Counting the cost of social disadvantage in primary care: retrospective analysis of patient data

Adrian Worrall, J Nicolas Rea, Yoav Ben-Shlomo

Kentish Town Health Centre, London NW5 2AJ
Adrian Worrall, *research officer*
J Nicolas Rea, *general practitioner*

Department of Social Medicine, Bristol University, Bristol BS8 2PR
Yoav Ben-Shlomo, *senior lecturer in clinical epidemiology*

Correspondence to: Dr Rea.

BMJ 1997;314:38–42

Abstract

Objective: To cost the relation between socioeconomic status and various measures of primary care workload and assess the adequacy of current "deprivation" payments in relation to actual costings for patients living in qualifying areas.
Design: Retrospective data on primary care were collected over a 4.5 year period from both computerised and manually filed records. Standardised data on socioeconomic status were obtained by postal questionnaire.
Setting: Inner city group practice with a socioeconomically diverse population.
Subjects: 382 male and female subjects of all ages, with a total of 1296 person years of observation.
Main outcome measures: Primary care costs resulting from consultations with a general practitioner or a practice nurse and both new and repeat prescriptions.
Results: Morbidity, workload, and costs of drug treatment increased with decreasing socioeconomic status. The difference in cost for patients in social classes IV and V combined compared with those in I and II combined was about £150 per person year at risk (£47 for workload and £103 for drugs). Deprivation payments met only half the extra workload cost for patients from qualifying wards.
Conclusions: The greater workload caused by social disadvantage has been previously underestimated by simple consultation rates. The absolute difference in costs for socially disadvantaged patients increases as more detailed measures of workload and drug treatment are included. Current deprivation payments only partially offset the increased expenditure on workload. This shortfall will have to be addressed to attract general practitioners to, or retain them in, deprived areas.

Introduction

The impact of social disadvantage on morbidity and mortality is now firmly established,[1] but its economic effect on health services is less well documented. Recent work has tried to produce a sensitive and valid formula for funding secondary care, taking measures of social deprivation into account.[2] In primary care the additional workload associated with deprivation has been acknowledged since 1990 through the provision for general practitioners of additional capitation payments for patients living in the most deprived electoral wards, as assessed by the underprivileged area score.[3] These payments have helped to raise the income of inner city general practitioners towards the review body's recommended level,[4] but discussion continues about the fairness and accuracy of these payments.[5-7] This study examines (*a*) the relation between socioeconomic status and primary care workload, including costs for doctors and practice nurses and drug related costs; and (*b*) the adequacy of current deprivation payments in meeting additional workload for patients living in qualifying areas.

Methods

Subjects

Subjects were a 5% computer selected random sample of the 12 014 patients registered with a group practice in north London. The age and sex distribution were compared with the practice and local borough populations.

Explanatory variables

We collected standardised data on lifestyle and socioeconomic status with a postal questionnaire, with covering letter from the subject's general practitioner, addressed to a parent or guardian if the subject was aged less than 16 years. We followed up the non-respondents to two reminders by telephone and personal visits, and by flagging records. We recorded the distance of each patient's address from the practice premises.

We took the questions on occupation from the 1991 census and coded the answers using the classification of the Office of Population Censuses and Surveys.[8] We classified married or cohabiting women according to their partner's occupational status. We chose social class to allow comparison with other studies and as a comprehensible measure of social disadvantage. We aggregated it into three groups for analysis: I and II, III non-manual and III manual, and IV and V.

Outcome measures

We collected retrospective data on primary care over four and a half years, ending 1 July 1994, the period for which computerised records were available. Measures comprised the number of contacts with general prac-

titioners or practice nurses and diagnostic, prescribing, and referral information; these were chosen if they were funded from family health services authority (primary care) budgets. Fee-for-service items have therefore been included. We examined both computerised and manually filed records. Where a discrepancy was found, we used the larger of two figures. We validated rates of contact with general practitioners by comparison with national expected rates.[9]

Procedure

A database inquiry application, MIQUEST,[10] was used to extract diagnostic Read codes from the practice Meditel system. These codes were then classified as "serious," "intermediate," or "minor," according to the Office of Population Censuses and Surveys' severity categories.[9] Only "serious" diagnoses have been reported here—for example, diseases that are possibly life threatening, frequently needing major surgery, or have a high probability of substantial disability.

