

PATTERNS
of
PRESCRIBING

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PATTERNS *of* PRESCRIBING

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with a foreword by
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Office of Health Economics

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Foreword

Outcomes, it is commonly said by general practitioners, are more difficult to measure in our discipline than those in hospital based specialties. This is true but it should not be used as an excuse for continuing sloppy work, for sufficient measures of outcome do exist to keep practices busy with audit for some time to come. We have good data – arguably the best in the world – about the incidence and prevalence of common disease in the community and where these can be linked to effective treatments we have a very valuable tool indeed. Two examples of this linkage are described in this paper. We know the prevalence of hypertension and diabetes. We know the benefit to patients of good control of these conditions and we can to some extent measure the savings to the National Health Service provided by that good control. We are now beginning to get good data about our prescribing for these conditions and combined they provide a lesson for every general practitioner in the country and an indication of where the first audit exercises might most usefully be concentrated.

Professor Teeling Smith has shown that even in those practices which have disciplined themselves to record accurately their prescribing, using computer systems, there is a significant under-identification of hypertensive patients and diabetic patients who could benefit from treatment. There is a probability that in less well-organised practices the shortfall would be greater. This is one important fact highlighted in this paper. There is a second, equally important. The phrase with which we have become comfortable, for it sounds better than ‘cutting costs’, ‘downward pressure’ on prescribing may actually do more harm than good and be more expensive if applied in an unsophisticated manner to our work. If our costs have been reduced by our failure to identify people, such as those who could benefit from care of raised blood pressure or non-insulin dependent diabetes, it would be a very expensive saving indeed.

Fortunately, it is unlikely to happen. The FHSAs are now advised by competent ex GPs who are unlikely to fail to understand the

message of this paper. It is even probable that it will trigger a welcoming response from busy GPs who wonder about the benefit to patients from much of what they are being asked to do by their new contract. Here is a real opportunity by which audit in the practice identifying the prevalence rates of two very common problems, linked with examination of PACT data, can do something intellectually satisfying and providing real help to their patients. Furthermore, it shows the way in which we can look at cost-benefit for many other conditions as diverse as hypothyroidism and schizophrenia – a very exciting prospect.

Michael Drury

Introduction

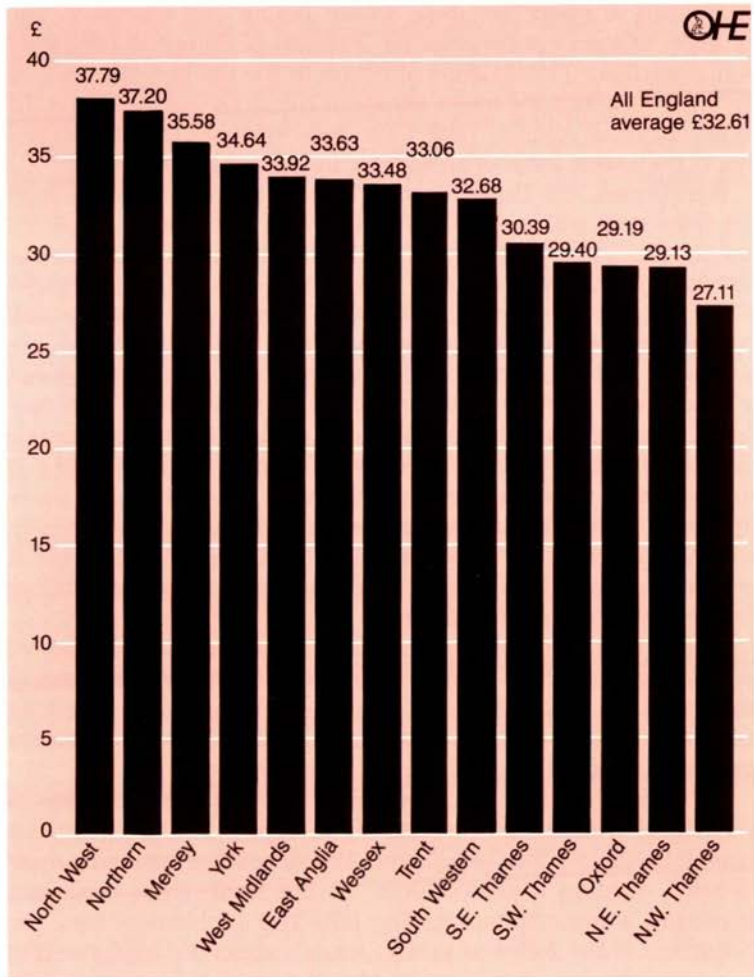
Over the years there has been considerable interest in the variations in patterns of prescribing both within Britain and elsewhere. For example, O'Brien's publication on 'Patterns of European Diagnoses and Prescribing' (1984) drew attention to the marked difference in the ways in which the major European countries treated disease. In terms of overall volume, Table I (on page 9) shows that Britain has one of the lowest levels of prescribing by European standards.

Nonetheless, the Department of Health has drawn attention to the differences within Britain in the cost of prescribing. It pointed out that in 1986/87 the cost per head ranged from £26 in one Family Practitioner Committee district to £48 in another (HMSO 1989). Figure 1 shows the Regional variations in 1987. The conventional wisdom has often been that 'lower' prescribers are somehow 'better' doctors. This paper questions that conventional wisdom, and produces evidence to suggest that those with low levels of prescribing may be failing to treat much of the chronic disease which is prevalent in their practice. Whilst there is undoubtedly wasteful and unnecessary prescribing in some instances, which the British government is properly seeking to eliminate through the appointment of local 'medical advisers', it would be dangerous to suppose that in general low cost prescribing represented 'good' medical practice.

