

Effect of practice and patient population characteristics on the uptake of childhood immunizations

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SUMMARY

Background. The target-linked payments introduced by the 1990 general practitioners' contract were intended to reflect a close association between payments and performance in general practice. However, a straightforward direct relationship between service uptake in primary care and financial incentives should not be assumed.

Aim. This study set out to examine the relationship between the factors which provide a broad profile of practices and general practitioners' performance in terms of primary childhood immunization targets.

Method. Anonymized data on primary immunization uptake rates in 208 practices in Greater Glasgow Health Board and selected characteristics of the practices and their patient populations were analysed.

Results. Seventy five per cent of the practices in the study qualified for a high-target payment in the last quarter of the 1991–92 financial year, but only 53% managed to do so in all four quarters of the year. Tests of differences between means showed that the provision of child health surveillance, the 'notional' mortality ratio for each practice's patient population and the percentage of patients attracting deprivation payments were significant differentiating factors among the practices grouped according to immunization target achieved at 1 October 1991 — high target, low target and neither. There was no evidence that the target achieved was significantly affected by the activity or clinical staffing levels of the practices — number of patients per general practitioner, number of practice nurses or being single handed. A disproportionate number of practices reaching the high target were located in the more affluent areas, whereas a higher than expected proportion of those which either achieved the low target or missed both targets was located in the more deprived areas. Similar results were obtained when the performance of the practices in achieving the high target over four consecutive quarters was considered.

Conclusion. Practices serving populations living in socially deprived areas and with poorer health were less likely to achieve the high target for childhood immunizations. Evidence of repetition of performance in immunization uptake among the practices leads to concern over increased risk of infectious diseases among children from socially deprived populations who fail to be immunized. This seems to be yet another example of the inverse care law.

Keywords: immunization rates; uptake; general practitioner targets; practice population; practice profiles; socioeconomic factors.

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Submitted: 7 March 1994; accepted: 25 August 1994.

© British Journal of General Practice, 1995, 45, 205-208.

Introduction

THE target-linked payments for childhood immunization, pre-school immunization boosters and cervical cytology introduced by the 1990 general practitioners' contract are a good example of an implicit relationship between payments and performance in general practice. Financial incentives in the form of a three-fold differential in the levels of fees between the high and the low target were expected to have a considerable impact on the national uptake levels for the services. While this has led to an increase in the number of general practitioners providing the services (Department of Health, press release H93/1040, 4 November 1993; Scottish Health Service, Information and Statistics Division, personal communication),¹ it would be naive to expect a straightforward direct relationship between service uptake in primary care and financial incentives. There is abundant evidence that the uptake of these services tends to be affected by confounding factors beyond the control of general practitioners, such as the socioeconomic conditions, ethnicity and place of residence (rural/suburban versus inner cities) of the patient populations.²⁻⁹ Some of the factors may intrinsically reflect conditions relevant only within the microcosm of an individual practice or a small number of practices in a locality, but others have a wider domain of reference.

Using data for the Greater Glasgow Health Board, this paper examines the relationship between the factors which provide a broad profile of practices and general practitioners' performance in terms of primary childhood immunization targets. Cross-sectional and short-term longitudinal analyses of the data were carried out in an attempt to identify differentiating aspects of the practices' characteristics and their patient populations which affect immunization uptake and may lead to repetition of performance by the practices.

Method

The data used in this analysis consist of anonymized information for 208 practices in the Greater Glasgow Health Board area on the uptake of childhood immunizations during the 1991–92 financial year and a set of selected descriptors which provides a profile of the practices and of their patient populations. The practices in the study comprised 92% of all practices in the Greater Glasgow Health Board during the 1991–92 financial year; those which operated for only part of the year or did not have children qualifying for primary immunizations were excluded. Tests for differences between means, based on analysis of variance, were used to identify associations between the childhood immunization targets achieved and the characteristics of the practices and their patient populations.

The information on immunizations related to mean uptake rates for three groups of antigens — diphtheria, tetanus and poliomyelitis; pertussis; and either measles or measles, mumps and rubella — notified to the health board for the purpose of calculating the quarterly immunization target payments during the 1991–92 financial year. High-target payments are made to general practitioners with uptake rates of 90% or more among their eligible patients (children aged two years on the first day of a quarter) and low-target payments to those with uptake rates

between 70% and 89%; rates below 70% do not qualify for these payments. Targets were calculated on the basis of the uptake rates achieved on the first day of each quarter and the payments were made in the following quarter.

