

Prescribing compliance: a review of the proportion of prescriptions dispensed

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Contents

Contents	3
Executive Summary	4
Introduction	6
Background	6
Study Design	7
Sources	8
Results	9
Representativeness of sample	9
Comparison of prescribed and dispensed items	10
Redemption Rate	15
Effect of Dispensing Status	25
Deprivation and redemption rates	25
Proportion of elderly or young and redemption rates	28
Conclusion	31
Glossary	33
Acknowledgements	35
References	36

Executive Summary

In recent years there has been an increasing interest in information collected from General Practice (GP) computer systems. The Quality and Outcome Framework (QOF) relies almost entirely on data extracted from such systems. It is pertinent therefore to consider how accurately such data describes patient care. One area in which we can obtain a separate dataset for comparison is prescribing where data on dispensed prescriptions can be obtained from the organisation responsible for reimbursement of dispensers. Another reason for comparing prescribed and dispensed items is concern over whether patients do not have their prescriptions dispensed because of the prescription fee or other reasons.

This bulletin compares the prescriptions written by a sample of general practices with the prescriptions actually dispensed for their patients. Note that is only one aspect of compliance. Patients may have the prescription dispensed but fail to take it as directed or even at all⁸. The prescribing data comes from the THIN (The Health Information Network) database of anonymised patient records compiled from GP computer systems by the commercial company Cegedim Strategic Data Medical Research Ltd (CSD MR UK). The dispensing data comes from NHS Prescription Services, a division of the NHS Business Services Authority (NHS BSA). All practices contributing data to the THIN database were approached. Of these who consented to be included, there were 145 for whom data was available for all of the five years studied.

Data was extracted from the THIN database for 2004, 2005, 2006, 2007 and 2008 for each British National Formulary (BNF) chapter and for selected groups of drugs. Data for these years for these practices was obtained from NHS Prescription Services (RxS), a division of the NHS Business Services Authority. It was not possible to match individual prescriptions and so the comparison is between the total number prescribed and the total number dispensed.

The data in this study indicate that overall the majority of prescriptions are dispensed. However, for some areas of prescribing, particularly vaccinations, there is extensive under-recording in the THIN database in the form of prescriptions issued to patients as the details of these are held in a different way. For some drug groups, for example antipsychotics, there seemed to be a number of prescriptions which were not dispensed.

The redemption rate (the percentage of recorded prescriptions which were dispensed) was compared between practices classified by their level of deprivation and by the proportion of young and elderly patients. Some significant correlations (at the 5% level or better) between these and the redemption rate were found.

- The sample represented 1.7 per cent of practices and 3.1 per cent of the registered population.
- The mean practice redemption rate for all prescribing was 99.6 per cent in 2004 and 98.5 per cent in 2008; the fall may reflect better recording by practices
- One area where redemption rates were low was antipsychotic medicines where the rate was 84.5 per cent in 2004 and 85.1 per cent in 2008
- Prescriptions for vaccines and anaesthesia seemed to have been under recorded; when these were excluded the mean practice redemption rates were 98.1 per cent in 2004 and 97.4 per cent in 2008

- The redemption rate was over 100 per cent for 37.2 per cent of practices in 2004 and 13.8 per cent in 2008, suggesting gaps in the recording of prescriptions issued for patients in the practices; when vaccines and anaesthesia were excluded the proportions fell to 7.6 per cent in 2004 and 2.1 per cent in 2008
- The only consistent significant correlation found between deprivation and redemption rates was that redemption rates for anti-psychotic medication were higher in more deprived areas (82.0 per cent in the most affluent quartile and 87.9 per cent in the most deprived in 2007). There was some evidence that redemption rates for antidepressants and medicines for musculoskeletal conditions were lower in deprived areas (96.0 per cent and 98.9 per cent respectively in the most deprived quartile and 97.4 per cent and 102.0 per cent in the least deprived in 2007).
- Generally redemption rates for total prescribing and almost all therapeutic areas were higher for practices with a large proportion of prescriptions for the elderly; conversely redemption rates were generally lower for practices with a high proportion of prescriptions given to the young (those aged under 16) although both groups are exempt from the prescription fee

Introduction

Background

A failure to take medication as prescribed may have serious consequences for the patient. Patients may have the prescription dispensed but fail to take it as directed or even at all ⁸. While we cannot be sure that a patient who has a prescription dispensed takes the medicine as prescribed, we can be fairly confident that a patient who does not have it dispensed, if it is a drug only available by prescription, is not doing so. There is the possibility that they have received the medication via another route such as through a hospital.

A prescription may appear in the practice computer system but not in the data on dispensed prescriptions for a number of reasons.

- the patient may not collect the prescription
- the patient may lose the prescription
- the patient may choose not to have it dispensed
- the dispensed prescription may not reach Prescription Services.

There can be several reasons why a patient chooses not to have an item on the prescription dispensed.

- the patient may decide that he or she does not need the medication (this can include cases where the patient is given a prescription and told only to have it dispensed if they feel later that they need the medication)
- the patient does not wish to take the medication because of previously experienced side effects
- the expense of the fee payable for each item may be a deterrent, although only 5.6 per cent of items are subject to a charge at the point of dispensing¹. For some medications it is possible that the patient purchases the item over the counter for less than the prescription fee rather than having the item dispensed.

A prescription may be dispensed which does not appear in the GP computer system for a number of reasons.

- the prescription was written outside the surgery, for example on a home visit by a GP or nurse and then not added to the patient record later.
- if the computer system was not working then a hand written prescription could be issued and may not be added to the patient's record once the system is working again.
- in some areas the Out of Hours service will absorb the cost of all the prescriptions it issues and none will be attributed to the patient's practice. In others, the details of the patient's practice will be ascertained, if possible, and the cost of the prescription will

¹ Prescription dispensed in the community Statistics for 2000 to 2010: England, Health and Social Care Information Centre, 2011

be charged to the practice, but the prescription may not be recorded in the patients notes.

- there is also the possibility (probably quite small) that the prescription is fraudulent and was never issued by the practice.

Study Design

To assess the extent to which prescriptions are or are not dispensed we obtained figures from the THIN database held by the CSD MR UK, who collect data from general practice computer systems, and compared them with figures on the number of items dispensed obtained from NHS Prescription Services. The figures provided by NHS Prescription Services reflect only those prescriptions which have been dispensed and submitted for reimbursement and where the practice can be identified from the prescription form.

Note that we could not directly match prescribed and dispensed items. The comparison is solely on the number of prescriptions issued and the number dispensed.

As well as total prescribing it was decided to study the following areas of prescribing (BNF refers to the British National Formulary²)

- each of BNF chapters 1 to 15
- the sum of chapters 18 to 23 (these are pseudo-chapters devised by NHS Prescription Services to classify dressings, appliances and other medicinal products not included in the BNF classification)
- statins and related drugs (atorvastatin, simvastatin, simvastatin with ezetimibe, ezetimibe, rosuvastatin, fluvastatin and pravastatin), part of BNF section 2.12
- antipsychotics (excluding antimania drugs) – the sum of BNF paragraphs 4.2.1 and 4.2.2
- antidepressants - BNF section 4.3
- bronchodilators - BNF section 3.1
- epilepsy - BNF section 4.8
- antibacterials - BNF section 5.1

The first three therapeutic areas (statins, psychosis and depression) were chosen because there had been suggestions that compliance for these areas may be low^{3,4,6,7}. Failure to take epilepsy medication could produce an attack and so it is important to determine if patients are compliant. Some prescriptions for antibacterials are given on a precautionary basis, that is, the patient is given the prescription but encouraged to have it dispensed only if their condition does not improve.

Note that THIN data is not based on the BNF classification. Allocating a preparation to a BNF chapter is a complex process as the same drug may be recorded for several different indications in the BNF. At an early stage we encountered a problem with drugs for epilepsy where we found redemption rates of over 200 per cent. Investigation showed that some drugs (notably Carbamazepine, Clobazam and Pregabalin) were recorded as epilepsy drugs by NHS Prescription Services but were recorded for other indications in the THIN database.

² British National Formulary, BMJ Group and RPS Publishing

Carbamazepine is used for bipolar disorder and trigeminal neuralgia as well as epilepsy, Clobazam is used for anxiety as well as epilepsy and Pregabalin is also used for neuropathic pain and anxiety. The analysis shown here is based on revised data where care was taken to align the THIN classification to the classification used by NHS Prescription Services.

We wished to investigate whether exemption from the prescription charge influenced the redemption rate, i.e. what proportion of prescriptions was dispensed. Accordingly we collected data from CSD MR UK on the proportion of prescriptions within each therapeutic area in each practice issued to the elderly (those 60 and over) and the young (those aged under 16) as both these groups are exempt from the prescription charge.

Since the prescription charge could discourage patients from having a prescription dispensed we investigated the link between deprivation and the redemption rate. To do this the proportion of prescriptions dispensed to those exempt from the charge due to low income was obtained from NHS Prescription Services. This was derived from a sampling process involving 5 per cent of prescriptions. A high proportion of prescriptions being given to patients exempt from the prescription charge is likely to be linked with a large number of prescriptions going to patients with incomes that are low but not so low that they qualify for exemption.