There are, of course, two factors which affect the cost of prescribing. The first is its total volume and the second the price of the individual items prescribed. Although this paper concentrates on variations in volume, it does also recognise that some attention must be paid to the price of different prescriptions.

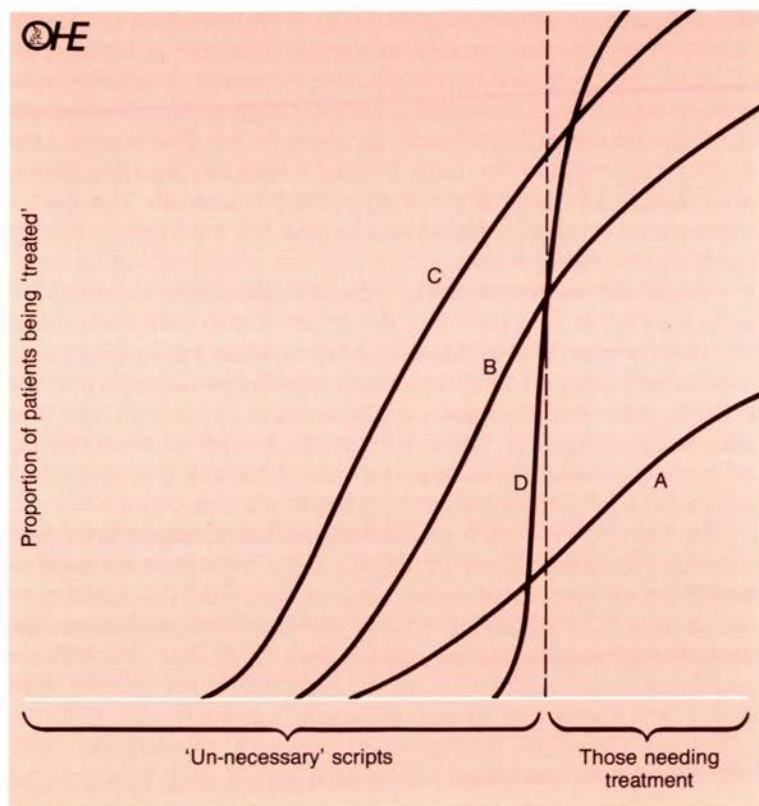
In terms of volume, the dilemma in reaching 'ideal' patterns of prescribing is illustrated theoretically in Figure 2. The square box represents the practice population. The dotted line separates those 'ideally' needing a prescription, on the right, from those not requiring a prescription on the left. The problem is that the judgement of the doctor as to who needs a prescribed medicine is to a considerable extent subjective. Also of course, it is influenced by the aggressiveness with which he tries to seek out patients requiring treatment. Line A represents a typical 'laissez faire' or 'economical' doctor, with a low level of prescribing. But, almost certainly, he will not only be missing many needful patients, but even with his low prescribing may still be treating some patients 'unnecessarily' – in an ideal sense. Lines B and C represent more enthusiastically interventionist doctors, treating a larger proportion

Figure 1 Variations in prescribing patterns NIC (£) per person 1987



Source: Department of Health

Figure 2 **Four patterns of prescribing**



of needful patients, but also a larger number 'unnecessarily'. The ideal physician is represented by Line D: virtually every one of his prescriptions is for the 'right patients'.

In practice, of course, the overall picture is made up of a whole series of individual sub-groups: a doctor may be 'overprescribing' in one therapeutic category and 'underprescribing' in another; for a third category the doctor may be an 'ideal' prescriber. Since 1988, the Prescription Pricing Authority has been making available detailed statistics on prescribing costs under a scheme known as 'Prescription Analysis and Cost' (PACT). The PACT data, which are now being studied both within practices and (more importantly) by the newly appointed Family Health Service Authorities' medical

advisers, will be invaluable in helping to identify problem areas. But the fact remains that downward pressure on costs which merely shifted a doctor's pattern of prescribing from Lines B or C towards Line A would almost certainly be harmful from the patients' point of view. A much more sophisticated approach is necessary to achieve a pattern of prescribing approximating to Line D. This will certainly not lower overall costs for every doctor. For example, the doctor represented by Line B needs to alter his pattern of prescribing, but probably not to reduce it overall. The doctor represented by Line A needs to increase his total prescribing to reach an optimum position.

Against this theoretical background it is interesting to look at the actual patterns of prescribing for hypertension and diabetes as revealed by data collected by the VAMP organisation from practices which have accepted their computers in return for supplying details of their prescribing for analysis. These data come from practices classified by VAMP as 'research practices' in view of the reliability of their reporting. The hypertension data are based on 108 practices and diabetes data on 114 practices.

The figures are shown for 'prescribing units' rather than total number of patients. These prescribing units have been obtained by weighting elderly patients by a factor of two. Even this understates the actual effect of having elderly patients in a practice, as the actual weighting should be greater than three, but this will not greatly affect the analysis for present purposes.

The Distribution of Prescribing

Figure 3 shows the distribution of overall rates of prescribing for 108 practices. The total spread (excluding one outlier) is fourfold, although the majority of practices fall in the range between 1.2 scripts and 1.8 scripts per prescribing unit per quarter. This corresponds well with the average figure of about seven scripts per person per year shown in Table I.

