1 Introduction

This publication provides a summary of results from the second year of the BEACH (Bettering the Evaluation and Care of Health) program, a continuous study of general practice activity in Australia. It covers the period April 1999 – March 2000 inclusive. It reports details of over 100,000 encounters between general practitioners (GPs and patients, from a random sample of more than 1,000 recognised practising GPs from across the country.

- There were about 19 million people resident in Australia in March (AIHW 2000, p 2).
- In 1998–99 there were 17,101 vocationally registered general practitioners and 1,478 registrars enrolled in the Training Program of the RACGP (DHAC 2000a).
- In December 1998 the national average was 11.3 GPs per 100,000 population, or 898 persons per GP (DHAC 2000a).
- In that year there were 102.6 million Medicare-paid attendances to non-specialist practitioners, an average of approximately 5.4 attendances per person per year (AIHW 2000, p 410).
- Total expenditure on services provided by non-specialist practitioners (including those not vocationally registered) was $2,873 million in 1998–99 (including Visiting Medical Officer services provided through the Department of Veterans' Affairs) (DHAC 2000a).
- Secondary costs generating from these non-specialist consultations including prescribed medications were $4,235 million in that year (DHAC 2000a).
- While primary costs (for non-specialist services) had increased by 9.3% over the previous five years, the secondary costs had increased by 40.0% over the same period (DHAC 2000a).

These figures demonstrate that general practice plays a vital role in providing health care to the community. General practitioners are recognised as the first port of call and the gatekeepers in the Australian health care system. It is important to be able to describe the clinical activities undertaken during GP consultations to understand better the health of the population and the primary medical care provided to it.

In 1994, when speaking of family practice in Ontario, Canada, Norton et al. suggested:

> It would be useful for researchers to keep up databases… over several years so that the changes over time and their consequences on quality of care and practice patterns can be quantified and a predictive model developed. Such a model could be used for projecting changes to the system and for planning in the future' (Norton et al. 1994).

The need for data about the activities of general practice and (more broadly) of primary care, has recently received increasing recognition throughout the world. In the United States the National Centre for Health Statistics collects data about ambulatory care visits in three ambulatory care settings—physicians' offices, hospital outpatient departments and hospital emergency departments. One-off studies were conducted in the early 1970s, and the program has been run on a regular annual basis since 1992 (Schappert 1998). The study uses national probability sampling survey methods that are, like BEACH, encounter-based. This is the only other ongoing national data collection program that attempts to provide nationally representative data regarding general practice or primary care. However, the differences in structure of the two health care systems render the data largely not comparable.

A national data collection program also exists in Norway but is limited to information about encounters involving sick leave certification (Brage et al. 1995). In Sri Lanka the

Institute of Policy Studies has recently completed a one-year pilot study of data collection in general practice utilising similar methods to those of BEACH. They are currently planning to instigate ongoing national data collection with this paper based, secondarily coded system (personal communication, Dr. Ravi Rannan-Eliya, Institute of Policy Studies, Sri Lanka).

In the United Kingdom (Lawrence et al. 1999) and in New Zealand (Tilyard et al. 1995) some research is conducted on specific morbidity or management types of interest, through the selective download of de-identified electronic data from electronic health records. However, the extent to which such data are representative of the activity of general practice in either country has not been demonstrated. Issues such as sample size and sample bias in self-selection of participating GPs need to be considered.

In other countries the move has been towards data collection from a group of practices or practitioners who supply clinical information on a regular basis. These are often referred to as registration networks. However, these networks can only represent the practices involved. The variance in practice patterns of individual clinicians, the cluster of patients around the GP and the consistency of behaviour of individual GPs affect the extent to which such groups can be regarded as representative of the profession in their country.

Such registration networks are established in Denmark (Schroll et al. 1998) and in the Netherlands (Cost et al. 2000). In Japan such registration practices have been established for specific studies of morbidity in the elderly (Yamada et al. 1998). French-speaking GPs from Belgium and France are also establishing a network of this type (personal communication,
M Jamoulle, Public Health School Universite Libre de Bruxelles, Belgium) while Malta is in the early stages (personal communication, Jean Karl Soler, Malta College of Family Doctors).

Clearly the international movement is towards seeking better information about the care provided by practitioners at the point of entry into the medical care system. Measurement of cost effectiveness and quality and the development of health policy cannot be successfully pursued in a data-free environment. Further, changes in clinical care which result from policy initiatives must be measured continually.

