

PRACTICE OBSERVED

Practice Research

An epidemiological method applied to practices to measure the representativeness of their prescribing characteristics

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Abstract

The standardised report of the Prescription Pricing Authority, which is concerned with the prescribing characteristics of practices, was used as an epidemiological tool to evaluate the prescribing representativeness of practices. Study practices were compared with average prescribing rates from family practitioner committees, which are specific for the geographical district and month sampled. The method was applied in 40 practices, representing 120 doctors who had been recruited to the third morbidity study in general practice. In these practices 488 items per 1000 people had been prescribed compared with 548 items per 1000 people from the matched values of family practitioner committees. There was a parallel reduction in the net ingredient cost of items per 1000 people—£1414 for the practices compared with £1600 for the family practitioner committees. These differences were highly significant. The average net ingredient cost was the same for both groups. Study practices were biased towards reduced prescribing costs for drugs used to treat infections, respiratory diseases, disorders of the nervous system, skin disease, rheumatic disorders, and gastrointestinal problems. The comparison and its interpretation provide a model that may be used by individual practices to evaluate their own prescribing reports.

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Introduction

In epidemiological studies it is often necessary to establish that the study population is representative of the population in which the study is based. Because of the variability introduced into the clinical consultation by the interpretation of the doctor or the former type of study—case-control—is associated with the rigorous testing of hypotheses that are generated independently and these studies produce new knowledge. The latter type is exemplified by the large scale morbidity study which is directed towards acquiring information to manage a health service, though this type of study may also produce new knowledge. In such a study the representativeness of the population and of the doctors participating is especially important. This paper discusses a method for examining the representativeness of the prescribing characteristics of practices. It was applied to practices that were recruited to the third morbidity study from general practice, which was conducted during the 12 months beginning July 1981. This study is based on a diagnostic index that is maintained in the practices and on analysis at the Office of Population Censuses and Surveys that is linked to data obtained through the national census.¹ The method is based on the annual practice report that is analysed of one month's prescribing that is undertaken for British general practitioners. The material was provided by the Prescription Pricing Authority, Newcastle upon Tyne, which is concerned with prescribing by doctors in England. Similar agencies exist in Scotland, Wales, and Northern Ireland. The paper also describes the prescribing report and

total net ingredient cost ($t=180$, $z=3.09$, $p=0.002$ —two tailed). Relative to family practitioner committee average values the 40 study practices incurred £38 000 less in costs during one month, equivalent to £700 000 a year (table IV).

TABLE IV—Gross prescribing costs of study practices compared with family practitioner committee average costs for practices of equal size

No of principals in partnership	Study (£)	% of family practitioner committee	Family practitioner committee (£)	Difference (£)
1	37 837	66.3	57 000	1 944
2	54 328	94.0	57 570	1 642
3	71 402	100.0	71 402	0
4	211 586	91.8	230 401	18 815
5-6	8 062	90.4	8 900	838
All	447 982	88.4	506 324	58 342

Table V gives the distribution of study practices related to family practitioner committee average values for the three prescribing statistics for each therapeutic class. Statistical evaluation using the Sign test was made on the distribution of practices for the net ingredient cost rate, which is a consolidation of the other two statistics. Results by therapeutic class are ranked roughly according to the value of the z statistic. The distribution of the number of doctors represented by the study practices is given for this statistic. The overall pattern shows bias in the distribution of study practices towards reduced item and net ingredient cost rates, with less effect on the average net ingredient cost. The pattern is not uniform, with a maximum impact in anti-infective drugs where the biased distribution for the net ingredient cost rate arises mainly from the negative bias in the item rate. For respiratory drugs the bias also stems from the negative bias in item rate which is of sufficient magnitude to submerge a positive bias in average net ingredient cost. For drugs used in the treatment of disorders of the nervous system, skin disorders, rheumatism, and cardiovascular disorders the bias in distribution of practices for average net ingredient cost is noteworthy.

Discussion

This report serves three purposes. The chief intention is to describe a method for use in epidemiological research which considers the representativeness of practices. Though the comparison is concerned only with prescribing characteristics, the information carries wider implications than are indicated by prescribing cost. Secondly, it has been used to assess the representativeness of practices recruited to the third morbidity study in general practice. Finally, it provides a model whereby practices may examine their own representativeness in relation to average results from the family practitioner committee. Doctors and not practices determine prescribing. Thus, data for individual doctors are preferable to average data for the practice. The report of the Prescription Pricing Authority cannot provide data about individual doctors as rates because:

TABLE V—Distribution by practice for prescribing data in relation to family practitioner committee average values

