Morbidity, deprivation, and antidepressant prescribing in general practice

IAN F MACKENZIE

KEN BUCKINGHAM

JAN M WANKOWSKI

MIKE WILCOCK

SUMMARY

Background. *Although the link between depression, unemployment, and measures of deprivation and morbidity has been previously documented, the relationship between general practice prescribing of antidepressants, morbidity, and the social demography of general practice populations is poorly understood.*

Aim. *To consider whether morbidity and the social demography of general practice populations influence the prescribing costs of individual practices.*

Method. *Data were analysed, using a forward stepwise regression procedure, of all 78 practices served by the Cornwall and Isles of Scilly Health Authority. Data on prescribing for antidepressants were provided by the Prescription Pricing Authority for the period from July to December 1995 and converted into defined daily doses (DDDs) to standardize for the variation in prescribing practice between general practitioners.*

Results. *A significant positive correlation exists between the rates of prescribing DDDs of antidepressants by general practices and the prevalence of permanent sickness in the areas in which these practices serve.*

Conclusion. *Demonstrating an association between morbidity and prescribing rates for depression may prove helpful in setting prescribing budgets.*

Keywords: depression; prescribing; social demography.

Introduction

HEALTH authorities are required to set prescribing budgets for general practices and primary care groups. The budget-setting process was initially based on an annual up-lift on historical spending on drugs, corrected for changes in list size. The process has become more sophisticated and now incorporates, via the ASTRO-PU (age, sex, and temporary resident originated prescribing unit), a recognition of the demographic features of the practice population that alter the likelihood of consulting and the cost of receiving treatment with a prescription.[1]

The variation in prescribing rates and cost between health authorities is known to be associated with the standardized mortality ratio of the health authority for its population aged under 75 years.[2] Other studies have shown that morbidity and socioeconomic factors, including unemployment, are associated with the variation in general practice prescribing costs when the data were aggregated up to health authority level.[3-5] However, when Pharoah and Melzer[6] examined a set of data relating to general practices, they failed to find any association between prescribing for antidepressants and general practice social demography. Since the publication of the *Black Report*[7] on inequalities in health, the link between socioeconomic factors and illness has become increasingly clear. Last year the independent inquiry, chaired by Sir Donald Acheson, published a report on inequalities in health between different parts of the country, and between different sections of the population,[8] which acknowledged the worse health and lower life expectancy in poorer people. We considered whether these factors influence the prescribing costs of individual practices.

Since the link between depression, unemployment, and measures of deprivation and morbidity has been previously documented,[9] this study focused on the relationship between general practice demography and the rate of prescribing of antidepressant drugs by general practices.

Method

The statistical technique

We used release 6.1 of SPSS for Windows to analyse the data. Because sociodemographic variables are frequently intercorrelated, it is possible that models containing different variables may have similar explanatory power. We therefore considered this possibility, first by examining relationships within the simple two-way correlation matrix, then by successively eliminating variables and re-estimating a multiple regression model. The models were estimated using a forward stepwise regression procedure, in which we examined the null hypothesis that general practice prescribing of antidepressant drugs is not related to the estimated practice sociodemographic characteristics.

The sample

Data were analysed from all of the 78 practices within the area served by the Cornwall and Isles of Scilly Health Authority. The area is primarily rural, but with locally high levels of deprivation, seasonal unemployment, and a declining extractive industrial sector. Despite small areas of high deprivation, no Jarman payments are made to general practitioners (GPs) under current regulations.

