

# 15 Selected topics—changes over time

This chapter uses multiple regression to examine more closely how observed changes in management rates of particular problems and changes in medication rates were reflected in medication management for particular problems of interest.

Topic selection was based on:

- medications or problems of topical interest in terms of public health initiatives or developments in treatments
- whether there were significant changes in overall rates of management of a problem, in overall rates of a medication or non-pharmacological treatments.

Using these criteria, five topics were selected for examination of management over time:

- Medication rates for depression, in particular the rates of selective serotonin reuptake inhibitors (SSRIs) versus other anti-depressants.
- Medication rates for lipid disorders over time, in particular the rates of HMG CoA reductase inhibitors (statins).
- Medication rates for asthma over time, in particular asthma preventives versus bronchodilators.
- The use of non-steroidal anti-inflammatory drugs (NSAIDs) to manage all arthritis (including osteoarthritis and rheumatoid arthritis) versus other musculoskeletal problems.
- The use of antibiotics to manage upper respiratory tract infections.

## 15.1 Method

### Multiple linear regression of medication rates adjusting for problems

For the topics of interest, multiple linear regression was used to predict changes in selected medication rates over time, after adjusting for the main morbidities of interest related to that medication. By adjusting for the morbidity of interest it is possible to detect whether:

- there has been a change over time in the medication management for the problem of interest (e.g. Was there an increase over the 4 years in the overall prescribing rate of anti-depressants for depression?); OR
- the observed change in medication rate is explained by a commensurate change in rates of management of the problems for which this medication is prescribed. This would mean there had been no change in medication management for that problem over the 4-year period, and that the observed changes in medication rates are due to the change in management rates of the selected problem(s).

The outcome variable for each multiple regression model was medication rate (per 100 problem contacts). The predictors were problem managed and time. Patient age and sex were included as potential confounders of the effect of time and morbidity on medication rates.

'Time by problem' interaction terms were entered into the multiple regression models to test whether changes in medication rates over time differed for specific problems of interest. For example: For NSAIDs, two interaction terms ('time X arthritis' and 'time X other musculoskeletal problems') were used to test whether any change in NSAID rates over time was more pronounced for the management of arthritic problems relative to other musculoskeletal problems.

SAS regression procedures were used that calculate robust standard errors to correct for the design effect of the cluster sample.<sup>11</sup> Test statistics and p-values based on the robust standard error are more conservative than those that are calculated without taking the design effect of the cluster sample into account. Thus the robust standard error provides a more stringent test of significant changes over time.

In this section, medications were grouped according to recommended use (e.g. medications for treating depression). Within these broad therapeutic groups the specific medications were further divided into pharmaceutical classes according to the ATC classification (e.g. selective serotonin reuptake inhibitors, tricyclic anti-depressants). Trends over time in the use of each medication class within each therapeutic group of drugs were analysed using linear regression. All medications whether prescribed, advised for over-the-counter purchase, or supplied by the GP, were included.

Changes in rates of selected medications were extrapolated to provide an estimate of the Australia-wide increase in the annual number of times the medication would have been prescribed, supplied or advised (where applicable). Note that this extrapolation does not provide an estimate of the increase or decrease in the number of prescriptions that cross the pharmacist's counter, as the number of repeats ordered by the GP has not been considered in these estimates.

## **15.2 Anti-depressant medications and the management of psychological problems over time**

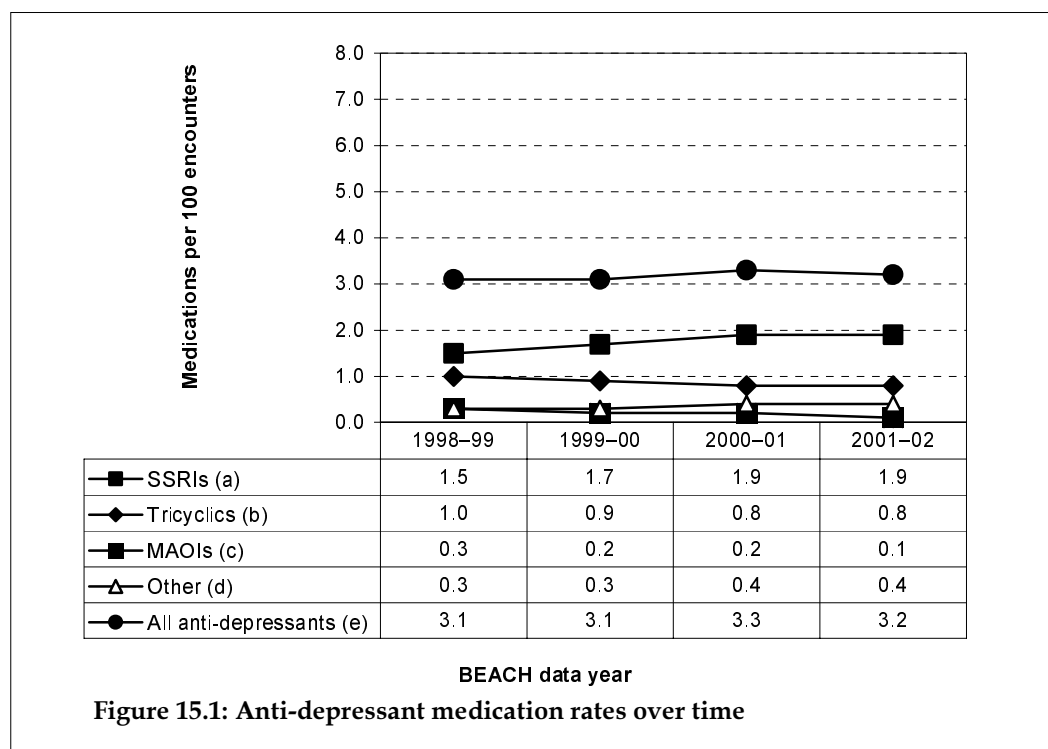
### **Medications for treatment of depression**

All anti-depressant medication included ATC medication group N06A. This was subdivided into SSRIs (ATC code N06A B), non-selective monoamine reuptake inhibitors (tricyclics, ATC code N06A A) and monoamine oxidase inhibitors (MAOIs, ATC codes N06AG, N06AF). Rates of anti-depressant medications were compared for depression versus all other psychological problems.

### **All anti-depressants—changes over time**

Figure 15.1 shows the overall rates of selected anti-depressant medications per 100 encounters, unadjusted for indication. The relative prescribing rate of all anti-depressants per 100 encounters did not change over the 4-year period; however, the prescribing rate of SSRIs rose significantly ( $p < 0.0001$ ). After adjusting for age and sex, this represented an

estimated average annual increase of 136,000 SSRI medications prescribed or supplied in general practice in Australia. The increase in rates of SSRIs was offset by significant decreases in the rates for tricyclic anti-depressants ( $p < 0.0001$ ) and monoamine oxidase inhibitors ( $p < 0.0001$ ).



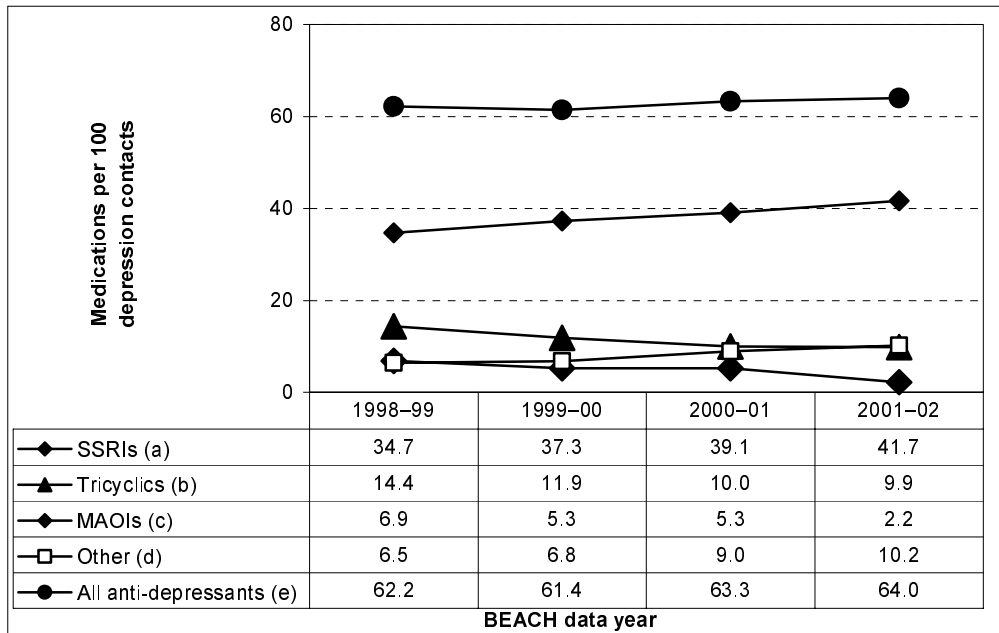
- (a) SSRI—Selective serotonin reuptake inhibitors, ATC code N06AB.
- (b) Non-selective monoamine reuptake inhibitors, ATC code N06AA.
- (c) MAOIs—Monoamine oxidase inhibitors, ATC code N06AG, N06AF.
- (d) Other anti-depressants, ATC code N06AX.
- (e) All anti-depressants ATC code N06A.

