General practice factors and MMR vaccine uptake: structure, process and demography

Kenneth H. Lamden1, Islay Gemmell2

1Cumbria and Lancashire Health, Protection Unit, York House, Ackhust Business Park, Foxhole Road, Chorley, Lancashire PR7 1NY, UK
2National Primary Care Research and Development Centre, University of Manchester, Oxford Road, Manchester M13 9PL, UK
Address correspondence to Kenneth Lamden, E-mail: kenneth.lamden@hpa.org.uk

ABSTRACT

Background Despite the fall in MMR uptake between 1998 and 2004, some general practices managed to sustain remarkably high MMR coverage.

Methods The aim of the study was to identify general practice factors associated with high MMR vaccine coverage. The study population included 257 general practices in Cumbria and Lancashire in 2005. Practice level MMR coverage data for 2002–04 were obtained from the child health information systems of eight Primary Care Trusts (PCTs) and linked to information on practice structure, census indicators for deprivation and ethnicity data at lower level super output area and information from a questionnaire survey of practice nurses.

Results Mean MMR uptake was 86.4% with a range from 59 to 98%. Twenty-eight per cent (74/257) practices achieved the Department of Health higher target payment level of 90%. The uptake was not associated with practice size, the number of general practitioners (GPs) or practice nurses. There was no correlation between uptake and deprivation or the percentage of non-white population. There was a strong negative association between MMR uptake and barriers to housing and services \( r = -0.230, P < 0.001 \). On the basis of a questionnaire response rate of 75.9%, having a strategic approach to MMR with clear objectives was associated with MMR uptake of 90% or above (odds ratio, 3.76, 1.26–12.04). There was no association between immunization by GP, practice nurse or health visitor.

Conclusions There are no easily identifiable characteristics of high-uptake MMR practices although having a strategic approach to MMR is important. Practices in rural areas should endeavour to ensure easy access to child vaccination. High uptake can be achieved by practices in deprived areas. Further research is needed to identify practice system factors associated with high MMR uptake.

Keywords immunization, health protection, primary care

Introduction

In 1995, a link was proposed between measles vaccine and inflammatory bowel disease.1 In 1998, a further hypothesis proposed a link between MMR vaccination, bowel disorder and the development of autistic spectrum disorder.2 Public confidence in MMR vaccine suffered and between 1996 and 2004 vaccine coverage in England and Wales fell from 92 to 81%.3 Subsequent studies failed to find any evidence to support a link between MMR vaccine and autism, and the hypothesis was eventually withdrawn by most of the co-authors of the original report.4 Widespread campaigns at national and local levels were undertaken to promote MMR and reassure parents.

Although overall vaccination levels fell, wide variations in MMR uptake occurred between general practices with some practices managing to sustain remarkably high coverage despite the generally negative climate. For example, in Chorley and South Ribble Primary Care Trust (PCT), between 2002 and 2004 the uptake ranged from 77 to 97% (mean, 88%) with five (14%) of the 37 general practices achieving over 95% uptake.5 So far from seeing MMR uptake collapse, some practices remained unaffected. Notable variation in uptake occurred between neighbouring practices with similar sociodemographic profiles, suggesting that practice factors may be important to influence the high uptake.

Factors affecting immunization uptake at general practice level may be considered in terms of demography (i.e. sociodemographic profile of practice population), structure
Methods

The study was undertaken on 257 general practices in Cumbria and Lancashire between March and October 2005. Practices from eight of the 13 PCTs in Cumbria and Lancashire who’s Director of Public Health agreed to participate were included, i.e. Blackburn with Darwen, Blackpool, Burnley Pendle and Rossendale, Chorley and South Ribble, Hyndburn and Ribble Valley, Morecambe Bay, West Cumbria and West Lancashire. The study area is socially and geographically diverse. The highest levels of deprivation are seen in Blackburn, Blackpool, Barrow and Burnley. Preston, Burnley and Blackburn have ethnic minority populations of >10%.

Information on general practice structure (practice size and number of general practitioners [GPs]) and numbers of general medical service (GMS) versus primary medical service (PMS) practices was obtained from the primary care databases for Lancashire, South Cumbria and North Cumbria. This information was linked by practice postcode to 2001 census data on ethnic profile, to the Index of Multiple Deprivation (IMD), a composite measure of deprivation and disability, education skills and training, barriers to housing and services, crime and the living environment. The linkage was at a lower level super output area (SOA). SOAs form part of a geographic hierarchy based on 2001 census data. Lower level SOAs have a mean population of ~1500 individuals.