Figure 4 shows the distribution for antihypertensive scripts. The spread is much larger with a sixteenfold difference between the highest and the lowest prescribers. With smaller numbers, it would be expected statistically that the spread would be greater, but a sixteenfold difference is remarkable. On the admittedly cavalier assumption that each script is for one month's treatment, the figures mean that the average practice (with about 0.12 antihypertensive scripts per quarter) is treating about 4 per cent of their patients for hypertension.* The lowest prescribers are treating 1 per cent and the highest (an obvious outlier) about 16 per cent. The relationship between these figures and the estimated prevalence of hypertension will be discussed later.

Figure 5 shows the relationship between overall prescribing and prescribing for hypertension. There is an enormous spread. Some high overall prescribers treat few cases of hypertension and vice versa. But overall there is a strong statistical correlation between high overall prescribing and high antihypertensive prescribing, which is shown by the regression line in the figure ($r = 0.61$). Thus, on average, high overall prescribers are treating a larger proportion of their hypertensives. The significance of this will also be discussed later.

Table I **Prescriptions per person: selected countries 1987**

France	28.9 (1981)	UK	7.3
Italy	19.3	Norway	6.6
W. Germany	12.2	Denmark	6.2
Spain	11.3 (1984)	Sweden	4.8
Belgium	8.4		

Source: OECD

*0.12 script per quarter equals 0.48 per year which equals 48 per 100 patients per year. Divided by 12 (one a month) this gives 4 patients per 100 being treated.

Figure 3 Average number of total prescriptions per prescribing unit

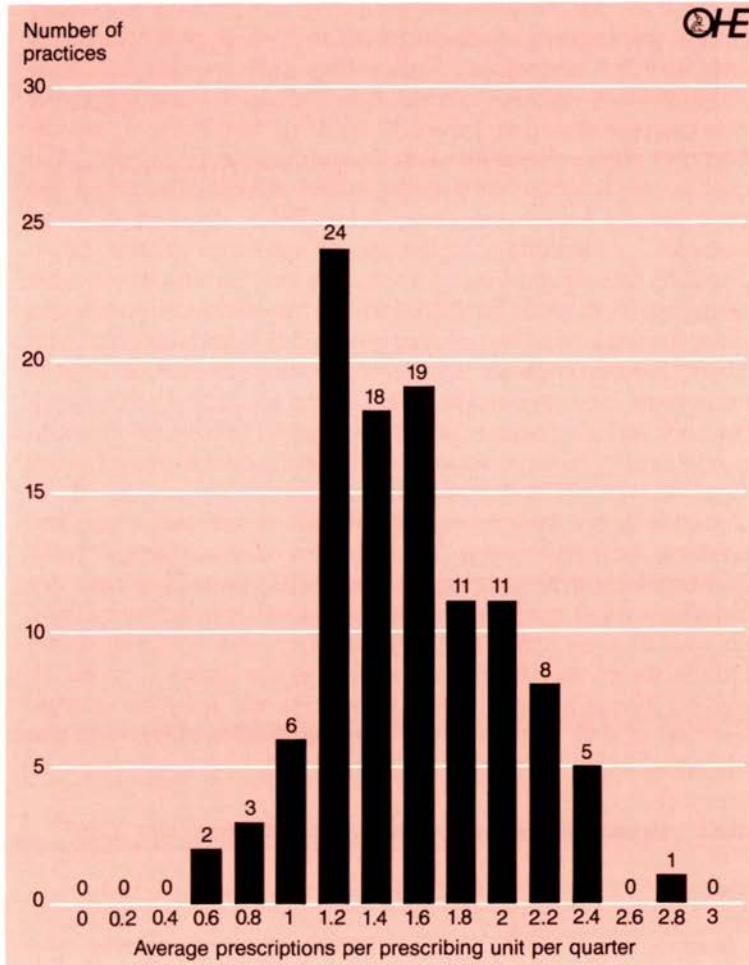


Figure 4 Average number of antihypertensive prescriptions per prescribing unit

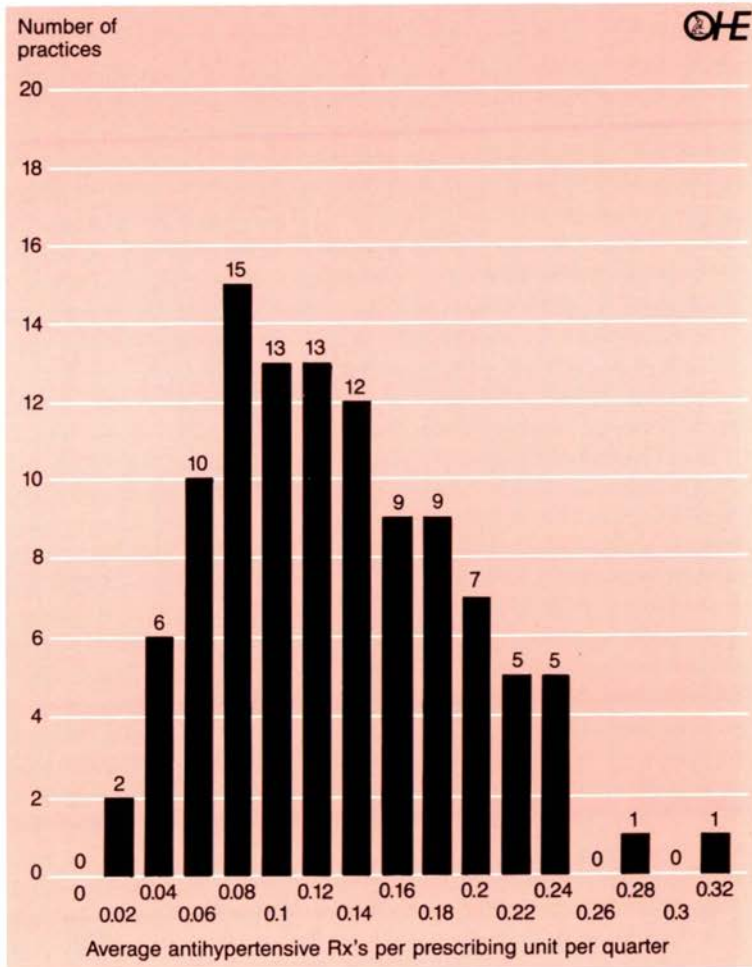


Figure 5 Average total prescriptions per prescribing unit against average hypertensive prescriptions per prescribing unit