Therapeutic class	Item rate			Average net ingredient cost			Net ingredient cost rate						
	Less	Same	More	Less	Same	More	Practice		Doctor		More		
Anti-infective	36	0	14	23	0	17	33	1	6	4 172*	95	3	22
Respiratory	25	3	15	15	1	13	28	0	12	2 374*	82	0	38
Nervous system	25	0	15	24	1	15	28	0	12	2 374*	82	0	38
Skin	25	1	14	20	1	14	20	0	12	2 374*	82	0	38
Cardiovascular	22	4	10	27	0	13	27	0	13	2 064*	86	0	34
Rheumatism	20	0	10	27	0	13	27	0	13	2 064*	86	0	34
Allergy	19	0	15	20	0	20	24	0	16	1 111	74	0	46
Constitutional	19	0	15	20	0	20	24	0	16	1 111	74	0	46
Hormones	19	2	10	24	0	16	20	2	18	1 116	66	7	67
All drugs	24	2	14	21	1	18	26	1	13	1 924*	82	5	33

* $p<0.01$ (one tailed).
* $0.01<p<0.05$ (two tailed).

illustrates how it may be used by practices to examine their own prescribing.

Prescribing reports

Since 1956 the prescriptions issued during one month in each year have been collected by the Prescription Pricing Authority. The month concerned is determined in each region, unknown to the general practitioners concerned. The prescriptions are analysed to provide the number of items each doctor has prescribed and their net ingredient cost, which includes dispensing costs and profit. Information from individual doctors is consolidated into practice results and presented as rates, using the number of patients registered on the practice list as the denominator. For comparison, similar information is provided about the local average rates from the family practitioner committee.

In the past two years the Prescription Pricing Authority has been computerising prescribing data, which has facilitated the preparation of more detailed prescribing reports (table I). Prescribing information

TABLE I—Extract from prescribing report

Analysis of practice prescribing for July 1981			
Practice profile	Practice	Family practitioner committee average	Variation
Total No of people on National Health Service list	8 886		
Including:			
No of people aged 65 and over	1 606		16.6%
No of temporary residents	46		
Comparison of prescribing with family practitioner committee average			
No of items prescribed	4 052	13 067	
Net ingredient cost for 1000 people	1 471	1 640	10% less
Net ingredient cost for 8886 people (£)	13 307	14 272	10% less
Gross cost of prescribing (£)	15 954	17 793	
Average net ingredient cost per item in therapeutic group for July 1981			
Therapeutic group	Practice (£)	Family practitioner committee (£)	Variation between practice and family practitioner committee
Nervous system	1.76	1.82	-0.06 3.1%
Cardiovascular system	4.06	3.75	+0.31 8.3%
Respiratory system	3.28	3.24	+0.04 1.2%
Anti-infectives, urinary	1.97	2.40	-0.43 17.9%
Anti-infectives, other	1.37	1.54	-0.17 12.5%
Malignancy	2.38	1.14	+1.24 108.8%
Skin and mucous membranes	1.72	1.71	+0.01 0.6%
Other drugs and preparations	1.36	1.36	0.0%
Dressings and appliances	1.70	1.88	-0.18 10.1%

for the specified month is presented for each therapeutic class, also indicating the variation from the local family practitioner committee average. In addition, the report gives details of the distribution of items on each prescription form issued, the total net ingredient cost, and the average net ingredient cost per item by therapeutic class. The report for individual doctors includes an analysis by major therapeutic group and a list of individual prescriptions.

Practice prescribing reports were consolidated by size of practice partnership (number of principals) at the time of the study. The average rates for the month in question obtained from the local family practitioner committee and presented in the report were used for comparison. Thus each practice value was matched geographically (at the level of the family practitioner committee, of which there are 90 in England) and by month of analysis. Each family practitioner committee value is a pooled average rate per population and will equal the average equivalent practice rates unless there are substantial differences in the prescribing characteristics of practices that are related to the size of the partnership. The mean rates in the study practices for the proportion of elderly people (aged 65 and over) and the mean prescribing rates for all

drugs (number of items prescribed per 1000 persons—item rate; average net ingredient cost per item—average net ingredient cost; net ingredient cost per 1000 persons—net ingredient cost rate) are compared with the family practitioner committee means. The differences between practice values for the number of items prescribed and total net ingredient cost, on the one hand, and family practitioner committee equivalent values, on the other, were ranked and these distributions were examined using a Wilcoxon's matched pairs signed ranks test. Item rates, average net ingredient cost, and net ingredient cost rates for each therapeutic class were also computed. The distribution of practices relative to the local family practitioner committee average was summarised and the Sign test applied to the distribution of practices for the net ingredient cost rate. Having established a difference in total prescribing for all drugs, a one tail test was used to test the hypothesis that the distribution of practices was biased towards a reduced net ingredient cost rate.