Information on uptake of MMR for children by the age of 24 months for the 3-year period from 1 January 2002 to 31 December 2004 using standard definitions was obtained from the child health information systems of the PCTs.

Information about the practice immunization system was obtained from a confidential questionnaire survey of practice nurses. A single questionnaire was sent to each practice. If there was more than one practice nurse, a collective response was requested. Questionnaire items included the skill mix of immunizers (GP/practice nurse/health visitor), the number of practice nurses, whether the practice had a strategy with clear objectives for MMR (self-report) whether MMR had been discussed at a practice meeting, presence of team working (self-report), recall of non-attenders, practice nurse knowledge of vaccine uptake, audit of non-attenders and use of the Department of Health MMR video.

Chi-square tests and odd ratios were used to test the associations between MMR uptake (<90% versus >90%) and the levels of categorical predictor variables for the 257 practices. The association between MMR uptake and the continuous variables, deprivation score, percentage non-white population and barriers to housing and services score was assessed using Pearson’s correlation coefficient.

Comparison of the mean MMR uptake for possible predictor variables identified from the questionnaire was performed using t-tests. Data were analysed using the statistical packages Epi-info, version 6.04, and SPSS, version 11.5.

Results

Demographic and structural analysis

Of the 257 practices, 78 (30.4%) were single handed. The mean number of GPs per practice was 2.95 and the mean number of patients per GP was 1906. IMD rank ranged from 133 to 31 000 out of a total of 32 482 SOAs in England (a low IMD rank represents increasing deprivation). A total of 16% (41/257) practices were situated in a lower level SOA with >10% non-white population.

A total of 257 practices comprised 44 234 children under the age of 24 months. Mean MMR uptake was 86.4% (95% confidence interval, 85.6–87.2) and ranged from 59 to 98% (Fig 1). Over 90% uptake was achieved by 74 (28.4%) practices and 15 practices (5.8%) achieved over 95% uptake.

There was no association between MMR uptake and practice size ($\chi^2 = 4.38$, $P = 0.22$) or the number of GPs ($\chi^2 = 1.3$, $P = 0.73$). There was no difference in uptake between the 192 GMS practices and 65 PMS practices (86.3 versus 86.4%, $t = 0.03$, $P = 0.97$) or between single-handed versus group practices (85.2 versus 86.9%, $t = 1.87$, $P = 0.062$).
The MMR uptake was not correlated with practice deprivation score ($r = 0.04$, $P = 0.45$) or the percentage of the population who were white ($r = 0.02$, $P = 0.78$) (Figs. 2 and 3).

However, the MMR uptake was strongly correlated with the IMD domain of barriers to housing and services ($r = -0.230$, $P < 0.001$) (Fig. 4). There was no significant correlation between MMR uptake and any of the other IMD domains.

**Questionnaire analysis**

The response rate to the questionnaire was 75.9% (195 of 257 practices). Five of the 195 responding practices did not have a practice nurse and were excluded from the analysis. The non-responding practices were not significantly different from the responders in terms of practice size (5414 versus 5738, $P = 0.41$) average number of GPs (2.7 versus 3.2, $P = 0.06$) and MMR uptake (87.2% versus 86.1%, $P = 0.22$).

There was no association between MMR uptake and the number of practice nurses ($X^2 = 0.64$, $P = 0.93$). Vaccinations were given less frequently by doctors compared with nurses. In 80 (42.8%) practices, a GP gave MMR vaccination in a clinic. At least one practice nurse gave MMR in 104 (54.8%) practices and at least one health visitor gave MMR in 115 (60.5%) practices. Of the total of 529 practice nurses, 246 (46.5%) gave MMR and, of the total, 318 health visitors identified as assisting the practices 140 (44%) gave MMR. There was a wide variation between PCTs regarding health visitors. For practices within the study, the proportion of health visitors vaccinating in each PCT ranged from 28 to 100% (Table 1).