While the BEACH program is the first continuous national study of its type in Australia, there have been a number of 'one-off' earlier studies that contributed to its development. The first was in 1962–63 (National Morbidity Survey Sub-committee 1966). Between 1969 and 1974 the RACGP undertook a morbidity and prescribing survey in conjunction with Intercontinental Medical Statistics (Bridges-Webb & RACGP 1976). The third study, the Australian Morbidity and Treatment Survey), was carried out in 1990–91 by the Family Medicine Research Centre (then Unit) at The University of Sydney (Bridges-Webb et al. 1992).

However, these studies were few and far between and until BEACH was established the assessment of Australia's health and health services at the national level relied mainly on: self-reported data from the Australian Bureau of Statistics' National Health Survey (Australian Bureau of Statistics 1996), data from the HIC (HIC 1999) (which mostly lack information about morbidity under management), hospital and mortality statistics (which tell us about those with serious illness); and disease registers (which are limited to a few specific diseases of interest).

The BEACH program now provides another view of the health of the vast majority of the community. It describes the problems presented to and managed by GPs for those who visit on a regular basis for the management of chronic illness and for those healthy individuals who present with an acute condition. The data can be combined with those from other

sources to provide a more comprehensive description of the health of the population. Some of the issues surrounding comparison of BEACH data with those from the HIC are investigated in the Discussion (Chapter 14).

The year 2000 has been fruitful for data users interested in general practice in Australia. While this report describes what happens in GP–patient encounters there have been two other major publications that provide information about the history of general practice and its changing role in the health care system: *General Practice in Australia 2000* (DHAC 2000a) and *Australia's Health 2000* (AIHW 2000).

Earlier publications from the BEACH program have been an interim report describing the data collection methods (Britt et al. 1999b), a report of results from the first year of the program (Britt et al. 1999c) and one describing the results of specific subjects (including aspects of patient health risk behaviour, prevalence of selected diseases and preventive care), studied in subsamples of the BEACH sample in 1998–99 (Sayer et al. 2000).

This publication provides an overview of the results from the second BEACH survey year (April 1999 – March 2000 inclusive). It also includes summaries of examples of analyses on specific topics, to facilitate understanding of the ways in which the database can be used. In general the report does not attempt to compare the results with those of the previous year. For reliable analysis of trends at least three measurement points are required. Next year, when three years of BEACH data are available, analyses will concentrate on measurable changes of general practice clinical activity from 1998 to 2001.

A second part of the BEACH program collects information about patient health and risk factors. This section is called SAND (Supplementary Analysis of Nominated Data) and it relies on the GP asking the patient questions about specific aspects of their health. Between ten and twenty topics are covered in SAND each year (depending on subsample size for each topic). However, there are four that are consistent across all years and in which all participating GPs are involved. Due to their standard nature, results pertaining to these topics will now be included in each annual report rather than in other publications. This report therefore includes summary results for patient self-assessed wellbeing; derived body mass index, smoking status, and alcohol consumption.

1.1 Aims

The BEACH program has three primary aims:

- to provide a reliable and valid data collection process for general practice which is responsive to the ever-changing needs of information users;
- to establish an ongoing database of GP–patient encounter information; and
- to assess patient risk factors and health states and the relationship these factors have with health service activity.

2 Methods

The methods adopted in the BEACH program have been described in detail elsewhere (Britt et al. 1999b; Britt et al. 1999c). In summary, a random sample of approximately 1,000 recognised GPs per year each records details about 100 GP–patient encounters of all types on structured paper encounter forms. It is a rolling sample, each GP participating only once in any RACGP quality assurance (QA) triennium and each being recruited approximately three weeks ahead. Approximately 20 GPs participate each week, 50 weeks a year.

2.1 The sample frame

The source population includes all GPs who claimed a minimum of 375 general practice A1 Medicare items (items 1–51, 601, 602) in the most recently available three-month HIC data period. This equates with 1,500 Medicare claims a year and ensures inclusion of the majority of part-time GPs whilst excluding those who are not in private practice but claim for a few consultations a year. The General Practice Branch of the Commonwealth Department of Health and Aged Care (DHAC) draws a sample on a regular basis.

2.2 Sampling methods

The methods adopted by the General Practice Branch of the DHAC aim to provide a series of researchers with a random unbiased selection of GPs while minimising overlap with past samples. The method is a modification of Classic Synchronised Sampling and has been described in detail elsewhere (Calcino 1993).

For Classic Synchronised Sampling a uniformly distributed random number, between zero and one, is allocated to each of the GPs in the sample frame. Each GP retains the same random number for as long as this sampling system remains. The GPs in the list are sorted in ascending random number order. Commencing with the GP with the lowest random number, the sample for the first study is drawn. For the next sample, the next GP is the first to be selected and so on until the last GP on the list is reached and selection restarts at the beginning of the list. If new GPs enter the sample frame they are added to the list at the position indicated by their random number. Similarly, GPs no longer part of the sample frame are removed from the list.