Results

Full prescribing reports were obtained from 40 of the 48 practices, incorporating data from 120 of the 144 principals participating in the third morbidity study. Reports were not available in the remaining eight practices.

Table II gives the mean number of patients in each practice by size of partnership. The mean proportions of patients aged 65 and over in each practice are similar to the family practitioner committee average values, overall and separately for each partnership size.

The distribution of the practice results (and the number of doctors represented by those practices) for each of the three prescribing statistics were examined. The distribution of the net ingredient cost item rates but the remaining two statistics were roughly normally distributed. The mean item rate in all practices was 488 (table III), which can be compared with the family practitioner committee equivalent of 548.

TABLE II—Practice population

No of principals in partnership	No of practices	Mean number of patients per list per doctor	Total No of patients	% of patients aged 65 and over
1	8	2232	17 856	20.3
2	7	2240	15 680	19.9
3	13	2222	11 544	15.1
4	6	2222	13 332	15.6
All	40	2174	260 994	19.7

TABLE III—Prescribing data by size of partnership and family practitioner committee average

No of principals in partnership	Item rate	Average rate		Net ingredient cost rate	
		Family practitioner committee	Family practitioner committee	Family practitioner committee	Family practitioner committee
1	570	2.99	1.667	1467	1467
2	452	3.17	1.677	1421	1499
3	508	2.97	1.643	1403	1457
4	568	2.96	1.652	1463	1463
All	488	2.97	1.646	1436	1610

The values for the study practices in each partnership size are all less than the family practitioner committee equivalent; values for the average net ingredient cost were similar; values for the net ingredient cost rate were less in study practices. The distribution of the results in study practices related to the family practitioner committee equivalent values for the total number of items prescribed was examined using a Wilcoxon matched pairs signed ranks test and a highly significant difference identified ($t=188$, $z=2.98$, $p=0.003$ —two tailed). A similar difference was found in comparing results for

million people included in these practices had less need for antibiotics than the population in general, and therefore it must be concluded that for this group of drugs there was a substantial difference in the prescribing behaviour in study practices. The study practices issued fewer prescriptions for respiratory drugs, especially fewer of the cheaper preparations, which strongly suggests that patients in the study practices were not given many drugs for minor respiratory illness—a policy advocated by Marsh.² Despite the overall similarity between study practices and family practitioner committee values for the average net ingredient cost, the results in many of the therapeutic classes suggests that the doctors recruited to the third morbidity study selected cheaper drugs. It is tempting to assume that these differences between the prescribing in study practices and family practitioner committee averages are evidence of responsible prescribing and indicate quality. Unfortunately, that judgment may be made only in relation to personal views about what quality is since it cannot be defined scientifically. Nevertheless, for the individual practice examining its own data, it is legitimate to evaluate results against personal judgments of what is desirable, which must, wherever possible, be based on the results of research and measured experience. The method described here provides a convenient and simple

Diary of Urban Marks: 1880-1949

In 1922 in March I thought I would like to go into public life a little more. The stepping stone to the council in those days was by way of the Board of Guardians in the majority of cases. Accordingly, I got a few friends to nominate me as a Guardian for the Alexandra Ward, the one in which I live. I appointed Mr Sidney Phillips as my agent and had a committee room just round the corner from my house. Phillips contrived to get together a band of canvassers who did their work thoroughly. I did no canvassing to any extent since I felt I was so well known and because there were five candidates for three places. Two of these, myself and Mr Malyn who was a fuel worker in the week time and a Salvation Army official on Sundays, standing in the Station square drum thumping, were independent candidates, while the other three were nominees of the Labour Council. Phillips reported to me one night that a man named Neal who owed his life to my labours on his behalf had said that he would not vote for me. Being interested as to his reason, we went to see him. On being asked by me why he was not in my firm he replied that he was a Labour man. I pleaded with him that he could give me one vote out of three but he was adamant. I offered him a cigarette and also a match which afterwards I blew out. Holding the spent match up I said to Neal: "Then it really comes to this. If this match were labelled Labour, you would vote for it although it is quite useless." Neal admitted that that would be the case. I felt I could not understand the mentality of the voters and said I would withdraw my candidature. Phillips told me not to be a fool, and so I went on. The election day dawned and I thought one of the worst snowfalls I have ever seen in this part of the world. The ward is very hilly but

(a) The registered list size of a doctor in a partnership often bears no relation to his total commitment to the practice. (b) The report is based on a sample of one month's prescribing and takes no account of the absences of individual doctors owing to sickness, holiday, or study during that month. (c) Variations in the working patterns of individual doctors in a practice may produce prescribing rates that cannot be compared meaningfully with family practitioner committee average rates. Thus, for example, the senior partner may see relatively more elderly patients, a woman doctor more women, and a doctor with a special interest (say, in psychiatry) may see one group of patients preferentially. (d) Prescriptions issued by trainees are analysed with those of principals.