Sources

CSD MR UK collects data from a number of general practice computer systems and compiles the THIN (The Health Information Network) database from this information. The data is anonymised to protect patient and practice confidentiality. In order to maintain this confidentiality, a researcher working directly with THIN approached the contributing practices on behalf of CSD MR UK to request permission to supply their data to the NHS Information Centre. A total of 145 practices agreed and were able to provide data for the years 2004 to 2008. The THIN researcher provided the encrypted practice identifiers to CSD MR UK and the data was extracted for the agreed areas of prescribing and supplied to the NHS Information Centre under an agreement ensuring confidentiality.

The practice codes for these practices were supplied to NHS Prescription Services who provided the corresponding dispensing data for these practices.

Since the GP computer systems would not include any record of prescriptions written by nurses working for the Primary Care Trust (PCT), data for PCT nurses was also obtained from NHS Prescription Services and subtracted from the data before the comparison was done. Nationally the proportion of items written by PCT nurses was less than 1 per cent in July to September 2010.

Results

Representativeness of sample

Data was available for all five years for 145 practices. The total registered population for each year is shown in Table 1.

Table 1: number and proportion female for THIN practices in sample

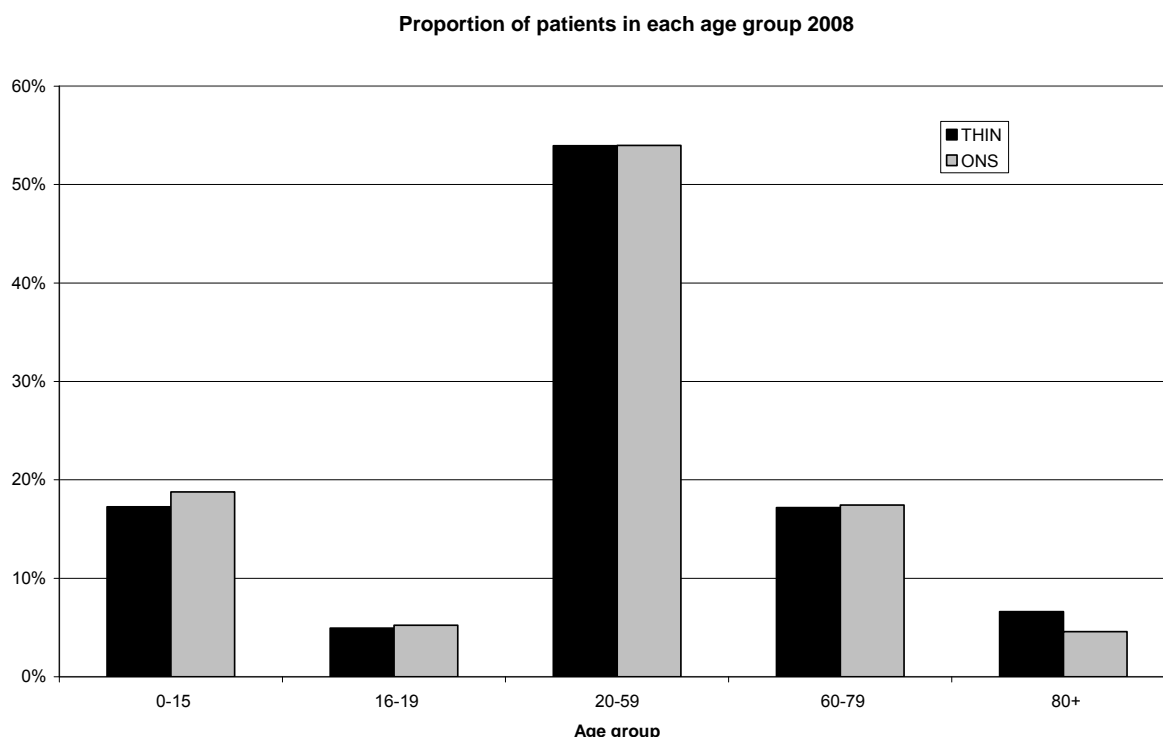
Year	Registered population	Per cent female
2004	1,507,552	51%
2005	1,546,829	52%
2006	1,594,535	52%
2007	1,644,746	52%
2008	1,690,098	52%

The Quality and Outcomes Framework⁹ data for 2007/8 contains data for 8,294 practices in England with a registered population of 54,009,831. Thus the sample represented 1.7 per cent of practices and 3.1 per cent of the registered population.

The registered populations in the practices who contributed data are a reasonable match to the national population. In 2008 the proportion of females in the practice populations was 51.9 per cent while the Office for National Statistics (ONS) mid-year estimates for 2008 estimated the national proportion as 50.8 per cent.

The chart below compares the proportion in different age groups between the 2008 practice populations and the ONS mid-year estimates. The practice populations contain slightly more elderly and slightly less young people than the ONS estimates.

Figure 1: proportion of patients in different age groups for THIN sample practices and from ONS population estimates



Comparison of prescribed and dispensed items

Patterns of prescribing

Table 2 below shows the use of each chapter and drug group for the prescribed (taken from THIN data) and dispensed data (taken from NHS BSA data) for the 145 practices. The table shows the number of items and their percentage of the total.

Table 2: Percentage of total items for prescribed and dispensed by chapter for 2008

Chapter	Prescribed (%)	Dispensed (%)	Dispensed as % of prescribed
1 Gastro-Intestinal System	1,458,242 (7.84)	1,394,708 (7.61)	96%
2 Cardiovascular System	6,171,818 (33.19)	6,034,590 (32.92)	98%
3 Respiratory System	1,282,659 (6.90)	1,205,370 (6.58)	94%
4 Central Nervous System	3,135,261 (16.86)	3,094,015 (16.88)	99%
5 Infections	890,328 (4.79)	866,060 (4.72)	97%
6 Endocrine System	1,692,647 (9.10)	1,646,573 (8.98)	97%
7 Obstetrics, Gynae+Urinary Tract Disorders	456,835 (2.46)	429,471 (2.34)	94%
8 Malignant Disease & Immunosuppression	112,588 (0.61)	83,127 (0.45)	74%
9 Nutrition And Blood	673,213 (3.62)	700,125 (3.82)	104%

10 Musculoskeletal & Joint Diseases	624,030 (3.36)	631,843 (3.45)	101%
11 Eye	421,592 (2.27)	403,292 (2.20)	96%
12 Ear, Nose And Oropharynx	240,406 (1.29)	213,430 (1.16)	89%
13 Skin	816,388 (4.39)	786,942 (4.29)	96%
14 Immunological Products & Vaccines	115,058 (0.62)	306,510 (1.67)	266%
15 Anaesthesia	21,569 (0.12)	26,483 (0.14)	123%
All others (including dressings and appliances)	483,692 (2.60)	508,530 (2.77)	105%

Clearly there is a large difference between prescribed and dispensed for chapter 14. Practices do not usually record vaccinations in the same way as other prescriptions since, particularly for influenza and child health, vaccinations are often administered in clinics from stock, not from supplies obtained using prescriptions forms. Since there appears to be a large systematic difference between what is recorded in the THIN database and what is dispensed, immunological products and vaccines are not considered further.

The British National Formulary section on anaesthesia warns, "The drugs in section 15.1 should be used by experienced personnel only and when resuscitation equipment is available". It gives a similar warning about most of the medicines in section 15.2 (the other part of the anaesthetic chapter) and so it is unlikely that a patient would be given a prescription for anaesthesia to have dispensed and taken home. For this reason (and because the number of prescription items for anaesthesia is very low) this chapter is not considered further in this bulletin.

The large difference for malignant disease and immunosuppression raises the possibility of coding differences for these drugs between THIN and NHS Prescription Services. However care has been taken to match the classification of drugs and there may be other factors such as the hospital admission or death of a patient before they are able to have the prescription dispensed.

Figure 2 shows the number of prescriptions by age group in 2008. Total figures have not been shown as the scale would then make it difficult to see any other group. Those aged 60 and over represent 24 per cent of registered patients but receive the majority of items prescribed (64 per cent) while the proportion of items for those aged under 16 is 4.2 per cent of the total although they represent 17 per cent of the registered patients.

