Accident and emergency attendance rates: variation among patients from different general practices

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SUMMARY. As a consequence of the 1989 National Health Service review health authorities are likely to take a greater interest in patterns of use of secondary care services by patients of different general practitioners. Use of accident and emergency departments has been shown to predict subsequent use of other hospital services. If meaningful comparisons are to be made between practices it is important to identify factors other than variation in clinical practice which influence attendance at accident and emergency departments. A one in 20 sample of patients attending an accident and emergency department was studied. Patients were aggregated by general practice and by electoral ward of residence, and the influence of a range of variables was examined using multiple regression. For both groups of patients distance from an accident and emergency department was an important factor in the rate of attendance. It was possible to examine the effect of several socioeconomic variables in the analysis by electoral ward: these were not associated significantly with attendance rates. Similarly, in the analysis by practice, mean list size per partner could not explain variation in attendance rates. This study supports others which have indicated that distance from an accident and emergency department must be taken into account when interpreting attendance rates.

Introduction

THE 1989 review of the National Health Service has drawn up proposals for general practitioners in larger groups to work within a budget for the provision of care for their patients.[1] Although attendances at accident and emergency departments will not fall within the scope of such budgets, outpatient referrals by general practitioners will. In addition, health authorities will be expected to monitor accident and emergency attendances to ensure that they are not used as a substitute for outpatient referral. This will inevitably involve examining attendance rates at accident and emergency departments by patients from individual general practices.

Studies have shown that between 8%[2] and 10%[3] of patients attending accident and emergency departments are subsequently referred to outpatient departments. Another study has shown that the attendance rate at accident and emergency departments predicts subsequent use of outpatient clinics.[4] Consequently factors which affect attendance rates at accident and emergency departments will affect general practice budgets.

Attendance at accident and emergency departments may be influenced by many factors, including distance from the patient's home to the department, socioeconomic status of the patient and characteristics of the patient's practice. Demographic information about individual practices is not routinely collected, although it is available for small geographical areas. This study sought to identify some of the factors associated with high attendance rates by examining the attendances of patients grouped by electoral ward of residence and by general practice.

Method

The study took place in an accident and emergency department of an acute general hospital in a rural area of Northern Ireland. A random one in 20 sample of all new attendances during 1986, stratified by month was used; 1029 patients were selected. The postcode for each patient's address was established and the electoral ward of residence and the grid reference corresponding to the address were identified using the central postcode directory.[5] The study was divided into two parts with patients grouped according to their ward of residence, and secondly by the general practice with which they stated that they were registered.

The linear distance between each address and the hospital was calculated as the hypotenuse of a triangle formed from the horizontal and vertical distances between both points. These were calculated as the differences between the eastings and northings respectively, which were obtained from the grid references. Annual attendance rates per 1000 population from each electoral ward were calculated using denominators from the 1981 Northern Ireland census. Annual attendance rates from each practice were derived using practice list sizes as the denominators.

There was no general practitioner recorded for 4% of patients. The mean distance from home to hospital was calculated for all recorded attendances from each ward and each general practice. This is a more accurate reflection of the distance travelled by patients from each ward than the distance from the geometric centre of the ward in view of the skew of the population distribution in some of the wards. It is the only way of determining the distance travelled by patients from each general practice. Information on travel time at ward level is not available in Northern Ireland outside the Belfast area, and the mode of travel to work may not be the same as that used to visit an accident and emergency department. As the area is well served by roads, many of which radiate from the town containing the hospital, and there are no major geographical barriers within the area included in the analysis of electoral wards, linear distance was assumed to be an accurate reflection of the distance travelled. Demographic characteristics of each electoral ward were extracted from data on file in the Northern Ireland census office.

The attendance rates from each electoral ward were compared with the distance travelled and with a number of socioeconomic

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variables, using multiple linear regression, in order to identify some of the factors associated with attendances and to quantify the extent to which these could explain variation in attendance rates. The analysis was performed using the statistical package for the social sciences (SPSS PC). The socioeconomic variables analysed were derived from the census: percentage of people living in families without a car; percentage of people living in overcrowded conditions (>1.5 people per room); percentage of people living in households whose head was in social class five; percentage of people lacking an inside bath or toilet; percentage of people aged under five years.