### Anti-depressants in the management of depression

Figure 15.2 shows the medication rates of anti-depressants specifically prescribed for depression. The rate of all anti-depressants prescribed for depression did not change over the 4 years. However the prescribing rate of SSRIs for depression increased significantly from 34.7 medications per 100 depression contacts in 1998-99 to 41.7 per 100 depression contacts in 2001-02. This was offset by a decrease over the period in the prescribing rate of non-selective monoamine reuptake inhibitors and monoamine oxidase inhibitors. There was also an increase in the prescribing rate of 'other' anti-depressants (ATC code N06A X) from 6.8 medications per 100 depression problems in 1999-00 to 10.2 per 100 in 2001-02. This pattern of results indicates that, although there was no overall increase in medication rates for depression managed in general practice over the 4 years of the study, SSRIs were being substituted for older classes of anti-depressants during the period.

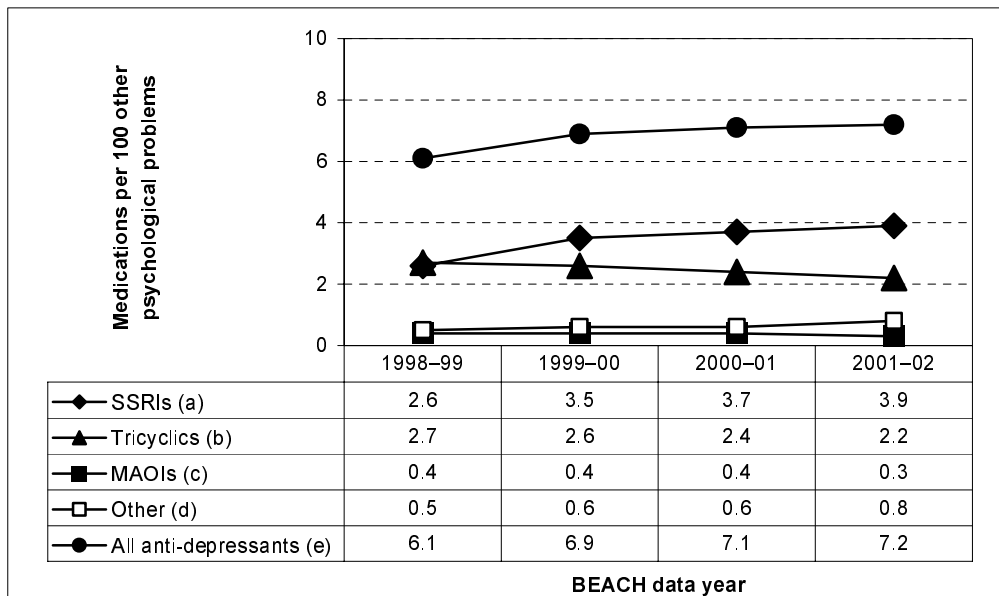
### Anti-depressants in management of other psychological problems

Figure 15.3 shows the prescribing rates over time of anti-depressant medications for all psychological problems other than depression. There was an increase in the rate of anti-depressants as a group for other psychological problems. This increase was explained by an increase in the prescribing rate of SSRIs for other psychological problems.



**Figure 15.2: Anti-depressant medication rates for depression over time**

- (a) SSRIs—Selective serotonin reuptake inhibitors, ATC code N06AB.
- (b) Non-selective monoamine reuptake inhibitors, ATC code N06AA.
- (c) MAOIs—Monoamine oxidase inhibitors, ATC code N06AG, N06AF.
- (d) Other anti-depressants, ATC code N06AX.
- (e) All anti-depressants ATC code N06A.



**Figure 15.3: Antidepressant rates for other psychological problems over time**

- (a) SSRIs—Selective serotonin reuptake inhibitors, ATC code N06AB.
- (b) Non-selective monoamine reuptake inhibitors, ATC code N06AA.
- (c) MAOIs—Monoamine oxidase inhibitors, ATC code N06AG, N06AF.
- (d) Other anti-depressants, ATC code N06AX (excluding Bupropion N06AX12).
- (e) All anti-depressants ATC code N06A.

## Multiple regression

### All anti-depressants

Multiple regression was performed to ascertain whether the patterns of anti-depressant prescribing rate for depression and for other psychological problems had changed over the period 1999–98 to 2001–02.

Multiple regression, with the prescribing rate of all anti-depressants as the outcome, found that the prescribing rate of all anti-depressants for depression had not changed significantly over time (time by depression interaction,  $p=0.09$ ). The prescribing rate of anti-depressants for all other psychological problems, however, had increased significantly (time by other psychological problems,  $p<0.0001$ ).

### SSRIs

Multiple regression with the prescribing rate of SSRIs as the outcome confirmed that the prescribing rate of SSRI medications for depression had risen, as had the rate of SSRI medications for all other psychological problems. However, a significant time by problem interaction term indicated that the increase in the SSRI prescribing rate was more marked for depression compared with other psychological problems (time by problem interaction,  $p<0.0001$ ).

## Conclusion

Overall rates of depression and anti-depressant medication remained steady over the 4 years. There was no overall increase in anti-depressant medications prescribed specifically for depression. However there is evidence that during the period SSRIs have increasingly been substituted for older classes of anti-depressant medication. There has also been an increase in the relative prescribing rate of anti-depressants, in particular SSRIs for other psychological problems.

## Current status of depression and its management

Figure 15.4 shows the relationship between depression and other variables during 2001–02. It gives an indication of the types of patients managed for depression, their reasons for encounter, co-morbidity managed and the treatments provided for their depression on that occasion.

### *Rate of depression management*

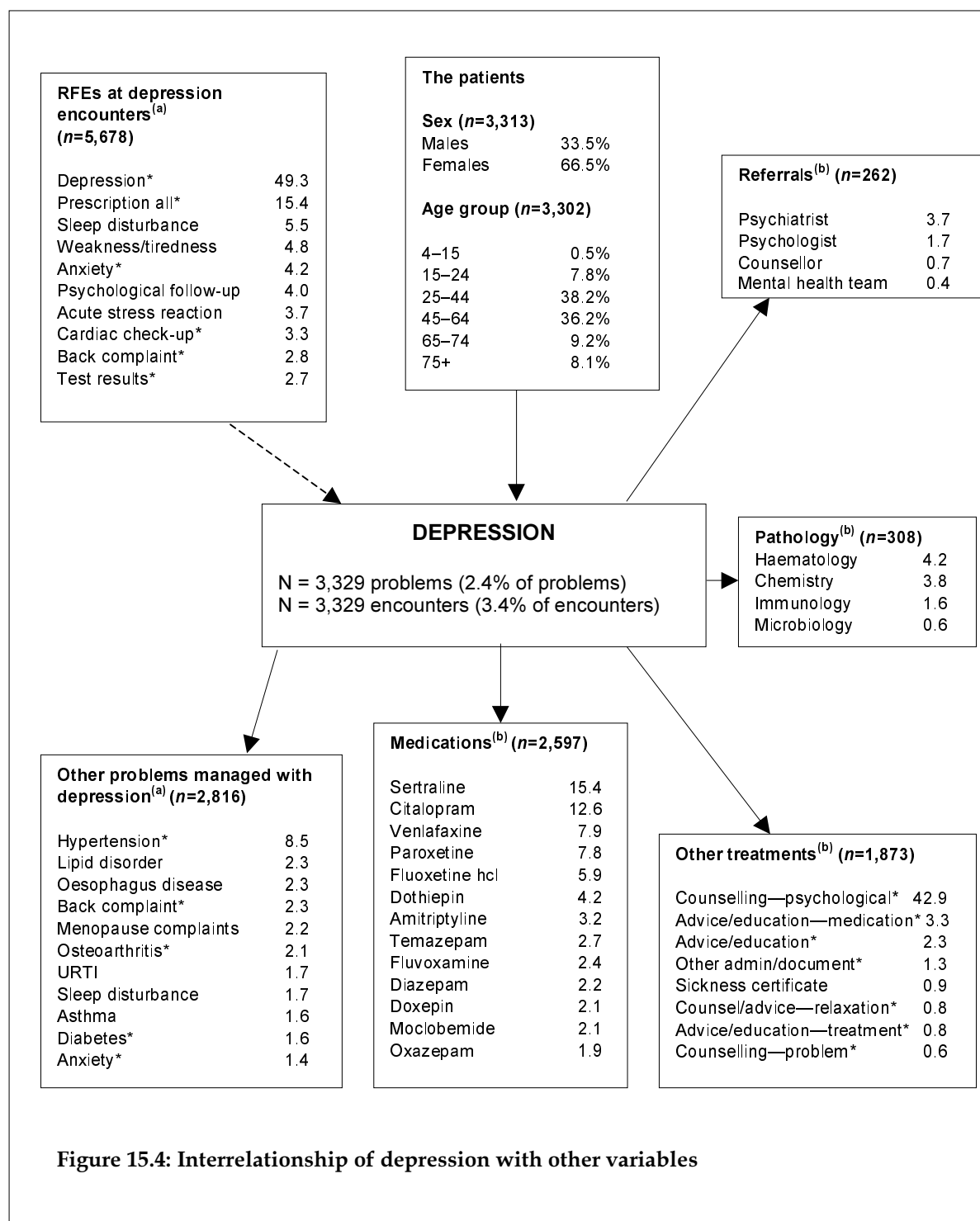
There were 3,329 occasions on which depression was recorded by GPs. Depression was managed at 3.4% of encounters and accounted for 2.4% of all problems managed.

