Factors influencing variation in prescribing of antidepressants by general practices in Scotland

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ABSTRACT

Background
The prescribing of antidepressants has been rising dramatically in developed countries.

Aim
As part of an investigation into the reasons for the rise and variation in the prescribing of antidepressants, this study aimed to describe, and account for, the variation in an age–sex standardised rate of antidepressant prescribing between general practices.

Design of study
Cross-sectional study involving analyses of routinely available data.

Setting
A total of 983 Scottish general practices.

Method
Age–sex standardised prescribing rates were calculated for each practice. Univariate and multivariate regression analyses were undertaken to examine how the variation in prescribing was related to population, GP, and practice characteristics at individual practice level.

Results
There was a 4.6-fold difference between the first and ninth deciles of antidepressant prescribing, standardised for registered patients' age and sex composition. The multivariate model explained 49.4% of the variation. Significantly higher prescribing than expected was associated with more limiting long-term illness (highly correlated with deprivation and the single most influential factor), urban location, and a greater proportion of female GPs in the practices. Significantly lower prescribing than expected was associated with single-handed practices, a higher than average list size, a greater proportion of GP partners born outside the UK, remote rural areas, a higher proportion of patients from minority ethnic groups, a higher mean GP age, and availability of psychology services. None of the quality-of-care indicators investigated was associated with prescribing levels.

Conclusion
Almost half of the variation in the prescription of antidepressants can be explained using population, GP, and practice characteristics. Initiatives to reduce the prescribing of antidepressants should consider these factors to avoid denying appropriate treatment to patients in some practices.

Keywords
antidepressants; clinical practice variation; family practice; Scotland.

INTRODUCTION

The prescribing of antidepressants has been increasing in many developed countries over the last two decades.[1–7] In 1992, 1.16 million prescriptions for antidepressant drugs were dispensed in the community in Scotland; by 2006, this had risen three-fold to 3.53 million.[8] The reason for this rise is unclear, but it is not due to an increase in the incidence or prevalence of depression.[9]

In the UK most antidepressants are prescribed by GPs, and previous research has demonstrated considerable variation in prescribing levels between individual general practices; as an example, a 25-fold variation was found between the highest and lowest prescribing practices in one area of the UK.[10] Factors that have been found to influence the prescribing levels for antidepressants include the age and sex composition of the practice population,[11,12] the levels

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Submitted: 9 May 2008; **Editor's response:** 27 August 2008; **final acceptance:** 6 September 2008.

This is the full-length article of an abridged version published in print. Cite this article as: *Br J Gen Pract* 2009; DOI: 10.3399/bjgp09X395076.

of permanent sickness and deprivation in the practice population,[13] the higher education level of patients,[14,15] their ethnic origin,[10] the country of birth and qualification of the GPs,[12] the geographical location of the practice,[16] the practice list size,[12] and the number of partners in the practice.[12] Other factors that have been suggested, but not shown, to be associated with prescribing levels include GP age and sex,[16] quality measures of care,[10] and the availability of non-drug treatment for depression, such as counselling.[11]

The aim of the study was to investigate the influence of a range of population, GP, and practice characteristics on an age- and sex-standardised measure of antidepressant prescribing in all practices in Scotland, and to determine how much of the variation in prescribing levels could be explained by known factors.

How this fits in

The prescription of antidepressants has been increasing in many developed countries. General practices are responsible for most antidepressant prescribing and there is considerable variation in levels of prescribing between individual practices. This study demonstrates that a range of population, practitioner, and practice factors are independently associated with prescribing levels. The level of limiting long-term illness in the practice, which is highly correlated with deprivation, is the most influential factor.

METHOD

The amount of prescribing was measured using defined daily doses (DDDs).[17] These are units representing the usual daily adult maintenance dose for the main indication of the drug. This enables comparisons across different formulations.

