Note to authors of letters: Please note that all letters submitted for publication should be typed with *double spacing*. Failure to comply with this may lead to delay in publication.

Clostridium difficile after antibiotic therapy

Sir,
The isolation of *Clostridium difficile* or detection of its toxin is a well recognized association with diarrhoea in hospital patients, where it accounts for 10–15% of cases of diarrhoea associated with antibiotic treatment.[1] In contrast, *C difficile* has only rarely been reported as a cause of diarrhoeal illness in general practice although, given the ubiquity of both the causative bacteria and antibiotic therapy, there is no reason to think it should not also occur.[2]

The results of all stool samples sent by general practitioners to the Department of Medical Microbiology, Southmead Hospital, Bristol, between August 1992 and April 1993 were reviewed. There were eight patients from whom samples had been sent by general practitioners and in which *C difficile* toxin was identified using the Premier Kit® (Meridan Diagnostics).

Seven of the patients were women and they were aged between 29 and 56 years; the man was aged 79 years. All had recently received a beta lactam antibiotic for a community-acquired infection: (chest infection (five cases), pelvic infection (one), urinary tract infection (one) and sinusitis (one). Three had received co-amoxiclav, two ampicillin, two cefixime and one amoxycillin. All had diarrhoea, most commonly occurring within one week after stopping antibiotic therapy but in one case a diagnosis was not made until 42 days later. All recovered from their diarrhoea after being treated with oral metronidazole 400 mg three times a day for 7–10 days.

Data from the Avon family health services authority for the period August 1992 to April 1993 showed that amoxycillin was the most commonly prescribed antimicrobial locally (R Grant, personal communication). There were 42 970 prescriptions for amoxycillin (33.7% of all antibiotics), 13 749 for co-amoxiclav (10.8%) and cefixime accounted for 0.5% of prescriptions.

The cases presented here illustrate what must be a common problem in general practice. Despite the fact that *C difficile* is a well-known hospital pathogen we have found only one published report of its association with diarrhoea in the community.[2] While most cases of *C difficile* diarrhoea are mild or moderate, for a proportion of hospital patients infection may lead to more severe outcomes such as bowel perforation or gram-negative shock. Diarrhoea due to *C difficile* has no particular clinical features and presents like many other enteric pathogens with the exception of a history of antimicrobial use within the previous two months.

Beta lactam antibiotics, which disturb the normal bowel flora, were commonly associated with infection in the patients studied here, as has been described in hospital patients.[3] Both co-amoxiclav and cefixime were more likely to be associated with *C difficile* diarrhoea than would be expected from the numbers of prescriptions for these agents.

Patients who have diarrhoea and who have recently received antibiotic therapy should have stool samples sent to a microbiology laboratory and a history of antibiotic use should be indicated, or a *C difficile* toxin test specifically requested.

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Unemployment and prescribing

Sir,
The possibility of using unemployment rates to explain or predict prescribing by general practitioners appears at first sight to be attractive, and the case is argued by Pringle and Morton-Jones (February *Journal,* p.53). We are concerned that their paper contains several unsupported assertions and ignores important issues.

The authors say that 'high prescribing levels suggest high workload', but measure prescribing in terms of cost per patient. Patients are not the most suitable denominator and cost is an unreliable numerator — two doctors prescribing for the same population do not necessarily use equally expensive drugs. The other two measures used — items per patient and net ingredient cost per item — are poor for another reason: the duration of a prescription affects both, and in opposite directions. This is especially important for repeat prescribing (estimated by the National Audit Office[1] to account for two thirds of costs) where each general practitioner is likely to use a consistent duration which may be different to that used by other general practitioners.

They also assert that the strong link between unemployment and prescribing costs per patient for all patients (not just those unemployed) suggests that unemployment has an effect on the population as a whole. While is has been shown[2] that unemployment, and more particularly the threat of unemployment, affects the health of individuals, we must be wary of over-simple interpretations. In the past it may have been reasonable to use unemployment in an area as a marker for poor standards of housing and education, industrial pollution and low income; more recently, and since the year of the study (1989), the increased element of white-collar unemployment makes the assumption open to question.