### *Age and sex distribution of patients*

Depression was most common in patients from the middle age group, those between 25–64 years accounting for almost 75.0% of depression problems managed. The sex distribution of the patients was predominantly female (66.5% compared with 57.4% female patients in the total sample).

## Reasons for encounter

The most commonly recorded patient reason for encounter was depression, described at a rate of 49.3 per 100 encounters at which depression was managed. A prescription request was also a common reason, recorded at 15.4 per 100 of these encounters. Several symptom descriptions were also relatively common including sleep disturbance and weakness/tiredness.



**Figure 15.4: Interrelationship of depression with other variables**

(a) Expressed as rates per 100 encounters at which depression was managed (N=3,329).

(b) Expressed as rates per 100 depression problems managed (N=3,329).

\* Includes multiple ICP-2 or ICP-2 PLUS codes (see Appendix 3).

### *Other problems managed*

Hypertension was the most common other problem managed, at a rate of 8.5 per 100 depression encounters. This corresponds with results from the total sample where hypertension was the most common problem managed at a rate of 9.0 per 100 encounters.

### *Medications prescribed or supplied*

A total of 2,597 medications were prescribed or supplied for depression, at rates of 78 per 100 depression problems. Sertraline and citalopram were the medications most frequently prescribed for depression, at rates of 15.4 and 12.6 respectively.

### *Other treatments*

Other treatments were utilised at a much higher rate than in the total data set (56.3 per 100 depression problems managed, compared with 36.2 per 100 total problems). Psychological counselling was by far the most common, at 42.9 per 100 depression problems.

### *Referrals, tests and investigation*

The patient was referred to other health professionals at a rate of 7.8 per 100 depression problems managed, most commonly to a psychiatrist. Pathology was ordered at a low rate of 9.8 per 100 depression problems.

## **15.3 Lipid-lowering agents and management of lipid disorders over time**

Lipid-lowering agents were defined as the medications included in the ATC code C10A. For analysis the lipid-lowering agents were further divided into the HMG CoA reductase inhibitors (statins, ATC subgroup C10A A) versus all other lipid-lowering agents.

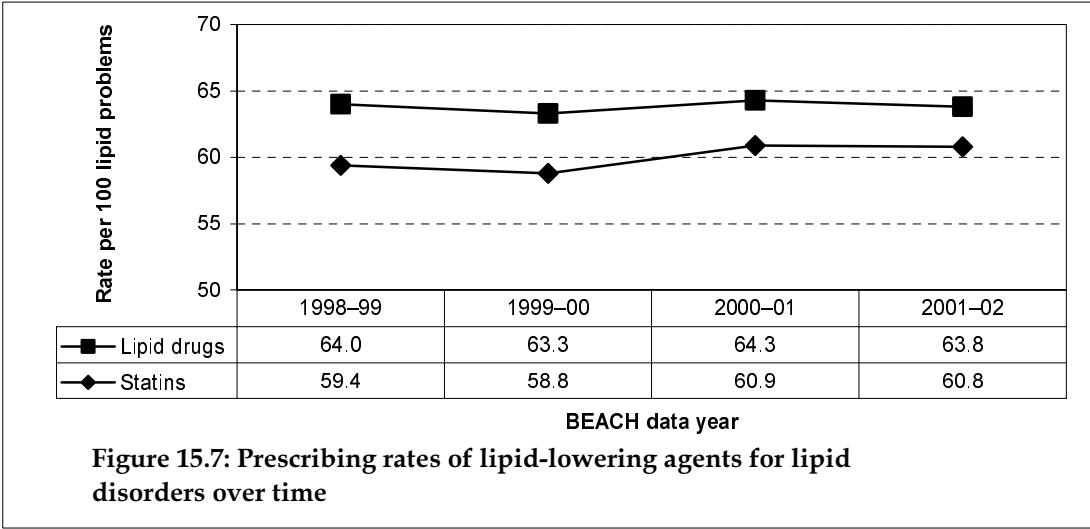
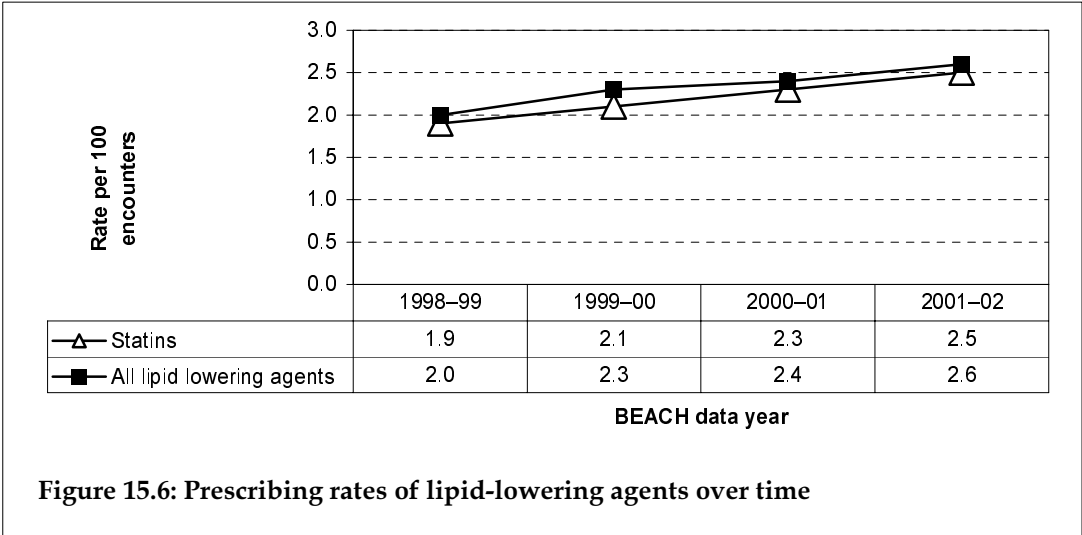
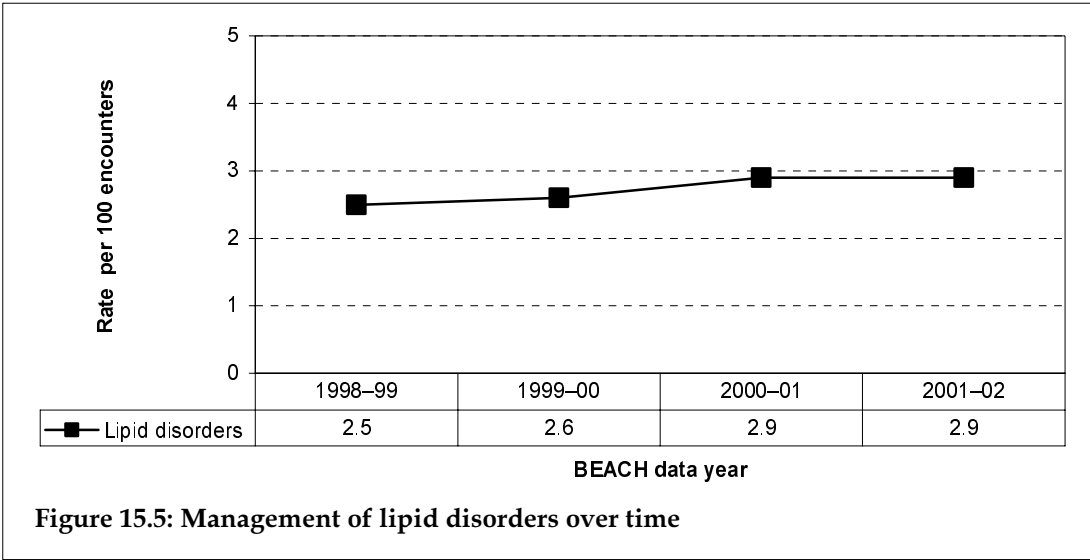
A problem was classified as a lipid disorder if the GP recorded it in the diagnosis/problem section of the form in terms such as: high cholesterol, hypercholesterolaemia, hyperlipidaemia, hypertriglyceridaemia or raised lipids (ICPC-2 Rubric T93).

### **Changes over time**

As described in Chapter 14 the management rate of lipid disorders increased significantly over the 4 year period and this change is graphically presented in Figure 15.5.

Figure 15.6 shows the rates of lipid-lowering medication per 100 encounters, unadjusted for morbidity. Statins represented the vast majority of lipid-lowering agents. There was a significant increase from 1998-99 to 2001-02 in the prescribing rate of lipid-lowering agents, almost entirely explained by an increase in the prescribing rate of statins over the period. After adjusting for age and sex it is estimated that the rate of increase represents an extra 170,000 statin medications nationally per year.