Practice nurses reported (excluding ‘don’t know’ responses) that 156 of 170 (91.8%) practices had a ‘team-working’ approach to MMR and that 127 of 160 (79.4%) had a self-reported strategic approach with clear objectives for MMR. MMR had been discussed in detail at a practice meeting in 74 of 175 (42.3%) practices. In total, 82% (134 of 163) of practices had a system for contacting non-attenders, 15.4% (27 of 175) had used the MMR video and 11% (17 of 155) had audited reasons for non-attendance. In only a quarter of practices (24.7%) did a practice nurse know their practice MMR uptake. The association between MMR uptake (above or below 90%) and questionnaire items is shown in Table 2.

Having a strategy with clear objectives for MMR was the only factor significantly associated with achieving an MMR uptake of over 90% (OR, 3.76, 1.26–12.04, $P = 0.01$). There was no association between MMR uptake and whether MMR was given by a GP practice nurse, health visitor or any combination of these three health professionals.

**Discussion**

**Main findings of this study**

This study has documented wide inter-practice variation in MMR uptake in Cumbria and Lancashire and has examined
of the MMR video were not associated with achieving the 90% MMR target.

**What is already known about this topic**

There has been relatively little research on reasons for variations in immunization uptake between GP practices, and characteristics of high uptake practices have not been well defined. Previous studies have focused mainly on the association between uptake of childhood immunization and practice demographic and structural characteristics. Practices serving populations in socially deprived areas of Glasgow were found to have lower uptake of child vaccinations with no association between immunization uptake and practice size or clinical activity levels. Single-handed status was associated with low MMR uptake in the unique setting of the Highlands of Scotland. Less is known about how the practice immunization system including the skill mix of immunizers (GPs, practice nurses and health visitors) is related to immunization coverage.

The association between MMR coverage and deprivation at population level has been more widely studied. Previous researches at Health Authority level have shown lower MMR coverage in urban deprived areas. A more pronounced fall in MMR coverage has been seen in affluent compared with deprived areas. The recent decline in MMR coverage has also been shown to be related to the proportion of educated population.
The relationship between MMR uptake and ethnicity has not been widely reported. A study of 6444 children in London found that the MMR uptake was highest among Asian children and lowest among white children.13

What this study adds

Our finding of no association between practice size and clinical staffing levels suggests that the substantial changes in general practice in the past 10 years have not had a different impact on the ability of small or large practices to deliver their childhood immunization programme.

We found a strong negative association between MMR uptake and barriers to housing and services. This deprivation indicator reflects road distance to services (i.e. GP premises, post office, supermarket and primary school) and access to housing (i.e. affordability and overcrowding).6 There is some evidence that it behaves differently from other deprivation indicators. For example, rural areas which generally fair well or better than average against deprivation indicators are relatively deprived in relation to barriers to housing and services in Central Lancashire14 and North Somerset.15 Rural locations tend to have higher house prices and be geographically remote from services. The practices with low uptake and a high ‘barrier to housing and services’ score tended to be in rural areas suggesting that being remote from a GP premises is associated with lower MMR uptake.

The lack of a correlation between MMR uptake and deprivation at practice level is unexpected and important. It suggests that high MMR coverage is achievable in socially deprived practices.

We found that practices reporting a strategy with clear objectives for MMR had higher uptake. Having a ‘strategic approach to MMR’ was a subjective judgement made by the respondents and was intended to imply a sense of direction and common purpose. There was a strong correlation between the responses to ‘MMR strategy’, ‘working as a team for MMR’ and ‘contacting non-attenders’, but the only one that was associated with MMR uptake was MMR strategy. It is likely that MMR strategy was a surrogate measure for these other more specific questions.

In total, 79% of respondents stated that their practice had a strategic approach to MMR. In contrast, when asked the same question about flu vaccination, 99% of respondents stated that their practice had a strategic approach to flu vaccination. This suggests that the MMR programme is less structured than the short and clearly focused seasonal flu programme. It is possible that respondents aligned their answer to this question to their MMR rates, i.e. if GPs knew their MMR uptake was high, they may comment that they had a ‘strategic approach’. However, we think that this is unlikely because 75% of practices reported they did not know their MMR uptake. In addition, practices did not know how their uptake compared with that of other practices.

We obtained information on the skill mix of immunizers within the practice (GP, practice nurse or health visitor) and found no association with MMR uptake. Similarly, no other immunization system factors were associated with MMR uptake. The failure to identify an overriding factor(s) for high uptake suggests that that high uptake practices probably use a combination of methods.

