

Specific therapeutic group age-sex related prescribing units (STAR-PUs): weightings for analysing general practices' prescribing in England

D C E F Lloyd, C M Harris, D J Roberts

Abstract

Objectives—To derive cost comparators for prescribing by English general practitioners in eight specific therapeutic groups, based on age-sex related weightings, and to confirm, from a new dataset, earlier age-sex weightings for overall prescribing (ASTRO-PUs).

Design—Calculations based on one year's prescribing data from selected practices using AAH Meditel software, held on MediPlus by Intercontinental Medical Statistics (IMS, UK and Ireland), and research practices using VAMP software, held on the General Practice Research Database.

Setting—112 English practices with 739 672 patients and 510 British practices with 3126 570 patients.

Main outcome measures—Cost based weightings for 18 age-sex groups and for temporary residents for eight leading specific therapeutic groups and for prescribing overall.

Results—The two datasets were similar in age distribution and in the way that prescription numbers were distributed by age-sex band in each therapeutic group. The cost based weightings for specific therapeutic groups showed great variation in the use of these groups for patients in different age-sex groups. When these weightings were applied to the prescribing of practices in two family health services authorities they differed in their power to predict prescribing costs: for cardiovascular and gastrointestinal drugs predictive power was particularly high; for drugs for infections it was particularly low, since these are widely used at all ages and for both sexes. Cost based weightings for overall prescribing derived from the IMS data were similar to those of the ASTRO-PU system even though they were derived by different methods from different datasets.

Conclusions—The weightings (STAR-PUs) offer a sound basis for cost comparisons at the therapeutic group level. Cost-based weightings for overall prescribing derived from the IMS data were reassuringly similar to those of the existing ASTRO-PU system.

Introduction

General practitioners' prescribing patterns, as revealed by data reported quarterly by the Prescription Pricing Authority, are largely judged in terms of how they relate to a local average. This is calculated by multiplying the local average cost of one "prescribing unit" by the number of prescribing units in the practice. In the prescribing unit weighting system each patient under the age of 65 counts as one prescribing unit, while older patients count as three. In a previous

paper from this unit a more extensive set of weightings (ASTRO-PUs) for overall prescribing was described, incorporating 18 age-sex groups and one temporary resident group.¹ These have been accepted as a fairer way of standardising for the effects of demography on a practice's overall prescribing, and they are used in the setting of prescribing budgets.

The effects of demography on prescribing within each specific therapeutic group will differ according to the kinds of condition for which the drugs are likely to be used, but this is currently not taken into consideration. At the moment, a practice's prescribing in every therapeutic group is compared with a local average based on the prescribing unit weighting. Standardising practice populations for individual therapeutic groups, using the 18 age-sex bands of the ASTRO-PU, would allow more valid comparisons to be made. The only published attempt to create comparators at therapeutic group level has been that of Sleator, who used data for one quarter in 1989 for a number of practices in one family practitioner committee area.²

In this paper we report our work to establish sets of weightings, using the demographic bands of the ASTRO-PU system, for eight specific therapeutic groups that together account for about 85% of the volume and cost of general practice prescribing in England. We have used a year's data from a large number of practices throughout England. The weightings are cost based; as the prescribing units are related to specific therapeutic groups and each age-sex band, they are called, acronymically, STAR-PUs.

The data available allowed us also to calculate cost based age-sex related weightings for overall prescribing and to compare them with the ASTRO-PU weightings that had been derived from the prescribing of a different set of doctors, in a different year, by slightly different methods.

Methods

The eight therapeutic groups we studied each corresponded to a chapter in the *British National Formulary*. They were the leading groups in terms of both volume and cost: gastrointestinal system (chapter 1), cardiovascular system (chapter 2), respiratory system (chapter 3), central nervous system (chapter 4), infections (chapter 5), endocrine system (chapter 6), musculoskeletal and joint diseases (chapter 10), and skin (chapter 13).

Data covering one year were obtained from two sources. One was the MediPlus Database assembled by Intercontinental Medical Statistics (IMS, UK and Ireland) from selected practices using AAH Meditel software; a description of this database and its methods of quality assurance is given in the appendix. The other was the General Practice Research Database (formerly

Prescribing Research Unit,
University of Leeds
Research School of
Medicine, Leeds LS2 9NZ
D C E F Lloyd, *applied
research
statistician*
C M Harris, *director*
D J Roberts, *unit manager*

Correspondence to:
Professor Harris.