The dependent variable

Data on prescribing for antidepressant drugs (section 4.3 of the *British National Formulary*) were obtained from the HAEPACT information system provided by the Prescription Pricing Authority for the period July to December 1995. We converted this data into defined daily doses (DDDs) to standardize, as far as is possible, for variation in prescribing practice between GPs. The concept of a DDD was developed by the World Health Organization Collaborating Centre for Drug Statistics Methodology as a measure of drug use in preference to using measures such as number of items or cost. The use of the 'item' as a measure of prescribing is unsatisfactory because it does not distinguish the duration of the course of treatment, while cost, as a measure of prescribing activity, may be sensitive to the precise choice of drugs; for example, selective serotonin re-uptake inhibitor (SSRI) drugs are many

I F Mackenzie, MFPHM, consultant in public health medicine; K Buckingham, PhD, health economist; J M Wankowski, MSc, scientific officer; and M Wilcock, MRPharms, pharmaceutical adviser, Directorate of Public Health Medicine, Cornwall and Isles of Scilly Health Authority.
Submitted: 23 February 1998; final acceptance: 5 June 1999.

times more expensive than traditional antidepressants. The DDD is defined as 'the assumed average dose per day for a drug used on its main indication in adults'.[10]

We should acknowledge that some of the drugs that we have assumed to be for the treatment of depression will have been used for other indications; for example, for the treatment of chronic pain (where the antidepressant amitriptyline is commonly used), or for enuresis in children; however, these minor indications are unlikely to have materially altered our findings.

Since our main concern was to identify the impact of sociodemographic factors on the use of antidepressant drugs, it would have been preferable to have age-standardized the dependent variable to exclude the influence of age in our modelling. However, age-specific use rates for antidepressants were not available. Since the evidence on consultation rates for depression[11] suggests that consultations are rare among younger people and tend not to vary substantially by age among adults, age standardization of practice populations was not considered essential. Instead we used the practice population of all people over the age of 15 years as the denominator in the calculation of use rates.

The explanatory variables

The principal explanatory variables were derived from the 1991 Census and were selected on the evidence provided in our review of the literature. Using information on the residential postcode of patients registered with practices in our sample, we assigned patients to enumeration districts, and thereby determined, for each practice, weighted average values for each of the Census variables under examination. The variables used are listed with abbreviations in Table 1.

Results

We see from the row headed 'DDDs per capita' in Table 2 that this variable has highly significant correlations with both 'long-term illness' and 'permanent sickness'. Somewhat weaker, but still statistically significant, correlations are evident with the variables 'lone parents' and 'class I or II'. All the correlations have the 'expected' signs, with higher morbidity and more lone parents being associated with greater use of antidepressants, and higher social class being associated with lower use of antidepressants.

As expected, many of the sociodemographic variables (with the exception of 'ethnicity' and 'family size') are strongly correlated with one another. Furthermore, both measures of morbidity recorded in the Census ('permanent sickness' and 'long-term illness') correlate highly with many of the sociodemographic variables. Strong correlations exist between 'long-term illness' and 'unemployment', 'education' and 'class I or II' (higher levels of education and higher social class being associated with less 'long-term illness'). These high levels of intercorrelation imply that we must be cautious when interpreting the results from multiple regression modelling, since variables that correlate strongly with one another can act as proxies, or may jointly enter into the equation with unexpected coefficients and/or signs.

Our first regression equation explained 24% of the variation in DDD per person; however, one practice was an 'outlier', with a very high standardized residual. To examine its influence on the model, we re-estimated the equation without this observation. With that observation excluded, the most significant variable was 'permanent sickness', which explained 20% of the variation in DDD per capita.

In order to determine what would have been the most important determinant of prescribing in this highly co-linear dataset, had the 'permanent sickness' variable not been available, we repeated our forward stepwise regression after excluding 'permanent sickness' from the model. Under these circumstances the most powerful influence on prescribing is 'long-term illness', another measure of morbidity. This accounts for 19% of the variation in prescribing. 'Education' is selected together with 'long-term illness' in this forward regression procedure and explains a further 10% of the variation in prescribing. When we exclude both morbidity variables ('permanent sickness' and 'long-term illness'), the only variable to enter the equation is 'lone parents', which accounts for 13% of the total variation in prescribing.