While this method is theoretically sound, the study population usually varies between research studies. Study populations of successive surveys may intersect or be mutually exclusive. Calcino therefore developed a Modified Synchronised Sampling method. It follows the same initial processes described above. However, after each sample is drawn the following steps are undertaken:

1. The random number of the last GP selected is noted and subtracted from the random number of each GP in the study population previously drawn. This makes the random number of the last GP selected zero and the numbers for all GPs selected in the previous sample negative.
2. The value of one (1) is then added to all random numbers less than or equal to zero.
3. The list is again arranged in ascending order using the modified random numbers. This places the GPs selected in the previous sample at the high random number end of the list.
4. The next sample is again taken from the low end of the random number list.

With this modification all selections begin with the lowest random number and the concept of 'last GP selected' does not arise. New study populations can be defined with the knowledge that GPs recently selected will be at the high end of the random number range (Calcino 1993).

2.3 Recruitment methods

The randomly selected GPs are approached by letter with telephone follow-up. GPs who agree to participate are set an agreed recording date approximately three to four weeks ahead. A research pack is sent to each participant about ten days before their planned recording date. The research pack contains a covering letter, a project information sheet, a GP profile questionnaire, a pad of 105 recording forms (to allow for some error), a detailed set of instructions, a height and weight measure conversion (to metric) chart (for body mass index calculation), a sample completed form with explanation, a pictorial 'standard drinks' chart to help patients answer questions on alcohol intake, additional instructions for completing supplementary questions on each form, a reply-paid envelope and several copies of a patient information sheet. The patient information sheet gives patients the choice to 'opt out' and not have details of their consultation included in the study by informing their GP of this decision. A telephone reminder is made to each GP participant in the first days of the agreed recording period. Non-returns are followed up by regular telephone calls.

Each participating GP earns 25 audit points towards their RACGP QA requirements. As part of this QA process they receive an analysis of their own results compared with those of nine other unidentified practitioners who recorded at approximately the same time. Comparison with the national average and with targets relating to the National Health Priority Areas is also made. In addition GPs receive some educational material related to the identification and management of patients who smoke or who consume alcohol at hazardous levels.

2.4 Data elements

BEACH includes three inter-related data collections: encounter data, GP characteristics, and patient health status. An example of the forms used to collect the encounter data and the data on patient health status is included as Appendix 1. The GP characteristics questionnaire is included as Appendix 2.

Encounter data include: date of consultation, type of consultation (direct, indirect), Medicare/Veterans' Affairs item number (where applicable), specified other payment source (tick boxes).

Information about **the patient** includes date of birth, sex, postcode of residence. Tick boxes are provided for health care card holder, Veterans' Affairs white card holder, Veterans' Affairs gold card holder, non-English-speaking background, Aboriginal (self-identification) and Torres Strait Islander (self-identification). Space is provided for up to three patient reasons for encounter (RFEs).

The **content of the encounter** is described in terms of the problems managed and the management techniques applied to each of these problems. Data elements include up to four diagnoses / problems. Tick boxes are provided to denote the status of each problem as new to the patient (if applicable) and if it was thought to be work-related.

Management data for each problem include medications prescribed, over-the-counter medications advised and other medications supplied by the GP. Details for each **medication** comprise brand name, form (where required), strength, regimen, status (if new medication for this problem this patient) and number of repeats. **Non-pharmacological management** of each problem includes counselling and therapeutic procedures, new referrals, and pathology and imaging ordered.

GP characteristics include: age and sex, years in general practice, number of GP sessions worked per week, number of full-time and part-time GPs working in the practice (to generate a measure of practice size), consultations in languages other than English, postcode of major practice address, country of graduation, postgraduate general practice training and FRACGP status, membership of professional organisations, brand substitution behaviour, broad usage level of computers in the practice, practice accreditation status, after-hours arrangements for the practice and external pathologist normally used by the practice (Appendix 2).

Supplementary analysis of nominated data (SAND): A section on the bottom of each recording form investigates aspects of patient health or healthcare delivery in general practice not covered by the consultation-based information (see Appendix 1). The year-long data collection period is divided into 10 blocks, each of five weeks. Each block is designed to include data from 100 GPs. Each GP's recording pack of 100 forms is made up of 40 forms which contain questions about patient wellbeing, height and weight (for calculation of body mass index, BMI) and alcohol intake, 40 which have a single question about the patient's smoking status together with questions on other subjects nominated for that block, and 20 forms with other nominated questions. The results of topics in the SAND substudies for patient wellbeing, alcohol consumption, smoking status and BMI are included in this report. The results of other substudy topics conducted in BEACH will be the subject of separate publications.