BMJ 1995;311:991-4

the VAMP research database) now held by the Office of Population Censuses and Surveys and fully described elsewhere.^{3,4} The former covered 112 practices in England with 348 952 male and 390 720 female patients from April 1993 to March 1994; the latter, 510 practices in the United Kingdom with 1 529 317 male and 1 597 253 female patients from April 1992 to March 1993. Figures were obtained separately for each practice for male and female registered patients in the age groups 0-4, 5-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75-84, and 85 and over, and also for male and female temporary residents. The General Practice Research Database data provided only the numbers of items prescribed, while those from IMS gave both the numbers of items and their costs. The age-sex distributions of the two samples of registered patients were closely similar to each other and to the 1993 mid-year population estimates for England produced by the Office of Population Censuses and Surveys. The average percentage of temporary residents per practice differed in the two datasets: in the former it was 1.8 for males and 2.5 for females, and in the latter 0.8 for males and 1.0 for females.

Only the IMS data, which covered both items and costs, were suitable for our objectives; but the distribution of items in the data could be pragmatically validated by comparing it with the distribution of items in the larger General Practice Research Database. From each of the two datasets we therefore calculated item based weightings for each therapeutic group and made the appropriate comparisons.

Having derived cost based STAR-PU values for each of the eight groups from the IMS data we calculated their power in accounting for practice prescribing costs in two family health services authorities for which we had detailed data—Bradford and Leeds.

Finally, we used the study data to derive weightings for overall prescribing that would be directly comparable with ASTRO-PU but calculated on the drug costs of a different group of doctors in a different year. We had the advantage of knowing the costs of all the items prescribed, whereas in the earlier work items had to be costed by extrapolating from the data of two health centres.

Results

The item based weightings derived from the two datasets were closely similar for seven of the eight therapeutic groups, but for the endocrine group there were some differences. Figures 1 and 2 show how they compared for central nervous system drugs (typical of the seven groups) and for endocrine drugs. Even for the latter the two curves are broadly similar, and the divergence occurs only in the older groups.

Analysis of the IMS item-based figures for gastrointestinal drugs, using a linear model, suggested that there was a significant practice effect. We would expect this with other drug groups too, as a result of factors such as differences between practices in deprivation related morbidity and prescription duration. The

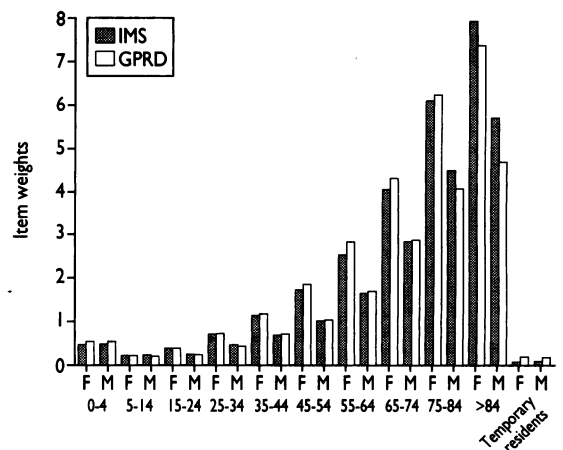


FIG 1—Comparison of item-based weightings by age and sex from IMS and General Practice Research Database (GPRD) data: central nervous system drugs

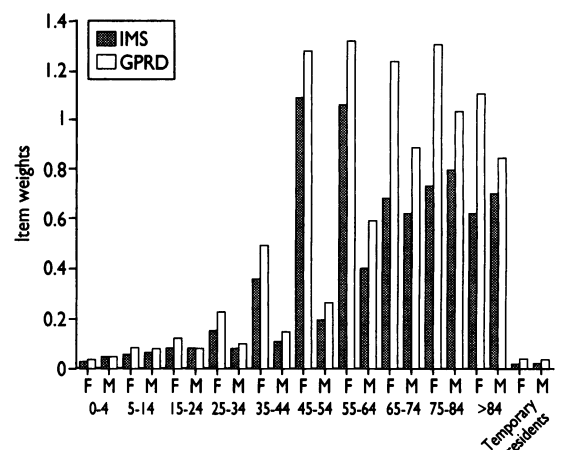


FIG 2—Comparison of item-based weightings by age and sex from IMS and General Practice Research Database (GPRD) data: endocrine system drugs

weightings, therefore, will never be able to explain all of the variation between practices.

