Uptake of pre-school immunization in a rural practice

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SUMMARY. The immunization records of all children born between 1 January 1976 and 31 December 1980, currently registered with the practice, were checked in a study of the uptake of pre-school immunization. Distinction was made between children born into the study practice and those who had moved into the practice from elsewhere.

Within the practice the uptake rates of all immunizations had increased over the five years. The uptake rates for children born into the practice were significantly higher than those for children who had come in and, by a similar margin, were also higher than the published overall rates for North Yorkshire Area Health Authority.

Introduction

THE suggestion from Great Ormond Street[1] of a connection between pertussis vaccination and brain damage received wide publicity. Subsequently, national acceptance of pertussis vaccine fell from over 80 per cent in 1974 to 31 per cent in 1978.[2] This was accompanied by a decline in acceptance of all childhood immunizations and followed by an increased incidence of whooping cough cases.[2]

The report from the National Childhood Encephalopathy Study[3] confirmed an association between serious neurological illness and pertussis vaccination, but cases were few and most of the affected children recovered completely. The benefit of vaccination is now said to strongly outweigh the risk.[4] We decided to study the uptake of pre-school immunization in our practice.

Description of the practice

The practice is a rural dispensing practice centred in a village lying south of York. There are just over 4,500 patients registered. The two principals have been in post for 26 and 14 years respectively. For most of the period covered by the study there was a vocational trainee at the practice. One health visitor is attached to the practice.

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The area covered is about 52 square miles and patients are drawn from 18 villages. The population is stable. It consists of the labouring, managerial and land-owning parts of the farming community; and there are both unskilled and professional people who commute to York and Selby.

Both principals actively recommend full immunization of all children unless there is a medical contraindication. The North Yorkshire Area Health Authority (NYAHA) computer issues postcard reminders whenever a child is due for immunization. These cards are given to the health visitor, who is then responsible for arranging with the mother for the child to be brought for immunization. It is practice policy that all pre-school immunizations are given in the surgery by one of the practice doctors. If transport to the surgery is difficult to arrange, then immunizations are given in the home. Immunization summary cards (FP7A, FP8A) are filed in the children's notes.

Aims

The primary aim of the study was to quantify the acceptance of pre-school immunization within the practice; secondly, by using practice records as the first source of information, to assess the accessibility of this information in the practice records.

Methods

The names of all children born between 1 January 1976 and 31 December 1980, inclusive, were taken from the age-sex register, as it stood at the end of April 1981.

As full an immunization history as possible was taken from the practice records, and any stated contraindication to pertussis vaccination was noted. The children whose immunization records were incomplete were subsequently identified. Their names and birth dates were sent to the North Yorkshire Area Health Authority, who were able to supply further information from computerized records and, in two cases, from school entry questionnaires.

The uptake rates of the practice were compared with the rates for the whole of the North Yorkshire Area for the same period. The NYAHA rates were drawn from the report of the DHSS Statistics and Research Unit[5] and from computer printouts issued under the NYAHA Child Health System. Immunizations given after 1 May 1981 were not included.

Statistical method. The proportions of the various populations that had been immunized were measured against a

Table 1. Distribution of children and number of completed courses.

Year born	Number of children			Completed courses		
	Born into study practice	Born into another practice	Total	DT/polio	Pertussis	Measles
1976	27	15	42	35	19	25
1977	30	7	37	33	27	28
1978	19	5	24	19	16	17
1979	34	6	40	38	29	32
1980	26	0	26	25	22	0
Total	136	33	169	150	113	102