2.5 The BEACH relational database

The BEACH relational database is described diagrammatically in Figure 2.1. Note that all variables can be directly related to GP and patient characteristics and to the encounter. Reasons for encounter have only an indirect relationship with problems managed. All types of management are directly related to the problem being treated.

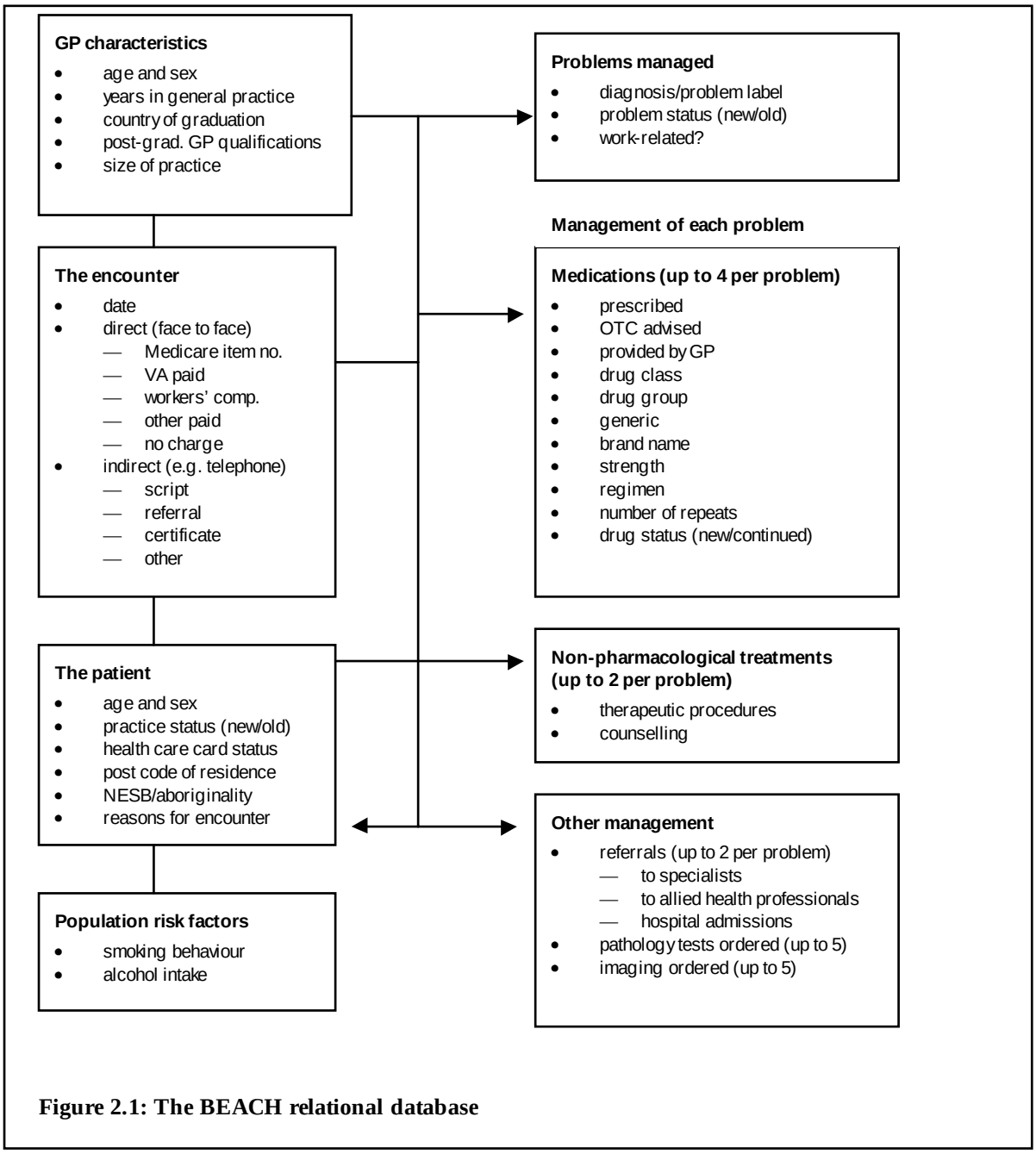

Figure 2.1: The BEACH relational database

2.6 Statistical methods

The analysis of the BEACH database is conducted with SAS version 6.12 (SAS Institute Inc. 1996) and the encounter is the primary unit of analysis. Proportions (%) are only used when describing the distribution of an event that can arise only once at a consultation (e.g. age, sex or item numbers) or to describe the distribution of events within a class of events (e.g. problem *A* as a per cent of total problems).