Two methodological approaches were used in this study. First, the practices were separated into three groups according to the target level achieved at 1 October 1991 — high target, low target or neither; *F* tests were applied to determine the statistical significance of the difference between the means for selected indicators across the groups. Secondly, in order to ascertain whether the same relationships held over time, the practices were grouped according to performance concerning the high target only over four consecutive quarters — consistent achievers (high target achieved in all four quarters), occasional achievers (one, two or three quarters) and non-achievers (none of the quarters) — and the same statistical analysis was performed across these groups.

A number of indicators based on 1991–92 data were used to compose a profile of the practices — list size and the number of general practitioners in the practice, number of children eligible for immunization, number of practice nurses, and whether or not the practice provided child health surveillance. All but the last of these give a general indication of activity in the practices. Both the number of general practitioners and practice nurses were measured in terms of whole time equivalents. Health visitors often play an important role in helping general practitioners to achieve their immunization targets, especially by making direct contact with families of children who fail to attend immunization appointments. However, information on the number of health visitors attached to the practices was not available. The list size and the number of general practitioners were used to provide a measure of potential workload — the number of patients per general practitioner. Providers of child health surveillance were expected to place greater emphasis on preventive child health services and would therefore be in a better position to take advantage of opportunistic contacts to carry out immunizations. Whether or not the practices were single handed was also included in the analysis.

The characteristics of the patient population of each practice were captured by a proxy for health status — the 'notional' standardized mortality ratio for the practice population — and by two socioeconomic indicators — the percentage of patients attracting deprivation payments based on the Jarman score, and the neighbourhood type of each practice location. The 'notional' standardized mortality ratio was calculated as the mean value for the mortality ratio for the postcode sector of residence of each patient in the practice population (standardized mortality ratio for Scotland = 100); this has been reported as being closely associated with a wide range of other health indices.¹⁰ The neighbourhood types were originally developed at the Greater Glasgow Health Board using 1981 census data to describe groups of postcode sectors with similar housing and socioeconomic characteristics.¹¹ Eight cluster groups revised on the basis of the 1991 census provide a ranking from the most affluent to the most deprived areas. Although the neighbourhood types relate to the practice location and not the patients' place of residence, they are expected to reflect the socioeconomic conditions of the area covering each practice's catchment population.

Results

The mean values of the practice and patient population characteristics for the practices grouped according to the target levels achieved are given in Table 1. The values for the group which failed to reach either the high or the low target are based on only 10 practices and should therefore be interpreted with caution. Exact confidence intervals were calculated for the percentages relating to the characteristics of the practices in this group to give a more precise measure for these intervals, given the small number of observations; this method was used because the assumption of normality does not hold in such cases.¹² Statistically significant differences were detected across the three groups in the mean values for the identifier of practices providing child health surveillance, the standardized mortality ratios and the percentage of patients attracting deprivation payments. A significantly higher percentage of high-target achievers were providers of child

Table 1. Practice and patient population characteristics, by immunization target achieved at 1 October 1991.

	Mean (95% CI) for practices achieving							
	High target (n = 155)		Low target (n = 43)		Neither target (n = 10)		All practices (n = 208)	
<i>Practice characteristic</i>								
Number of patients per GP ^a	1738	(1672 to 1804)	1841	(1655 to 2027)	1682	(1275 to 2089)	1764	(1699 to 1829)
Number of eligible children ^a	58	(52 to 64)	54	(40 to 68)	31	(19 to 43)	56	(51 to 61)
% of providers of child health surveillance services ^a	72.3	(65.3 to 79.3)	53.5	(38.6 to 68.4)	30.0***	(6.7 to 65.3) ^b	66.4	(63.1 to 69.7)
% of single-handed practices ^a	20.6	(14.2 to 27.0)	25.6	(12.6 to 38.6)	50.0	(18.7 to 81.2) ^b	24.0	(21.4 to 27.0)
Number of practice nurses ^c	0.81	(0.74 to 0.88)	0.67	(0.56 to 0.78)	0.37	(0.16 to 0.57)	0.77	(0.71 to 0.83)
<i>Patient population characteristic</i>								
'Notional' SMR ^d	116.5	(114.1 to 118.9)	129.1	(124.8 to 133.4)	138.3***	(131.2 to 145.4)	120.1	(117.9 to 122.3)
% of patients attracting Jarman deprivation payments (deprivation levels) ^a								
High	3.5	(3.0 to 4.0)	6.0	(5.1 to 6.9)	9.8***	(7.3 to 12.3)	4.4	(3.9 to 4.9)
Medium	5.4	(4.7 to 6.1)	9.0	(7.6 to 10.4)	9.9***	(7.9 to 11.9)	6.3	(5.7 to 6.9)
Low	8.3	(7.4 to 9.1)	12.1	(10.1 to 14.1)	14.1***	(10.5 to 17.7)	9.3	(8.5 to 10.1)
Total	17.2	(15.5 to 18.9)	27.1	(23.7 to 30.4)	33.8***	(30.5 to 37.1)	20.0	(18.4 to 21.6)