Figure 2: Number of prescribed items by age group in 2008

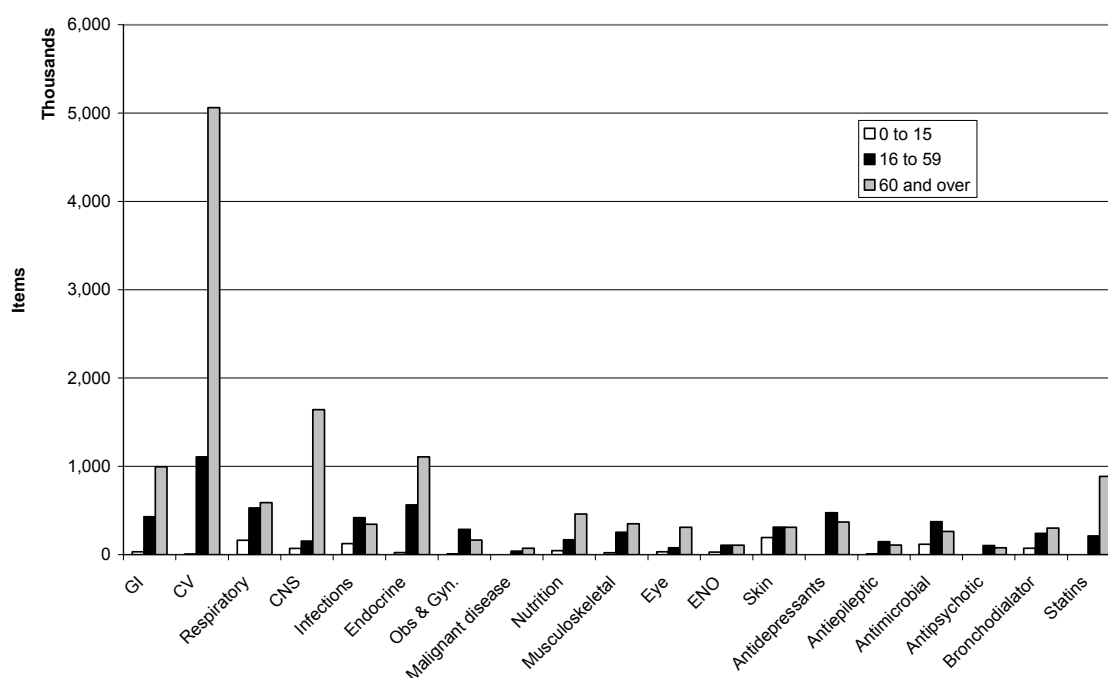


Figure 3 shows the proportion of items prescribed to male and female patients in 2008 for the 13 chapters and selected groups of drugs. The total column is for all prescribing.

Figure 3: Proportion of prescribed items by gender in 2008

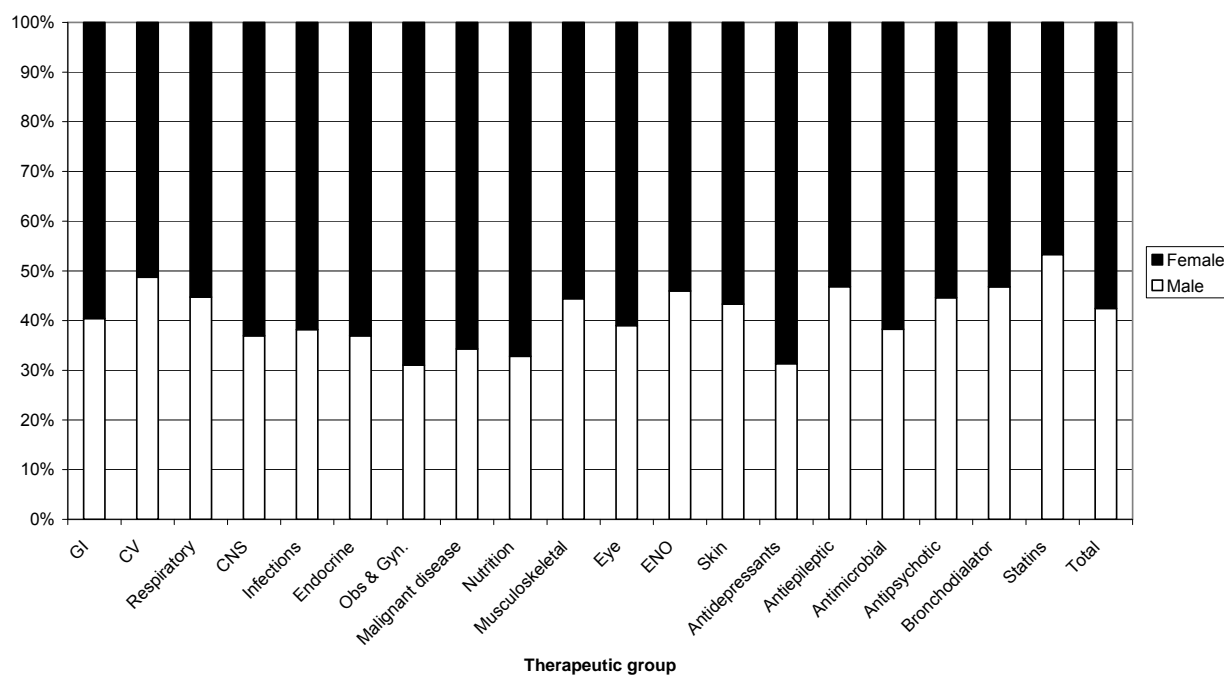


Figure 4 shows equivalent figures as for figure 3 but only for patients aged under 16.

Figure 4: Proportion of items prescribed to patients aged under 16 by gender in 2008

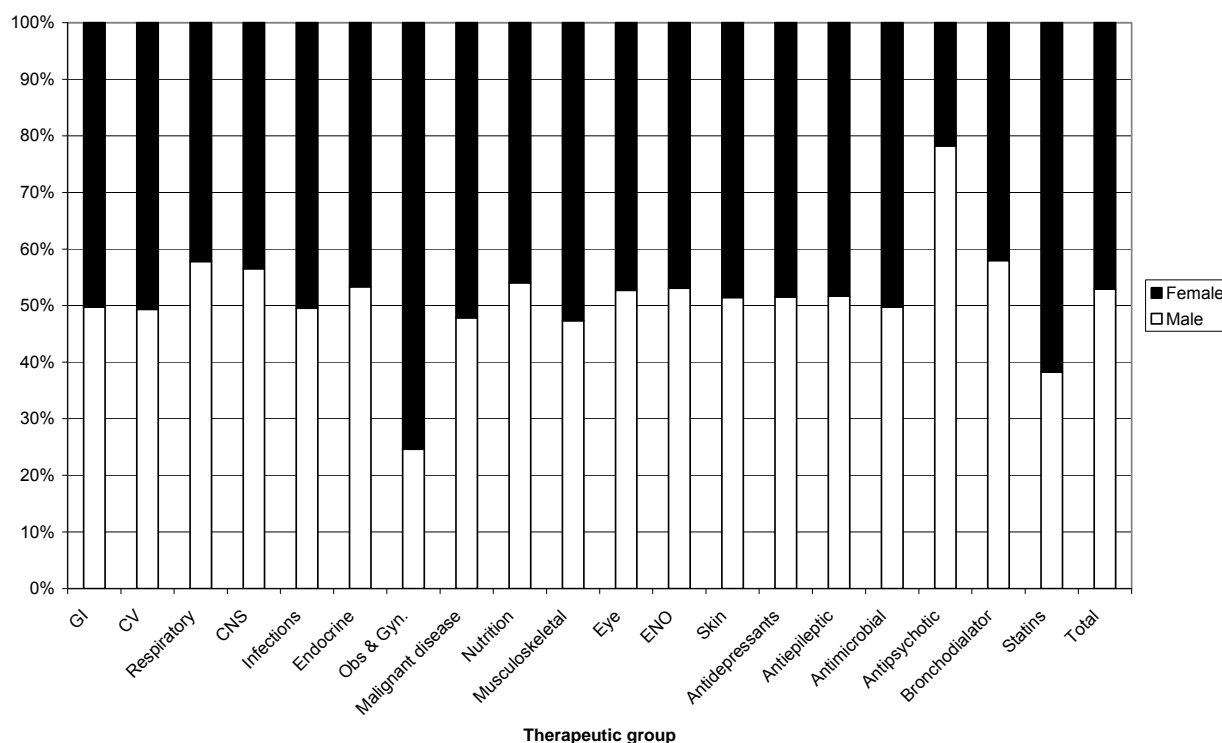
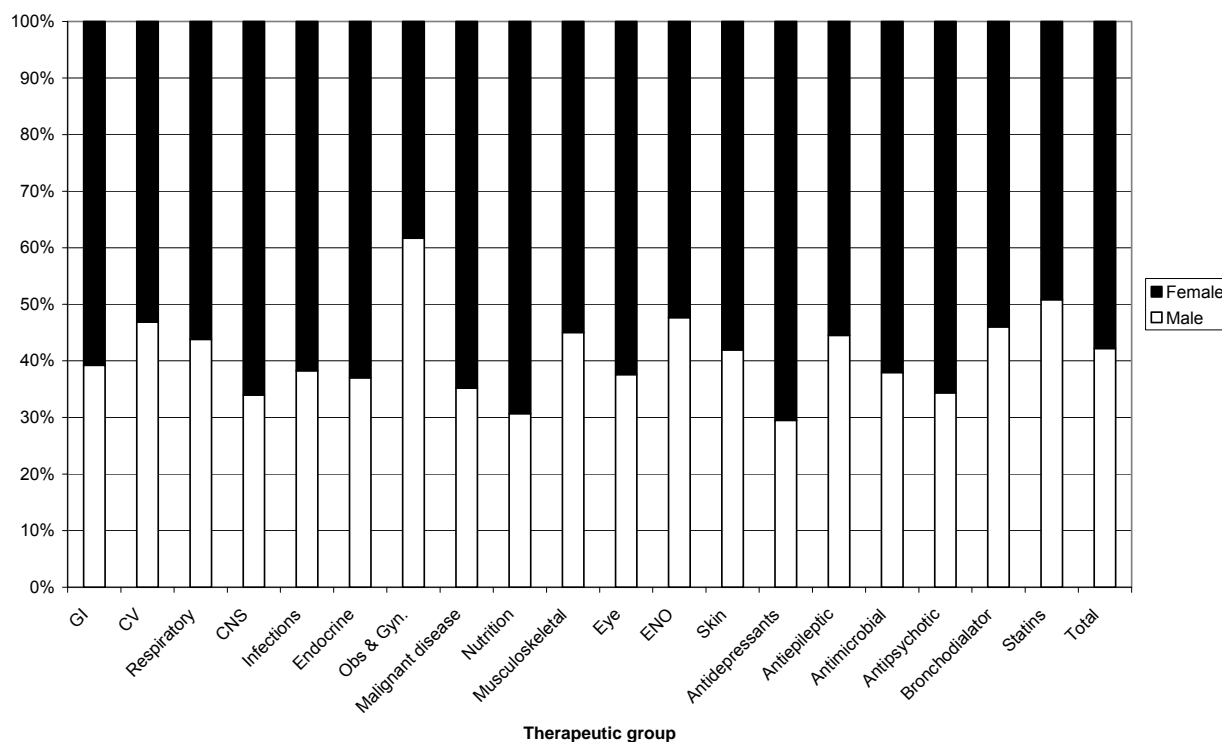