Rates per 100 encounters are used when an event can occur more than once at the consultation (e.g. RFEs, problems managed or medications). Rates per 100 problems are also sometimes used when a management event can occur more than once per problem managed. In general, the following results present the number of observations (n), rate per 100 encounters and the 95% confidence intervals.

The BEACH study is essentially a random sample of GPs, each providing data about a cluster of encounters. Cluster sampling study designs in general practice research violate the simple random sample (SRS) assumption because the probability of an encounter being included is a function of the probability of the GP being selected (Sayer 1999).

There is also a secondary probability function of particular encounters being included in the GP's cluster (associated with the characteristics of the GP or the type and place of the practice) and this increases the likelihood of sampling bias. In addition, there will be inherent relationships between encounters from the same cluster and this creates a potential statistical bias. The probability of gaining a representative sample of encounters is therefore reduced by the potential sampling and statistical bias, decreasing the accuracy of national estimates.

When a study design other than SRS is used, analytical techniques that consider the study design should be employed. In this report the standard error calculations used in the 95% confidence intervals accommodate both the single-stage clustered study design and sample weighting according to Kish's description of the formulae (Kish 1965). SAS 6.12 is limited in its capacity to calculate the standard error for the current study design, so additional programming was required to incorporate the formulae.

Post-stratification weighting was also applied to the raw data before analysis. This procedure and the reasons for it are fully described in Chapter 3.

2.7 Classification of data

Patient reasons for encounter, problems managed, therapeutic procedures, other non-pharmacological treatments, referrals, and pathology and imaging ordered are coded using ICPC–2 PLUS (Britt 1997b). This is an extended vocabulary of terms classified according to the International Classification of Primary Care (Version 2) (ICPC–2), a product of WONCA (WICC 1997). The ICPC is regarded as the international standard for data classification in primary care.

ICPC has a bi-axial structure with 17 chapters on one axis (each with an alphabetic code) and seven components on the other (numeric codes). Chapters are based on body systems, with additional chapters for psychological and social problems. Component 1 includes symptoms and complaints while Component 7 covers diagnoses. These are independent in each chapter and either can be used for patient RFEs or for problems managed.

Components 2 to 6 cover the process of care and are common throughout all chapters, each rubric being equally able to be applied to any body system. The processes of care, including referrals, non-pharmacological treatments and orders for pathology and imaging, are classified in these process components of ICPC–2. Component 2 (Diagnostic screening and prevention) is also often applied in describing the problem managed (e.g. check-up, immunisation).

2.7.1 ICPC–2 PLUS

The ICPC–2 is an excellent epidemiological tool. The diagnostic and symptomatic rubrics have been selected for inclusion on the basis of their relative frequency in primary care settings or because of their relative importance in measuring the health of the community. It has only about 1,370 rubrics and these are sufficient for meaningful analyses. However, reliability of data entry, using ICPC–2 alone, would require a thorough knowledge of the classification if correct classification of a concept were to be ensured. In 1995, recognising a need for a coding and classification system for general practice electronic health records, the Family Medicine Research Centre (then Unit) developed an extended vocabulary of terms classified according to the ICPC. These terms were derived from those recorded in more than half a million encounter forms by GPs participating in the quality assurance option mentioned earlier.

Each term has its own extended code. For example, while the ICPC code A77 is 'Other viral illness', the PLUS terms provide a list of some 33 specific viral illnesses under A77 (e.g. Ross River Fever—A77 001). This allows far greater specificity in data entry and ensures high inter-coder reliability between staff. It also facilitates analyses of information about more specific problems when required (Britt 1997b).

In this report some grouping of ICPC–2 rubrics has been made to overcome differences in the level of specificity recorded by GPs in describing patient RFEs or ascribing problem labels. The issue of variance in labelling is discussed below. For example, results are reported for the problem label 'rash'. Individual analysis of 'localised' and 'generalised' rash may have meant that the relative frequencies of each were insufficient to report. Another example is osteoarthritis. There are multiple rubrics into which this problem may fall depending on its body location (i.e. osteoarthritis of the knee has a different ICPC–2 code to osteoarthritis of the shoulder). Osteoarthritis of the back is only a small part of a broader rubric. In this case the concept here reported as 'osteoarthritis' includes all the ICPC–2 PLUS terms associated with osteoarthritis rather than a number of ICPC–2 rubrics. The codes included in each grouped label are listed in Appendix 3.