Limitations of the study

The sociodemographic analysis at lower level SOA profiles a small area around the practice (average population, 1500). For practices with a large number of patients living outside

---

Table 2 Association between General Practice factors and MMR uptake

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>&lt; 90% (n/total)</th>
<th>&gt; 90%, (n/total)</th>
<th>Odds ratio (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP does immunisation clinic</td>
<td>187</td>
<td>40.2 (51/127)</td>
<td>48.4 (29/60)</td>
<td>1.39 (0.71–2.73)</td>
<td>0.40</td>
</tr>
<tr>
<td>Practice works closely with health visitor</td>
<td>180</td>
<td>80.3 (98/122)</td>
<td>82.8 (48/58)</td>
<td>1.18 (0.48–2.90)</td>
<td>0.85</td>
</tr>
<tr>
<td>MMR discussed at a practice meeting</td>
<td>175</td>
<td>28.7 (35/122)</td>
<td>37.8 (20/53)</td>
<td>1.51 (0.72–3.16)</td>
<td>0.31</td>
</tr>
<tr>
<td>Practice works as a team for MMR</td>
<td>170</td>
<td>89.6 (103/115)</td>
<td>96.4 (53/55)</td>
<td>3.09 (0.61–21.06)</td>
<td>0.23</td>
</tr>
<tr>
<td>Practice has self-reported MMR strategy</td>
<td>160</td>
<td>73.1 (76/104)</td>
<td>91.2 (51/56)</td>
<td>3.76 (1.26–12.04)</td>
<td>0.01</td>
</tr>
<tr>
<td>Practice contacts non-attenders</td>
<td>163</td>
<td>83.4 (90/108)</td>
<td>80.0 (44/55)</td>
<td>0.80 (0.32–2.01)</td>
<td>0.77</td>
</tr>
<tr>
<td>A practice nurse knows MMR uptake</td>
<td>190</td>
<td>26.4 (34/129)</td>
<td>21.3 (13/61)</td>
<td>0.76 (0.34–1.67)</td>
<td>0.92</td>
</tr>
<tr>
<td>MMR audit done in practice</td>
<td>155</td>
<td>9.3 (10/108)</td>
<td>14.9 (7/47)</td>
<td>1.72 (0.54–5.40)</td>
<td>0.45</td>
</tr>
<tr>
<td>Practice nurse uses MMR video</td>
<td>175</td>
<td>16.7 (20/120)</td>
<td>12.7 (7/55)</td>
<td>0.73 (0.26–2.00)</td>
<td>0.66</td>
</tr>
</tbody>
</table>
the immediate area of the practice, the SOA may not accurately reflect the profile of the practice population. Hence, the sociodemographic analysis is not as powerful as one linked to an individual’s place of residence.

The information on the practice system for immunization was obtained through a questionnaire survey of practice nurses. The questionnaire was designed to provide information on different aspects of the immunization system within the practice. However, it can be difficult to investigate complex issues or detect subtle differences in the way practices run their MMR programme through a postal questionnaire. Qualitative methods, including interviews with practice staff, may be required to examine practice systems in more detail. This approach would help identify the finer details of what works and what does not in a strategy for MMR.

Conclusions

There will always be variation in immunization uptake between GP practices. However, for MMR vaccine, it is likely that the range of variation can be reduced. Our finding that sociodemographic factors and practice size were not associated with coverage strongly suggests that ‘process’ factors are important, i.e. the way practices approach and run their child vaccination programme. Although behavioural factors including individuals’ attitudes and beliefs are known to be important determinants of uptake, it is unlikely that they could explain the large variations in uptake between practices with similar sociodemographic profiles.

More research is required to understand how high uptake practices retain the confidence of parents for MMR and how these practices run such highly effective programmes. Some possible factors, for example, the commitment and confidence of immunizers, and the team working within the practice may be difficult to quantify. Parents do see health professionals as a key source of immunization advice and practice may be difficult to investigate complex issues or detect subtle differences in the way practices run their MMR programme through a postal questionnaire. Qualitative methods, including interviews with practice staff, may be required to examine practice systems in more detail. This approach would help identify the finer details of what works and what does not in a strategy for MMR.

Acknowledgements

We would like to thank the Child Health System Managers from the participating Primary Care Trusts for providing the MMR data, Suzanne Millward and Ruth Park from the Lancashire and South Cumbria Agency for providing the general practice data and Andy Wagner for providing the census data.

References