Figure 5 shows equivalent figures for patients aged 60 and over.

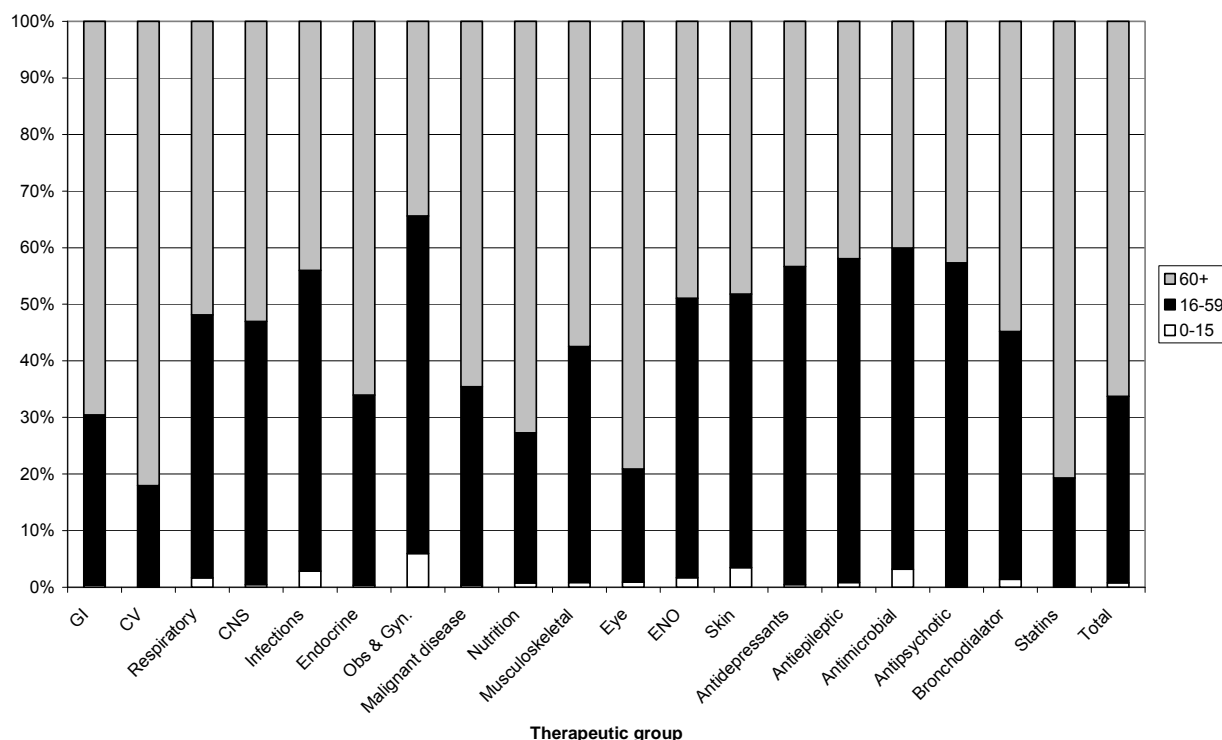
Figure 5: Proportion of items prescribed to patients aged 60 and over by gender in 2008



The figures for BNF chapter 7 (Obstetrics, Gynaecology and Urinary Tract Disorders) are interesting. Across all age groups 68.9 per cent of items go to female patients. However for the elderly group only 38.3 per cent of items are for females. This reflects the reduced need for obstetric and contraceptive medicines by older females, and the increased prescribing of medicines for urinary tract disorders and erectile dysfunction in older males.

Figure 6 shows the proportion of items prescribed to those aged under 16, those aged 16 to 59 and those 60 and over.

Figure 6: Proportion of items prescribed for different age groups in 2008



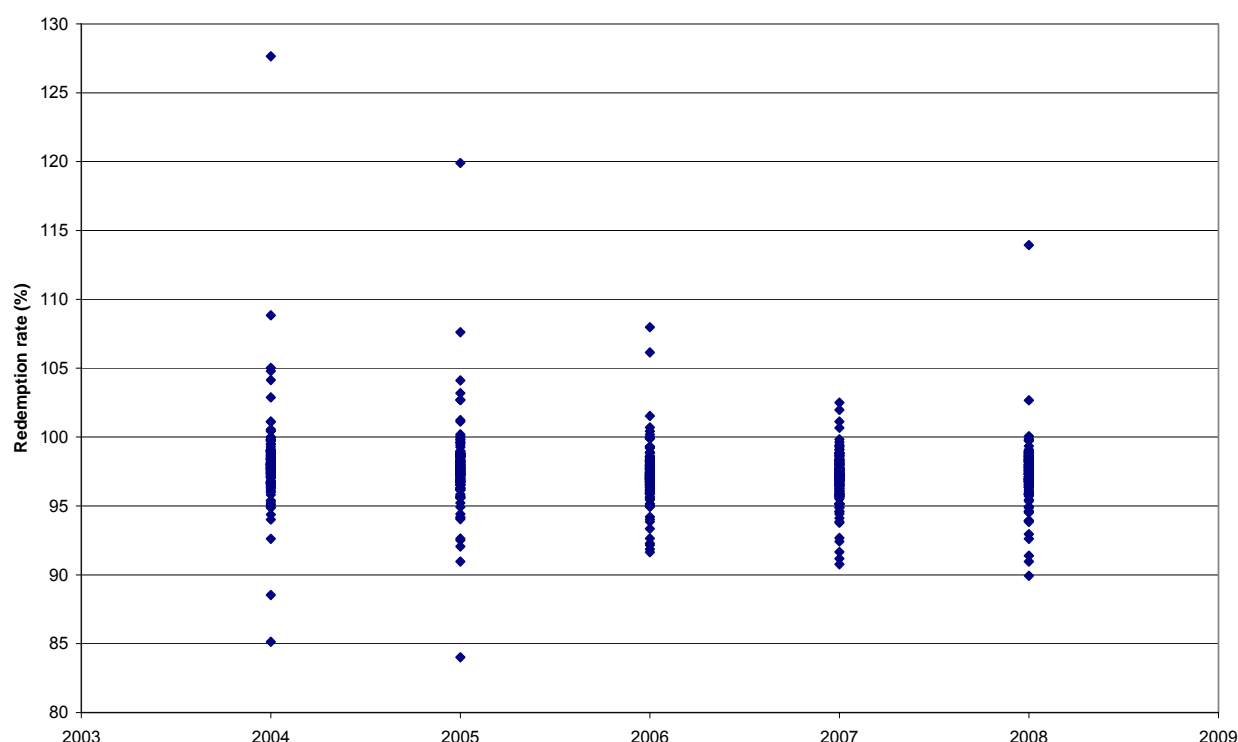
Redemption Rate

The basic measure used in comparing the number of items prescribed and dispensed was the redemption rate. This is defined as the number of items dispensed for a particular drug or area of prescribing (taken from NHS Prescription Services data) divided by the number of items prescribed for that drug or area of prescribing (taken from THIN data) expressed as a percentage. A figure less than 100 per cent would suggest that patients might not be having all their prescriptions dispensed while a figure of over 100 per cent might indicate that prescriptions were supplied but not recorded on the practice system (e.g. Out of Hours service, home visits etc). A prescription may be issued but not collected from the practice or be collected but not presented for dispensing.

Conclusions need to be tentative as prescriptions are valid for six months and patients may delay taking a prescription for dispensing. We tried to allow for this by comparing prescribed and dispensed both for the same period and also by comparing prescriptions issued in a year with the prescriptions dispensed in the year starting and ending one quarter later. We found that this did not change the results or our conclusions.

Figure 7 shows the spread of the overall redemption rate at practice level for each year. Chapters 14 and 15 are not included because of the reasons described earlier.