We calculated the clinical labour cost for each patient by allocating an independently determined cost to each clinical labour event.[11] The amounts used for contact with a general practitioner at the surgery, a general practitioner's home visit, and contact with a practice nurse were £16, £46, and £9.23 respectively (each including an element relating to practice expenses, confirmed as reasonable estimates for the practice studied). A "total" primary health care cost per patient was obtained by adding the cost of prescribed items[12] and dispensing fees to the clinical labour cost.

Analytic procedure

We determined for each subject the number of clinical episodes and the respective person years at risk, enabling us to calculate a specific rate that could be aggregated by socioeconomic status.

We used analysis of covariance to determine mean rates per year by social class groups, after adjusting for age and sex as covariates. As the actual rate distribution was positively skewed, significance testing used a logarithmic transformation after addition of a constant term (+ 1) to remove zero values. Assumptions of linearity and equal variance were checked by examining the distribution and variance of the rates. Social class was entered in the model both as a set of dummy variables and as a continuous variable (values 1-3) to test for linear trend. Age was included in the regression by using four dummy variables for the following age groups: 0-4, 5-19 (baseline), 20-44, 45-64, and 65 and over.

We compared the rate of contact with a doctor with that observed in the fourth national morbidity survey by using age group and sex specific rates from the latter and calculating an expected rate (indirect standardisation). We converted consultation rates from the national survey to contact rates using the provided ratios.[9] In our study population, "ghost" patients—that is, those registered with the practice but who had died, moved away, or re-registered elsewhere—were excluded from the denominator, unlike in the national survey. We therefore applied the national contact rates to our population including ghost patients. Each ghost patient was assumed to have contributed the average length of person years (4.04 years). The expected number of contacts was then divided by the actual number of person years, excluding ghosts, to allow a comparison that takes into account both demographic differences and the exclusion of ghost patients.

To examine whether the pattern of workload across social class groups was overly influenced by heavy users we repeated the analysis using logistic regression and dichotomising each measure into a high and low workload group at the median rate. Odds ratios obtained this way may be misinterpreted as indicative of actual use, rather than high or low use.[13] Accordingly, the age and sex adjusted means have also been included. Interactions between sex, age, and social class were examined by the likelihood ratio test.[14]

The deprivation payment for each subject was ascertained according to the underprivileged area score for his or her electoral ward.

Results

Only 448 of the 572 subjects were resident in the practice area. In all, 382 out of these 448 subjects responded to the questionnaire (response rate 85%). Respondents had a significantly lower general practitioner contact rate than the 64 non-respondents (4.1 *v* 5.6 contacts per person year, $P < 0.01$).

Table 1 shows that the sample population contained fewer men aged 15-44 years than either the practice or census populations. This is not surprising as this subgroup had the highest list inflation rate and also is less likely to take part in research studies.[15] The social class distributions of our sample (social class I and II 40%, III 34%, IV and V 15%, and unclassified 11%) were fairly similar to those in the census data (37%, 40%, 18%, and 4% respectively). Some of these differences reflect the larger proportion of subjects in our study who were not classifiable—for example,

Table 1 Age and sex distribution of study population versus practice and local populations. Values are percentages of patients in whole of each population

	Study population (n=382)		Practice population (n=12 014)		Local borough population (n=356 905)*	
Age group (years)	Male (n=173)	Female (n=209)	Male (n=5926)	Female (n=6088)	Male (n=172 447)	Female (n=184 458)
0-4	3.4	2.9	2.9	2.6	3.3	3.2
5-14	6.8	8.6	5.7	6.4	5.3	5.2
15-44	16.2	25.9	24.3	25.2	24.9	25.8
45-64	15.4	12.0	12.0	10.5	9.6	9.7
65-74	1.8	3.4	2.7	3.1	3.3	3.9
≥75	1.6	1.8	1.8	2.8	1.9	3.9
Total	45.3	54.7	49.3	50.7	48.3	51.7

*Camden and Islington (source: Office of Population Censuses and Surveys, 1993)

Table 2 Morbidity and workload rates per year by grouped social class, adjusted for age group* and sex

