 (249/291)	71.8 (209/291)
Deprivation‡		***	***	***
Most deprived	96.7 (995/1029)	78.2 (805/1029)	95.9 (987/1029)	77.1 (793/1029)
Deprived	98.3 (1194/1215)	83.9 (1019/1215)	97.0 (1178/1215)	82.8 (1006/1215)
Least deprived	98.4 (1148/1167)	85.9 (1003/1167)	97.9 (1142/1167)	85.1 (993/1167)

*Data missing for 96 cases.

†Data missing for 126 cases.

‡Data missing for 174 cases.

Difference significant, 0.01 < p < 0.05; *difference highly significant, p < 0.01.

Table 3 Independent odds ratio (OR) (95% confidence interval (CI)) for each factor of consent being given for specific and groups of antigens estimated from logit model

Factor	DTPol* (OR (95% CI))	Pertussis† (OR (95% CI))	MMR‡ (OR (95% CI))	All antigens§ (OR (95% CI))
Sex				
Boys	1.0	1.0	1.0	1.0
Girls	1.11 (0.63 to 1.95)	1.26 (1.04 to 1.52)	1.16 (0.73 to 1.84)	1.23 (1.02 to 1.48)
Family position				
First child	1.0	1.0	1.0	1.0
Second child	1.67 (0.78 to 3.56)	0.59 (0.46 to 0.74)	0.64 (0.37 to 1.13)	0.57 (0.45 to 0.72)
Third child	1.12 (0.47 to 2.67)	0.38 (0.29 to 0.5)	0.73 (0.35 to 1.48)	0.39 (0.30 to 0.51)
Fourth child and above	0.5 (0.23 to 1.09)	0.34 (0.25 to 0.46)	0.46 (0.22 to 0.96)	0.36 (0.26 to 0.49)
Family type				
Two parents	1.0	1.0	1.0	1.0
Lone parent	0.73 (0.4 to 1.31)	0.63 (0.52 to 0.77)	1.1 (0.67 to 1.8)	0.65 (0.53 to 0.79)
Migration into Liverpool				
Resident at birth	1.0	1.0	1.0	1.0
Moved in since birth	0.21 (0.1 to 0.45)	0.78 (0.5 to 1.2)	0.14 (0.08 to 0.25)	0.6 (0.4 to 0.9)
Deprivation				
Per ODI unit	0.92 (0.83 to 1.02)	0.94 (0.91 to 0.97)	0.9 (0.83 to 0.98)	0.94 (0.91 to 0.97)

*Likelihood ratio $\chi^2 = 32.14$, with 7 df, $p < 0.0001$.†Likelihood ratio $\chi^2 = 110.47$, with 7 df, $p < 0.0001$.‡Likelihood ratio $\chi^2 = 65.2$, with 7 df, $p < 0.0001$.§Likelihood ratio $\chi^2 = 107.20$, with 7 df, $p < 0.0001$.

family type, and ODI score each had significant independent effects on consent to pertussis, so that children with older siblings, those living with a lone parent, and those living in more materially deprived wards were less likely to have had consent given.

Discussion

In Liverpool, consent to immunisation is sought by the health visitor when the child is approximately 10 days old. As she is often the first health professional to discuss immunisations with parents, the health visitor is in a key position of influence in obtaining consent, but general practitioners will become increasingly significant as they become more involved in preventive child health care. Regular training and updating is important for all professionals to ensure that consistent advice is given. For example, it has been suggested that neither the public nor health professionals have been given clear guidance on the safety of immunisations when the child has an intercurrent (or previous) illness.^{4,12,21}

Previous research has identified several child related factors as significant influences on immunisation course completion rates. These factors

include family position,^{4,5} socioeconomic deprivation and social class,^{4,5,8,9,22} and area of residence.^{7,9} There is, however, conflicting evidence as to whether children who move between health districts during the immunisation period are less likely to be fully immunised.^{7,23-25} Our research indicates that each of these factors had a significant effect on consent to invitation for the full course of primary immunisations, and to specific antigens, among the children studied. The nature of the data, however, prevented exploration of the influence on consent of other factors identified as significant in immunisation completion: racial/ethnic group,^{10,11} acute and chronic illness in the child or other members of the family,^{4,5} and beliefs, fears, and scepticism about 'needles' and immunisations against diseases which most parents will never have encountered.^{4,5}

In our cohort of children, the rate of consent to the pertussis vaccine was low. Clearly, despite optimism that national targets of 95% coverage are realistic for 1995,⁶ they will not be achieved in Liverpool until a greater proportion of parents give consent. Professional advice to parents is likely to reflect the degree of misunderstanding in primary care about precise contraindications

to the vaccine,^{4,21} not helped by mixed and inconsistent messages from family and friends.

Several factors were associated with the withholding of consent to immunisation against pertussis: older siblings, lone parents, living in materially deprived areas, and the child being male. The decline in consent to pertussis with later family position may reflect a cohort effect associated with increasing parental experience. Previous children may have been perceived as having reacted adversely to the vaccine. Also, if older non-immunised children escape the clinical disease,⁵ or cope with a mild attack, the perceived risks of the pertussis vaccine may outweigh the apparent benefits, particularly to parents old enough to remember the 1970's scare. Recent changes in official advice and guidelines may cause confusion or provoke scepticism among older parents. Many districts now concentrate health visiting on first children,²⁶ but our data indicate that it cannot be assumed that willingness to give consent will be carried over from the first to subsequent children, particularly for pertussis.