The rate of lipid-lowering agents prescribed specifically for lipid disorders appeared to remain steady for the period 1998-99 to 2001-02 (Figure 15.7).





## Multiple regression

### Total lipid-lowering agents

Multiple regression, with the rate of all lipid-lowering agents per 100 problems as the outcome, found a significant increase in the prescribing rate of lipid-lowering agents over time once changes in the management rate of lipid disorders were taken into account ( $p < 0.0001$ ).

### Statins

Multiple regression, with prescribing rate of statins per 100 problems as the outcome, found a significant increase over time in the prescribing rate of statins, even after the increase in the management rates of lipid disorders had been taken into account (time adjusted for lipids,  $p < 0.0001$ ).

### Problems (other than lipid disorders) for which lipid-lowering agents were prescribed in 1998–99 and in 2001–02

This unexplained increase in prescribing rates of lipid-lowering agents, and of statins in particular, was regarded as worthy of further investigation. Table 15.1 lists the most common labels other than a described lipid disorder) recorded by GPs for problems for which they prescribed lipid-lowering agents, in 1998–99 compared with 2001–02.

In 1998–99 about one in five lipid-lowering agents (20.9%) were prescribed for problems not labelled as a lipid problem. In 2001–02 this had risen to one in four (25.0%). The most common (non-lipid) problem for which lipid-lowering agents were prescribed in 1998–99 was ischaemic heart disease (29.1% of all non-lipid problems for which they were prescribed) followed by hypertension (18.3%) and by the simple label of 'prescription'. In 2001–02 ischaemic heart disease (16.9% of the non lipid problems) and hypertension (16.9%) remained important indications for the prescribing of lipid-lowering agents. However, lead position was taken by 'prescription'.

In reviewing some of the paper records of such encounters it appears that for patients who do not have a high cholesterol reading but who have one of the risk factors listed as PBS qualifying criteria (for example, patients with existing coronary heart disease with a cholesterol level  $>4.0$ ),<sup>42</sup> some GPs record the lipid-lowering prescription under the coronary disease label (e.g. IHD) while others label the problem separately as 'prescription', being unable to label it as hypercholesterolaemia.

The increase in prescribing of lipid-lowering agents for morbidity other than lipid problems would explain the overall increase in lipid-lowering agents previously noted.

**Table 15.1: Problems (other than lipid disorders) for which lipid-lowering agents were prescribed in 1998–99 and in 2001–02**

Morbidity managed with lipid-lowering agents	1998–99	2001–02
	Per cent of non-lipid problem labels (n=401)	Per cent of non-lipid problem labels (n=619)
Ischaemic heart disease	29.4	22.2
Hypertension*	18.3	16.9
Prescription—all*	13.3	26.3
Blood test endocrine/nutritional	9.7	5.2
Test results*	2.9	2.8
Cardiac check-up*	2.5	1.7
Diabetes*	2.4	5.0
Acute myocardial infarction	2.1	0.6
General check-up*	2.0	1.2
Heart failure	1.7	0.6
<i>Subtotal: top ten non-lipid problems</i>	<i>84.1</i>	<i>82.5</i>
<b>Total (number)</b>	<b>404</b>	<b>620</b>
<b>Per cent of total problems for which lipid-lowering medications prescribed</b>	<b>20.9</b>	<b>25.0</b>

\* Includes multiple ICPC–2 or ICPC–2 PLUS codes (see Appendix 3).

## Conclusion

Although the crude prescribing rates of lipid-lowering medications increased in the 4 year period of the study, it was accompanied by an increase in the management rates of lipid disorders. While there was no evidence of any major change in medication rates of statins for lipid disorders, there was a significant increase over time in the prescription rate of statins that was not explained by the increase of lipid disorders. It appears that lipid-lowering medications are increasingly being prescribed for problems and risk factors other than lipid disorders per se.

## 15.4 Asthma inhalant medications and the management of asthma problems over time

The investigation of changes over time for asthma medications concentrated on the adrenergic and other inhalants (ATC codes R03A, R03B). The inhalants were classified as either preventive inhalants or as bronchodilators/spasm relaxants according to CAPS (see Chapter 2, Section 2.6).

### Changes over time

The management rate of asthma decreased significantly from 3.2 contacts per 100 encounters in 1999–00 to 2.8 per 100 encounters in 2001–02 ( $p < 0.0001$ ) (Figure 15.8).

Figure 15.9 shows the prescribing rate of asthma medications per 100 encounters over the 4 years, unadjusted for morbidity. Since 1999–00 there has been a decrease in the prescribing rate of asthma medications, mainly explained by a decrease in the prescribing of bronchodilators ( $p < 0.0001$ ).

When the decrease in the relative rate of management of asthma was taken into consideration there appeared to have been little change in the prescribing rates specifically for asthma problems over the last 4 years (Figure 15.10).