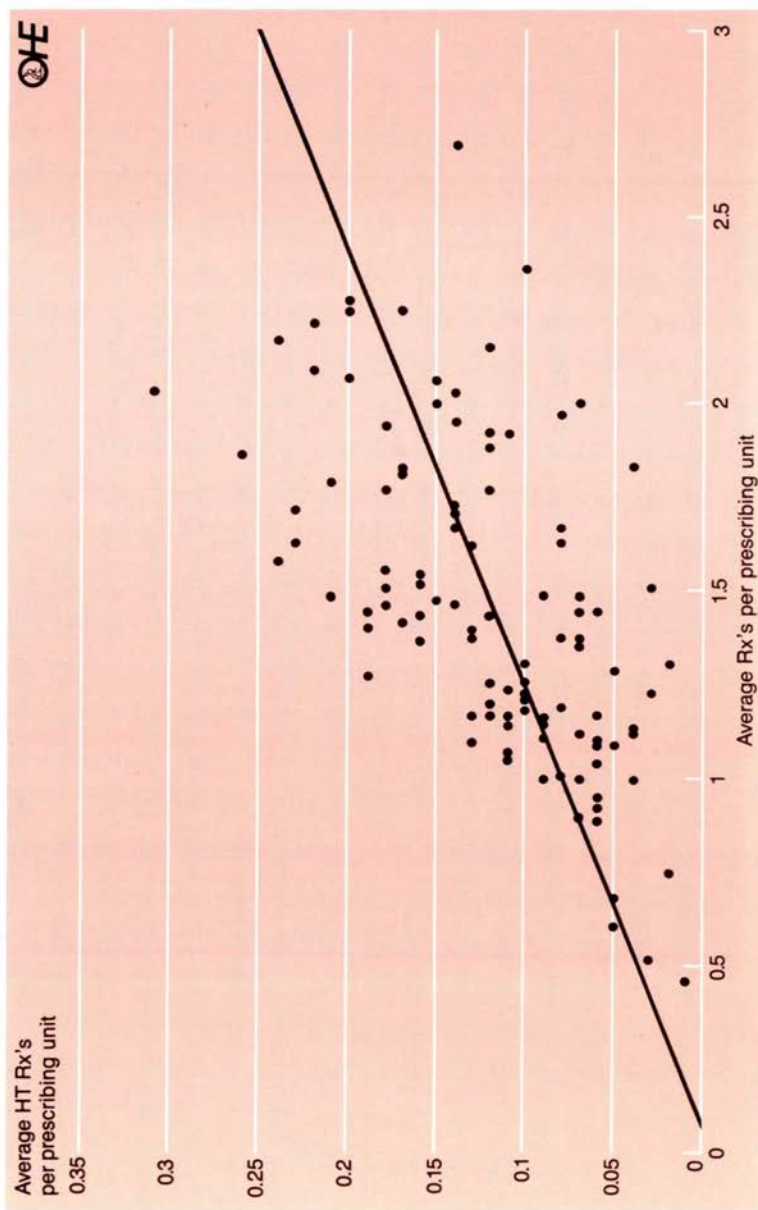


Figure 6 shows the distribution of antidiabetic scripts. There is a nineteenfold spread between the highest and the lowest prescriber. Here it is likely that the amounts prescribed may be more variable, and therefore the discussion of the range of patients treated will be held over to the later section discussing types of treatments prescribed.

Figure 7 confirms for diabetes that there is a substantial spread when the distribution of overall prescribing is plotted against the distribution for antidiabetic prescribing. But once again there is a strong statistical correlation between high overall prescribers and high antidiabetic prescribers shown by the regression line of the figure ($r = 0.46$).

Thus, it is clear from the data so far that high overall prescribers are likely to be treating a larger proportion of both hypertensive and diabetic patients than lower overall prescribers. The epidemiological and economic significance of this fact will be covered in the discussion section of this paper.

Types of Prescriptions

In addition to looking at overall patterns of prescribing, the VAMP data were analysed to examine the patterns of medication. To do this both samples of doctors – those analysed for their hypertensive prescribing and those analysed for their diabetic prescribing – were divided into quartiles. Thus in Figure 8, the four bars shown for each type of medication for hypertension represent respectively the lowest 25 per cent of overall prescribers, the next lowest 25 per cent, the next higher 25 per cent and finally the 25 per cent of highest overall prescribers.

Perhaps surprisingly, there is very little difference in the choice of types of medicine between the four quartiles. Diuretics and betablockers are the commonest scripts for all four groups. The high prescribers use marginally more ace inhibitors and marginally fewer calcium channel blockers, but the general pattern is one of uniformity between high and low prescribers. The bars, of course, represent the *proportion* of scripts in each quartile, and naturally the actual *numbers* of each type of script will be higher for those in the upper quartiles.