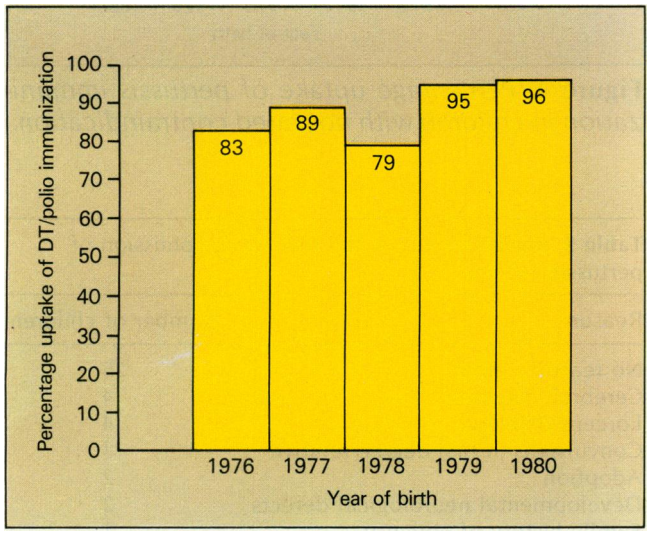

Figure 1. *Percentage uptake of DT/polio immunization by year of birth.*

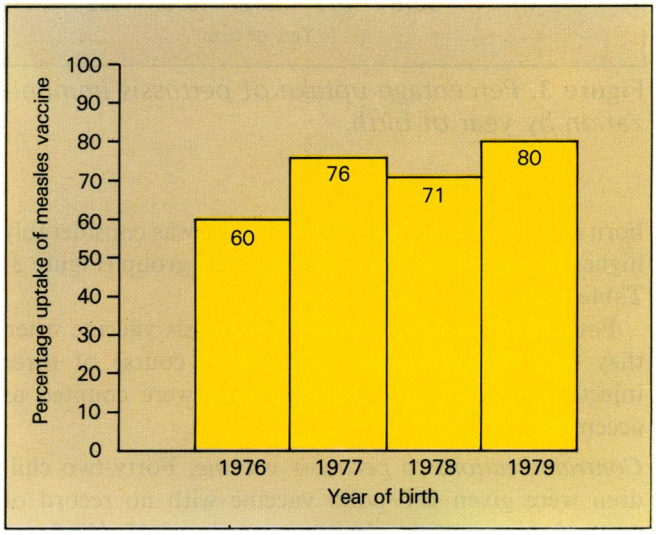

Figure 2. *Percentage uptake of measles vaccine by year of birth.*

normal distribution using a one-tailed test. Details are given in the statistical appendix.

Results

The names of 175 children were initially drawn from the age–sex register. Of these, five were found to have moved out of the practice, and one child's name was incorrectly filed by age. The total sample number was 169. The distribution by year of birth is shown in Table 1.

Diphtheria, tetanus and polio

From practice records a full immunization history was found for 143 (84.6 per cent) of the children. NYAHA was able to complete the records of a further seven children. Of the remaining 19 children, there was no record of immunization of six children and only a partial record for 13.

Only those children with a complete record of immunization against diphtheria, tetanus and polio (DT/polio) were included in figures of uptake. Children born in the latter part of 1980 were too young in April 1981 to have had the third DT/polio vaccine. They were counted as acceptors if the first two of the course had been given. The overall uptake rate was 150 (88.8 per cent). There was an increase in uptake over the period of the study (Figure 1, Table 1).

Without exception, injection of diphtheria and tetanus vaccine was accompanied by administration of oral polio vaccine.

Measles

Many of the children born in 1980 were too young in April 1981 to have had measles vaccine. Figures are not given for those born in 1980. Overall uptake was by 102 children (71.3 per cent). There was an increase in uptake from the 1976 group to the 1979 group (Figure 2, Table 1).

Pertussis

One hundred and thirteen children (66.9 per cent) had a complete course of pertussis vaccination. As with DT/polio, only complete courses are counted, and two injections are counted as a complete course for those