In calculating the cost based weightings from the IMS data, we combined the 75-84 year age groups with those for 85 years and over, since the numbers in the latter were small. The values are given in table I. The range was greatest in the gastrointestinal and cardiovascular drug groups, with age as the important factor. Sex difference was particularly pronounced in the endocrine drugs; skin preparations and drugs used for infections, however, did not vary greatly in their level of use across the age-sex groups. These values are the STAR-PU weightings.

We applied them to 73 practices in Bradford and to 123 practices in Leeds. For each drug group we standardised for population size by calculating the cost per patient and the number of STAR-PU per patient and modelled cost per patient by STAR-PU per patient in a regression equation. Table II shows the r^2 values for Bradford and Leeds expressed as a percentage of

TABLE I—Cost based weightings (STAR-PU) for eight specific therapeutic groups by age and sex of patients and temporary resident status

Age group	Gastrointestinal		Cardiovascular		Respiratory		Central nervous system		Infections		Endocrine		Musculoskeletal		Skin	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-4	0	0	0	0	3	2	1	1	3	3	0	0	0	0	3	3
5-14	0	0	0	0	5	4	1	1	2	3	1	1	0	0	2	2
15-24	1	1	0	0	4	4	2	2	4	4	2	1	0	0	2	2
25-34	3	2	0	0	2	3	3	4	2	3	1	3	1	1	1	3
35-44	5	4	3	2	3	3	4	7	2	3	1	6	2	2	1	2
45-54	8	8	9	7	3	4	6	10	2	3	1	13	3	5	1	2
55-64	15	15	27	21	6	8	8	11	3	3	2	12	6	9	2	2
65-74	23	23	42	36	12	10	10	13	4	3	3	4	9	12	3	3
≥75	30	33	41	38	13	6	16	20	4	3	3	2	10	13	4	5
Temporary residents	0	0	0	0	0	0	0	0	0.5	0.5	0	0	0	0	0	0

the variation explained. It looks as though our system is best at accounting for cost differences between practices in the drug groups whose weightings show a wide range of values; these drug groups also happen to be the most expensive.

Table III shows the cost based weightings for prescribing overall and compares them with ASTRO-PU values. There is a reassuring similarity. The two sets are in fact not absolutely comparable, for two reasons. Firstly, the ASTRO-PU data came from VAMP practices, and their coding scheme included some dressings and appliances not included in the IMS data. Secondly, the number of temporary residents in the IMS data was low compared with the national average.

TABLE II—Adjusted percentage of variance in cost per patient explained by the cost based weightings for 73 Bradford practices and 123 Leeds practices

Specific therapeutic group	Bradford	Leeds
Gastrointestinal	55	52
Cardiovascular	60	66
Respiratory	7	14
Central nervous system	28	26
Infections	18	0
Endocrine	24	37
Musculoskeletal	13	36
Skin	0	0

TABLE III—Comparison of ASTRO-PU weightings with similar cost based weightings derived from IMS data (weightings standardised for purposes of comparison)

Age	IMS weight		ASTRO-PU weight	
	Male	Female	Male	Female
0-4	1	1	1	1
5-14	1	1	1	1
15-24	2	1	2	1
25-34	2	1	2	1
35-44	3	2	3	2
45-54	5	3	4	3
55-64	7	6	6	6
65-74	9	9	10	10
≥ 75	11	11	12	10
Temporary residents	0.2	0.2	0.5	0.5

Discussion

The new sets of weightings allow age-sex standardised costs to be calculated for each practice for eight therapeutic groups. By using these standardised costs

practices may be compared with each other or with a local average that is similarly standardised.

The value of any comparator or performance indicator lies in its ability to highlight areas that may require further exploration. The extent of our standardisation produces comparators that do this more sensitively than those based on local averages weighted only by the prescribing unit system. Nevertheless, the origin of our weightings in real prescribing data means that no implications of "goodness" are carried by the comparators derived from them.

Being cost based, our comparators are most appropriately used in looking at costs. We have not given item based weightings because we have previously shown the unreliability and invalidity of using the number of items as a volume measure.⁵ When they are available, however, the number of defined daily doses could be used for volume weightings.