In the analysis by practice the absence of demographic information about each practice limited the variables which could be examined to distance and mean list size per partner. As almost all of the practices involved were group practices, no attempt was made to examine the age of general practitioners or their date of qualification.

Results

The overall annual attendance rate at the accident and emergency department for the 1029 patients was 220 per 1000 population. Attendance rates were higher in general than those found in a comparable study in London.[6] In one ward close to the hospital the attendance rate was equivalent to three out of every four of the population attending each year. As this was a sample study it was not possible to identify with accuracy how many times each individual attended. Nevertheless during extraction of the case notes it was clear that some individuals had attended up to 10 times in the year with different complaints.

Attendance rate by electoral ward

In the first part of the study patients were grouped according to the electoral ward in which they resided.

Electoral wards with fewer than five recorded attendances were excluded; of the total attendances 948 (92% of the total) were from 42 electoral wards and these cases were analysed. As the distribution of both the attendance rates and distance were skewed, the logarithm of each was calculated to produce a normal distribution. Figure 1 shows the $\log_{10}$ of attendance rate per 1000 population plotted against $\log_{10}$ of mean distance from the accident and emergency department (km). The correlation matrix showed that $\log_{10}$ distance was the variable most closely associated with attendance rates ($r = -0.73$, adjusted $r^2 = 0.52$) (Table 1). Variation in the $\log_{10}$ of the distance explained 53% of the variation in attendance rates. The sociodemographic variables did not increase the explanatory power of the equation further. The criterion for including a variable was a probability associated with the F statistic of 0.05 or less. The final equation describing the relationship was: $\log_{10}$ (attendance rate per 1000 population) = 2.58 − 0.44 ($\log_{10}$ distance).

The differences between the observed and predicted values for each ward were examined for other factors that may have been related to attendance. Only one ward was outside two standard deviations from the predicted value; this had a lower than

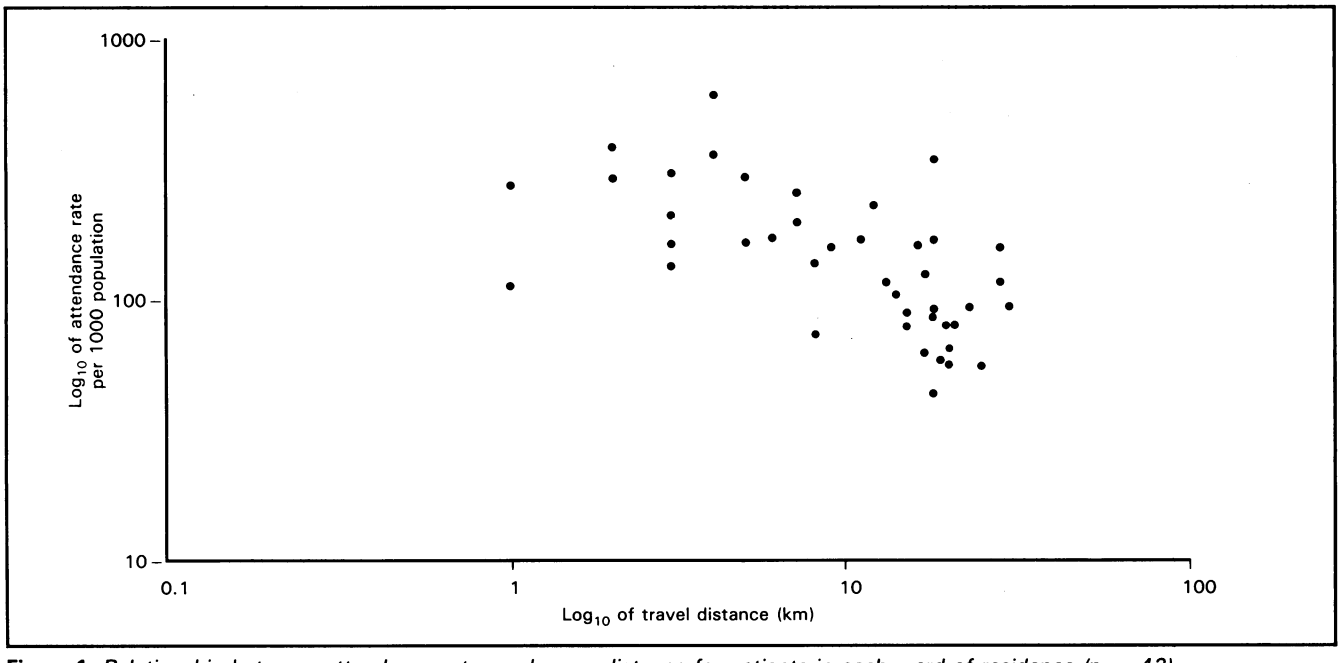

Figure 1. *Relationship between attendance rates and mean distance for patients in each ward of residence (n = 42).*

Table 1. Correlation between variables (see text for definitions of variables).