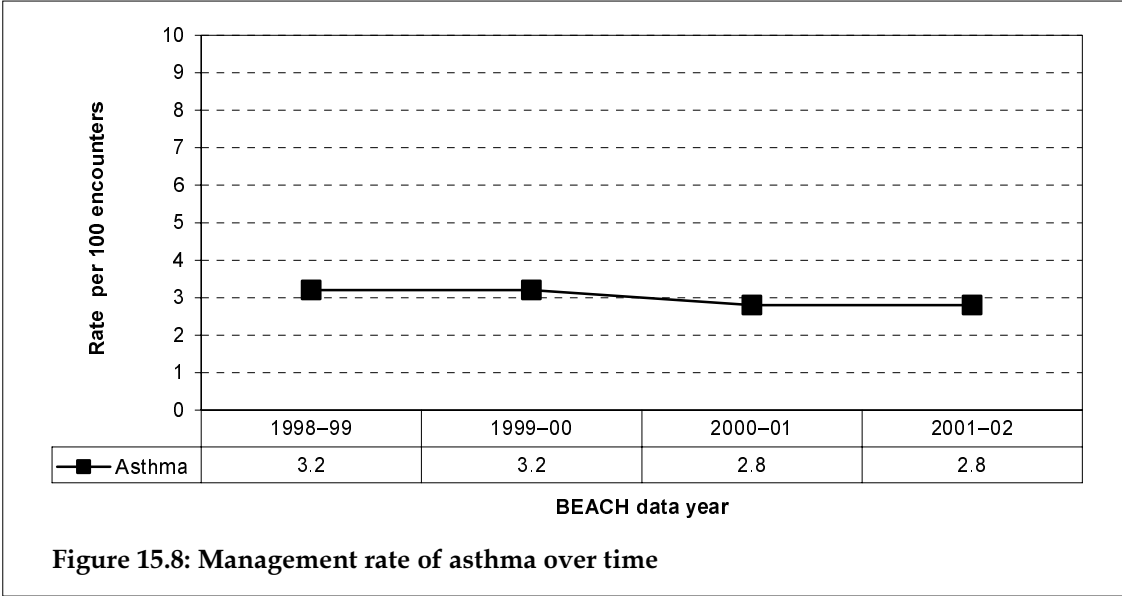


Figure 15.8: Management rate of asthma over time

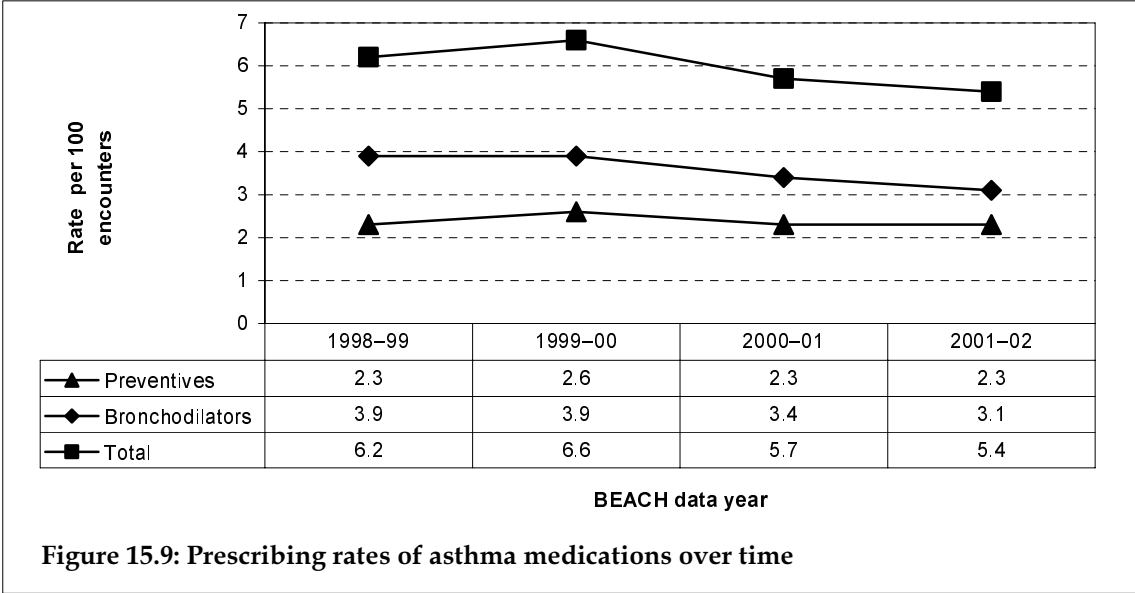
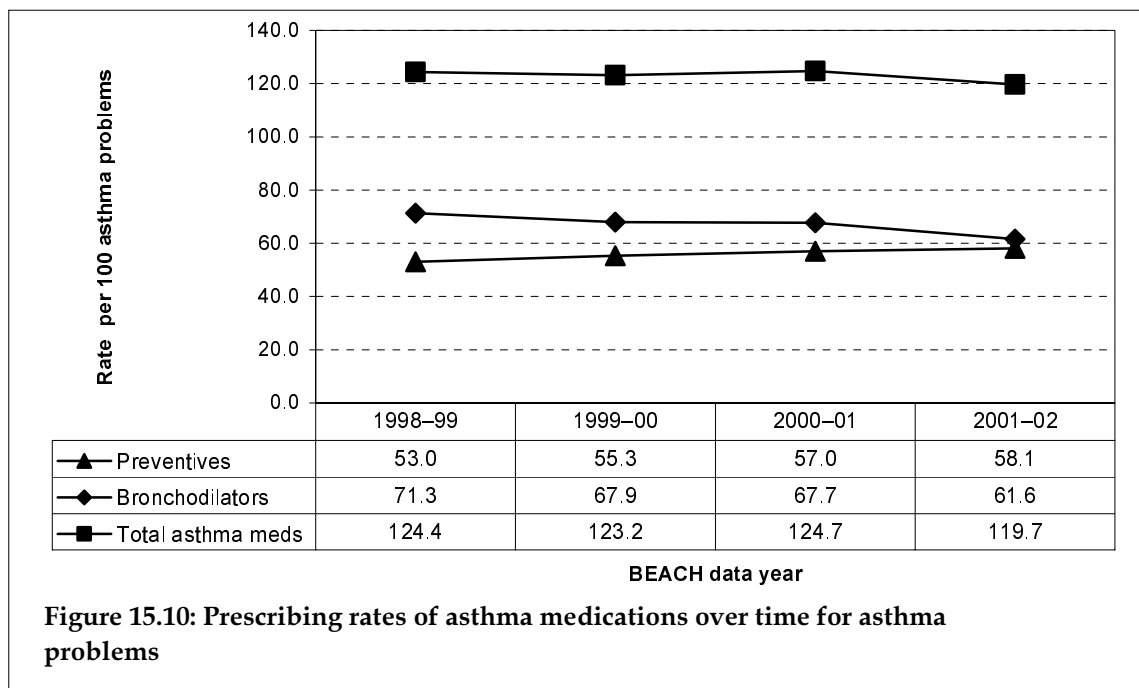


Figure 15.9: Prescribing rates of asthma medications over time



## Multiple regression

### Asthma preventives

Multiple regression, with the rate of asthma preventives per 100 problems as the outcome, found no significant effect of time on the prescribing rate of preventive medications once the management rate of asthma was taken into account (time adjusted for asthma,  $p=0.42$ ) (Figure 15.10).

### Bronchodilators

Multiple regression, with the rate of bronchodilators as the outcome, indicated a significant decrease in the prescribing of bronchodilators for all problems, but this decrease was more pronounced for the management of asthma (time by asthma,  $p=0.0008$ ) (Figure 15.9).

## Conclusion

The relative rate of management of asthma decreased between 1999-00 and 2001-02. The rate of bronchodilator medications also decreased during this period. The multiple regression analyses indicated that after changes over time in the management rate of asthma were taken into account there was some evidence that the use of bronchodilators in the management for asthma decreased in the last 2 years of the study.

## 15.5 Non-steroidal anti-inflammatory drugs (NSAIDs) and the management of arthritis and other musculoskeletal problems

### Changes over time

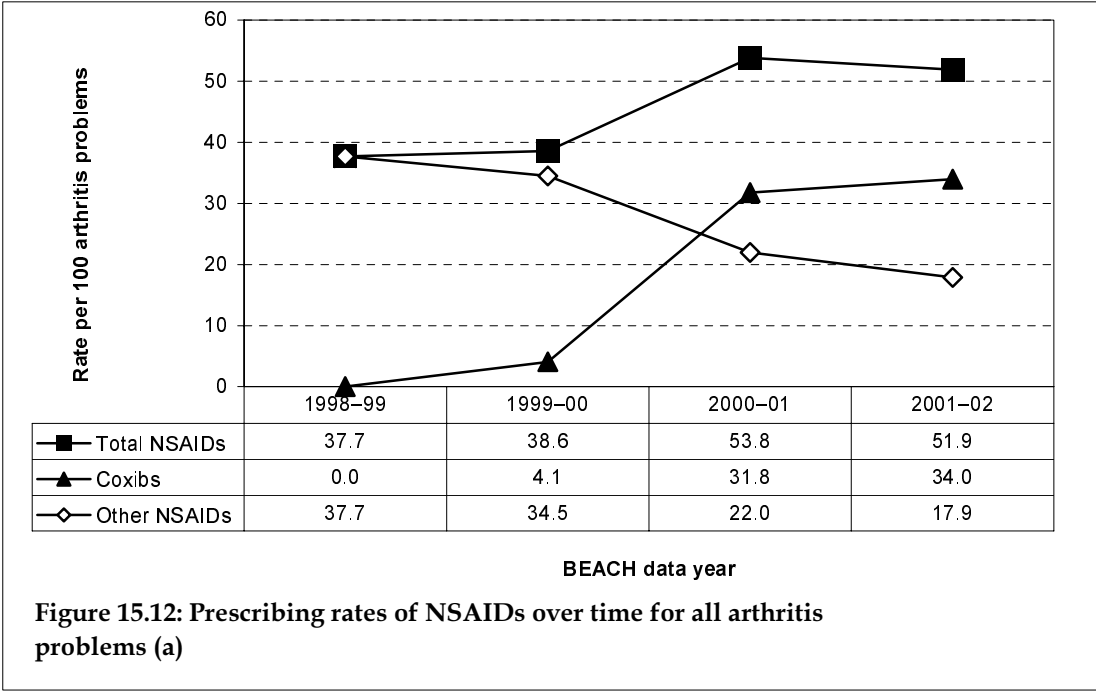
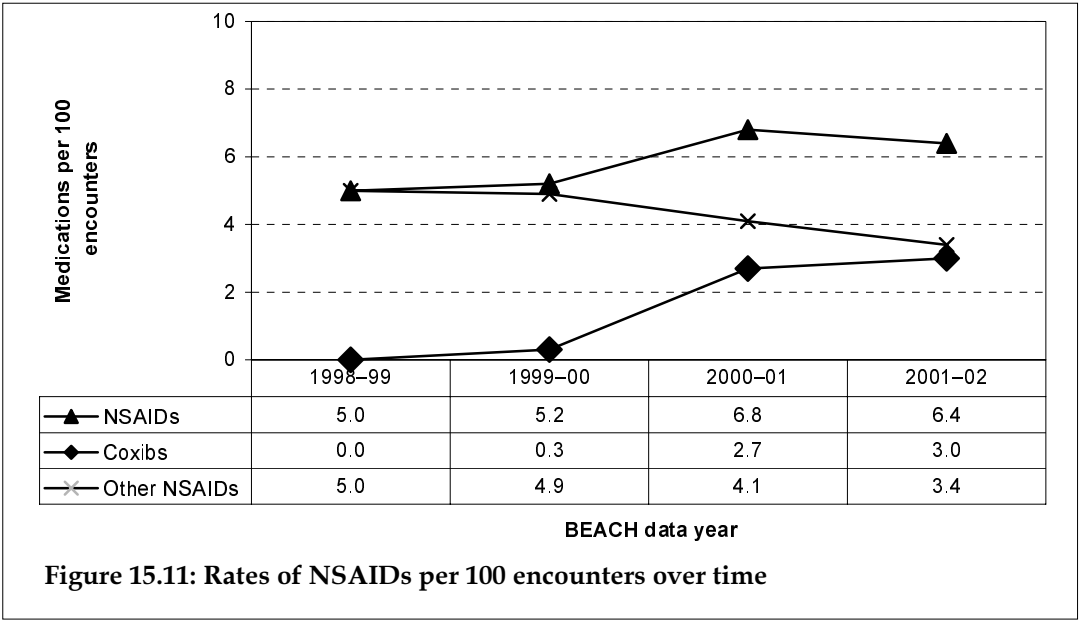
Non-steroidal anti-inflammatory drugs (NSAIDs) were defined as the medications grouped in the ATC code M01A. For analysis the NSAIDs were further subdivided into Cox-2 inhibitors (ATC subgroup M01A H) and all other NSAIDs.