Turning to diabetes, Figure 9 once again divides prescribers into the four quartiles depending on their levels of total prescribing. In this case, however the bars represent actual numbers of scripts rather than proportions of diabetic scripts. The remarkable fact is

Figure 6 Average number of antidiabetic prescriptions per prescribing unit

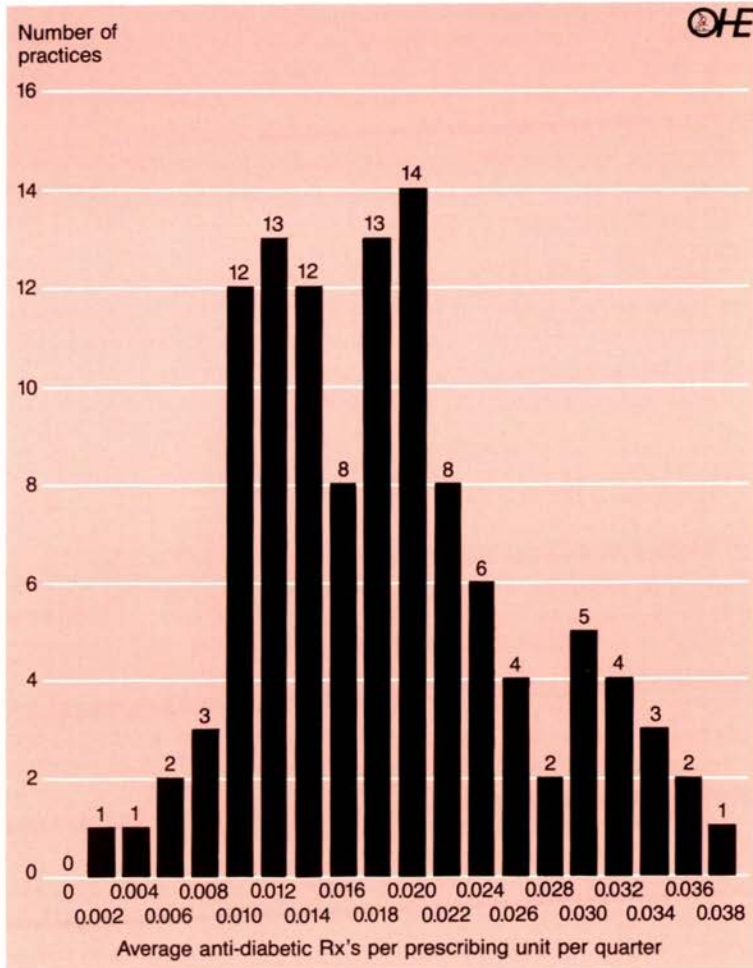
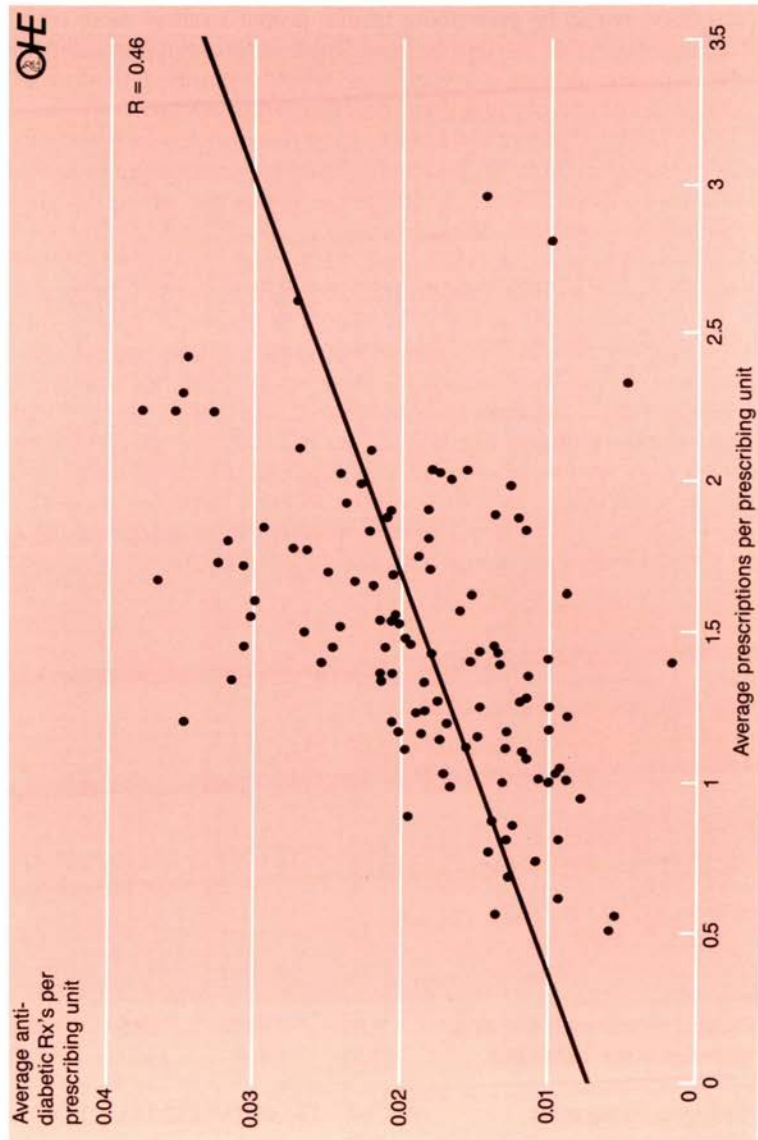


Figure 7 Average antidiabetic prescriptions per prescribing unit against average prescriptions per prescribing unit



that in the case of scripts for insulin there is no variation in the number of scripts written per prescribing unit between the high and low prescribers. In terms of proportions, therefore, the low prescribers would be prescribing insulin proportionately more often. It seems that the variation in volume of prescribing seen for hypertension and for diabetes as a whole according to doctors' volume of total prescribing does not occur with insulin.