Thus the only basis for comparison is the practice average. When comparing rates based on practices of different numbers of partners, however, consideration must be given to the number of doctors represented. The use of the total number of items prescribed and total net ingredient cost (rather than rates) provides a weighting appropriate to the population of the practice. The potential for difference between the practice and family practitioner committee equivalents (either positive or negative) is maximal in large practices, which are thus more likely to gain a high rank for a test based on ranked differences.

In ranking study practices and average family practitioner committee rates it is not possible to discriminate between differences in average net ingredient cost due to the prescribing of a reduced quantity of drugs from those due to prescribing cheaper drugs. The former is unlikely, however, anti-infective drugs, for example, are invariably prescribed by general practitioners in five day courses, and there are widely accepted prescribing norms in most prescribing areas. Furthermore, for chronic disorders, such as cardiovascular disease, a reduced average net ingredient cost, if due to the reduced quantity of prescriptions, would be compensated by an increased frequency of prescribing and hence an increased item rate. The proportion of elderly people in study practices accorded closely with family practitioner committee values regardless of practice size. Though recruitment of practices to the third morbidity study was not made at family practitioner committee level, it is gratifying to note this similarity, with the implication for the representativeness of the population.

The reduction in prescribing are not uniform, which suggests that they are not due simply to a generalised reduction in consultation rates in the study practices, though it does not exclude some selective reductions. Statistics are not available for the proportion of consultations that do not result in a prescription being issued; hence these variations cannot be studied further. The most plausible explanation is that the study doctors are less likely to prescribe than doctors in general. This does not mean that they see different patients or have different problems or that they diagnose them differently. These are separate issues.

Patients cannot purchase antibiotics without a prescription from a doctor. It is beyond credibility that the quarter of a

way to assess the prescribing representativeness of the practices using data which are available from a source that is independent of the researcher. The analysis must be comprehensive and examine in detail the various therapeutic classes if the comparison is to be adequately applied.

This study was undertaken as the result of the cooperation of the staff of the Prescription Pricing Authority in Newcastle upon Tyne, who provided the prescribing reports. I thank the doctors recruited to the second morbidity study in general practice for allowing this material to be released. K W Cross (Department of Social Medicine, Birmingham University) for helpful statistical advice, and my colleague D L Crombie for help in the preparation of this paper.

References

- Birmingham Research Unit of the Royal College of General Practitioners. The diagnostic index. *J R Coll Gen Pract* 1971; 21: 608-12.
- Office of Population Censuses and Surveys, Royal College of General Practitioners, Department of Health and Social Security. *Morbidity statistics from general practices*. *Statistical Series No. 1987-72*. Studies on Medical and Social Administration, London, 1972.
- Royal College of General Practitioners, Office of Population Censuses and Surveys. *Statistical Series No. 1977-72*. Studies on Medical and Social Administration, London, 1977.
- Marsh GN. "Caring" minor illness in general practice. *Br Med J* 1977; 1: 257-60. (Accepted 30 July 1984)

I had plenty of cars to take the voters to the polling booths, one in Trinity Place and one in Ebenezer Street, which is off the High Street.

Malyn had very few cars and during the morning he came to my house and asked me for the loan of some of mine. He suggested that as we were the two independent candidates we should pool our resources in cars and voters. He said that if I would tell my supporters to vote for him he would reciprocate. He could get scores of voters from his particular quarter. I agreed and also suggested that we should have some cards printed with "Vote for the two Ms." These were hurriedly done and distributed. So the day wore on. I went after voters who were in no hurry and at eight o'clock when the voting ceased I was dead tired. Nevertheless, I had to stop in the polling booth for the count, which resulted in Malyn, myself, and Mrs Kelly being elected. I was carried shoulder high from the booth and had to make a speech from my front gate. The election resulted in a majority for the Independents by no less than eight. Every month before the Board of Guardians met the Independents held a meeting at the offices to discuss policy. I soon found that the Independents were too independent. If one of us suggested a certain line of policy and if one single member disagreed with it he would refuse to back the policy and reserved the right to speak again at the board meeting. Now the Labour side put up one man to propose a resolution and another to second it, and whatever the individual views might have been each member voted for the motion. So that the net result was that in spite of our majority the Independent side got very little done at all.