Nature of contact with general practice	Adjusted mean rates				P value for linear trend	Odds ratios (95% confidence intervals)			
	Total mean rate (median)	I and II	III Non-manual and manual	IV and V		I and II	III Non-manual and manual	IV and V	P value for linear trend
GP at surgery	3.75 (2.89)	3.12	4.18	4.50	0.002	1.00	1.80 (1.08 to 2.98)	1.99 (1.03 to 3.84)	0.016
GP home visits in hours	0.07 (0)	0.05	0.03	0.28	<0.001	1.00	1.48 (0.66 to 3.34)	3.65 (1.52 to 8.76)	0.006
GP home visits out of hours	0.05 (0)	0.03	0.06	0.09	<0.001	1.00	1.51 (0.69 to 3.28)	3.24 (1.33 to 7.88)	0.013
Practice nurse	0.87 (0.44)	0.65	0.88	1.79	0.005	1.00	1.80 (1.09 to 2.95)	2.18 (1.11 to 4.26)	0.008
Outpatient referrals	0.28 (0.22)	0.27	0.29	0.32	0.25	1.00	1.25 (0.77 to 2.03)	1.87 (0.97 to 3.61)	0.06
Accident and emergency attendances	0.06 (0)	0.05	0.08	0.07	0.19	1.00	1.53 (0.78 to 2.98)	1.95 (0.84 to 4.55)	0.09
Serious illness	0.15 (0)	0.09	0.16	0.38	<0.001	1.00	2.45 (1.36 to 4.43)	3.73 (1.80 to 7.76)	<0.001

GP=general practitioner.
Person years at risk for social class groups I and II, III non-manual and manual, and IV and V are 581, 500, and 215 respectively.
*Age groups (years): 0-4, 5-19 (baseline), 20-44, 45-64, ≥65.

students or unemployed people who had never worked.

The population provided 1296 person years of observation that could be classified by social class (569 male, 727 female). The general practice contact rate per person year at risk for our study population was 3.7 compared with an expected rate of 2.9, extrapolating from the national morbidity survey. With adjustment for the "ghost" population, however, the expected rate increased to 3.8, demonstrating that observed rates were similar to those found elsewhere.

Table 2 presents the mean rates and odds ratios for various measures of workload by socioeconomic status. All the measures showed a linear increase by social class, although the pattern for outpatient referrals and recorded use of accident and emergency departments was both weaker and non-significant. Similarly the odds ratios for being a heavy user varied from 2.0 (seeing a general practitioner at surgery) to 3.7 ("serious" illness) between social class IV and V and social class I and II .

Distance of residence from the practice had no independent effect on any of the main outcome measures—86% of the study population lived within a radius of 1.6 km.

Figure 1 shows the cumulative costs of various types of clinical contact and drug treatment by social class. The cost per year of contact with a general practitioner combined with contact with a nurse rose from £60 in social class I and II to £107 in social class IV and V. The relative differences in clinical labour costs were greatest for home visits. The difference in the "total" primary healthcare cost including drugs between social class IV and V and social class I and II was £150 per person year at risk. The costs of drugs showed the steepest cost gradients, with repeat drugs being the largest component, rising from £30 in social class I and II to £100 in social class IV and V. All cost measures showed significant linear trends in this direction.

Table 3 summarises the workload costs according to payment bands based on the underprivileged area score derived from the 1991 census. Remuneration (£43 417) was 47% less than the costs of the additional workload of patients from qualifying wards (£82 303); this shortfall would vary between practices.

Discussion

Both primary care use and drug costs increased in a linear fashion with decreasing socioeconomic status to a greater extent than in several other studies.[7 9 16] These gradients increased as more detailed data on cost were included (see figure 1). Attendance rates alone underestimate social class differentials. This is analogous to the increased social gradient seen for mortality based on potential years of life lost rather than standardised mortality ratios.[17] Differences may be more apparent in a single practice with a shared approach than in a cross section of practices with varied thresholds for prescribing, home visits, follow up consultations, or referrals.

This increased cost reflects greater levels of morbidity, particularly with chronic diseases, as indicated by the large differential costs for repeat prescriptions. The cost of drugs outweighed clinical labour costs, more so for lower socioeconomic status. Similarly, increased use of home visits probably reflects reduced mobility due to ill health as well as less access to a car.