CI = confidence interval. n = number of practices. SMR = standardized mortality ratio. ^aMean over the four quarters of the 1991–92 financial year. ^bExact confidence intervals. ^cRelates to the end of March 1991; data were not available on a quarterly basis. ^dBased on mortality figures for 1987–89. ****P* < 0.001 across the three target groups.

health surveillance. There was also evidence of a gradient in the mean values for the standardized mortality ratios and the total percentage of the practice populations attracting deprivation payments. These values were, respectively, 9.8% and 36.5% lower among the practices which achieved the high target, compared with the low-target achievers. The gap between the high-target practices and those which missed both targets was even greater — the latter had an excess mortality of 18.7% and proportionally almost twice as many patients living in deprived areas.

The relationship between the target achieved and social deprivation was confirmed by the distribution of the practices by neighbourhood type (Table 2). Over half the high-target practices were located in the more affluent areas (neighbourhood types one to four). In contrast, some 60% of both the low-target practices and those which missed the two targets were in the most deprived areas (seven and eight); none of those practices failing to reach either target was in the most affluent areas (one and two). These figures do not reflect the pattern shown by the distribution of all 208 practices across the neighbourhood types; a disproportionate number of the high-target achievers were located in the more affluent areas and of the other two groups in the more deprived areas.

Just over half of the 208 practices qualified for high target payments for all four quarters of the 1991–92 financial year (53.4%). The statistically significant differences in practice and patient characteristics for consistent achievers of the high target, occasional achievers and non-achievers are shown in Table 3. The consistent achievers were more likely to have lower mortality rates and a lower percentage of patients receiving deprivation payments, compared with those practices which repeatedly failed

to reach the 90% target. The provision of child health surveillance and the number of eligible children also emerged as significant differentiating factors. Except in the case of the latter, the mean values for all the variables for the occasional achievers fell between those for the other two groups.

Sixty four per cent of consistent achievers, but only 30.6% of the occasional achievers and 14.3% of the non-achievers, were located in the more affluent neighbourhoods (one to four); the equivalent figures for the more deprived neighbourhoods (seven and eight) were, respectively, 21.6%, 46.8% and 60.0% (Table 4).

One important aspect of these findings is the indication that, when measured by standardized mortality ratios, the health of the patient populations of the practices which repeatedly failed to reach the high target was significantly poorer than that of the populations of the consistent achievers. Apart from the indication of a gradient in the mean standardized mortality ratios across the three groups, 80.8% of the practices in the bottom quartile of the standardized mortality ratio distribution (84.3–111.5) were consistent achievers and the remaining 19.2% occasional achievers. Among the practices in the top quartile (130.7–171.4), most were non-achievers (42.3%), followed by the occasional achievers (32.7%) and consistent achievers (25.0%).

Discussion

The half-yearly published figures on childhood immunizations in Scotland show that at least since April 1990, the percentage of general practitioners in the Greater Glasgow Health Board area achieving the 90% childhood immunization target has been consistently below the mean for the health boards in Scotland; from April 1991 to April 1993 that percentage was the lowest of all the health boards, except for the Western Isles (October 1991) and Highland and Orkney (October 1992) (Scottish Health Service, Information and Statistics Division, personal communication).¹³

The Greater Glasgow Health Board is in the unenviable position of having to provide health care for a population of about 900 000 people, half of whom live in the most deprived areas in Scotland and suffer from relatively poor health.¹⁴ It is therefore of great concern, albeit not surprising, that socioeconomic and health-related indicators appear to have a significant effect on the ability of the general practices in the health board to reach high immunization targets and that fewer of its general practitioners, compared with most health boards in Scotland, have been able to

Table 2. Distribution of practices by neighbourhood type and immunization target achieved at 1 October 1991.

Neighbourhood type	% of practices achieving			All practices (n = 208)
	High target (n = 155)	Low target (n = 43)	Neither target (n = 10)	
1/2	14.8	2.3	0	11.5
3/4	40.0	16.3	20.0	34.1
5/6	18.1	20.9	20.0	18.8
7/8	27.1	60.5	60.0	35.6

n = number of practices.

Table 3. Practice and patient population characteristics, by achievement of high immunization target over the four quarters of 1991–92.