DDDs of all antidepressants (*British National Formulary*,[18] section 0403) for the financial year 2004–2005 were taken from Prescribing Information Systems at Information Services Division (ISD) Scotland for each practice. Data on the size, age–sex composition, and geographical distribution of registered populations were taken from the Community Health Index population counts from 30 September 2004 from ISD. These can be inaccurate because of population turnover and delays in the de-registration process, so they were adjusted to reduce them to the General Register Office for Scotland's totals within each health board.[19]

A standardised prescribing ratio (SPR) was created to allow for variations in the population size and age–sex composition of each practice. Expected values were calculated using specific therapeutic group age–sex related prescribing units[20] and the age–sex composition of the practice population. The SPR is a ratio of actual to expected prescribing. It is expressed centred on a national average, which is calculated by dividing total DDDs dispensed per day by the total Scottish population. As such, each practice's SPR represents the percentage of the Scottish population that would be prescribed antidepressants if all practices were prescribing at this practice's rate, assuming one DDD per capita daily. As prescribing data are collected for the whole year, and for the population on one date, there is a risk of extreme low or high values from practices that are open for only part of the year, or that have a seasonal population, such as university-based practices. To remove these outliers, practices were excluded if their SPRs were beyond the first and 99th percentiles.

The standardised illness ratio — an age–sex standardised rate of limiting long-term illness — and the proportion of minority ethnic groups were obtained from the 2001 Census by small geographical areas. The Scottish Executive Urban Rural Classification[21] and the income and education domain scores from the Scottish Index of Multiple Deprivation 2004 (SIMD)[22] were also obtained by small geographical areas. Using the residential postcodes of patients registered with the practices, patients were assigned to small geographical areas, and the weighted mean for each of these variables was calculated for each practice.

GP characteristics were obtained from the practitioner contractor database at ISD on 1 April 2005. The number of GPs, their mean age, the proportion of female GPs, and the proportion of GPs born and qualified outside the UK were calculated for each practice.

Quality of care is difficult to measure. Three indicators were used, the first of which was the percentage of the maximum potential points achieved on the Quality and Outcomes Framework (QOF) for 2004–2005.[23] The QOF is a system for allocating points to practices for their achievement under a selection of quality and administrative criteria. It was also considered whether a practice had at least one registered GP trainer and had participated in the Scottish Programme for Improving Clinical Effectiveness in Primary Care (SPICE-PC) clinical quality assurance initiative in 2004–2005.[24] In the SPICE-PC scheme, Scottish practices voluntarily submit data each year on clinical effectiveness and receive comparative feedback. Finally, the availability of psychology services was considered. The whole-time equivalent (WTE) of all clinical staff in psychology services on 30 September 2004 was extracted from workforce data at NHS Health Board level held. This was divided by 10 000s of the

population of the board area, with the variable to practices attached accordingly.

The unit of analysis was the practice. To allow for variations in size, summary statistics and analyses were weighted by the expected rate of prescribing. Univariate linear regression coefficients were derived relating the SPR to each independent variable in turn. A backwards stepwise regression, with addition and removal criteria of $P = 0.05$ and $P = 0.01$ respectively identified the independent variables with a significant effect on the SPR. Checks for multicollinearity were undertaken using variance inflation factors. All analyses were conducted using the STATA 8 statistical package.

RESULTS

Of 1004 practices in Scotland in 2005, 21 were removed from the analyses because they were outliers and a total of 983 practices were retained for the analysis.

The mean SPR was 6.77; the minimum SPR was 2.24 and the maximum was 13.84. The ratio between the first and ninth deciles was 4.6 so, excluding outliers, the practices in the lowest decile for prescribing were prescribing at less than a quarter of the level of the practices in the highest prescribing decile.

The standardised illness ratio, which is centred on a national average of 100, varied from 51 in the healthiest practice population to 186 in the least healthy practice population. The SIMD income deprivation score represents the percentage of the population receiving state benefits on the grounds of low income, and has a mean value of 15 and a range of 2 to 43. The SIMD education deprivation score is a composite of variables reflecting attainment and further education participation, and is measured as a z-score with a mean of 0 and a standard deviation range of –1.6 to 1.7.

The mean proportion of patients belonging to minority ethnic groups was 2% in the sample of practices, the mean list size was 5300, and mean number of GPs in a practice was 4.38. In all, 10% of the practices were single-handed. Mean age of the GPs was 44.9 years and 42% were female; 14% of the GPs were born outside the UK and 10% qualified outside the UK. Of the practices, 28% of were training practices and 38% participated in the SPICE-PC initiative. The practices achieved an average of 92% of the total available QOF points. A mean of just over one WTE psychology services clinical staff member was available per 10 000 residents (Appendix 1).