It is unclear whether the increased use of health care by those of lower socioeconomic status adequately reflects their increased need.[18 19] Despite increasing

Table 3 Underprivileged area scores and workload costs

Payment band (score)*	Study population			Application to practice population			
	No (%) of subjects	Mean workload cost per patient (£)	Additional workload cost over band 0 (£)	No (%) of subjects	Additional workload cost over band 0 (£)	Deprivation payment rate (£)	Deprivation payment total (£)
0 (<30)	157 (42)	67.01	0	4982 (41)	0	0	0
1 (30-39)	185 (49)	78.28	11.27	6318 (53)	71 204	5.95	37 592
2 (40-49)	26 (7)	83.89	16.88	602 (5)	10 162	7.75	4 666
3 (≥50)	9 (2)	75.38	8.37	112 (1)	937	10.35	1 159
Total	377 (100)	–	–	12 014 (100)	82 303	–	43 417

*Underprivileged area score allocated according to electoral ward of subject's address (the higher the score, the more underprivileged).

consultation rates for serious illness, the pattern for both outpatient referrals and recorded accident and emergency attendance was weaker and did not show a significant linear trend. Our results cannot determine whether this reflects underuse of hospital services by patients from social class IV and V or overuse by those in social class I and II. Other evidence suggests that poorer patients may be less likely to be referred for a specialist opinion[20] or to have an operation.[21]

On the basis of the current measure of deprivation for determining levels of remuneration, we found an almost 50% shortfall between the extra workload costs and the extra remuneration provided. These differences would vary depending on the practice profile: less of a shortfall for more affluent practices and more of a shortfall for practices in more deprived areas.

Key messages

- The costs of providing primary health care including drug treatment increased with decreasing socioeconomic status from £107 in social classes I and II to £256 in IV and V per person year at risk
- Previous studies that used simply consultation rates have underestimated the differences by socioeconomic status compared with the use of more detailed measures of cost
- Repeated drug treatment, indicating chronic illness, was the largest component of the total drug and labour cost
- The additional workload costs for patients from qualifying electoral wards were only partially offset by deprivation payments
- Additional deprivation payments could be used to expand the work of practice nurses, although this needs further evaluation

Limitations of study

Our study has several potential limitations. Firstly, our sample size was relatively small; this enabled us, however, to extract detailed information from both computerised and manual records. It is unclear whether the consultation behaviour of our patients is generalisable to the rest of Britain; the overall consultation rate, however, was closely similar to that observed in a national survey.[9] Secondly, data were collected over a retrospective period. This will selectively deplete the number of terminally ill patients, as they could not have been represented in the sample. This will result in underestimating the social class gradient, as these patients are more likely to be of lower socioeconomic status and have higher rates of use. The possibility of "reverse causality" must also be considered, as ill health may result in downward social mobility, exaggerating the socioeconomic relation. This is, however, unlikely to have a large effect.[22] Thirdly, other studies have shown that more detailed composite measures—for example, including housing tenure—will further increase the social gradient.[23 24] Finally, we could not measure the actual time or complexity of each consultation, nor was adequate information available on the workload of district nurses and health visitors. Some evidence suggests that doctors give more consultation time to educated or articulate patients.[25 26] Deprived patients, however, had more consultations for "serious" illness, which is often accompanied by other social problems that might be more demanding for general practitioners. Future prospective studies should try to measure these more subtle aspects of workload.

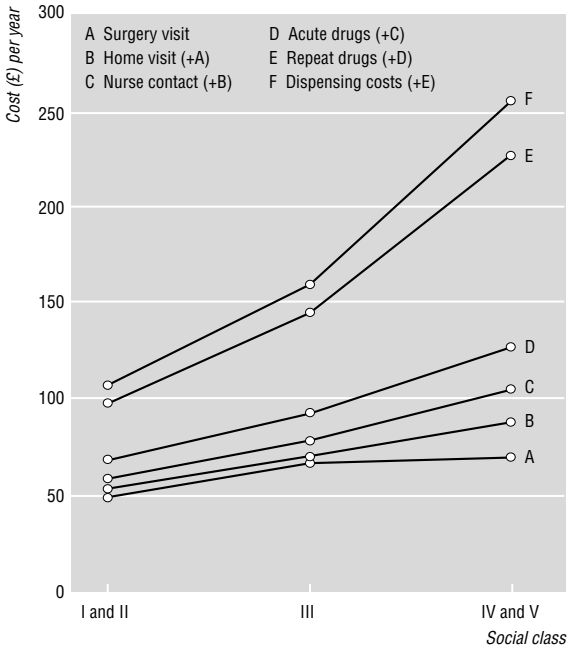

Fig 1 The cumulative costs per year with each additional primary care item by social class. Costs for each activity have been added to previous activity to produce a cumulative value