Discussion

The lack of evidence of a relationship between general practice demography and prescribing of antidepressants, as reported by Pharoah and Melzer,[6] was surprising in the light of the other evidence for such a relationship. This may, in part, be explained by our findings, which indicate that population-based morbidity measures are more important than sociodemographic factors, and that social factors are more likely to enter the model once the effect of morbidity has been accounted for. Pharoah and Melzer's failure to find a relationship may also, in part, have resulted from the way they used Census information to estimate practice characteristics. Although this seems to be the only method that is generally available,[12-14] estimates can be unreliable because the Census information relates to geographical

Table 1. Description of variables.

Variable name	Variable definition	Mean	Standard deviation
DDDs per capita	Defined daily doses per person aged over 15 years	4.555	1.607
No car	Proportion of residents in households with no car (used as a proxy measure of wealth)	0.245	0.072
Ethnicity	Proportion of residents in households with head of household born in the New Commonwealth	0.010	0.003
Lone elderly	Proportion of those of pensionable age living alone	0.292	0.028
Lone parents	Proportion of persons in lone parent households	0.075	0.016
Permanent sickness	Proportion of adult population that is permanently sick	0.037	0.008
Unemployment	Proportion of the economically active that is unemployed	0.054	0.012
Education	Proportion of persons aged 18+ with some qualification	0.117	0.031
Class I or II	Proportion of persons in households with head of household in social class I or II	0.344	0.072
Family size	Proportion of households with 1 or more dependent children	0.049	0.006
Marital status	Proportion of single, widowed, or divorced residents	0.497	0.022
Long-term illness	The ratio of the number of people recorded as having limiting longstanding illness divided by the number of such people who would be predicted as having limiting longstanding illness using national prevalence rates by age.	0.132	0.013

Table 2. Pearson's correlations between all dependent and explanatory variables.

	DDDs per capita	No car	Ethnicity	Lone elderly	Lone parents	Permanent sickness	Unemploy-ment	Education	Class I or II	Family size	Marital status	Long-term illness
DDDs per capita	1.000	0.145	0.156	0.252[a]	0.375[b]	0.475[b]	0.324[b]	-0.096	-0.256[a]	0.073	0.253[a]	0.486[b]
No car	0.145	1.000	0.062	0.790[b]	0.663[b]	0.311[b]	0.355[b]	-0.189	-0.376[b]	-0.100	0.783[b]	0.327[b]
Ethnicity	0.156	0.062	1.000	0.304[b]	0.368[b]	0.096	0.095	0.287[b]	0.028	-0.288[b]	0.143	0.108
Lone elderly	0.252[a]	0.790[b]	0.304[b]	1.000	0.794[b]	0.491[b]	0.537[b]	-0.125	-0.333[b]	-0.203[a]	0.831[b]	0.497[b]
Lone parents	0.375[b]	0.663[b]	0.368[b]	0.794[b]	1.000	0.534[b]	0.587[b]	-0.209	-0.396[b]	-0.149	0.772[b]	0.600[b]
Permanent sickness	0.475[b]	0.311[b]	0.096	0.491[b]	0.534[b]	1.000	0.728[b]	-0.468[b]	0.395[b]	0.059	0.561[b]	0.887[b]
Unemployment	0.324[b]	0.355[b]	0.095	0.537[a]	0.587[b]	0.728[b]	1.000	-0.512[b]	-0.479[b]	-0.121	0.638[b]	0.754[b]
Education	-0.096	-0.189	0.287[b]	-0.125	-0.209	-0.468[b]	-0.512[b]	1.000	0.699[b]	-0.353[b]	-0.411[b]	-0.619[b]
Class I or II	-0.256[a]	-0.376[b]	0.028	-0.333[b]	-0.396[b]	0.395[b]	-0.479[b]	0.699[b]	1.000	-0.249[a]	-0.529[b]	-0.570[b]
Family size	0.073	-0.100	-0.288[b]	-0.203[a]	-0.149	0.059	-0.121	-0.353[b]	-0.249[a]	1.000	-0.057	0.193
Marital status	0.253[a]	0.783[b]	0.143	0.831[b]	0.772[b]	0.561[b]	0.638[b]	-0.411[b]	-0.529[b]	-0.057	1.000	0.612[b]
Long-term illness	0.486[b]	0.327[b]	0.108	0.497[b]	0.600[b]	0.887[b]	0.754[b]	-0.619[b]	-0.570[b]	0.193	0.612[b]	1.000