Musculoskeletal problems (ICPC chapter 'L') were divided into all arthritic problems (rheumatoid arthritis, osteoarthritis, and unspecified arthritis) versus all other musculoskeletal problems. These broad categories of problems of interest were derived from the recommended indications for the use of Cox-2 inhibitors<sup>43</sup> and the problems for which NSAIDs were most often prescribed (shown later in Figure 15.14). The prescribing rate of NSAIDs for arthritic problems was compared with the prescribing rate for other musculoskeletal problems. Multiple regression was used to examine trends over time in the prescribing rate of NSAIDs for arthritis, other musculoskeletal problems and all other problems.

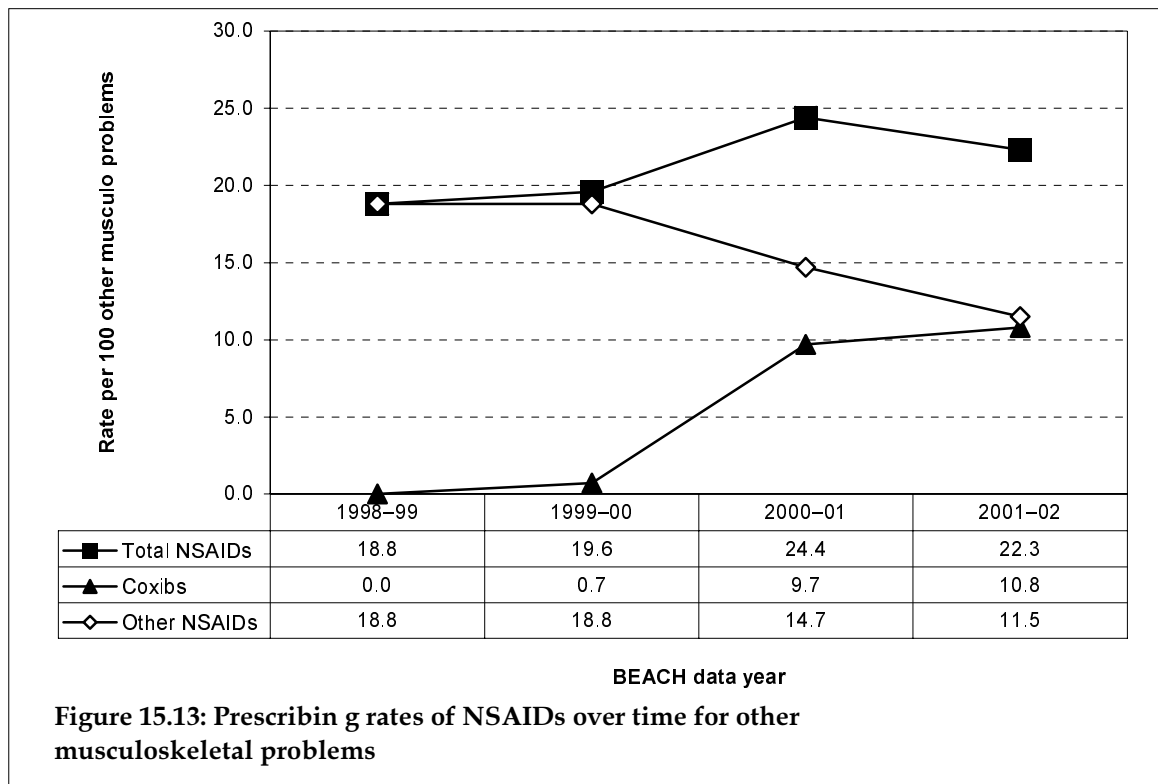
Figure 15.11 shows the prescribing rate of NSAIDs per 100 encounters unadjusted for morbidity. As reported in Chapter 9, the univariate analysis indicated that the overall prescribing rate of NSAIDs had increased over the 4 year period. Specifically, the prescribing rate of Cox-2 inhibitors had increased significantly from 1999-00 to 2001-02, while the prescribing rate of the other NSAIDs had declined.

The rate of total NSAID prescribing specifically for arthritic problems increased from around 38 medications per 100 arthritic problems in 1999-00 to 54 per 100 arthritic problems in 2000-01, with no further rise in 2001-02 (Figure 15.12). This increase was entirely due to an increase in the prescribing rate of Cox-2 inhibitors from 4 per 100 arthritic problems in 1999-00 to 34 per 100 arthritic problems in 2001-02. At the same time the prescribing rate of other NSAIDs decreased from 35 per 100 arthritic problems in 1999-00 to 18 per 100 in 2001-02. This changing pattern of medication management indicates that the increase in Cox-2 inhibitors was largely responsible for an overall increase in the total NSAID medication rate for arthritic problems. The decrease in other NSAIDs indicates that there has been considerable substitution of Cox-2 inhibitors for other NSAIDs.

The prescribing rate of NSAIDs for musculoskeletal problems other than arthritis rose over the period 1999-00 to 2000-01, with no further increase in 2001-02 (Figure 15.13). The prescribing rate of Cox-2 inhibitors for other musculoskeletal problems continued to increase in 2001-02, while the rate of all other NSAIDs decreased. Again, substitution of Cox-2 inhibitors for other NSAIDs was demonstrated.



(a) Includes multiple ICPC-2 codes for osteoarthritis and arthritis (see Appendix 3) and rheumatoid arthritis (ICPC rubric L88).



## Multiple regression

### All NSAIDs

Multiple regression, with the prescribing rate of total NSAIDs as the outcome, found a significant time by problem interaction for the prescribing rate of total NSAIDs ( $p < 0.0001$ ). This interaction indicates that since 1999-00 the increase in the prescribing rate of total NSAIDs for arthritic problems has been more pronounced than the increase in the prescribing rate of total NSAIDs for other musculoskeletal problems.

### Cox-2 inhibitors

Multiple regression, with the prescribing rate of Cox-2 inhibitors as the outcome, found a significant time by problem interaction for the prescribing rate of Cox-2 inhibitors ( $p < 0.0001$ ). This interaction indicates that the rate of uptake of Cox-2 inhibitors from 1999-00 to 2001-02 was more pronounced for arthritic problems than for other musculoskeletal problems.

### Other NSAIDs (not Cox-2 inhibitors)

Multiple regression, with the rate of NSAIDs other than Cox-2 inhibitors as the outcome, found a significant time by problem interaction ( $p < 0.001$ ). This interaction indicates that, from 1999-00 to 2001-02, the decrease in the prescribing rate of other NSAIDs was more pronounced for arthritic problems relative to other musculoskeletal problems.

## Conclusion

From 1999–00 to 2000–01, there was a marked increase in the prescribing rate of total NSAIDs for both arthritic problems and other musculoskeletal problems, an increase which was entirely explained by an increase in the rate of Cox-2 inhibitors. This increase levelled off somewhat in 2001–02. There was evidence that Cox-2 inhibitors were substituted for other NSAIDs for both arthritic problems and other musculoskeletal problems, as there was a decrease in medication rates of other NSAIDs. Significant time by problem interactions indicated that the increase in the prescribing rate of total NSAIDs, the uptake of Cox-2 inhibitors and the discarding of other NSAIDs were significantly more pronounced for arthritic problems relative to other musculoskeletal problems.

## Current status of Cox-2 inhibitors

Considering the changes in pattern of prescribing of NSAIDs, reflecting the introduction of Cox-2 inhibitors on the PBS investigation of the patients and problems for whom Cox-2 inhibitors were prescribed in 2001–02 may be of interest. Figure 15.14 shows the relationship between prescriptions for Cox-2 inhibitors and other variables in the fourth year of the BEACH program.

### *Rate of prescription, supply or recommendation*

There were 2,942 occasions on which Cox-2 prescriptions were recorded by GPs, accounting for 2.9% of all medications recorded. They were given at a rate of 3.0 per 100 total encounters and at a rate of 2.1 per 100 total problems. Of the two Cox-2 inhibitors available during this recording period, celecoxib was slightly more common than rofecoxib.

### *Prescribed daily dose*

Celecoxib had a median PDD of 200 mg, which is the lowest recommended dose suggested in MIMS. The 25 mg median PDD for rofecoxib was the highest dose recommended in MIMS.<sup>43</sup>

### *Age and sex distribution of patients*

Patients over the age of 44 years accounted for 80.0% of patients at coxib encounters compared with 51.4% in the total sample. Half of these were aged between 45 and 64 years and half were older patients. The sex distribution of the patients was the same as that of the total sample.