2.7.2 Classification of pharmaceuticals

Pharmaceuticals prescribed or provided and over-the-counter medications advised by the GP are coded and classified according to an in-house classification, the Coding Atlas for Pharmaceutical Substances (CAPS). This is a hierarchical structure that facilitates analysis of data at a variety of levels, for example, medication class, medication group, generic composition and brand name. CAPS is mapped to the Anatomical Therapeutic Chemical classification (ATC) (WHO 1997) which is the Australian standard for classifying medications at the generic level. Strength and regimen are independent fields which, when combined with the CAPS code, give an opportunity to derive prescribed daily dose for any medication or group of medications.

2.7.3 Quality assurance

All morbidity and therapeutic data elements are automatically coded and classified by the computer as staff enters key words or word fragments and select the required term or label from a pick list. A quality assurance program to ensure reliability of data entry includes ongoing development of computer-aided error checks ('locks') at the data entry stage and a physical check of samples of data entered versus those on the original recording form.

2.8 Validity and reliability

In the development of a database such as BEACH, data gathering moves through specific stages: GP sample selection; cluster sampling around each GP; GP data recording; secondary coding and data entry. At each stage the data can be invalidated by the application of inappropriate methods. The methods adopted to ensure maximum reliability of coding and data entry have been described above. The statistical techniques adopted to ensure valid reporting of recorded data are described in Chapter 4.

Previous work has demonstrated the extent to which a random sample of GPs recording information about a cluster of patients represents all GPs and all patients attending GPs (Driver et al. 1991). Other studies have reported the degree to which GP reported patient reasons for encounter and problems managed accurately reflect those recalled by the patient (Britt et al. 1992) and the reliability of secondary coding of RFEs (Britt 1998) and problems managed (Bridges-Webb et al. 1992). The validity of ICPC as a tool with which to classify the data has also been investigated in earlier work (Britt 1997a).

Limitations regarding the reliability and validity of practitioner recorded morbidity have been discussed elsewhere and should always be borne in mind. However, these apply equally to data drawn from medical records (whether paper-based or electronic) as to active data collection methods (Britt et al. 1996; Gehlbach 1979). There is as yet no more reliable method of gaining detailed data about morbidity and its management in general practice. Further, irrespective of the differences between individual GPs in their labelling of problems, morbidity data collected by GPs in active data collection methods have been shown to provide a reliable overview of the morbidity managed in general practice (Britt et al. 1998).

3 The general practitioners

3.1 Results of recruitment

Contact was attempted with 2,977 GPs, and established with 2,678 (90%) of these. Of the 299 who could not be contacted (10% of those approached), there were 45 for whom telephone numbers could not be established, 146 had moved and were untraceable, were retired or deceased, and 34 were unavailable for other reasons (e.g. overseas, on maternity leave). A further 74 were unable to be contacted after five attempts by telephone recruiters. Of the 2,678 available practitioners, 1,215 (45.4%) agreed to participate but 168 (5.6%) failed to complete the study. The final participating sample consisted of 1,047 practitioners, representing 39.1% of those who were contacted and available, and 35.2% of those with whom contact was attempted (Table 3.1).

Table 3.1: Recruitment and participation rates

	Number	Per cent of approached (N=2,977)	Per cent of contacts established (N=2,678)
Letter sent and phone contact attempted	2,977	100.0	. .
No contact	299	10.0	. .
No phone number	45	1.5	. .
Moved/retired/deceased	146	4.9	. .
Unavailable	34	1.1	. .
No contact after 5 calls	74	2.5	. .
Telephone contact established	2,678	90.0	100.0
Declined to participate	1,463	49.2	55.0
Agreed but withdrew	168	5.6	6.3
Agreed and completed	1,047	35.2	39.1

3.2 The participating GPs

All participants returned a GP profile questionnaire although some were incomplete. Of the 1,047 participants, 69.9% were male and 58.9% were 45 years of age or older. Three-quarters of the participants (75.4%) had been in general practice for more than 10 years and 15.3% could be regarded as practising part time, working fewer than six sessions per week. Almost one fifth of participants were in solo practice (18.1%). The majority (73.3%) had graduated in Australia and almost one-third (31.0%) were Fellows of the RACGP. One in ten respondents (10.6%) conducted more than half of their consultations in a language other than English. Twenty-three GPs (2.2%) were currently undertaking the RACGP Training Program and 43.5% had already completed it.