No previous studies have explored the influence of family type on consent to, or completion of, immunisations. The significant independent influence of recorded family type on consent to the full set of antigens, and particularly to pertussis, merits further careful investigation. Future studies need to have clear criteria for definition as a 'one parent family', and to take account of the heterogeneity of lone parents, most of whom are lone mothers, who may be single, divorced, separated, or widowed.²⁷ Generally, however, lone mothers are younger, have fewer formal educational qualifications, and are more likely to be living on income support than women living with their children and with male partners.²⁸ Other studies have established these circumstances as associated with a lower uptake of preventive health services, the longer term benefits of which may be outweighed by competing short term demands on the lone parent's time and resources.²⁹

Greater local material deprivation was significantly associated with withholding of consent to pertussis and MMR immunisations. Particular care may be needed to ensure that parents living in materially deprived areas are given sound information and advice about the risks and benefits of all immunisations, so that they can make a truly informed choice on behalf of their child.

The significant sex difference in consent to pertussis is surprising, and the reasons are not clear. Although there are more boys than girls among survivors of neonatal special care,³⁰ we consider that neonatologists are likely to emphasise the importance of pertussis immunisation (except when valid contraindications apply). It is possible to speculate that the sex difference reflects parents' greater concern about the risk of brain damage to sons than daughters.

The least reliable records in this cohort are likely to be those of children who moved into Liverpool. Their recorded consent rates may thus be 'fictional',²⁵ in part at least, reflecting problems of information transfer between health

districts.²³ Incomplete data transfer may explain why migration was the only variable to have an independent effect on recorded consent to DTPol. Compatible computer systems would help to overcome this problem. It is also possible, however, that parents who move into the district do not establish the same rapport with health visitors and other primary care staff who were not involved with their pregnancy and postnatal care. Health visitors see the 'birth visit' as a key factor in gaining and maintaining entry to households.³¹

In conclusion, our findings suggest that successful immunisation strategies will need to address several practical issues related to consent: (a) staff training should aim to provide consistent and authoritative advice to parents about immunisation; (b) improving consent rates for pertussis immunisation must be a priority; (c) serious consideration should be given to differential resource allocation, particularly of health visitor time, to target materially deprived areas and families with two or more children, with consistent advice and support; and (d) the reliability of immunisation data transfer when families move to another health district should be investigated.

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'Ecstasy', Ophelia, and the nightingale

That unmatch'd form and feature of blown youth
Blasted with ecstasy: O, woe is me,

(Ophelia) *Hamlet* Act 3, scene 1

Is it hypocrisy to drink alcohol and condemn the use of 'Ecstasy'? Reports from the United States have suggested that Ecstasy (3, 4-methylenedioxymethamphetamine, MDMA) is widely used and usually only mildly toxic. A recent paper in the *Lancet* from the National Poisons Information Service at Guy's Hospital, London (J A Henry and colleagues, 1992; 340: 384-7) describes experience during 1990 and 1991 and records seven fatal cases and five cases of severe acute toxicity in young people after apparently modest doses.

In the series of fatal cases there were five males and two females aged between 16 and 21 years. In two the dose is not stated but the other five had taken 1, 2, 3, 3, and 5 tablets, all of them at a party, club, or concert. One patient had a liver transplant after four days but died 18 days later. The remaining six died from 2.5 to 60 hours after admission to hospital. All had tachycardia and a temperature of 40°C or more at presentation. One had fixed, dilated pupils and severe cardiac arrhythmia and died after 2.5 hours. Six had seizures and three developed rhabdomyolysis, disseminated intravascular coagulation (DIC), and acute renal failure. Two were hypertensive and four hypotensive when first seen. The authors attribute the deaths to heatstroke caused by taking the drug in circumstances involving vigorous exercise (dancing), high ambient temperature, and inadequate fluid intake.

A 13 month old child who swallowed a single tablet of Ecstasy was described in detail in this journal (1992; 67: 1114-5). Four other people aged 19 to 25 years took 2, 2.5, 3, and 3 tablets. Two developed rhabdomyolysis, DIC, and acute renal failure and one needed haemodialysis for 20 days. One was comatose and had diarrhoea and vomiting but recovered with forced diuresis and chlorpromazine. One had a subarachnoid haemorrhage within a few hours of taking the tablets. A further seven people aged 19 to 29 years developed hepatotoxicity as a late complication. One died and one needed a liver transplant.

Is Ecstasy different from alcohol? The answer must be 'Yes' because the toxicity seen in this series was not dose related. Whereas the moderate 'social' use of alcohol is free of this kind of severe acute toxicity, there appears to be no 'safe' dose of MDMA. Taking a single tablet can kill. It looks as if we can continue to enjoy the Jacob's Creek dry red while advising against the use of Ecstasy and still avoid a charge of hypocrisy when, like Keats listening to his nightingale, we need 'A draught of vintage'

'That I might drink, and leave the world unseen,
And with thee fade away into the forest dim:

Fade far away, dissolve, and quite forget
What thou among the leaves hast never known,
The weariness, the fever, and the fret
Here, where men sit and hear each other groan'.