By contrast, the scripts for oral hypoglycaemic agents follows the more general pattern. High overall prescribers are on average also high prescribers of oral hypoglycaemic agents. It seems that 'enthusiastic' and 'laissez-faire' practices treat the same proportion of insulin-dependent diabetics, but differ in the likelihood of their treating late-onset non-insulin-dependent diabetics with oral agents.

This is confirmed in Table II which analyses the VAMP data according to numbers of 'prescribing units' treated rather than numbers of scripts written. It shows that both low and high prescribers treat the same proportion of cases in their practice with insulin. Interestingly, the line showing treatment on diet alone shows a level rate between all four quartiles of the practices. It is only when it comes to treatment with the oral hypoglycaemics that the variation in total prescribing is matched by a similar variation in antidiabetic prescribing. For non-insulin-dependent late-onset

Table II Number of diabetic patients and prevalence per 1,000 prescribing unit (PU)

	<i>Quartile 1</i>	<i>Quartile 2</i>	<i>Quartile 3</i>	<i>Quartile 4</i>
Patients treated with insulin (Prevalence per 1,000 PU)	435 (2.2)	352 (2.4)	291 (2.2)	243 (2.2)
Patients treated with oral hypoglycaemic agents (Prevalence per 1,000 PU)	648 (3.3)	690 (4.8)	765 (5.8)	631 (5.7)
Patients treated with diet alone (Prevalence per 1,000 PU)	829 (4.2)	637 (4.4)	545 (4.1)	495 (4.4)
Total prescribing units (Total prevalence per 1,000 PU)	196,764 9.7	144,069 11.7	132,131 12.1	111,359 12.3

Figure 8 Percentage distribution of antihypertensive prescriptions in quartiles

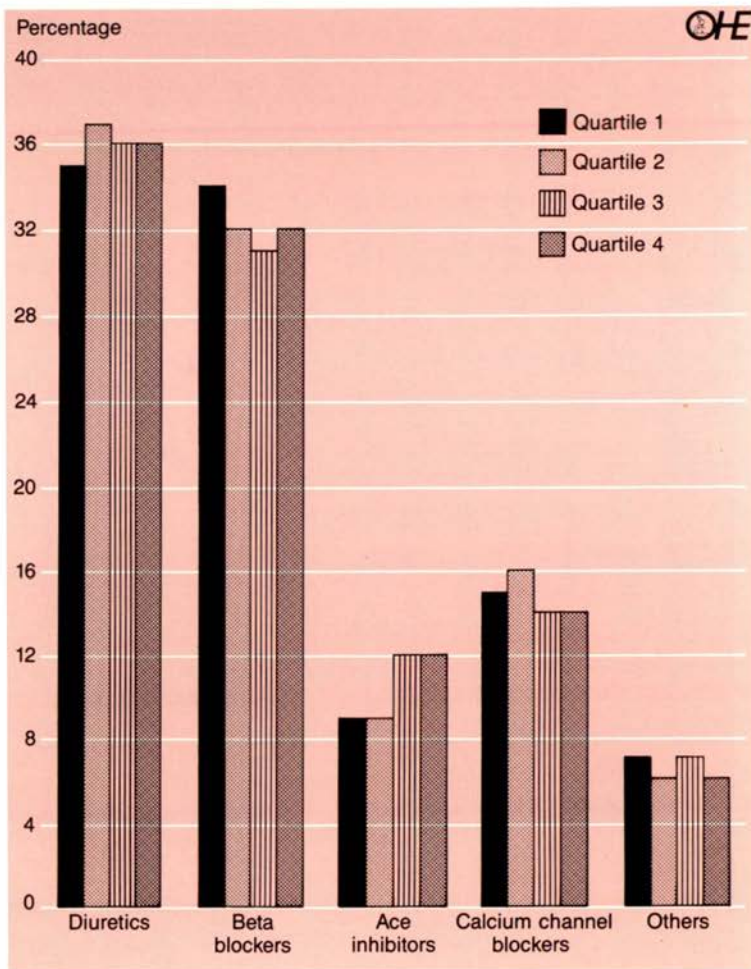
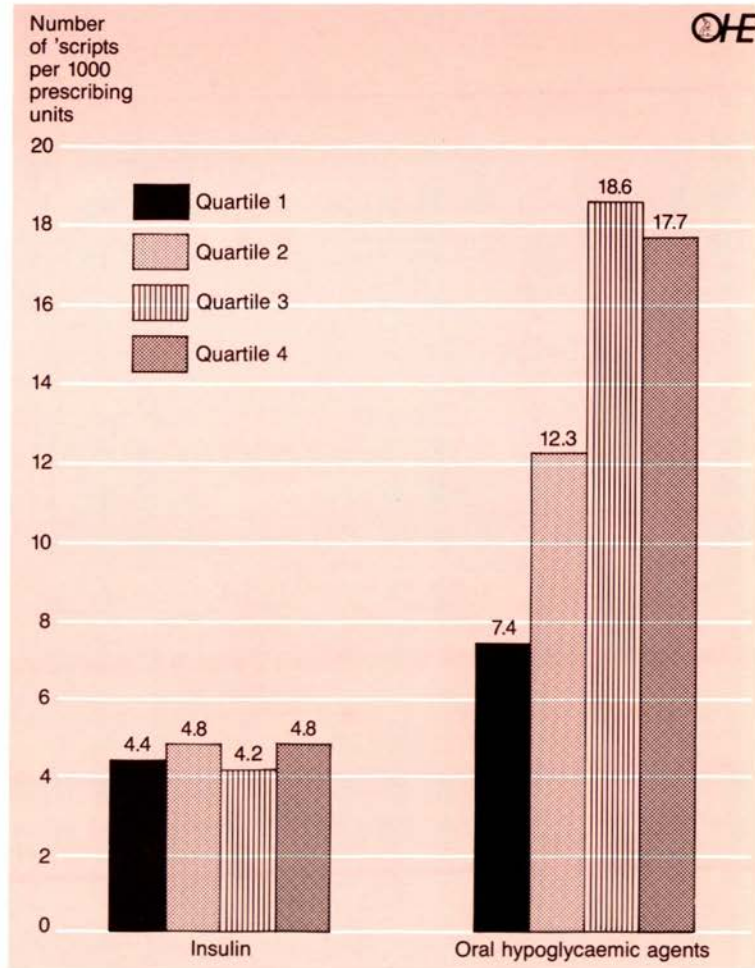