Five factors were significantly associated with the prescribing of antidepressants in the univariate regression analysis (Table 1): the standardised illness ratio, income deprivation score, and education deprivation score were positively associated with antidepressant prescribing levels, that is, the higher the score, the higher the prescribing level; the number of GPs in the practice and the mean GP age were negatively associated with antidepressant prescribing, that is, smaller practices and younger GPs were associated with higher prescribing.

The effect of geographical location was investigated by comparing all categories (from primary cities to very remote, rural areas) with each other in the univariate regression analysis. Higher levels of prescribing were found in cities and urban areas and lower levels were found in rural areas (Appendix 2).

None of the quality-of-care indicators investigated was found to be significantly associated with prescribing levels.

When the multivariate regression was modelled, nine factors were significantly associated with antidepressant prescribing levels. The standardised illness ratio, location in an urban settlement, and the proportion of female GPs were positively associated with prescribing levels of antidepressants. The proportion of patients from minority ethnic groups in the practice, practice list size, very remote rural settlements, single-handed practices, mean GP age, and proportion of GPs in the practice born outside the UK were negatively associated with prescribing levels (Table 2). The availability of psychology services was also negatively associated with prescribing, but was of marginal significance ($P = 0.031$).

Table 1. Influence of variables investigated in the univariate regression analyses on antidepressant prescribing.

Variable	Coefficient (SE)	Beta	*P*-value
Standardised illness ratio	0.05 (0.00)	0.64	<0.001
Income deprivation score, SIMD	0.16 (0.01)	0.61	<0.001
Education deprivation score, SIMD	1.96 (0.09)	0.60	<0.001
Proportion of minority ethnic groups	–6.17 (2.52)	–0.08	0.015
List size, 000s	–0.42 (0.02)	–0.08	0.032
Number of GPs	–0.07 (0.03)	–0.11	0.003
Single-handed practice	–0.41 (0.25)	–0.04	0.102
Mean GP age	–0.05 (0.01)	–0.12	<0.001
Proportion of female GPs	0.68 (0.31)	0.08	0.028
Proportion of GPs born outside UK	–0.23 (0.30)	–0.02	0.444
Proportion of GPs qualified outside UK	–0.15 (0.39)	–0.01	0.702
Training practice	–0.27 (0.14)	–0.07	0.051
SPICE-PC	–0.19 (0.13)	–0.05	0.153
% Quality and Outcomes Framework points	–0.01 (0.01)	–0.02	0.477
Availability of psychological services	0.09 (0.18)	0.01	0.640

SE = standard error. SIMD = Scottish Index of Multiple Deprivation 2004.
SPICE-PC = Scottish Programme for Improving Clinical Effectiveness in Primary Care.

The multivariate model explained 49.4% of the variation in prescribing antidepressants between practices in Scotland.

Table 2. Variables that significantly influence antidepressant prescribing in the multivariate regression model.

Variable	Coefficient (SE)	Beta	*P*-value	VIF
Standardised illness ratio	0.06 (0.00)	0.66	<0.001	1.10
Proportion of minority ethnic groups	–8.58 (1.81)	–0.11	<0.001	1.14
List size, 000s	–0.04 (0.01)	–0.07	0.004	1.28
Urban settlements	0.35 (0.10)	0.09	0.001	1.16
Remote rural settlements	–0.59 (0.27)	–0.04	0.030	1.08
Very remote rural settlements	–1.39 (0.23)	–0.11	<0.001	1.14
Single-handed practice	–0.67 (0.23)	–0.07	0.003	1.21
Mean GP age	–0.05 (0.01)	–0.14	<0.001	1.21
Proportion of female GPs	0.59 (0.22)	0.07	0.008	1.18
Proportion of GPs born outside UK	–0.70 (0.24)	–0.07	0.003	1.10
Availability of psychological services	–0.31 (0.14)	–0.05	0.031	1.08

SE = standard error. VIF = variance inflation factor.

DISCUSSION

Summary of main findings

The mean SPR for antidepressants in this study was 6.77, that is, 6.77% of the Scottish population would be prescribed an antidepressant if all practices prescribed at the average rate. There was a wide range of prescribing levels across the sample, with some practices prescribing at around a third of the standardised level and others at approximately double the level. The study showed that practices with higher than average numbers of patients from minority ethnic groups and partners born outside the UK tended to have lower than expected prescribing. It was also found that practices with higher than average list sizes tended to have prescribing levels that were lower than expected. No association was found between the examined quality markers of care examined at and antidepressant prescribing.