Figure 7: overall redemption rates by practice by year (chapters 14 and 15 excluded)



The proportion of practices with redemption rates between 95 and 105 per cent is shown in Table 3.

Table 3: Proportion of practices with a redemption rate (excluding chapters 14 and 15) between 95% and 105% by year

2004	2005	2006	2007	2008
93.1%	91.7%	91.0%	91.0%	90.3%

The width of the interquartile range (the range of values within which the middle 50 per cent fell) have narrowed slightly from 1.7 percentage points in 2004 to 1.6 in 2008 and the range between maximum and minimum has reduced from 42.5 in 2004 to 24.0 in 2008. This may reflect an improvement in recording over the years 2004 to 2008. However, it is not clear why the maximum value increased in 2008, as can be seen from figure 7. The highest redemption rate was 113.9 per cent in 2008 but the next highest figure was only 102.7 per cent so this single practice could distort the mean value for 2008.

Table 4 shows the number of items prescribed by the practices (as recorded in the THIN database), the number recorded as dispensed by Prescription Services (with PCT nurse items removed), the mean practice redemption rate and the minimum and maximum redemption rate. The final row shows the proportion of practices with a redemption rate of 100% or higher.

Table 4: annual overall redemption rates (excluding chapters 14 and 15)

Year	2004	2005	2006	2007	2008
Items prescribed (thousands)	14,608.1	15,433.9	16,346.2	17,513.4	18,466.2
Items dispensed (excluding PCT nurse items) (thousands)	14,330.3	15,093.3	15,908.9	16,996.0	17,998.1
Mean practice redemption rate	98.1	97.8%	97.2%	97.0%	97.4%
Minimum practice redemption rate	85.1%	84.0%	91.6%	90.8%	89.9%
Maximum practice redemption rate	127.7%	119.9%	108.0%	102.5%	113.9%
Proportion of practices with redemption rate >= 100%	7.6%	6.9%	4.8%	2.8%	2.1%

It can be seen that the mean redemption rate fell from 98.1 per cent in 2004 to 97.0 per cent in 2007 and rose slightly to 97.4 per cent in 2008. However the proportion of practices with exemption rates of 100 per cent or over fell dramatically in 2006 and continued to fall after that. This may indicate an improvement in the recording of prescriptions by practice. The Quality and Outcomes Framework, part of the General Medical Services (GMS) contract, was introduced in 2004. It was anticipated that this would lead to an improvement in recording on GP clinical systems. This may be linked to the changes observed.

Chapters 14 (Immunological products and vaccines) and 15 (Anaesthesia) have been excluded from the main analysis. The overall redemption rates for chapter 14 from 2004 to 2008 were 272.1 per cent, 264.7 per cent, 263.5 per cent, 277.0 per cent and 266.4 per cent. For some practices there were prescriptions dispensed from this chapter according to data from NHS Prescription Services but no prescriptions were recorded as having been written in the THIN data. Since most practices will carry out vaccination programmes (for example, for influenza), it is clear that these are recorded in a different way to normal prescriptions. CSD MR confirmed that vaccines are recorded differently in GP software and patients receiving

these do have individual records. A similar issue may affect prescriptions for chapter 15 where the overall redemption rates for 2004 to 2008 were 134.3 per cent, 129.0 per cent, 131.1 per cent, 125.3 per cent and 122.8 per cent.

Table 6 shows the statistics on redemption rates at practice level. For each year the table shows the mean redemption rate, the minimum redemption rate and the maximum redemption rate.

The figures in Table 6 are affected both by true redemption rate (largely driven by patient choice) and under-recording by the practice. A more detailed list of the reasons for differences between the number prescribed and the number dispensed appears on page 6.

Table 6: redemption rates by chapter and drug group by year

Therapeutic Area	2004			2005			2006			2007			2008		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
All prescribing	99.6	84.4	127.3	99.4	84.6	119.5	98.5	91.4	107.7	98.3	91.8	102.9	98.5	91.1	113.6
All prescribing except vaccines and anaesthesia	98.1	85.1	127.7	97.8	84.0	119.9	97.2	91.6	108.0	97.0	90.8	102.5	97.4	89.9	113.9
Gastro-intestinal	96.5	83.2	124.4	96.0	79.9	117.7	95.6	88.5	105.8	95.3	86.1	100.8	95.5	85.2	111.8
Cardiovascular	98.0	87.8	110.2	98.0	85.5	109.6	97.7	92.8	105.4	97.5	90.9	103.2	97.8	90.1	114.6
Respiratory	95.0	78.5	154.9	94.7	76.8	144.6	94.2	86.3	117.0	93.6	86.4	104.4	94.1	86.8	112.5
Central Nervous System	99.6	84.5	130.6	99.2	85.1	121.2	98.6	93.1	110.5	98.4	90.9	107.1	98.7	89.2	116.9
Infections	102.2	83.8	297.0	99.3	82.5	210.6	97.2	84.2	129.8	97.0	86.9	107.2	97.1	84.4	108.6
Endocrine system	97.8	87.1	108.2	97.6	87.8	106.3	97.1	91.4	103.2	97.1	91.0	100.8	97.2	89.6	110.0
Obstetrics, gynaecology and urinary tract disorders	93.4	79.7	123.0	93.1	77.4	110.1	94.4	78.0	117.1	94.3	81.6	114.0	94.1	77.3	115.4
Malignant disease and immunosuppression	80.7	51.5	116.3	79.2	47.6	108.5	77.2	53.3	103.8	74.5	50.2	101.4	73.5	43.3	109.5
Nutrition and blood	97.4	82.9	140.0	97.8	84.4	128.6	98.0	78.2	120.3	98.7	85.3	126.1	103.7	88.3	130.6
Musculoskeletal and joint diseases	100.2	80.1	154.7	100.4	82.1	158.1	100.4	88.8	115.1	100.5	90.1	113.8	101.4	87.1	115.9
Eye	98.0	85.5	157.8	97.0	83.6	134.7	96.3	82.6	119.4	95.7	82.1	105.2	95.6	85.4	108.1
Ear, nose & oropharynx	93.7	72.8	226.2	92.9	65.4	226.9	90.6	65.0	166.8	89.1	63.6	120.6	88.6	67.5	103.3
Skin	102.2	80.9	210.8	100.7	80.7	191.9	97.6	85.3	142.2	97.1	87.3	123.0	96.5	87.0	120.4
2.12 Statins	99.7	88.7	112.4	100.8	86.7	115.4	101.1	95.0	118.1	104.6	96.9	117.3	102.3	92.7	120.8
3.1 Bronchodilators	92.4	77.0	111.5	92.2	74.5	108.9	91.7	79.3	103.9	91.1	81.3	100.3	91.7	83.2	113.8

	2004			2005			2006			2007			2008		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
4.2 Antipsychotics (excluding antimania)	84.5	50.4	110.8	85.0	57.0	113.9	85.2	67.2	122.8	84.7	65.0	117.4	85.1	62.0	108.8
4.3 Antidepressants	96.9	83.7	109.7	96.7	83.2	107.9	96.3	88.3	103.4	96.4	87.4	101.5	96.7	88.2	112.5
4.8 Epilepsy	98.0	85.1	108.7	98.0	84.6	109.9	97.6	90.1	103.9	97.3	87.9	103.1	97.6	88.5	115.0
5.1 Antibacterial drugs	103.2	84.3	343.3	100.0	83.8	235.3	97.7	85.3	134.7	97.3	84.3	107.5	97.2	80.6	109.1

All Prescribing

The mean practice redemption rate for all prescribing is between 98.3 per cent and 99.6 per cent for each year. However these figures are misleading since they include chapters 14 (vaccines) and 15 (anaesthesia) where we know there is under-recording in the THIN data.

All Prescribing (excluding chapters 14 and 15)

The mean practice redemption rate for all prescribing (excluding chapters 14 and 15) is between 97.2 per cent and 98.1 per cent for each year and falls steadily from 2004 to 2007 with a small increase in 2008. The proportion of practices with a redemption rate over 100% fell from 7.6% to 2.1% over the five years which may suggest improved recording over time.

Gastro-intestinal System (BNF Chapter 1)

The mean practice redemption rates are lower than 100 per cent in each year and 6 or fewer practices have a rate in excess of 100 per cent in each year. This suggests that not all patients have all items dispensed. Since many preparations in this chapter can be purchased over the counter, patients required to pay prescription charges may choose to purchase those preparations which are cheaper. This is investigated further when we look at redemption rates by age and deprivation later.

Cardiovascular System (BNF Chapter 2)

The mean practice redemption rate is between 97.5 per cent and 98.0 per cent for the five years and a small proportion of practices (between 2.8 per cent and 4.1 per cent) have a rate of 100 per cent or higher. Since the preparations in this chapter are usually not available over the counter (low dose aspirin is an exception) we would speculate that some patients were failing to have their prescriptions dispensed.