Figure 9 Average number of antidiabetic 'scripts per prescribing unit



diabetes it appear that high overall prescribers are treating a larger proportion of their patients with tablets. The relationship between this pattern of prescribing and the estimated prevalence of diabetes will be described in the discussion section of this paper.

The Size of Practices

It has sometimes been suggested, and it might be expected on statistical grounds, that single handed practices would more often deviate from the mean than larger practices where individual doctors' behaviour would be averaged within the practice.

To examine this question, the distribution of different sizes of practice between the four quartiles was analysed. The results are shown in Table III. The figures are based on an amalgamation of the diabetes sample and the hypertension sample, giving a total of 220 'practice-quarters' as the basis for the analysis. The table indicates that single handed practices in fact follow exactly the same pattern as practices as a whole. They divide exactly into 25 per cent in the lowest quartile, 25 per cent in the highest quartile, and the remainder in the two middle quartiles.

Table III Distribution of levels of overall prescribing according to size of practice

<i>Numbers of partners</i>	<i>Total number of 'practice-quarters'</i>	<i>Number in lowest quartile</i>	<i>Number in central quartiles</i>	<i>Number in highest quartile</i>
Single handed	63	16 (25%)	31 (49%)	16 (25%)
2/3	106	25 (24%)	49 (46%)	32 (30%)
4/5	42	12 (29%)	23 (55%)	7 (17%)
6/7	11	2	8	1
Total	222	55(25%)	111(50%)	56(25%)

For the remainder of practices, those with two or three partners show a slight tendency to be over-represented in the top quartile, while the larger practices show a slight tendency to be over-represented in the middle and bottom quartiles. As has already been pointed out, the concentration of the largest practices in the middle of the range could have been predicted on statistical grounds.

It must, however, be borne in mind that the practices in this analysis have been classified as 'research' practices, and it is possible that less research minded single handed practices would show a greater tendency to deviate from the average, either as high or low prescribers. However, there is certainly no evidence from the present study to suggest that single handed practitioners differ in their prescribing behaviour from that of larger practices.

Discussion

Nothing in this paper contradicts the widespread belief that some prescriptions are written unnecessarily by general practitioners under the National Health Service. Indeed Figure 2 graphically illustrated that probable situation. However, to counterbalance that, there is also firm evidence that some doctors are underprescribing, for example for hypertension and diabetes. This should be at least as much a matter for concern by the recently appointed Family Health Services Authorities' medical advisers as the problem of wasteful prescribing, particularly since it is in general the low overall prescribers who appear to be 'missing' the largest numbers of their hypertensive and late-onset diabetics.

In the case of hypertension, there is a straight-line correlation between the incidence of stroke (expressed on a log scale) and blood pressure (Wald *et al*: in preparation). Furthermore, a classic study from Renfrew in Scotland suggested that 5.5 per cent of the population have a diastolic pressure over 110 mm of Hg and no less than 15.6 per cent are over 100 mm of Hg (Hawthorne *et al*, 1974).

The VAMP data suggest that the *average* general practitioners from their 'research' practices are treating about 4 per cent of patients for hypertension, and the practices with the lowest levels of prescribing may be treating only 1 per cent. (These figures assume that the average prescription is written for one month's supply.) Thus, some cases of moderate to severe hypertension are probably not being treated even in the 'average' practices, with the consequent significantly increased risk of developing a stroke. The

lowest prescribers may be 'missing' as many as four out of five of their moderate to severe hypertensives. Even the highest prescribers in the VAMP sample, who may be prescribing for about 16 per cent of their patients on the same assumption, are still probably not treating 'borderline' cases with a diastolic pressure between 90 and 100 mm of Hg. They have merely decided that cases between the levels of 100 mm of Hg and 110 mm of Hg justify treatment, which it would be hard to challenge on available epidemiological evidence.

From an economic point of view, OHE has estimated that the reduction in the incidence of new cases of stroke between 1955/56 and 1981/82 saved the NHS hospital service £204 million in 1985 (Teeling Smith, 1988). That reduction can be largely attributed to the better control of hypertension over that 25 year period, yet in 1985, the total cost of all antihypertensives prescribed amounted to only £185 million at manufacturers' prices. Thus, when the total economic picture is taken into account, the control of hypertension is a highly cost-effective activity. It is therefore disturbing both from a clinical and from an economic point of view that not all moderate to severe hypertensives are currently being treated. The new initiative to set up screening clinics within general practice, and routinely to measure the blood pressure of all new patients joining a practice should be very cost-effective policies.