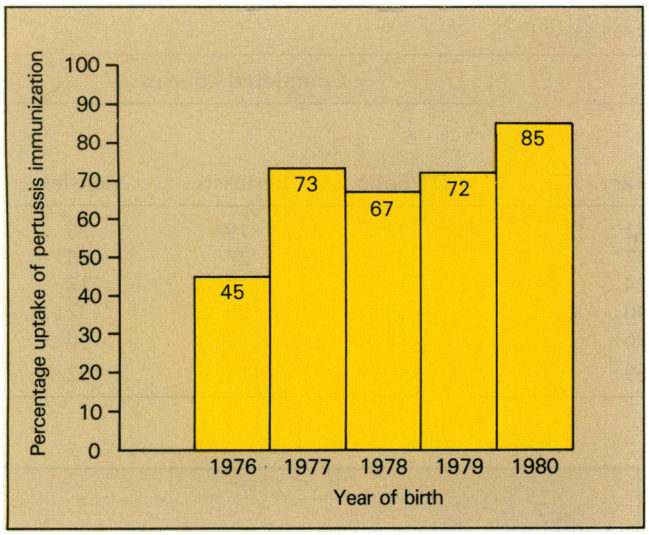

Figure 3. *Percentage uptake of pertussis immunization by year of birth.*

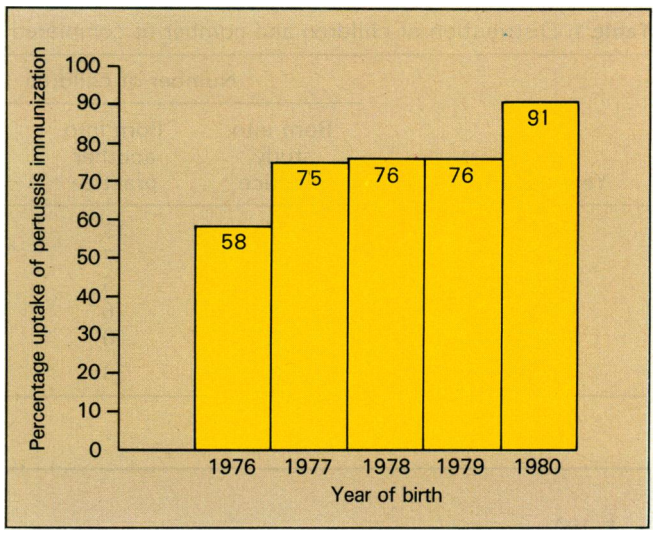

Figure 4. *Percentage uptake of pertussis immunization in children with no stated contraindication.*

born in the latter part of 1980. Uptake was considerably higher in the 1980 group than the 1976 group (Figure 3, Table 1).

Four children were not given pertussis vaccine when they had DT/polio, but later had a course of three injections of pertussis vaccine. They were counted as acceptors.

Contraindications to pertussis vaccine. Forty-two children were given DT/polio vaccine with no record of pertussis vaccination. In the records of 17 (40.5 per cent) there was a stated contraindication to pertussis vaccine—either on the immunization summary card or in hospital discharge letters. Exclusion of these children gives an uptake rate of 74.3 per cent (Figure 4). The stated reasons for not vaccinating are summarized in Table 2. The two adopted children are included because their incomplete family history was the reason given in the notes for the omission of pertussis immunization. In the case of the child with the remote family history of epilepsy, immunization was at the time said to be contraindicated, but would not be now. Nine of the 17 children in whom immunization was said to be contraindicated were born in 1976.

Table 2. Reasons given in the records for omission of pertussis vaccine.

Reason	Number of children
No reason stated	25
Cerebral irritation	4
Forceps delivery	4
Convulsions in first-degree relative	3
Adoption	2
Developmental neurological defects	2
Family history of epilepsy (not first-degree relative)	1
Reaction to previous dose	1
Total not vaccinated	42

Children first registered at another practice

Thirty-three children had moved into the practice having first been registered elsewhere. The notes of 20 of these children did not contain a complete immunization history. All the supplementary information from NYAHA applied to these children, to the time of their being registered elsewhere.

Rates of uptake for all types of immunization were higher in the children born in the study practice than in those who had moved into it. For each immunization (DT/polio, measles, pertussis) the difference between the uptake of the two groups was highly significant ($P<0.005$). Similarly, the rates of uptake of the practice-born children were all significantly higher ($P<0.001$) than the figures given for the whole of North Yorkshire area.

The area figures applied to children born in the same period as the study population (Figure 5). It was not possible to follow up children born into the practice who had moved to another practice.