Role of practice nurse

The practice studied has long experience of working with nurses.[27-29] Practice nurses were consulted more often by patients of lower socioeconomic status. This may be a useful approach in managing patients with chronic disease,[30] the major component of excess morbidity in underprivileged groups. The nurse may be seen as a more approachable figure, more likely to be consulted about family and social problems related to deprivation.[30 31]

Implications

Current government policy is aimed at increasing the proportion of fundholding practices. Our results showed that current deprivation payments to this practice fell short of the true increased workload costs. The total costs including drug treatment for patients in social class IV and V were around £150 a year more than for their counterparts in social class I and II. The maximum deprivation payment covers less than 10% of this additional expenditure: it therefore does not make economic sense for practices with a high proportion of disadvantaged patients to become fundholders. In addition, because the relation between socioeconomic status and workload is continuous, it is inappropriate to use the current, extreme cut off level in determining payments.[32] Many practices that do not receive payments will experience above average work-

loads because of the social class composition of their population.

Conclusion

Deprivation payments might be used to enable practice nurses to work more effectively in primary care, although this needs more detailed evaluation. Practice nurses are particularly suited to treating chronic illness, the major component of the excess morbidity in underprivileged groups. The greater workload and expense associated with these groups has so far been underestimated and inadequately targeted. This will have to be addressed to attract general practitioners to, and retain them in, deprived areas and increase the range of care that they provide.

We thank Mr Martin Shipley for his statistical advice, the partners and staff of the practice, and all the patients who helped by taking part in the study.

Funding: Partly funded by the Research and Development Directorate of the North East Thames Regional Health Authority.

Conflict of interest: None.

1 Marmot M. The social pattern of health and disease. In: Blane D, Bruner E, Wilkinson R, eds. *Health and social organisation.* London: Routledge, 1996:42-67.
2 Carr-Hill R, Sheldon TA, Smith P, Martin S, Peacock S. Hardman G. Allocating resources to health authorities: results and policy implications of small area analysis of use of inpatient services. *BMJ* 1994;309:1046-9.
3 Jarman B. Identification of underprivileged areas. *BMJ* 1983;286:1705-9.
4 Leese B, Bosanquet, N. Change in general practice and its effects on service provision in areas with different socioeconomic characteristics. *BMJ* 1995;311:546-50.
5 Hobbs R. Deprivation payments. *BMJ* 1993;306:534-5.
6 Carr Hill RA, Sheldon T. Designing a deprivation payment for general practitioners: the UPA 8 wonderland. *BMJ* 1991;302:393-6.
7 Ben-Shlomo Y, White I, McKeigue PM. Prediction of general practice workload from census based social deprivation scores. *J Epidemiol Community Health* 1992;46:532-6.
8 Office of Population Censuses and Surveys. *Standard occupational classification.* London: HMSO, 1991.
9 McCormick A, Fleming D, Charlton J. *Morbidity statistics from general practice. Fourth national study 1991-1992.* London: HMSO,1995.
10 Allan K, Markwell D. *MIQUEST project report.* Morpeth: MIQUEST Project Team, 1994. (Report to Northern Regional Health Authority.)
11 Netten A, Dennett J. *Unit costs of community care.* Canterbury: Personal Social Services Unit, 1995.
12 British Medical Association, Royal Pharmaceutical Society of Great Britain. *British national formulary.* London: Pharmaceutical Press, March 1994.
13 Carr-Hill R, Rice N. Fourth national morbidity survey [letter]. *Br J Gen Pract* 1995;45:505.
14 Clayton D, Hills M. *Statistical models in epidemiology.* Oxford: Oxford University Press, 1993.
15 Walsh, K. Evaluation of the use of general practice age-sex registers in epidemiological research. *Br J Gen Pract* 1994;44:118-122.
16 Carr-Hill RA, Rice N, Roland M. Socioeconomic determinants of rates of consultation in general practice based on fourth national morbidity survey of general practices. *BMJ* 1996;312:1008-13.
17 Blane D, Davey Smith G, Bartley M. Social class differences in years of potential life lost: size, trends, and principal causes. *BMJ* 1990;301: 429-32.
18 Blaxter M. Equity and consultation rates in general practice. *BMJ* 1984;288:1963-7.
19 Collins E, Klein R. Equity and the NHS: self-reported morbidity, access, and primary care. *BMJ* 1980;281:1111-5.
20 Marsh GN, Channing DM. Deprivation and health in one general practice. *BMJ* 1986;292:1173-6.
21 Chaturvedi N, Ben-Shlomo Y. From the surgery to the surgeon: does deprivation influence consultation and operation rates? *Br J Gen Pract* 1995;45:127-31.
22 Fox J, Goldblatt P, Jones D. Social class mortality differentials: artifact, selection or life circumstances? In: Goldblatt P, ed. *Longitudinal study. Mortality and social organisation.* London: HMSO, 1990:99-108.
23 Goldblatt P. Mortality and alternative social classifications. In: Goldblatt P, ed. *Longitudinal study. Mortality and social organisation.* London: HMSO, 1990:164-90.
24 Davey Smith G, Shipley MJ, Rose G. Magnitude and causes of socioeconomic differentials in mortality: further evidence from the Whitehall study. *J Epidemiol Community Health* 1990;44:265-70.
25 Buchan IC, Richardson IM. *Time study of consultations in general practice.* Edinburgh: Scottish Home and Health Department, 1973. (Scottish Health Studies No. 27.)
26 Joyce CRB, Caple G, Mason M, Reynolds E, Mathews JA. Quantitative study of doctor-patient communication. *Q J Med* 1969;38:183-94.
27 Rea JN, Weiss M. The nurse as an ancillary. *Medical World* 1962;37:291-3.
28 Jeffreys LA, Clark AL, Koperski M. Practice nurses' workload and consultation patterns. *Br J Gen Pract* 1995;45:415-8.
29 Jefferys M, Sachs H. *Rethinking general practice.* London: Tavistock Publications, 1983:91-103.
30 Marsh GN. *Efficient care in general practice.* Oxford: Oxford University Press, 1991:40-5.
31 Lucas J. Practice nurse workload [letter]. *Br J Gen Pract* 1995;45:692.
32 Jarman B. *Social deprivation and health service funding.* London: University of London, 1990. (Papers in science, technology, medicine and public policy, No 22.)