A similar situation exists with diabetes. The VAMP data indicate that when treatment with insulin, oral antidiabetics and diet alone are taken together about 1.4 per cent of patients are being treated in the *highest* prescribing practices. About 1 per cent are being treated by the lowest prescribers in this sample. The best epidemiological estimates are that 2 per cent of the population are properly classified as diabetics, using the strict World Health Organisation definition, although taking doctors as a whole in Britain only 1 per cent of the population are being treated under the National Health Service (Laing and Williams, 1989). Incidentally, this suggests that the VAMP 'research' doctors, for all their apparent undertreatment, may be 'better' prescribers than general practitioners as a whole.

The extent of undertreatment suggested by that paragraph is alarming. The data indicate, as one would expect, that insulin-dependent diabetes is rarely missed. Untreated patients are obviously severely ill. However, with late-onset non-insulin-dependent diabetes the position is different. The onset is insidious, but if not recognised damage may start to occur in the retina and to the peripheral vascular system. Without treatment this damage

may lead to blindness or, eventually, to an amputation. The VAMP data suggest that even amongst the higher prescribers, six per thousand patients may be going unrecognised while this damage is occurring.

There are repeated anecdotal indications that some previously untreated cases of diabetes may first be recognised by an optometrist or even a chiropodist. Port and Pope (1988) have published figures to show that in 1986, 58,000 patients were referred by optometrists to their general practitioner with a diagnosis of diabetic retinopathy. There were no figures to show how many of these were already known to their general practitioner, but data are now being collected in 1990 to establish that figure. However, the fact that 0.1 per cent of the total population (one diabetic in twenty) is referred to a doctor by an optometrist as having diabetic retinopathy is at least supportive evidence of the extent of untreated diabetes in the community. Incidentally, Harrison *et al* (1988) have reported two cases of diabetes first diagnosed as a result of ocular screening by ophthalmic opticians in Staffordshire.

Once again, there must be a substantial economic cost associated with the complications of untreated diabetes, and it is likely that these costs would be greater than the cost of early and effective treatment of all diabetics.

So far, this paper may have presented a rather gloomy picture of the 'efficiency' of prescribing under the National Health Service. However, the general practitioners' contract and the establishment of the medical advisers under the new Family Health Service Authorities bring very encouraging opportunities for the future.

In the early discussion it was suggested that more 'downward pressure' on prescribing costs (which was proposed in the original White Paper 'Working for Patients') could do more harm than good in shifting an already imperfect pattern of prescribing to one which was even less effective. Instead, each aspect of prescribing needs to be examined, and the evidence from PACT data that some doctors are underprescribing needs to be tackled along with evidence of overprescribing.

But what has become clear from this paper is that average patterns of prescribing may differ significantly from optimal patterns. It would be dangerous, within any therapeutic group, to assume that the average rate is the correct rate, and therefore attempts to shift current high prescribers to the average level may be strongly counterproductive in both clinical and economic terms.

medical advisers already recognise that they should be setting out to improve the patterns of prescribing, as well as discouraging any unnecessary overprescribing. In some cases these 'improvements' will result in substantial increases in prescribing costs. Perhaps, however, the Family Health Service Authorities themselves may sometimes be less enlightened, and still be influenced by the now discredited phrase of 'downward pressure'. They, too, must recognise that better prescribing may be more costly for the health service as a whole than more expensive *appropriate* prescribing. There is, of course, also the question of a possible shift from a more expensive preparation to a cheaper preparation for the same patient. Many factors will affect this decision, but it is unlikely that 'cheap' prescribing in this sense will compensate for the need to increase prescribing volume in other cases. Interestingly, in the case of antihypertensive scripts, it has been pointed out that high and low prescribers did not vary in their pattern of choice between more expensive and less expensive types of preparation (Figure 8).

One problem, of course, is that economies from effective prescribing generally arise in the hospital service rather than under the Family Health Service Authorities' budgets. The Department of Health (1990) has recognised this in their paper on 'Improving Prescribing', where paragraph 2.20 points out the need 'to examine alternative treatment regimes and their relative costs and benefits and to disseminate the results so that GPs can consider in appropriate circumstances whether to prescribe, perhaps on a long-term basis, rather than to refer a patient to hospital for treatment or in order to prevent a condition that might otherwise result in a hospital admission'. It is important that both the Regional Health Authorities and the Family Health Service Authorities recognise the importance of this statement and accept its cost implications. High costs in one sector of the Health Service, such as the pharmaceutical service, may often result in lower costs elsewhere, bringing an overall saving for the Health Service as a whole.

However, there is a further problem. The 'savings' from effective prescribing release National Health Service resources which are usually quickly taken up to meet some previously unmet need – more transplants, better care for the elderly, and suchlike. Thus although better patterns of prescribing will not only improve the clinical well-being of patients but may also save specific Health Service expenditures, there will be no reduction in the total Health Service budget. The overall quality of care will be improved, instead of the previous pattern of care merely costing less. In this context the same Department of Health paper (paragraph 2.21) referred to

the scope for pharmaceutical manufacturers to undertake studies to demonstrate the cost-benefit or cost-effectiveness of their products in relation to the quality of care for patients.

All those involved in the Health Service need to work together to ensure that the most cost-effective medical care is provided for the benefit of patients. But within the Family Health Service Authority area itself, the important point is that the re-organised Health Service provides the opportunity to improve the pattern of general practitioner prescribing for the benefit of the population as a whole and not only for patients consulting with symptoms. As more prescribing data become steadily available in association with epidemiological evidence, it will become increasingly clear how optimum patterns of prescribing can be achieved. But frequently, as this paper has shown, this may result in an increase in prescribing rather than the reverse.

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