The weightings for cardiovascular and gastrointestinal drugs show that these two groups are the most demographically sensitive. Using them for comparators will therefore be of particular value in justifying costs to economical practices that have an unusually high proportion of middle-aged and elderly patients—where they may also reveal apparent under-spending. In most of the other groups some age or sex effect is present, though to a lesser extent; comparisons with the new local averages are more likely to pick up apparent overspending.

Not surprisingly, the STAR-PU weightings differed greatly for different therapeutic groups; they also differed from the overall weightings provided by either the prescribing unit or the ASTRO-PU system. We believe that they should be used in the quarterly analyses of prescribing in specific therapeutic groups sent to general practitioners and that local average comparators based on them should replace those based on the prescribing unit.

Having calculated cost based weightings for overall prescribing from our data, we were pleased to find that they were so similar to ASTRO-PU, even though they were derived from the prescribing of different doctors, in a different year, by a different method.

We thank IMS (UK and Ireland) and the Office of Population Censuses and Surveys for the data used in the study.

Funding: The Prescribing Research Unit is funded by the Department of Health.

Conflict of interest: None.

Key Messages

- Existing weighting systems are based on, and therefore apply to, overall prescribing, but there are differences in the age and sex of patients for whom drugs in each specific therapeutic group are usually prescribed.
- Weightings for each specific therapeutic group are needed that allow for the age and sex structure of each practice's patient population.
- The practices in a family health services authority can be more fairly compared with each other or with a local average when costs for each specific therapeutic group have been standardised for age and sex in the population.
- A specific therapeutic group age-sex related prescribing unit (STAR-PU) system is likely to be best at accounting for cost differences between practices where the group's weightings show a wide range of values.
- Aggregated data from the computer systems of many practices provide a valuable resource for research.

Appendix

Description of the MediPlus database and methods of quality assurance

The MediPlus database is built up from information collected by Intercontinental Medical Statistics (UK and Ireland) from practices using AAH Meditel's System 5 software. A panel of 140 practices contributes to the database on a long term basis in order to track the drug management of disease over time. The aim is to obtain data from about 500 general practitioners with an identifiable prescribing code number, both full time and part time. Data from trainees are included, though they cannot be identified as such because the scripts are written on trainers' prescription forms. The extent to which the panel is representative of UK practices and the methods of assuring quality control are described below.

Information is collected daily via the AT&T Istel network. Practice systems dial in each night to upload their activities, and the data are downloaded early each morning by Intercontinental Medical Statistics (IMS). At the initial installation an encryption key is generated at random. This is used to encrypt the patient reference

TABLE AI—Percentage distribution of general practitioners in United Kingdom and in MediPlus, by age group and sex

	24-33	34-43	44-53	≥54	Male	Female
UK	13	44	29	15	70	30
MediPlus	11	44	29	16	72	28

TABLE AII—Distribution of population by age group in United Kingdom (1991 census data) and in Mediplus practices

Age	1991 Population (000s)	MediPlus projected (000s)
0-4	2883	3219
5-14	7168	7246
15-24	8211	7132
25-34	8965	9207
35-44	7932	7971
45-49	9513	10542
60-64	2894	2732
65-74	5075	5247
75-84	3112	3136
≥85	897	1201

tion. IMS employs an independent medical adviser to monitor adherence to these guidelines.

All doctors and staff in a panel practice must agree to operate the system, and the national representativeness of the panel is monitored in terms of doctors' age and sex, fundholding status, dispensing status, and age structure of the patient population. Table AI shows that, at the time of this study, the percentage distributions of general practitioners by age and sex were very similar in MediPlus and in the United Kingdom as a whole; table AII shows that the age distribution of the MediPlus population was close to that of the United Kingdom in the 1991 census. In MediPlus 34.5% of the practices were fundholders compared with 36% nationally (up to the fourth wave); 27.6% were dispensing, against a national 11.0%.

Practices in the database are regularly scored on 13 quality specifications. The maximum score is 610, and a practice must score at least 500 for its data to be considered suitable for research purposes. The specifications are shown in table AIII.

The data obtained for MediPlus are compared with those obtained from a separate UK practice database operated by IMS, the Medical Data Index. This is based on a structured sample of 500 general practitioners each calendar quarter: the doctors record their prescriptions and linked diagnoses for one week, with the weeks being spread over the quarter.