Respiratory System (BNF Chapter 3)

The mean practice redemption rate falls from 95 per cent to 94.1 per cent over the five years and is as low as 93.6 in 2007. The proportion of practices with redemption rates of 100 per cent or higher is between 0.7 per cent and 4.1 per cent. Since cough medicines, which are readily available at low cost over the counter, are included in this chapter, patients choosing to purchase the items rather than have them dispensed may be a factor. In 2008 cough preparations (BNF section 3.9) represented 2.7 per cent of dispensed prescriptions from this chapter. Patients whose asthma has been stabilised on an inhaled steroid may not need to regularly use a bronchodilator and so may still have such medication left when they obtain a repeat prescription. In such a case they may choose not to have the bronchodilator dispensed. This is supported by the bronchodilator figures which show mean practice redemption rates of 92.4 per cent, 92.2 per cent, 91.7 per cent, 91.1 per cent and 91.7 per cent.

Central Nervous System (BNF Chapter 4)

While the mean practice redemption rate ranges from 98.4 per cent to 99.6 per cent, the proportion of practices with redemption rates of 100 per cent or higher was 34.5 per cent, 27.6 per cent, 17.9 per cent, 13.1 per cent and 17.2 per cent. There are several preparations

within this chapter, e.g. analgesics, which are likely to be prescribed away from the surgery on home visits and may not be recorded on the computer system.

Infections (BNF Chapter 5)

The mean practice redemption rate varies from 102.2 to 97.0 per cent with the proportion of practices with 100 per cent or higher redemption rate ranging from 14.5 per cent to 46.9 per cent. The overall redemption rate and proportion with high redemption rates falls from fairly high values in 2004 and 2005 to much lower values in 2006 to 2008. This may be due to a “delayed prescription” strategy used to reduce the use of antibiotics (a Department of Health national policy) where a prescription is issued but collection and dispensing is delayed until it is clear that it is required. While this chapter includes drugs other than antibacterials, the figures for antibacterials alone show a similar decline over time. In 2008 antibacterials represented 85 per cent of the total dispensed items from this chapter in England.

A possible explanation for the number of practices with redemption rates in excess of 100 per cent is that these drugs are often prescribed away from the surgery (either on home visits or by Out of Hours services) and so may be under-recorded on the GP clinical systems. We are unable to determine the scale of these factors from this data.

Endocrine System (BNF Chapter 6)

The majority of prescriptions from this chapter are for diabetes and thyroid conditions (together these accounted for over 73 per cent of items from this chapter in 2008). Both these conditions give exemption from the prescription charge. The mean practice redemption rate has been between 97.1 per cent and 97.8 per cent over the five years with the proportion of practices with redemption rates of 100 per cent or higher ranging from 1.4 per cent to 5.5 per cent. In 2008 fewer than 10 per cent of items for this chapter were for drugs affecting bone metabolism. In many cases these drugs would be prescribed to treat or prevent osteoporosis. The majority of these are likely to be for patients aged over 60 and exempt from prescription charges.

Obstetrics, gynaecology and urinary tract disorders (BNF Chapter 7)

The mean practice redemption rate was below 95 per cent in each year (93.4 per cent, 93.1 per cent, 94.4 per cent, 94.3 per cent and 94.1 per cent). However, while the mean rate was low there were several practices with redemption rates of 100 per cent or more and the proportion ranged from 7.6 per cent to 13.8 per cent. About half of the items from this chapter in 2008 were for contraceptives (which are exempt from the prescription charge) and most of the rest were for genito-urinary disorders.

This chapter has a high proportion of personally administered items, 4.5 per cent while the average for chapters 1 to 13 is only 0.4 per cent (2008 figures from ePACT). Since personally administered items are administered to the patient in the practice, the records from NHS Prescription Services should match the practice records in such cases and so increase the redemption rate as the patient would have no discretion as to whether to have the prescription dispensed.

Malignant disease and immunosuppression (BNF Chapter 8)

The mean practice redemption rates for this chapter are very low and decline over the time period (80.7 per cent, 79.2 per cent, 77.2 per cent, 74.5 per cent and 73.5 per cent). The proportion of practices with redemption rates of 100 per cent or more was low ranging from 0.7 per cent to 3.4 per cent. In 2008 65 per cent of dispensed items were for sex hormones and hormone antagonists in malignant disease and 32 per cent for drugs affecting the immune response. A possible explanation for the low redemption rate is that practices are issuing prescriptions on a regular basis but the patients with these conditions have regular contact with specialists and are unlikely to receive all their care from a general practice.

This chapter has a high proportion of personally administered items, 7.7 per cent while the average for chapters 1 to 13 is only 0.4 per cent (2008 figures from ePACT). These would mainly be injections. This would increase the redemption rate as the prescriptions would be returned by the practice and the patient would have no discretion as to whether to have the prescription dispensed.

Nutrition and Blood (BNF Chapter 9)

The mean practice redemption rates are moderately high (97.4 per cent, 97.8 per cent, 98.0 per cent, 98.7 per cent and 103.7 per cent) and there are a high proportion of practices with redemption rates of 100 per cent or more (range 17.9 per cent to 67.6 per cent). In 2008 over 37 per cent of dispensed items were for vitamins and 25 per cent were for oral nutrition. It is possible that some of these were prescribed for patients in residential and nursing homes during visits and not subsequently recorded on the practice computer system.

This chapter has a high proportion of personally administered items, 2.4 per cent while the average for chapters 1 to 13 is 0.4 per cent (2008 figures from ePACT). This would increase the redemption rate as the prescriptions would be returned by the practice and the patient would have no discretion as to whether to have the prescription dispensed.

Musculoskeletal and joint diseases (BNF Chapter 10)

The mean practice redemption rate in each year was greater than 100 per cent (100.2 per cent, 100.4 per cent, 100.4 per cent, 100.5 per cent, 101.4 per cent) and the majority of practices had rates of 100 per cent or more (52.4 per cent, 48.3 per cent, 52.4 per cent, 59.3 per cent and 63.4 per cent). This may be due to prescribing outside the surgery where the prescription was not entered into the practice computer, such as by Out of Hours Services.

This chapter has a significant proportion of personally administered items, 1.8 per cent while the average for chapters 1 to 13 is 0.4 per cent (2008 figures from ePACT). This would increase the redemption rate as the prescriptions would be returned by the practice and the patient would have no discretion as to whether to have the prescription dispensed.

Eye (BNF Chapter 11)

The mean practice redemption rate varied from 95.6 per cent to 98.0 per cent. The proportion of practices with rates of 100 per cent or higher fell from 24.1 per cent in 2004 to 4.1 per cent in 2008, possibly reflecting better recording.

Ear, nose & oropharynx (BNF Chapter 12)

The mean practice redemption rate in each year fell with a value of 93.7 per cent in 2004 and 88.6 per cent in 2008. The proportion of practices with a redemption rate of 100 per cent or higher in each year was 13.1 per cent, 9.0 per cent, 4.8 per cent, 2.8 per cent and 4.1 per cent. A proportion of the drugs in this chapter are available over the counter at less than the prescription charge. This is a possible reason for low redemption rates.

Skin (BNF Chapter 13)

The mean practice redemption rate fell across the five years (102.2 per cent, 100.7 per cent, 97.6 per cent, 97.1 per cent and 96.5 per cent). In 2008 almost 90 per cent of dispensed items from this chapter were from sections where the average cost per item was less than the prescription charge. It may be that patients were purchasing medicines available without a prescription at a lower cost than the prescription charge. However a comparison of redemption rates for this chapter with levels of deprivation (we would expect higher redemption rates as more patients would be exempt) does not support this.

The proportion of practices with a redemption rate of 100 per cent or over also fell (64.1 per cent, 48.2 per cent, 18.6 per cent, 14.5 per cent and 11.7 per cent) but the proportions were still high. The most likely explanation is a failure to record all the prescribing by the practice.

Statins (BNF Chapter 2.12)

We chose to investigate the use of statins as a specific therapeutic area as there is concern about compliance^{6,7} for this group of medicines. Statins are used to reduce the risk of future cardiovascular events rather than to treat symptoms. While we cannot know if patients actually take the medication, we have found that the mean practice redemption rate is 99 per cent or higher for each year and so most patients do seem to have their prescriptions dispensed.

Bronchodilators (BNF Chapter 3.1)

The mean practice redemption rate fell from 92.4 per cent to 91.1 per cent over the first four years but rose to 91.7 per cent in 2008. This is discussed above under the Respiratory chapter.

Antipsychotics (excluding antimanica drugs) (BNF Chapter 4.2.1 and 4.2.2)

The mean practice redemption rate is around 85 per cent in each year and has remained static. The data suggest that many patients did not have their prescriptions dispensed (in one practice the redemption rate was just over 50 per cent). This is a worrying finding as it suggests that some patients are failing to benefit from their prescribed medication. A review of studies of compliance among patients with psychosis by Nosé, Barbui and Tansella³ reported rates of failure to take medication as directed of between 24 per cent and 90 per cent with a weighted average of 26 per cent. However it is possible that patients receive supplies of the medication from hospital (possibly on discharge from an episode in hospital) as care will not be provided solely by general practices. Compliance may be influenced by the condition, and the side effects of the medicine.