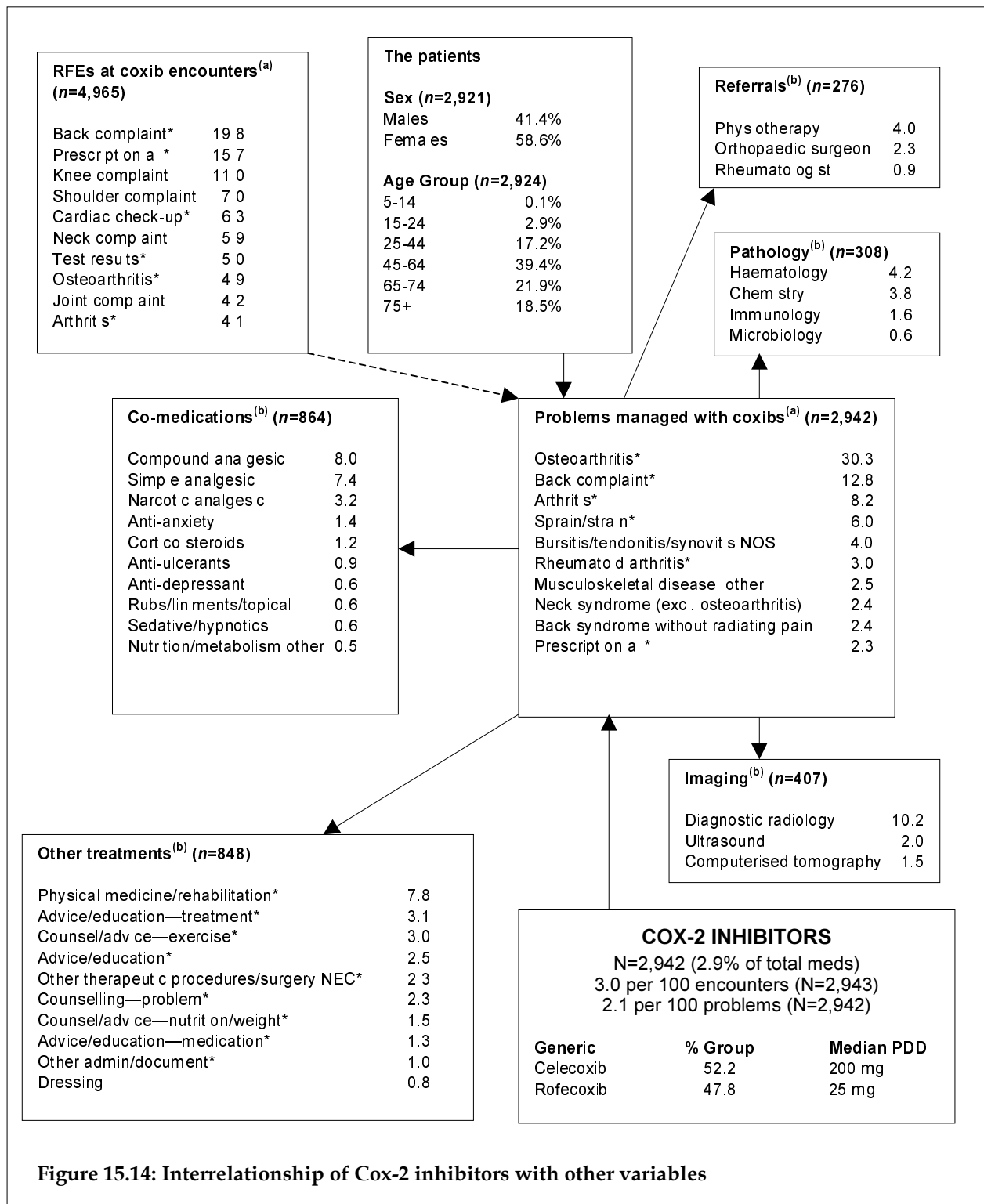
### *Reasons for encounter*

The most commonly described patient reason for encounter was back complaint, described at a rate of 19.8 per 100 encounters at which Cox-2 inhibitors were prescribed or given. A prescription request and knee complaint were also common reasons, at rates of 15.7 and 11.0 per 100 of these encounters.

### *Problems managed*

Osteoarthritis was the most common problem managed with Cox-2s, at a rate of 30.3 per 100 coxib encounters. Back complaint was the second most frequent problem treated with Cox-2 inhibitors (at a rate of 12.8 per 100 coxib encounters), followed by arthritis (not otherwise specified) and then by a range of other musculoskeletal problems.





(a) Expressed as rates per 100 encounters at which Cox-2 inhibitors were used (N=2,943).

(b) Expressed as rates per 100 problems for which Cox-2 inhibitors were used (N=2,942).

\* Includes multiple ICD-2 or ICD-2 PLUS codes (see Appendix 3).

Note: Meds—medications prescribed or supplied by the GP, PDD—prescribed daily dose.

### *Other medications prescribed or supplied*

A total of 864 medications were prescribed, supplied or recommended at the same encounter and for the same problem for which the Cox-2s were used. Compound and simple analgesics were the most common co-medications, at rates of 8.0 and 7.4 per 100 of these problems.

### *Other treatments*

Other treatments were utilised at a lower rate than in the total data set (29.0 per 100 problems managed with coxibs, compared with 36.2 per 100 total problems). Physical medicine/rehabilitation was the most common, at 7.8 per 100 coxib problems. Various types of advice and education made up the majority of the rest of these treatments.

### *Referrals, tests and investigation*

The patient was referred to other health professionals for these problems at a rate of 9.4 per 100 problems managed, most commonly for physiotherapy. Pathology was ordered at a rate of 10.5 per 100 problems managed with coxibs, and, as would be expected, imaging was ordered at the high rate of 13.8 compared with a rate of 5.5 in the total sample.

## **15.6 Antibiotics and the management of acute upper respiratory tract infection**

### **Changes over time**

Antibiotics were defined as the medications grouped in ATC code J01. Antibiotics were further subdivided into broad-spectrum penicillin (ATC code J01CA), cephalosporin (J01DA), and other antibiotics (the balance of J01). Acute upper respiratory tract infection (URTI) was selected on the ICPC rubric R74.

There has been no change over time in the management rate of URTI over the period 1998–99 to 2001–02 (see Figure 15.15).

As described in Chapter 14, Section 14.3, there was a significant decrease in antibiotic rates per 100 encounters over time. When this decrease was investigated in more detail for particular classes of antibiotics, there was a significant decrease in rates of cephalosporins but there was no decrease in the rates of broad-spectrum penicillin (Figure 15.16).

### **Multiple regression**

As shown in Figure 15.17, after adjusting for URTI management there was a significant decrease over time in the overall rate of antibiotic prescribing ( $p < 0.0001$ ), which was reflected in a decrease in cephalosporins ( $p < 0.0001$ ). This indicates that the decrease in the prescribing rate for antibiotics was not confined to a decrease in antibiotics for URTI. There was a marginally significant decrease in the rate of broad-spectrum penicillin prescribed for URTI, but no change in the rate of broad-spectrum penicillin prescribed for all other problems (problem by time interaction,  $p = 0.034$ ).

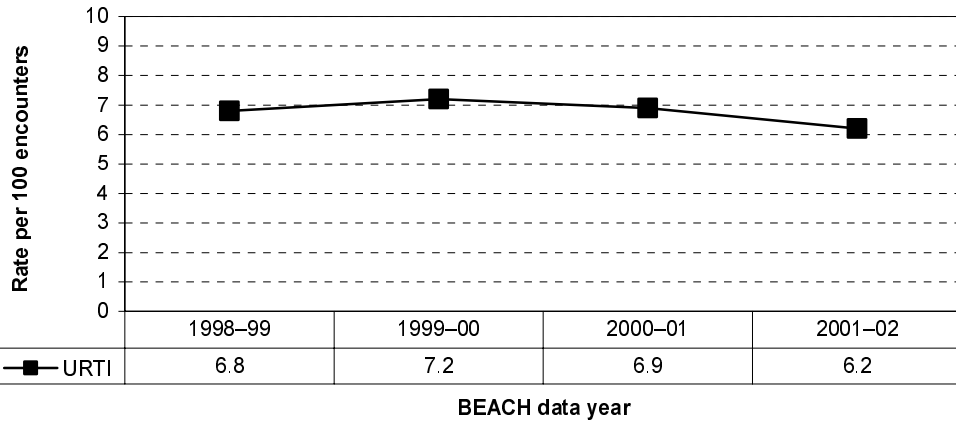


Figure 15.15: Management rate of acute upper respiratory tract infection over time