Correlation coefficients	Log_{10} distance	No car	Over-crowded	Social class 5	Under 5 yr olds	No facilities
Log_{10} attendance rate	−0.73	0.22	−0.36	0.11	0.10	−0.25
Log_{10} distance	—	−0.31	0.57	−0.19	0.33	0.34
No car	—	—	−0.06	0.69	0.10	−0.54
Overcrowded	—	—	—	0.05	0.39	0.37
Social class 5	—	—	—	—	−0.04	−0.15
Under 5 yr olds	—	—	—	—	—	−0.15

expected attendance rate and it was a rural area with an elderly population. One ward, where the observed value was 1.67 standard deviations greater than predicted, largely comprised a relatively new public housing development, although other wards with similar developments did not have unexpectedly high attendance rates. In two wards with an attendance rate that was lower than expected the road network would have increased the actual distance travelled.

Attendance rate by practice

In the second part of the study, patients were grouped according to the general practice that they were registered with.

Although patients attending the department came from 52 practices, only 26 practices had more than 10 attendances each and accounted for 87% of attendances. These were analysed further. The $\log_{10}$ of attendance rates for these practices are shown in Figure 2, plotted against the $\log_{10}$ of mean distance from home to hospital for the patients in each practice.

The $\log_{10}$ of the attendance rates was associated with the $\log_{10}$ distance ($r = 0.64$). Mean list size (patients per partner) did not increase the explanatory power of the equation. Distance thus explained 38% of the variation between practices. The equation derived for the relationship was: $\log_{10}$ (attendance rate) = 2.79 − 0.64 ($\log_{10}$ distance).

Examination of the differences between observed and predicted values identified one outlying practice which had an attendance rate which was 2.49 standard deviations greater than predicted. The presence of one outlying practice less than three standard deviations from the mean in a sample of this size is consistent with a normal distribution. Although none of the socioeconomic variables examined had a significant association with attendance rates, one cannot exclude the possibility that a weak association might have been detected with a larger sample.

There was no evidence from inspection of the differences between observed and predicted values that attendance rates differed between patients of general practitioners in health centres and those attending other types of surgery.

Discussion

This study suggests that distance from the patient's home to the accident and emergency department, but not some of the more commonly measured demographic variables, is associated with variation in attendance rates from different areas. Distance also explained a significant amount of variability between general practices, but to a lesser extent than among electoral wards. The number of patients per partner and the use of a health centre do not seem to influence attendances. The absence of an association between attendances and socioeconomic variables when analysed by ward suggests that these variables are unlikely to be important in explaining differences between general practices.

Moore has demonstrated a large amount of random variation in small studies of referral rates to outpatient clinics,[7] and a similar factor is likely in our study. A larger study based on computerized records should reduce the component of variability owing to random variation.

The association between accident and emergency attendance rates and distance has been shown in several studies. Although our study examined the situation in a rural area, similar results have been observed in urban[4,8] and mixed[9] areas. Those living nearest to an accident and emergency unit tend to use it as a substitute for general practice.[10] Magnusson has suggested that this may be due to unavailability of general practitioners, as measured by high patient:doctor ratios.[4] This was not found in our study. The association of attendance rates and distance may be partially explained by the judgements of general practitioners about which conditions should be treated initially in hospital. Pepiatt has shown that general practitioners working near to a district general hospital are more likely than those further away to believe that patients with minor conditions should go directly to the accident and emergency department.[11]

The absence of an association between attendance rate and socioeconomic measures is perhaps surprising. It is possible that the use of data relating to a geographical area may obscure individual differences, although the choice of electoral wards should reduce the likelihood of this possibility. This study raises the possibility that the high levels of attendance at some inner city accident and emergency departments may be related more