Table 3.2: Characteristics of participating GPs

GP characteristic	Number[(a)]	Per cent of GPs[(a)] (n=1,047)
Sex		
Male	729	69.6
Female	318	30.4
Age (missing=4)		
<35 years	88	8.4
35–44 years	338	32.4
45–54 years	338	32.4
55+ years	279	26.7
Years in general practice (missing=8)		
<2 years	7	0.7
2–5 years	83	8.0
6–10 years	166	15.9
11–19 years	331	31.9
20+ years	452	43.5
Sessions per week (missing=6)		
<6 per week	159	15.3
6–10 per week	691	66.0
11+ per week	191	18.3
Size of practice (missing=5)		
Solo	189	18.1
2–4 GPs	480	46.1
5+ GPs	373	35.8
Place of graduation (missing=2)		
Australia	767	73.3
UK	89	8.5
Asia	99	9.4
Europe	20	1.9
Africa	25	2.4
New Zealand	16	1.5
Other	29	2.8
More than 50% consultations in languages other than English	105	10.6
Currently in RACGP Training Program	23	2.2
Completed RACGP Training Program	348	43.5
Fellow of RACGP	325	31.0
Member of RACGP	465	44.4
Member of AMA	469	44.8

(a) Missing data removed.

3.3 Comparison between participating and non-participating GPs

The General Practice Branch of the DHAC provided some information about each of the GPs drawn in the initial sample from HIC data. This information was used to determine the extent to which the final participating GPs were representative of the initial sample of practitioners. These data included the number of general practice Medicare items claimed in the previous 12 months, and in the previous quarter. For the purposes of this analysis, the number of items in the previous quarter was compared and is referred to as 'activity level'.

In Table 3.3 the characteristics of the final participants are compared with those of all other GPs drawn in the initial sample using DHAC data elements. There are considerable discrepancies between the DHAC information about the participants (Table 3.3) and that self-reported by the GPs (Table 3.2), suggesting that the reliability of DHAC GP characteristic data may be questionable. There is, however, no reason to assume that the accuracy of DHAC data should differ for the participants and non-participants.

Differences between participants and non-participants were tested using the chi-square statistic (significance at the 5% level), using the DHAC characteristic data from both groups. There were no significant differences between participants and non-participants in terms of sex, place of graduation, State or Territory, and location of practice categorised using the Rural Remote Metropolitan Area (RRMA) classification.

The age distributions for participants and non-participants were significantly different, with GPs under the age of 35 years being under-represented in the participant population and those aged 55 years or more over-represented. The difference in years since graduation of participants compared to non-participants reflected this age difference (results not shown). There was no statistically significant difference in activity level in the previous quarter (measured by the number of A1 Medicare items of service claimed) between participants and non-participants. In the annual report of BEACH activity for 1998–99, activity levels for the previous year were used for reporting and analysis (Britt et al. 1999c). For the 1999–2000 report, the activity level during the previous quarter was analysed as it gives a more reliable estimate of the GP's most recent activity. For example, maternity or other long-term leave at any time during the previous year would reduce the annual activity level.

Table 3.3: Comparison of characteristics of participating and non-participating GPs[a]

GP characteristics	Participants (n=1,047)		Non-participants (n=1,631)	
	Number	Per cent of GPs[b]	Number	Per cent of GPs[b]
Sex (χ^2=0.56, p=0.769)				
Male	729	69.6	1,157	70.9
Female	318	30.4	474	29.1
Age (χ^2=21.9, p=0.00007)				
<35 years	82	8.4	190	12.5
35–44 years	290	29.5	473	31.1
45–54 years	327	33.3	527	34.6
55+ years	283	28.8	333	21.9
Missing	65	. .	108	. .
Place of graduation (χ^2=1.2, p=0.562)				
Australia	776	74.1	1,238	76.0
Overseas	271	25.9	392	24.0
State (χ^2=11.1, p=0.133)				
New South Wales	390	37.2	559	34.3
Victoria	213	20.3	307	18.8
Queensland	211	20.2	335	20.5
South Australia	95	9.0	152	9.3
Western Australia	92	8.8	197	12.1
Tasmania	25	2.4	42	2.6
Australian Capital Territory	12	1.1	29	1.8
Northern Territory	9	0.9	10	0.6
RRMA (χ^2=12.5, p=0.052)				
Capital	679	64.9	1,073	65.8
Other metropolitan	77	7.4	133	8.2
Large rural	80	7.6	118	7.2
Small rural	66	6.3	124	7.6
Other rural	130	12.4	157	9.6
Remote centre	4	0.4	10	0.6
Other remote	9	0.9	4	0.2
Activity (χ^2=1.27, p=0.529)				
375–750 services in previous quarter	179	17.0	253	15.5
751–1,500 services in previous quarter	444	42.4	696	42.7
> 1,500 services in previous quarter	424	40.5	682	41.8

(a) Data drawn from that provided by the DHAC.
(b) Missing data removed.