(Accepted 31 October 1996)

WORDS TO THE WISE

Learning from the past

How many practising chest physicians can envisage the treatment of pulmonary tuberculosis without antibiotics? Doctors in Africa and in India and the Far East may be faced with this problem within a few years—and the rest of the world soon afterwards. The emergence of resistant strains of *Mycobacterium tuberculosis* may soon outpace the development of new antibiotics.

As recently as 1950 we treated thousands of patients with tuberculosis with prolonged bedrest and collapse therapy. My own artificial pneumothorax was induced at Guy's on VE Day in 1945 and abandoned five years later. Streptomycin or para-aminosalicylic acid were not to come into general use for some years; isoniazid followed only in the mid-1950s and was in short supply even then.

Many junior doctors suffering from pulmonary tuberculosis at the end of the second world war specialised in chest medicine, and I followed that path partly out of interest but mainly because most other careers were barred. We were all constantly advised to rest as much as possible and never to work excessive hours or at night.

As a young chest physician I must have induced scores if not hundreds of artificial pneumothoraces during the next ten years. However, though many papers, including one of my own, were published on this treatment we do not know if the thousands of pneumothoraces induced during the 1940s and 1950s did any good; there were of course no controlled trials.

When I look back on those days I am amazed at our patients' tolerance in the face of endless months of bedrest, of uncertainty about the future, about loss of livelihood, disruption of family life, and all the other stresses of prolonged illness. Nowadays to be incapacitated for several years would be regarded—rightly—as intolerable, yet in the 1950s many hundreds of patients accepted these burdens with understanding and a degree of composure. Every city in Britain was ringed with several sanatoriums—all full to overflowing.

Then, with the widespread use of streptomycin and para-aminosalicylic acid, we had the problems of compliance and the first emergence of resistant strains. In 1954 I played a small part in introducing urine testing to check on the compliance to para-aminosalicylic acid only to find that nearly half the patients were not taking para-aminosalicylic acid—it is a very unpalatable drug.

The costs of DOTS (Directly Observed Treatment Short) courses, which requires health workers to monitor each and every dose of medication, although monstrous, pale in comparison with sanatorium treatment of tens of thousands of patients. I just hope that ministers of health all over the world are taking this seriously enough. Are they?

W M Dixon *is a retired occupational health physician in Buckinghamshire*

We welcome filler articles of up to 600 words such as *A memorable patient, A paper that changed my practice, My most unfortunate mistake,*or any other piece conveying instruction, pathos, or humour. If possible the article should be supplied on a disk.