We agree with the authors in preferring Office of Population Censuses and Surveys estimates of family health services authority populations to numbers of registered patients as a way of avoiding the problem of list inflation, but they should not have ignored the age and sex structure of the population. They could have incorporated prescribing units (PUs), where patients aged over 65 years have a weighting three times that of younger

patients, into their calculations, and would have done even better to use the more sensitive ASTRO-PUs.[3]

In our own work on modelling prescribing costs we have considered the power of unemployment in accounting for prescribing variation and found it less than that of other variables (Table 1). Pringle and Morton-Jones' unemployment data were for 1989, and will therefore differ from ours, but even if their values are accepted it is clear that permanent sickness is a much better predictor of prescribing costs than unemployment. While it is true that permanent sickness data are collected only every 10 years, we have found (unpublished study) that there was little change, relatively, between family health services authorities, from 1981 to 1991. The 10 year gap is therefore unlikely to cause problems.

Finally, it must be emphasized that Pringle and Morton-Jones' study was conducted at family health services authority level. If, therefore, unemployment rates were to be used in the allocation of prescribing money, they would affect only the share of the national prescribing pot obtained by each family health services authority. They could not be used for distribution by family health services authority to its practices: at practice level a marker must relate to factors that can be collected at practice level. Variables that tend to average out at family health services authority level may be very important in characterizing individual practices.

Unemployment rates are available, after considerable delay, at family health services authority level, but they are neither the best, nor even very good, markers for prescribing costs.

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Sir,
In their study of prescribing trends, Pringle and Morton-Jones noted an inverse relationship between the number of items prescribed per patient and the net ingredient cost per item across the family health services authorities (February *Journal,* p.53). The product of these two prescribing rates (cost per item, items per patient) gives an overall prescribing cost per patient. As a measure of prescribing, cost per patient is unaffected by changes in repeat prescribing frequency and compensatory changes in prescription duration, whereas both items per patient and cost per item will reflect these changes. Misleading conclusions may arise through examining correlations between ratios which have common elements.[1,2] In this case, the number of prescription items appears in the numerator of one ratio and the denominator of the other, leading to the inverse relationship observed. A constant value for cost per patient but variation, however small, in items per patient would give a perfect negative correlation ($r = -1$) between items per patient and cost per item. The negative correlation observed is therefore unsurprising, and results from inappropriate analytical methods rather than an underlying prescribing model in need of explanation.

Figure 1 shows family health services authority prescribing rates for the calendar year 1990, calculated using 1989 mid-year Office of Population Censuses and Surveys population estimates (the general picture is similar to that of Pringle which was based on prescribing data for a slightly earlier period). The superimposed curves indicate constant values for net ingredient cost per patient and show that Pringle's split between family health services authorities with high item cost, low item number (group 1) and those with low item cost, high item number (group 2), is by no means a split according to low/high net ingredient cost per patient as is claimed. However, the cost per patient is, on average, lower among group 1 family health services authorities.

The unemployment variables considered may be reasonable predictors for these two groups of family health services authorities but what interpretation can be given to the groups? They do not accord with low and high overall per capita prescribing costs, which might have supported a link between ill health and unemployment. Perhaps in areas of higher employment, doctors write more repeat prescriptions of long duration because more of their patients are not exempt from prescription charges? Overall, this would give higher item cost and lower numbers of items, as in the group 1 family health services authorities. The virtue of predicting a family health services authority's group is not clear; it tells us something about how medicines are prescribed rather than how much is prescribed.

The prescribing picture is not simple, and many things, including patient demographics, product mix and practitioners' approach, contribute substantially to variation in prescribing costs. Explanatory regression models are difficult to interpret when only some of the many possible influences are included, especially as these influences are so often correlated. Those variables that are included may be acting as surrogates for others that have not been considered. Examination of patient-linked prescribing and diagnostic data my shed some light on the variation in prescribing rates, whether at family health services authority or practice level. The widespread use of computerized general practitioner record systems now make this a feasible research approach.

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Table 1. Pearson product moment correlation coefficients of prescribing variables.

Variable	Correlation coefficient		
	Cost[a] per patient	Cost[a] per PU	Cost[a] per ASTRO-PU
No access to a car[b]	0.35	0.41	0.48
Unemployment[b]	0.38	0.45	0.52
Premature SMR[c]	0.53	0.60	0.67
Permanent sickness[b]	0.73	0.77	0.79

[a]Net ingredient cost for 1990–91. [b]1991 census. [c]Standardized mortality ratio for ages 15–64 years from the public health common dataset 1992.

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Sir,
Having worked both in Brighton (the 'affluent' south) and now in Bellshill,