Comparison with existing literature

In a previous study, a 25-fold variation was found between the highest and lowest prescribing practices in 164 practices in East London in 1996[10] and an eight-fold difference between the highest and lowest prescribing practices of 61 practices in Cambridgeshire in 1992–1993.[11] It is likely that, within any wide prescribing range, there are some practices that are prescribing at excessively low levels and those that are prescribing at excessively high levels, given the needs of their practice populations. The difficulty with determining the correct prescribing level of antidepressants in any given population with any given set of characteristics is that there are many gaps in the evidence base around the diagnosis and management of depression in primary care. For example, it is not known what proportion of the Scottish population diagnosed with depression in primary care should be treated with an antidepressant drug instead of receiving other management options. Almost half of the variation in antidepressant prescribing levels in our study can be explained by population, GP, and practice factors. This is a very high proportion of the variation and compares favourably with other similar studies.[10,11]

Deprivation has previously been identified as one of the strongest indicators of prescribing for all drugs[25] but it has not been found to be significant in multivariate models of antidepressant prescribing.[10–12] Deprivation has been used as a proxy for morbidity,[26,27] and when morbidity was considered — specifically permanent sickness and long-term illness — it was the most influential factor on antidepressant prescribing in 78 practices in western England in 1995.[13] In this study, limiting long-term illness was the single most influential factor on variation in antidepressant prescribing levels and it acted as a proxy for deprivation.

Several of the other associations found confirm the findings of other researchers but others are at odds with the findings of previous studies. It was found that higher proportions of patients from ethnic minority groups and GPs born outside the UK were associated with lower antidepressant prescribing, a finding that is supported by previous research.[12] It is likely that specific cultural factors are operating in these practices and it is possible that patients attending them have unmet needs for the treatment of depression. Other researchers have reported lower than expected prescribing in single-handed practices.[14]

Other researchers, however, have not found any influence of GP age or sex on antidepressant prescribing and they have demonstrated an increase in prescribing in remote and rural areas which conflicts with the current findings.[11,16] It was also found that lower than expected levels of prescribing in practices with higher than average list sizes which conflicts with previous work.[12] Although the reasons for the findings can be speculated on, the authors believe that further work — particularly qualitative interviews with GPs — would help to explain some of them.

The inability to find any association between the quality markers of care examined and antidepressant prescribing confirms the work of previous researchers who looked at some of the same indicators as well as some that were different.[10] The quality markers examined may, however, not fully reflect the quality of care for patients with depression. It is the authors' opinion that there is

currently no particularly effective measure of this as it is not universally agreed what constitutes good care in relation to antidepressant prescribing; some experts argue that there are still too few patients being treated with antidepressants.[28] Practices with low levels of prescribing may be poor at recognising and treating depression or they may, on the other hand, be good at limiting antidepressant prescribing by appropriate use of non-drug treatments for mild depression. Similarly, practices with high levels of prescribing may be good at diagnosing depression or may be prescribing inappropriately for minor psychological illness.

The availability of non-drug treatment might be expected to reduce prescribing, that is, practices that have good access to psychological treatments might have low antidepressant prescribing levels. A weak negative relationship was identified between the availability of a psychologist and antidepressant prescribing levels once other factors in the multivariate model were controlled for. This refinement may explain why the results differ from previous research that has shown no correlation between prescribing behaviour and accessibility to therapy or counselling.[11]

Strengths and limitations of the study

Previous multivariate analyses investigating antidepressant prescribing used smaller sample sizes: 61 to 64 practices.[10–13] This study analysed information from 983 practices. In addition, the prescribing data from ISD are of high quality but hospital prescriptions, and others not linked to a GP prescriber, were omitted to allow for practice-level analysis. As most depression is treated in primary care, it can be confidently assumed that the impact of hospital inpatient prescriptions is negligible.

Although DDDs are the most meaningful measure of prescribing volume, they may not represent the actual doses, especially where one drug has several common indications at different doses.[13] An example of this is amitriptyline, which is recommended in low doses for neuropathic pain, but high doses for depression.