Antidepressants (BNF Chapter 4.3)

The mean practice redemption rate has remained between 96.3 per cent and 96.9 per cent. The proportion of practices with redemption rates of 100 per cent or higher was 4.2 per cent or less in each year. In a meta-analysis of 12 studies DiMatteo, Lepper and Croghan ⁴ found that patients with depression were three times as likely as other patients to be non-compliant with their medication. However the redemption rates found here do not seem to suggest such a high level of failure to have prescriptions dispensed but “non-compliance” includes a failure to take the medication as prescribed.

Epilepsy (BNF Chapter 4.8)

The mean practice redemption rate is between 97.3 per cent and 98.0 per cent for each year. However there are a number of practices where the redemption rate is over 100 per cent (between 5.5 per cent and 12.4 per cent). As we have taken some care to match the drugs, this is likely to be due to prescriptions being issued outside the surgery and not being recorded in the practice systems.

Antibacterials (BNF Chapter 5.1)

The mean redemption rate was over 100 per cent in 2004 but fell to 97.2 per cent in 2008. See the comments for the Infections chapter.

Effect of Dispensing Status

Some of the practices in the sample were dispensing practices, that is, they had at least one patient for whom they were permitted to dispense medicines. There were 20 such practices in the last quarter of 2004 and 22 in the last quarter of 2008. It might be expected that these practices would have a high redemption rate as a proportion of the patients could receive their medication directly from the practice. The average redemption rates for these practices were 98.3 per cent in 2004 and 98.8 per cent in 2008 while the figures for the total sample were 98.1 per cent and 97.4 per cent respectively.

It is rare for all the patients in a practice to be dispensing patients. In 2004 the proportion of patients to whom the practice could dispense in our sample ranged from 8% to 88%. In 2008 it ranged from under 1% to 82%.

There was no significant correlation (at 5% or better) between the proportion of dispensing patients and the overall redemption rate in 2008 (2008, Pearson $r = 0.36$, see Glossary for details of the Pearson coefficient) but there was in 2004 (2004, Pearson $r = 0.43$).

Deprivation and redemption rates

We decided to investigate if there was any link between the redemption rate and deprivation, measured by the Low Income Score Index (LISI) for each practice. Patients with a low income are exempt from the prescription charge. However, a high level of deprivation may be a marker for a large number of patients whose income is not low enough to be exempt but low enough for the prescription charge to be a deterrent to having a prescription dispensed. However, over 90 per cent of prescriptions are not charged at the point of dispensing and so any such effect is likely to be small.

The LISI is the number of prescriptions to those exempt because of low income compared with the total number of prescriptions. Details are given in Lloyd, Harris and Clucas⁵. The index is produced by financial year and the score for 2004/5 has been used for 2004, 2005/6 for 2005 and so on. Table 7 below shows the correlation between the LISI score and the redemption rate for each chapter (excluding vaccines and anaesthesia) for 2004 to 2007. The LISI score was not produced for 2008/9 and so we cannot calculate the correlation for 2008. In most years all practices prescribed from all the drug groups but in 2005 one practice did not prescribe antidepressants.

Ideally we would only look at those prescriptions for patients not exempt due to age or other reasons not related to income. However the data from Prescription Services is not split in this way and so the redemption rates are based on all prescriptions.

Table 7: correlations between LSI score and redemption rate

Therapeutic area	2004	2005	2006	2007
All prescribing (excluding vaccines and anaesthesia)	0.06	-0.01	-0.14	-0.09
Gastro-intestinal	0.06	-0.10	-0.17*	-0.18 *
Cardiovascular	0.00	-0.10	-0.19*	-0.08
Respiratory	0.07	0.06	-0.09	-0.02
Central Nervous System	-0.02	-0.07	-0.15	-0.12
Infections	0.14	0.10	0.02	0.11
Endocrine system	0.08	0.05	-0.09	-0.00
Obstetrics, gynaecology and urinary tract disorders	0.08	-0.04	-0.05	-0.01
Malignant disease and immunosuppression	0.02	0.03	0.00	0.00
Nutrition and blood	0.09	0.08	0.06	0.03
Musculoskeletal and joint diseases	-0.12	-0.19 *	-0.43 *	-0.42 *
Eye	0.04	0.01	-0.09	-0.05
Ear, nose & oropharynx	-0.00	-0.01	-0.09	-0.19 *
Skin	0.14	0.10	0.11	0.14
2.12 Statins	0.01	-0.01	-0.07	-0.02
3.1 Bronchodilators	0.02	0.08	-0.08	0.03
4.2 Antipsychotics (excluding antimania)	0.27*	0.27*	0.19*	0.25*
4.3 Antidepressants	-0.14	-0.20*	-0.27*	-0.25*
4.8 Epilepsy	-0.08	-0.07	-0.26*	-0.09
5.1 Antibacterial drugs	0.13	0.08	-0.00	0.08

* Indicates that the correlation is significant at the 5 per cent level or better; note that we are doing multiple tests and so the effective significance level is different.

A positive correlation indicates that the redemption rate increases as the level of deprivation increases, a negative correlation that the redemption rate falls with higher levels of deprivation. A value close to zero suggests that there is no link between the redemption rate and deprivation while a value close to plus or minus one indicates a strong association. It does not mean that one causes the other, only that there seems to be an association. The significance level indicates how unlikely it would be to see a correlation value this large or larger if there were no association between the two measures. We have used the conventional level of 5 per cent to suggest that a correlation is significant.

About half of all the correlations are positive and several are close to zero. This does not support the idea that redemption rates are generally lower in areas of greater deprivation. If this were the case then we would find many significant negative correlations.

Apart from 2004, there is a consistent significant negative correlation for chapter 10, (Musculoskeletal and joint diseases) and the correlation coefficients are large in value for 2006 and 2007. There is a similar pattern for antidepressants. This suggests that higher levels of deprivation are associated with lower redemption rates. This could be a chance result or it could indicate that patients in practices where there are a large proportion of low income patients do not have their prescriptions for such medicines dispensed. For antipsychotics the correlation coefficients are significant and positive showing that, in general, the redemption rates for these drugs are higher in areas which are more economically depressed.

As an alternative way of exploring these links we split the practices into four equally sized groups (quartiles). Practices with LSI scores of 6.15 or less in 2007 were assigned to the most affluent group, those with scores higher than 12.84 in 2007 were assigned to the most deprived group. The mean redemption rate in 2007 for musculoskeletal and joint diseases medications was 98.9 for the most deprived group and 102.0 for the least deprived. For antidepressants the corresponding figures were 96.0 and 97.4 while for antipsychotic medication the figures were 87.9 and 82.0.

Proportion of elderly or young and redemption rates

We investigated if there was any link between the redemption rate and the proportion of those medicines being prescribed to elderly patients (i.e. those aged 60 and over) and similarly for those under 16. These are the groups who are exempt from the prescription charge due to age. The proportion of prescription items given to the elderly or young was derived from THIN data who record the age of the patient for each prescription.

Table 8 shows the correlation between the proportion of items prescribed to the elderly and the redemption rate for each BNF chapter (excluding vaccines and anaesthesia) and therapeutic group for 2004 to 2008.

Ideally we would only look at prescriptions for the elderly but the data from Prescription Services does not allow us to do this and so the redemption rates are based on all prescriptions.

Table 8: correlation between proportion of prescriptions for the elderly and the redemption rate

Therapeutic area	2004	2005	2006	2007	2008
All prescribing (excluding vaccines and anaesthesia)	0.08	0.14	0.31*	0.28*	0.21
Gastro-intestinal	0.09	0.20*	0.29*	0.28*	0.15
Cardiovascular	0.01	0.11	0.27*	0.18*	0.13
Respiratory	0.11	0.07	0.22*	0.26*	0.23*
Central Nervous System	0.12	0.17*	0.26*	0.20*	0.17*
Infections	0.08	0.10	0.17*	0.20*	0.17*
Endocrine system	0.04	0.05	0.19*	0.15	0.03
Obstetrics, gynaecology and urinary tract disorders	0.10	0.11	0.20*	0.11	0.07
Malignant disease and immunosuppression	0.03	-0.04	-0.02	-0.03	-0.01
Nutrition and blood	0.01	0.05	0.17*	0.03	0.08
Musculoskeletal and joint diseases	0.13	0.25*	0.40*	0.46*	0.39*
Eye	0.07	0.13	0.21*	0.31*	0.27*
Ear, nose & oropharynx	0.17*	0.23*	0.26*	0.28*	0.32*
Skin	0.07	0.11	0.15	0.15	0.23*
2.12 Statins	-0.02	-0.00	0.10	0.01	0.10
3.1 Bronchodilators	0.19*	0.15	0.33*	0.35*	0.25*
4.2 Antipsychotics (excluding antimania)	-0.05	0.01	-0.02	-0.04	-0.06
4.3 Antidepressants	0.16	0.23*	0.29*	0.24*	0.09
4.8 Epilepsy	0.09	0.05	0.21*	0.08	0.10
5.1 Antibacterial drugs	-0.01	-0.03	0.04	0.10	0.09

* indicates that the correlation is significant at the 5 per cent level or better

There are no significant negative correlations in the table. There are however many significant positive correlations suggesting that the redemption rate is higher when a large proportion of the prescriptions are for the elderly. This could relate to the delivery service run by many community pharmacies for elderly and frail patients and support from community services.