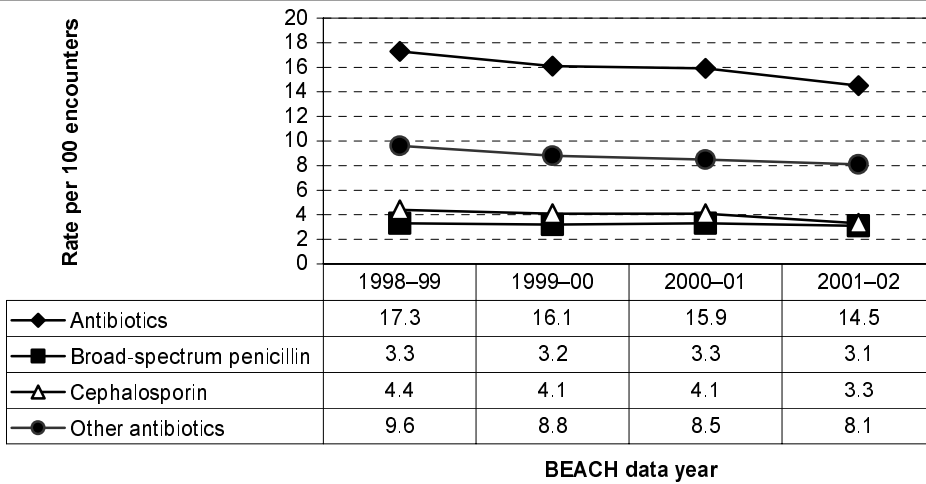


Figure 15.16: Rates of antibiotics per 100 encounters over time

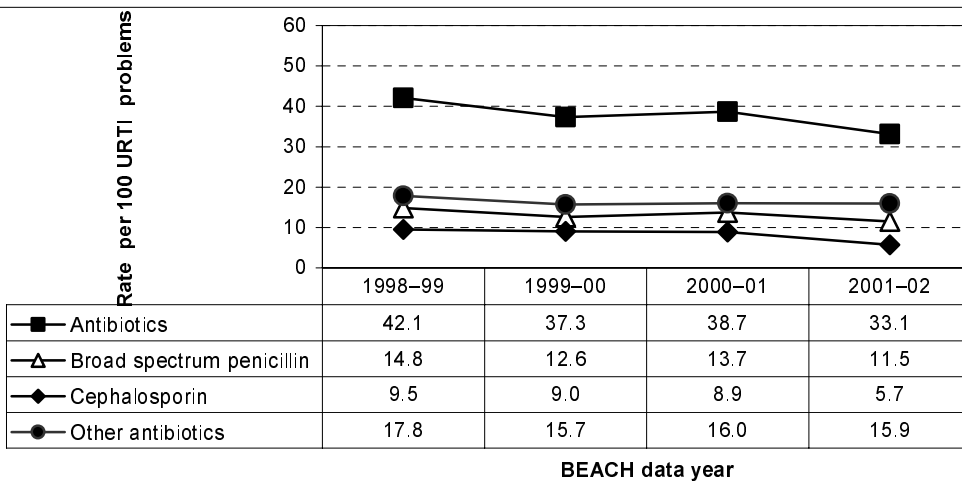


Figure 15.17: Prescribing rates of antibiotics over time for all URTI problems

## Conclusion

There has been a general reduction in total antibiotic prescribing over the 4 year period, mainly explained by a decrease in antibiotics other than broad-spectrum penicillins. There has been a decrease in antibiotic prescribing rates for URTI problems, including broad-spectrum penicillin.

## Current status of antibiotic prescribing

Considering the changes in antibiotic prescribing patterns in the management over the last 4 years an investigation of the characteristics of the patients for whom it was prescribed, the problem for which it was prescribed and the other management processes recorded in conjunction with the antibiotic prescriptions may be of interest. Figure 15.18 shows the relationship between antibiotics and other variables.

### *Rate of prescription, supply or recommendation*

There were 14,085 occasions on which antibiotics were recorded by GPs, accounting for 13.9% of all medications recorded. They were given at a rate of 14.5 per 100 total encounters and at a rate of 10.1 per 100 total problems. Amoxycillin was the most common individual antibiotic, followed by cephalexin.

### *Prescribed daily dose*

Amoxycillin had a median PDD of 1,500 mg, which is the maximum recommended dose suggested in MIMS.<sup>43</sup>

### *Age and sex distribution of patients*

Patients under 25 years of age accounted for about 23.0% of all patients but almost 36.0% of patients at antibiotic encounters. On the other hand, those aged 65 years and over were under-represented at antibiotic encounters, accounting for only 17.0% of all patients receiving them (compared with 24.9% of the total sample). The sex distribution of the patients was the same as that of the total encounter population.

### *Reasons for encounter*

The most commonly described patient reason for encounter was cough, described at a rate of 22.9 per 100 encounters at which antibiotics were prescribed or given. Throat symptom/complaint was also a commonly cited reason, at 15.1 per 100 of these encounters. The other relatively common reasons for encounter were largely symptomatic in nature.

### *Problems managed with antibiotics*

Acute bronchitis was the most common problem managed with antibiotics (15.3 per 100 antibiotic encounters), followed by upper respiratory tract infections (14.4 per 100), urinary tract infections (8.6 per 100), sinusitis (7.9), (acute otitis media (7.7) and tonsillitis (7.3 per 100 antibiotic encounters).

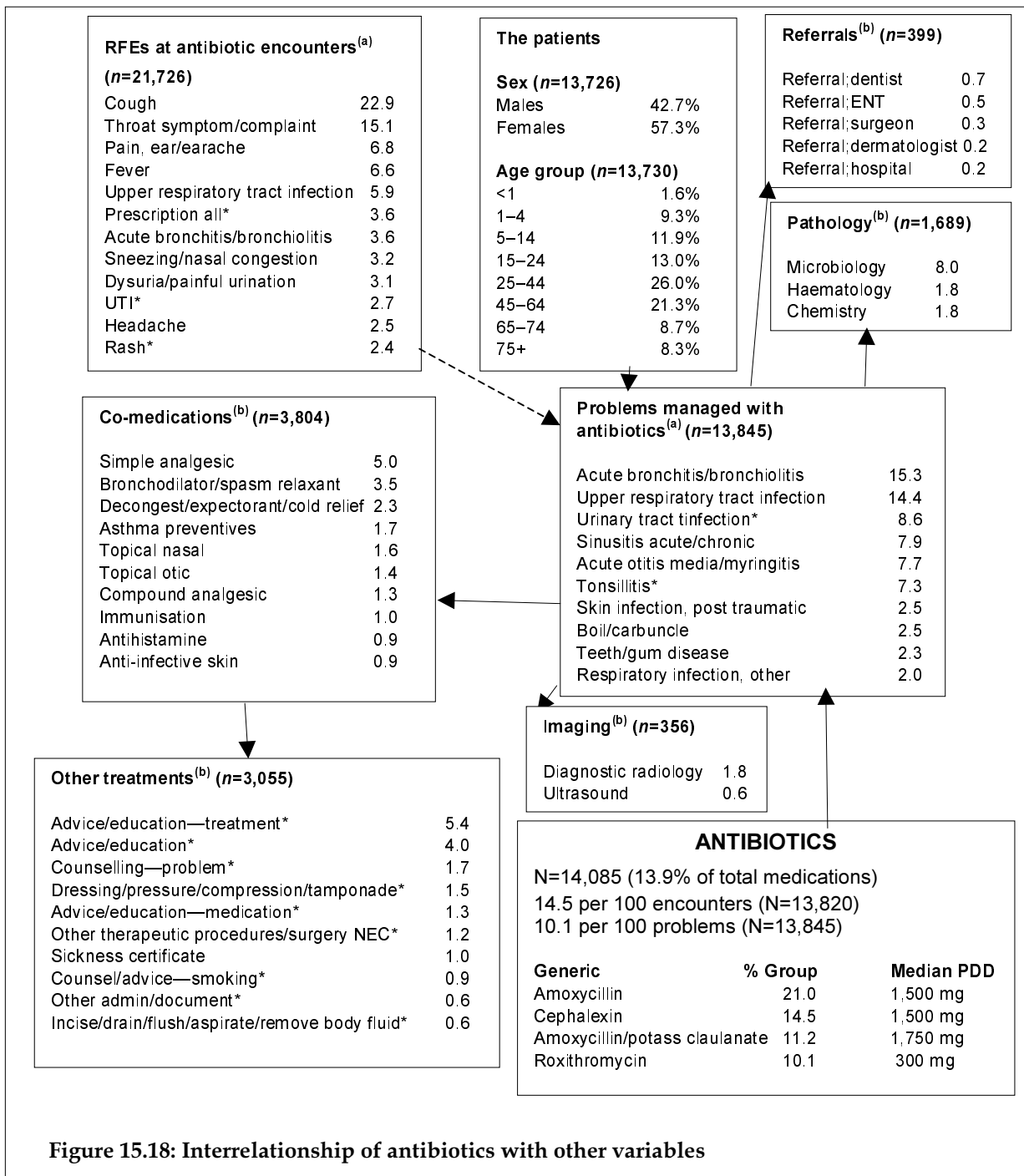
### *Other medications prescribed or supplied with antibiotics (for the same problem)*

A total of 3,804 co-medications were prescribed, supplied or recommended for the same problem at the same encounter. Simple analgesics were the most common, at a rate of 5.0 per 100 problems managed with antibiotics.

### Other treatments, referrals, tests and investigations

Other treatments were utilised at a lower rate than in the total data set (22.1 per 100 problems managed with antibiotics, compared with 36.2 per 100 total problems). Various types of advice and education made up the majority of these treatments.

The patient was referred to other health professionals for these problems at a rate of only 2.9 per 100 problems managed, most commonly to dentists. Pathology was ordered at a very low rate of 5.0 tests per 100 problems managed with antibiotics (compared with a rate of 21.6 in the total data) and imaging at a rate of 2.6 per 100.



**Figure 15.18: Interrelationship of antibiotics with other variables**

(a) Expressed as rates per 100 encounters at which antibiotics were used (N=13,820)

(b) Expressed as rates per 100 problems at which antibiotics were used (N=13,845)

\* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 3)

Note: Meds—medications prescribed or supplied by the GP, PDD—prescribed daily dose.