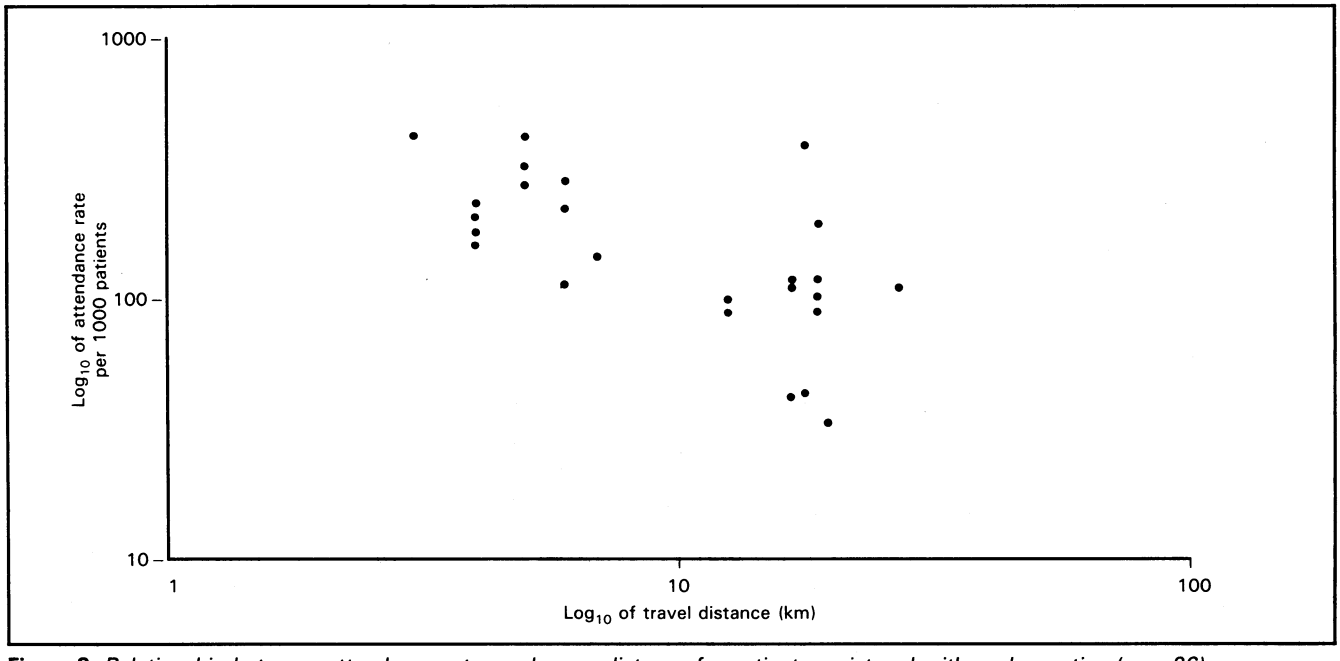

Figure 2. *Relationship between attendance rates and mean distance for patients registered with each practice (n = 26).*

to a high concentration of population in the immediate area of the hospital rather than to social deprivation, although this theory would have to be tested in such a department. The provision of primary care in the centre of many British cities is also sufficiently different from that in rural Northern Ireland to preclude extrapolating from the results of this study.

During the preliminary discussions, staff at the accident and emergency department had been asked informally about which practices and which areas were considered to generate particularly high attendance rates. Although the one 'outlying' practice was identified, so were several others whose high rates could be explained largely by proximity to the department. In addition, larger practices are likely to produce more attenders, although the attendance rate may not be unduly high.

Empirical observations of apparently high rates of attendance may be incorrect, and attempts to identify practices which produce large numbers of accident and emergency attendances must take account of differences in proximity and practice size. Nevertheless, considerable variation among practices remain. This study emphasizes the complexity of the relationship between the use of primary and secondary care, and the importance of proximity in determining the use of hospital services.

Accident and emergency departments have been shown to be an important mode of entry to secondary care and to be associated with subsequent outpatient attendances. It is possible that distance from the department may independently influence use of both services rather than accident and emergency services causing the increased use of other services. Nonetheless this study is consistent with others which have demonstrated the importance of travel distance in determining patients' use of secondary care. It has also suggested that distance is much more important than patients' socioeconomic situation. The location of general practices should be taken into consideration when comparing the use of hospital services and general practitioners should take this factor into account when considering whether to adopt their own budgets.

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