[a]significant at 5% level; [b]significant at 1% level.

areas rather than practice populations. The most reliable estimates occur when general practices have local monopolies: a condition that we found to hold for many of the practices in our sample.[15] Moreover, Census-based estimates tend to be more precise when enumeration districts, rather than electoral wards (as preferred by Pharoah and Melzer), are used because the smaller size of the former allows a more precise attribution of populations to practices. The hypothesized relationship between need for antidepressants and social characteristics may also be difficult to identify using relatively small samples because of the variability of GP prescribing behaviour.

Conclusion

When considering the component of the prescribing budget necessary to meet the needs of the population of practices for drug treatment of depression, knowledge of the level of morbidity and social deprivation is important. It is clear that practice populations differ in the amount of morbidity they treat. It is also clear that this will have implications for their prescribing costs.

In setting prescribing budgets, medical and pharmaceutical advisers are asked to assess individual practices, taking into account local knowledge about the needs of patients.[16] Demonstrating an association between morbidity and prescribing rates for depression will inform discussions with practices and provide an evidence base for increased allocations for this part of the prescribing budget to those practices in areas of higher morbidity.

References

1. Roberts SJ, Harris CM. Age, sex and temporary resident originated prescribing units (ASTRO-PUs): new weightings for analysing prescribing of general practices in England. *BMJ* 1993; **307:** 485-488.
2. Forster DP, Frost CEB. Use of regression analysis to explain the variation in prescribing rates and costs between family practitioner committees. *Br J Gen Pract* 1991; **44:** 67-71.
3. Morton-Jones A, Pringle M. Explaining variation in prescribing costs across England. *BMJ* 1993; **306:** 1731-1734.
4. Pringle M, Morton-Jones A. Using unemployment rates to predict prescribing trends in England. *Br J Gen Pract* 1994; **44:** 53-56.
5. Beale N, Nethercott S. The nature of unemployment morbidity. *BMJ* 1988; **38:** 197-202.
6. Pharoah PDP, Melzer D. Variation in prescribing of hypnotics, anxiolytics and antidepressants between 61 general practices. *Br J Gen Pract* 1995; **46:** 595-599.
7. DHSS. *Inequalities in Health: The Black Report*. London: HMSO, 1980.
8. Department of Health. *Report of the independent inquiry into inequalities of health.* London: HMSO, 1998.
9. Eachus J, Williams M, Chan P, *et al*. Deprivation and cause specific morbidity: evidence from the Somerset and Avon survey of health. *BMJ* 1996; **312:** 287-292.
10. WHO Collaborating Centre for Drug Statistics Methodology. *Anatomical therapeutic chemical (ATC) classification index with defined daily doses.* Oslo: World Health Organisation, 1997.
11. McCormick A, Flemming D, and Charlton J. *Morbidity Statistics from General Practice: Fourth National Study 1991-1992*. London: HMSO, 1995.
12. Scrivener G, Lloyd DCEF. Allocating Census data to general practice populations: implications for study of prescribing variation at practice level. *BMJ* 1995; **311:** 163-165.
13. Majeed FA, Cook DG, Poloniecki J, Martin D. Using data from the 1991 Census. *BMJ* 1995; **310:** 1511-1514.
14. Majeed FA, Cook DG, Poloniecki J, *et al*. Sociodemographic variables for general practices: use of census data. *BMJ* 1995; **310:** 1373-1374.
15. Buckingham K. Using Census information to estimate GP practice morbidity. *Public Health* 1996; **110:** 191-195.
16. Department of Health. *The new NHS modern and dependable. Primary Care Groups: delivering the agenda.* [HSC 1998/228.] Leeds: National Health Service Management Executive, 1998.

Address for correspondence

Dr I F Mackenzie, Directorate of Public Health Medicine, Cornwall and Isles of Scilly Health Authority, St Austell, Cornwall PL25 4NQ.