Practice characteristic	Mean (95%CI) for practices achieving high target		
	Consistently (n = 111)	Occasionally (n = 62)	Never (n = 35)
<i>Practice characteristic</i>			
Number of eligible children ^a	62 (55 to 69)	45 (38 to 52)	58* (42 to 74)
% of providers of child health surveillance ^a	77.5 (69.7 to 85.3)	61.3 (49.2 to 73.4)	40.0*** (23.8 to 56.2)
<i>Patient population characteristic</i>			
'Notional' SMR ^b	114.2 (111.3 to 117.1)	123.9 (120.8 to 127.0)	134.0*** (129.5 to 138.5)
% of patients attracting Jarman deprivation payments (deprivation levels) ^a			
High	3.1 (2.6 to 3.6)	4.6 (3.9 to 5.4)	7.6*** (6.4 to 8.8)
Medium	4.5 (3.8 to 5.1)	7.4 (6.2 to 8.5)	10.5*** (9.1 to 11.8)
Low	7.7 (6.7 to 8.7)	9.7 (8.4 to 11.0)	14.1*** (12.0 to 16.0)
Total	15.3 (13.4 to 17.2)	21.7 (19.0 to 24.0)	32.2*** (29.1 to 35.3)

CI = confidence interval. n = number of practices. SMR = standardized mortality ratio. ^aMean over the four quarters of the 1991–92 financial year.

^bBased on mortality figures for 1987–89. *P<0.05, ***P<0.001 across the three target groups.

Table 4. Distribution of practices by neighbourhood type and achievement of high immunization target over the four quarters of 1991–92.

Neighbourhood type	% of practices achieving high target		
	Consistently (n = 111)	Occasionally (n = 62)	Never (n = 35)
1/2	19.0	4.8	0
3/4	45.0	25.8	14.3
5/6	14.4	22.6	25.7
7/8	21.6	46.8	60.0

n = number of practices.

reach immunization uptake rates of 90% and over. What is striking, however, is the evidence that, despite these adverse factors, more than half the practices achieved the high target repeatedly during the period under study and that 22% of those in this group were located in the most deprived areas served by the health board.

This study is based on anonymized, aggregate, routinely collected data, which precludes an indepth examination of the circumstances of individual practices. Selected indicators have been used to provide a profile of the practices accounting for potential workload, clinical staff availability and the characteristics of the patient populations. These factors, however, do not seem to explain fully the forces which enable some practices in a group facing similar conditions, to perform considerably better.

All general practitioners in the Greater Glasgow Health Board benefit from a centralized call and recall system, supported by health visitors' contacts with the families of children who fail to attend appointments without an explanation. In addition, general practitioners make their own arrangements for contacting non-attenders. Although information is not available for each practice on the numbers of patients failing to attend appointments, the procedures adopted by practices to contact these patients, or the success rate, it would be expected that differences in the management of such cases would explain some of the variation in the immunization uptake of these practices. The data available, however, do not allow exploration of this issue.

The setting of the area served by Greater Glasgow Health Board, with its problems of social deprivation and poor health, offers a valuable opportunity for an examination of the appropriateness of a global measure of performance in health care provision applied to general practices operating under considerably different conditions. The evidence discussed here does not provide a great deal of support for such a measure. There may be a case for recognition, beyond the deprivation-related payments, that in the case of some practices the effect of exogenous constraints cannot be offset by financial incentives, despite the importance of such incentives.

The negative association between immunization uptake and social deprivation demonstrated here corroborates findings from a number of studies showing lower uptake rates for health services in Great Britain, including childhood immunizations, among socially deprived populations compared with more affluent groups.^{2,4-6,8} The pressing issue of public health concern in the context of childhood immunizations is, however, that the populations of the practices having difficulties in reaching the high immunization target are also those with poorer health. This problem is aggravated by the indication that practices with past uptake rates within the low-target limits have a low probability of reaching the high target in the future.¹⁵ The consistent repetition of poor performances in immunization uptake in areas of social deprivation is likely to increase further the risk of infec-

tious diseases among the children from such populations who are not immunized. This seems to be yet another example of the inverse care law.²

This study has identified only some of the factors driving this apparent 'deterministic' process, but it is important that further exploration of these issues is undertaken through an indepth analysis of the *modus operandi* and ecology of the practices failing to achieve the high immunization target to provide an understanding of the reasons for their performance.

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Acknowledgements

I am grateful to John Womersley and colleagues at the Greater Glasgow Health Board and to the Information and Statistics Division (Edinburgh) for their cooperation in providing the data used in this paper. I am also grateful to Andrew Boddy and three anonymous referees for helpful comments. Any errors are my own responsibility. The Public Health Research Unit is supported by the Chief Scientist Office of the Scottish Office Home and Health Department and by the Greater Glasgow Health Board. The opinions in this paper are not necessarily those of the Scottish Office Home and Health Department or the Greater Glasgow Health Board.

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