In addition, comparisons with information available to the practices on the total number of items dispensed show that MediPlus picks up more than 95% of these.

- 1 Roberts S, Harris CM. Age, sex and temporary resident originated prescribing units (ASTRO-PUs): new weightings for analysing prescribing of general practices in England. *BMJ* 1993;307:485-8.
- 2 Sleanor DF. Towards accurate prescribing analysis in general practice: accounting for the effects of practice demography. *Br J Gen Pract* 1993;43:102-6.
- 3 Jick H, Jick SS, Derby LE. Validation of information recorded on a general practitioner based computerised data resource in the United Kingdom. *BMJ* 1991;302:766-8.
- 4 Jick H, Terris BZ, Derby LE, Jick SS. Further validation of information recorded on a general practitioner based computerised data resource in the United Kingdom. *Pharmacoepidemiology and Drug Safety* 1992;1:347-9.
- 5 Bogle SM, Harris CM. Measuring prescribing: shortcomings of the item. *BMJ* 1994;308:637-40.

(Accepted 19 September 1995)

TABLE AIII—MediPlus data quality specifications

Criterion	Requirement	Score
1 % "Active patients" reported in previous 12 months	50%	40
2 Number of consultations/week/1000 registered patients	40	50
3 % Completed demographic data on all registered patients	95%	40
4 Number of registered patients per partner	1000	50
5 Number of prescribed items/week/1000 registered patients	40	50
6 % Consultations with problem or diagnosis specified	90%	50
7 % Consultations with problem or diagnosis recorded at 3rd level or lower of Read code	60%	30
8 % Of acute prescription items linked to a problem or diagnosis	80%	100
9 % Of repeat prescription items linked to a problem or diagnosis	90%	100
10 % Of drug detail present to 3rd level or lower of Read scale	100%	10
11 % Of problem or diagnosis detail present at 3rd level or lower of Read code	60%	20
12 % Of detail present on dosage and quantity	85%	40
13 Ratio of repeat to acute prescriptions	<5:1	30

number, so that the number by which IMS knows a patient cannot be related to the number used in the practice system.

Data collection conforms to the guidelines of the Royal College of Practitioners and the General Medical Services Committee of the British Medical Association.

A PAPER THAT CHANGED MY PRACTICE

Light in the darkness

The article which has had the biggest effect on me was the review of medical ethics, "Four principles plus attention to scope," by Raanan Gillon.¹ This offers a system for considering ethical issues without specifying which answers the thinker should come to.

Its basis is that there are four fundamental ethical principles shared by people of widely differing cultural backgrounds: autonomy, the right of individuals to make choices about their own lives; beneficence, the desire to do good; non-maleficence, the desire to do no harm; and justice, the need for actions to be considered fair and equitable.

The scope of each of these principles to the ethical question is considered in turn. From this framework you are encouraged to come to a reasoned opinion without jumping to conclusions based on just one principle. Gillon works through each of these principles with relevant examples from everyday practice.

If problems are thought of according to this method we can at least all be thinking in the same mental language. Equally, it encourages the thinker to approach problems from several different angles. Most importantly, it is easy to remember and apply.

The article appeared at the right time. I was emerging from the long sleep induced by medical school, compounded by junior hospital posts where ambition had

been reduced to getting through the next on call rota. My brain had survived by clinging to intellectual activities, like music and literature, that I saw as entirely separate from medicine.

In Gillon's article, however, I was being encouraged to think for myself about ethics, not wait for the opinions of however many wise men the BMA or the General Medical Council could gather together in debate. Right or wrong, I could at least develop my own views with this system. Its simplicity and elegance allowed some sort of internal debate to occur even when working in the small hours of the morning. It made me realise how many things there were to debate when there had just been dogma before.

I emerged from reading the article invigorated and eager to look at myself and my actions critically. Most importantly, I glimpsed again the beauty of medicine as an intellectual activity, which could absorb and also inform many of my other interests.

This article was an important step towards recovering my self esteem as a doctor. It stands for the light of our profession, and is all the more welcome when so many of us cannot see beyond the darkness.—WAYNE LEWIS is a general practitioner in Blaenavon, Gwent

1 Gillon R. Medical ethics: four principles plus attention to scope. *BMJ* 1994;309:184-8.