Discussion

The figures as presented are open to a number of criticisms. First, they take no account of migration. This may account for some of the difference between those born into the practice, and those who have moved into it. However, the similarity between the uptake by the immigrants to the practice and the overall uptake in North Yorkshire is striking, particularly with regard to pertussis and measles immunization. It would be interesting to know about 'emigrants' from the practice. Second, the sample numbers are small. This is inevitable given the size and nature of the practice studied. How-

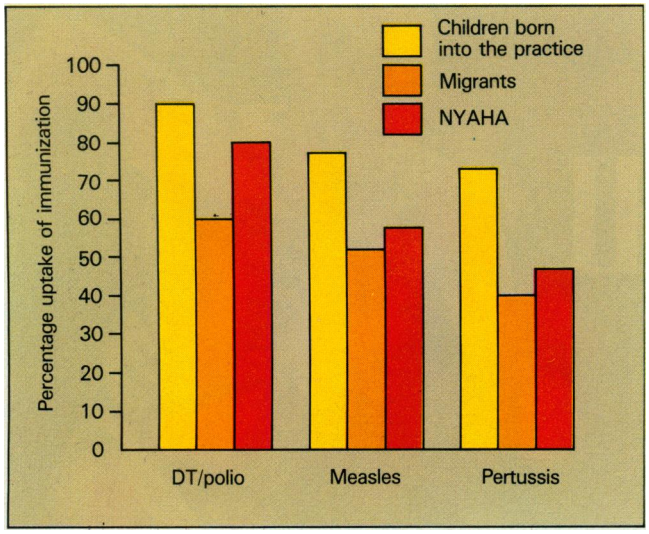

Figure 5. *Percentage uptake of immunization. Comparison of children born into the practice with migrants into the practice, and all children born in the North Yorkshire area. (Born between 1 January 1976 and 31 December 1980.)*

ever, the figures do stand up to statistical analysis. For the purpose of comparison with the NYAHA figures, it was necessary to take all the five-year groups together. Third, the rates are likely to be underestimates. Only completed courses which are recorded at either the practice or NYAHA are counted. There is no way of telling if a gap in these records indicates that the injection was not given or that there was a failure of recording.

That said, it is clear that the uptake rate in the practice is much higher than the overall rate for the North Yorkshire area. A number of factors may be responsible for this: the composition and stability of the population; the attitudes of parents and doctors; the organization of the system applied by the practice (the use of computer cards, the role of the health visitor, injection by practice doctors in the surgery). The principals in the practice feel that the distribution of the computer cards by the health visitor is particularly important. The postcards are designed for direct mailing to the parents, but they are sometimes wrongly addressed and so might never reach the child's parents. The health visitor is able to correct these mistakes. Also, the personal contact is thought to be a more effective reminder.

Two areas of further research stand out: first, to look more closely at the effects of the publication of the Great Ormond Street report[1] by looking at the uptake rates before 1974; second, to investigate the factors which might account for the high uptake rates in this practice.

It would be invaluable if the effects of migration were quantified. It would also be extremely difficult to do. Indeed, the DHSS report[5] takes no account of migration or death. One approach would be to see if the difference between the migrant group and the practice-born group is reflected in other practices in the North Yorkshire area. Equally, it would be interesting to know if the social and family backgrounds of the practice population are sufficiently unusual to be a factor. This sort of detailed demographic information is not available, and could only be obtained by an extensive questionnaire. In the absence of this information, one is left with the structure and organization of the practice, and the relationship between its staff and the patients. How much influence may be attributed to the individuals working in the practice and how much to its small size, is a matter for conjecture.

Statistical appendix

The sampling statistic used is:

$$Z = \frac{P_1 - P_2}{\sqrt{P(1-P)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

where P_1 and P_2 are the proportions in sample sizes N_1 and N_2.

$$P = \frac{N_1 P_2 + N_2 P_2}{N_1 + N_2}$$

is used as an estimate of the population proportion p under $H_0{:}P_1 = P_2$. Z was measured against the standard normal deviation in a one-tailed test of $H_0{:}P_1 = P_2$ against $H_1{:}P_1 > P_2$.

This method was used to compare practice-born children first with the population of children which had moved into the practice, and second with the population of children born in the North Yorkshire Area Health Authority.

During the period 1976–80 the NYAHA changed their system of data collection to batch processing. This has meant that there are unavoidable minor approximations in the NYAHA figures, as whole-year data are not available for all the years in question.

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