Table 9 shows the correlation between the proportion prescribed to those under 16 and the redemption rate for each chapter (excluding vaccines and anaesthesia) and drug groups for 2004 to 2008. Note that for some chapters and drug groups not all practices prescribed medicines to those under 16. Since the significance level is linked to the sample size this means that some values are not significant even though they are larger than other values which are.

Ideally we would only look at prescriptions for those aged under 16 but the data from Prescription Services does not allow us to do this and so the redemption rates are based on all prescriptions.

Table 9: correlation between the proportion of prescriptions to the young and the redemption rate

Therapeutic area	2004	2005	2006	2007	2008
All prescribing (excluding vaccines and anaesthesia)	-0.16*	-0.19*	-0.31*	-0.32*	-0.27*
Gastro-intestinal	-0.15	-0.15	-0.27*	-0.24*	-0.22*
Cardiovascular	0.00	0.06	-0.12	-0.28*	-0.25*
Respiratory	-0.13	-0.07	-0.21*	-0.30*	-0.22*
Central Nervous System	-0.10	-0.10	-0.11	-0.15	-0.18*
Infections	-0.07	-0.00	-0.10	-0.14	-0.17*
Endocrine system	-0.12	-0.15	-0.08	-0.16	-0.01
Obstetrics, gynaecology and urinary tract disorders	-0.10	-0.12	-0.20*	-0.12	-0.26*
Malignant disease and immunosuppression	0.18	0.21	0.08	0.07	0.23*
Nutrition and blood	-0.12	-0.13	-0.20*	-0.08	-0.11
Musculoskeletal and joint diseases	-0.24*	-0.30*	-0.44*	-0.48*	-0.40*
Eye	-0.15	-0.14	-0.21*	-0.27*	-0.24*
Ear, nose & oropharynx	-0.19*	-0.24*	-0.40*	-0.46*	-0.59*
Skin	-0.15	-0.24*	-0.24*	-0.18*	-0.26*
2.12 Statins	0.03	-0.03	0.26	-0.29	-0.19
3.1 Bronchodilators	-0.28*	-0.26*	-0.40*	-0.47*	-0.28*
4.2 Antipsychotics (excluding antimania)	-0.01	-0.12	0.03	-0.01	-0.19
4.3 Antidepressants	-0.00	0.07	0.00	0.19	0.03

4.8 Epilepsy	0.12	0.08	0.05	0.04	-0.11
5.1 Antibacterial drugs	-0.00	0.10	-0.02	-0.07	-0.11

* indicates that the correlation is significant at the 5 per cent level or better

That there is a significant negative correlation for each year for both total prescribing and for chapter 10, Musculoskeletal and joint diseases, is surprising. Since prescriptions are free to this group there would seem to be no reason why redemption rates are lower in practices where there is a higher proportion of prescriptions for the young. However, at least for musculoskeletal prescribing, this result is similar to the one found for deprivation and practices with high deprivation rates tend to have a higher proportion of young patients (in 2007 the correlation between the LSI score and the proportion of patients aged 15 or under for the practices in the study was 0.30). As can be seen from Figure 6, the proportion of prescriptions for this group of medicines to the young is very small.

While the correlation for the elderly was significant and positive for each year for chapter 12, Ear, nose & oropharynx, it is significant and negative in each year for the young. Apart from 2004, the correlation is negative and significant for each year for chapter 13, Skin. In the latter case there is a possibility that prescriptions are given in case the child's eczema (or a similar condition) flares up but it proves unnecessary to have it dispensed.

There is a significant negative correlation in each year for bronchodilators. This may be due to patients with asthma whose condition is controlled by corticosteroids and, when they receive a prescription for a bronchodilator, they decide that they do not need to have it dispensed. From Figure 6 we can see that very few prescriptions for bronchodilators are for this age group.

Conclusion

Comparing the numbers of prescribed and dispensed items proved more difficult than initially expected, partly because of differences in the way some drugs are classified into therapeutic areas between Prescription Services and the drug dictionary used in THIN. These classification differences were resolved but need to be kept in mind in any future study comparing prescribed and dispensed items. It is also clear that some activity which generates a prescription report to the NHS Prescription Service (especially vaccinations) is not recorded on general practice systems in the same way as “normal” prescribing. This also applies to prescribing for a patient registered with a practice where no record is made on the practice computer system. This will include home visits and supplies from Out of Hours Services.

The initial hypothesis was that we would find that not all prescriptions are dispensed, i.e. a redemption rate less than 100 per cent, and we intended to examine some of the possible drivers for this. However we found that in many cases there seemed to be more prescriptions dispensed than were prescribed. The most likely explanation seems to be a failure to record the prescription on the clinical computer system when supplied outside the practice. We anticipated that prescriptions issued by community nurses would not be recorded on the GP system and so removed them from the NHS Prescription Service data before making the comparison. However we had no way of removing prescription issued by Out of Hours services on behalf of the practice and these are the most likely cause of the excess prescriptions.

Overall the redemption rates were high with a mean rate of over 97 per cent in each year (after exclusion of vaccines and anaesthesia) although values for individual practices ranged widely. However some therapeutic areas had much lower rates, particularly malignant disease and immunosuppression, and antipsychotics. These findings are of concern given the possible consequences of a failure to take these medications as prescribed for the patients. However it is possible that patients receive supplies of the medication from hospital (possibly on discharge from an episode in hospital) or other healthcare providers and so do not need to have every prescription from their general practice dispensed.

There has been speculation that patients do not take statins as prescribed, although many of these studies have been on non-UK populations. This study indicates that most patients have their prescriptions dispensed but does not tell us whether they subsequently take them in the prescribed manner.

The influence of deprivation on the redemption rate was examined. Although a low income is a qualifying condition for exemption from the prescription charge, a high level of deprivation in a practice may indicate the presence of other patients in difficult economic circumstances but who do not qualify for exemption. Significant negative correlations were found for musculoskeletal and joint diseases, antipsychotics and antidepressants. Although some alternatives for musculoskeletal and joint disease prescriptions could be bought over the counter, this is not the case for antidepressants and antipsychotics and so it is likely that some patients were not receiving their medication. Whether this was an active choice due to the cost, side effects, or some other reason cannot be determined from our data.

Since the elderly and the young are exempt from the prescription charge we anticipated that redemption rates would be higher when a large proportion of the medications were

prescribed to these groups. This proved to be the case for the elderly. For this group there were significant negative correlations for musculoskeletal and joint diseases, ear, nose and oropharynx, skin and bronchodilators. Successful asthma control using corticosteroids might explain the failure to have bronchodilators dispensed. This appeared not to be the case for the young but this may be limited by the data available. Many medicines are rarely prescribed for those aged under 16. For example, they accounted for less than 1 per cent of prescriptions for cardiovascular drugs (see figure 5). Explanations for the other correlations found are not possible based on the data available.

The study covered only 145 practices (there are over eight thousand practices in England) and so any conclusions may not apply generally. Matching of individual prescriptions was not possible and so the reported redemption rates are an estimate. Since prescriptions remain valid for six months we cannot be sure that prescriptions issued within a particular time period will be presented within that period.

Glossary

Adherence – an alternative term for compliance

Compliance – a patient who takes their medication as directed is considered to be compliant

Concordance – an alternative term for compliance

Item – a single entity on a prescription specifying a medicine; a prescription can specify several different medications on a single form and each is termed an item

Low Income Scheme Index – this is a measure of the economic deprivation of the patients in a practice based on the number of items where the patient claimed exemption from the prescription fee because of low income. The number of such items was determined from a 5% sample of prescriptions. Currently this index is not produced because of problems with processing exempt items.

Over the counter (OTC) – this describes a medication which can be purchased without a prescription

Pearson correlation - The Pearson product-moment correlation coefficient, typically denoted by r , is a measure of the correlation between two variables, giving a value between +1 and -1 inclusive. It is widely used in the sciences as a measure of the strength of linear dependence between two variables. A value near zero implies little or no association while a value close to one implies a strong association. A negative value implies that high values of one variable are associated with low values of the other. Note that a strong association is not proof of causality, a third factor may be driving both the observed variables or the association may be due to chance.

Prescription – this refers to the form (known as an FP10) which a prescriber such as a GP or nurse uses to specify the medications required by the patient. The dispenser (usually a community pharmacist) dispenses the medication and sends the form to the NHS Business Services Authority who will then reimburse the dispenser for the cost of the medication.

Prescription charge – unless a patient is exempt (because they are in a particular age group or have a low income or for one of a range of other reasons) a patient is required to pay a fee to have an item dispensed. Currently (April 2011) the fee is £7.40.

Personally administered items – a prescriber may prescribe a medicine for a patient which needs to be administered personally, e.g. an injection. In such cases the prescriber usually writes a prescription but may not give it to the patient. The prescriber sends the prescription directly to Prescription Services for reimbursement

Reimbursement – the process whereby the person who dispenses a prescription receives payment for the cost of the medicine plus a fee. This is done by Prescription Services who are based in Newcastle who need to cost each prescription and then calculate the payment due.

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