This study also used more accurate indicators for important variables than previous research. SPR was used rather than DDDs per capita to standardise for population, age, and sex composition, and where a previous study defined rurality as being more than 3 miles from the surgery,[11] the Scottish Executive's eight category definitions was used, which rate rurality and remoteness separately. In terms of deprivation, the SIMD, comprising six domains, is more comprehensive than the Townsend index, which has been used in previous studies.[11,12] The two selected domains reflect more deprivation indicators than the Townsend index. The full SIMD was not used as it includes the health indicator that incorporates the 'proportion of the population being prescribed drugs for anxiety or depression or psychosis'.[25] Other researchers have used patients' names to determine ethnicity[10,12] but this study used census data, which are likely to be more accurate.

The prescribing data are linked to practices through the prescriber. They cannot be linked to the patient or to their diagnosis. This is a limitation of the British datasets that are currently available and means that the following could not be examined: whether the differences in prescribing were due to differences in the number of patients receiving antidepressants, average doses, average durations of treatment, or whether antidepressants are prescribed for conditions other than depression.

Implications for future research and clinical practice

The minimal impact of accessibility to psychological treatments in the analysis may be explained by the overall poor availability of these services, but this is still a potentially worrying finding for policy-makers who expect an increase in the availability of psychological therapies to reduce prescribing levels of antidepressants. The Scottish Government, for example, has set a target to stabilise the increase in the prescribing levels of antidepressants levels by 2010 and, thereafter, to reduce it by 10%;[29] part of the strategy to achieve this is to provide increased access to psychological therapies.[30] It will be important to monitor the impact of this policy on the prescribing levels of antidepressants and to ensure that some patients in already low-prescribing practices are not further disadvantaged because they do not receive appropriate treatment with antidepressants.

Funding body

This study was funded by the Chief Scientist Office of the Scottish Executive Health Department (reference number: CZH/4/198). This work is independent of the funder and does not necessarily represent its views

Ethics committee

This study was approved by Southampton Multi-Centre Research Ethics Committee (reference number: 04/Q1702/53)

Competing interests

The authors have stated that there are none.

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Appendix 1. Summary statistics for all variables included in the regression analysis to investigate their influence on antidepressant prescribing (for sources see text).

Variable	Mean	SD	Min	Max
Standardised illness ratio	99.96	23.67	50.91	186.27
Income deprivation score, SIMD	15.32	7.94	2.46	43.12
Education deprivation score, SIMD	0.00	0.60	–1.59	1.67
Proportion of minority ethnic groups	0.02	0.03	0.00	0.28
List size, 000s	5.30	3.30	0.12	23.32
Number of GPs	4.38	2.58	1.00	15.00
Single-handed practice	0.10	0.30	0.00	1.00
Mean GP age, years	44.91	6.07	20.00	67.00
Proportion of GPs female	0.42	0.26	0.00	1.00
Proportion of GPs born outside UK	0.14	0.25	0.00	1.00
Proportion of GPs qualified outside UK	0.10	0.22	0.00	1.00
Training practice	0.28	0.45	0.00	1.00
Participant in SPICE-PC	0.38	0.49	0.00	1.00
% Quality and Outcomes Framework points	92.20	9.06	28.00	100.00
WTE psychologists per 10 000 population	1.01	0.34	0.00	1.73

SPICE-PC = Scottish Programme for Improving Clinical Effectiveness in Primary Care. WTE = whole-time equivalent.

Appendix 2. Influence of urban/rural classification[a] on the prescribing of antidepressants in univariate regression analyses.[b]

Category	Coefficient (SE)	Beta	*P*-value
Primary cities	0.37 (0.14)	0.10	0.008
Urban settlements	0.45 (0.13)	0.11	0.001
Accessible small towns	–0.44 (0.18)	–0.08	0.016
Remote small towns	–0.11 (0.43)	–0.01	0.794
Very remote small towns	–0.62 (0.34)	–0.04	0.069
Accessible rural areas	–0.89 (0.20)	–0.12	<0.001
Remote rural areas	–1.44 (0.27)	–0.11	<0.001
Very remote rural areas	–1.92 (0.20)	–0.15	<0.001

[a]This is taken from The Scottish Executive Urban Rural Classification. [b]In each case, the category of interest is compared with all other categories. SE = standard error.