4 Representativeness

4.1 Comparison of BEACH GPs with the national GP population

The generalisability of a study sample is a function of its ability to represent the population from which the sample is drawn. Random sampling of GPs improves the likelihood that a study will be representative, as each GP has an equal probability of being selected into the study sample. The representativeness of a study can also be improved through the calculation of sample weights to better reflect the population characteristics that may influence the final results. Wherever possible there should be a comparison between the final study group of GPs and the population from which the GPs were drawn in order to identify, consider and adjust for any bias that may impact on the findings of the study.

Comparisons of the characteristics of participants and non-participants were reported in Chapter 3 (Table 3.3). Statistical comparisons were then made between BEACH participants and all recognised GPs in Australia who claimed more than 1,500 general practice Medicare item numbers during 1999 using the chi-square statistic (χ^2) (Table 4.1). The GP characteristics data for the BEACH participants has been drawn from the GP profile questionnaire to ensure highest reliability. The data for Australia were provided by the GP Branch of the DHAC.

No statistical differences were apparent for GP sex or place of graduation. However, BEACH participants were significantly less likely to be under 35 years of age (χ^2 =10.98; p=0.012). This is likely to be due to the fact that the national GP profile utilises a sample frame that includes GPs who are currently undertaking the RACGP Training Program. These GPs are not required to complete QA activities during training, nor in the QA triennium in which they complete training. This means that the offer of QA points is far less likely to attract them. In the majority these GPs would be aged less than 35 years.

A significantly greater proportion of participants were from NSW and Queensland compared with the national profile of GPs (χ^2 =15.02, p<003); however, there were no differences between participants and the national profile by RRMA (remote, rural or metropolitan area).

Analysis (not shown) of participating GPs aged less than 35 years suggests a different morbidity and management profile than GPs of other ages. Principally, there appeared to be a greater rate of the management of acute conditions and younger patients. Therefore any examination of the raw encounter details (RFEs, problems managed, medications, etc.) may provide lower precision of national estimates due to the under-representation of young GPs. For example, it could be speculated that the management rate of respiratory infections would be lower than the true rate in the overall GP population. Therefore, post-stratification, the sample of encounters should reflect the age mix of GPs in Australia when determining national estimates of GP encounter activity.

The data were only weighted for factors thought to have an important effect on morbidity and management. Although there were differences between the sample and the Medical Benefits Schedule (MBS) data in terms of the proportion of GPs from each State, there was no difference in their distribution across RRMA categories. It was assumed that the

morbidity and management profile of GPs was similar across States and therefore weighting by State was not undertaken. Post-stratification weighting of the raw data by age (stratified by sex) was therefore undertaken to adjust for the slight under-representation of younger GPs in the sample and this weighting combined with that for the activity level of the participating GPs (see section 4.3.2 below).

Table 4.1: Comparison of BEACH participants and all active recognised GPs in Australia

	BEACH[(a)]		Australia[(a)(b)(c)]	
Variable	**Number**	**% of GPs**	**Number**	**% of GPs**
Sex (χ^2=0.13; p=0.937)				
Males	729	69.6	10,832	70.2
Females	318	30.4	4,608	29.8
Age (χ^2=10.98; p=0.012)				
<35	88	8.4	1,760	11.4
35–44	338	32.4	4,946	32.0
45–54	338	32.4	5,037	32.6
55+	279	26.7	3,697	23.9
Place of graduation (χ^2=3.03; p=0.220)				
Australia	776	74.1	11,820	76.5
Overseas	271	25.9	3,635	23.5
State (χ^2=15.02; p=0.003)	. .	. .	. .	. .
New South Wales	391	37.4	5,359	34.7
Victoria	210	20.1	3,762	24.3
Queensland	211	20.2	2,764	17.9
South Australia	95	9.1	1,368	8.9
Western Australia	92	8.8	1,427	9.2
Tasmania	25	2.4	416	2.7
Australian Capital Territory	12	1.1	256	1.7
Northern Territory	9	0.9	103	0.7
RRMA (χ^2=9.82; p=0.132)				
Capital	679	64.9	10,525	68.1
Other metropolitan	77	7.4	1,180	7.6
Large rural	79	7.5	954	6.2
Small rural	64	6.1	967	6.3
Other rural	127	12.1	1,601	10.4
Remote centre	4	0.4	113	0.7
Other remote	10	1.0	115	0.7

(a) Missing data removed.
(b) Data provided by GP Branch, DHAC.
(c) All GPs who claimed at least 1,500 A1 Medicare items during the most recent 12-month period.

4.2 Comparison of BEACH consultations with all GP consultations in Australia

Another means of testing the extent to which the data are representative of general practice activity is to investigate whether the age–sex distribution of patients at the consultations is similar to the age–sex distribution for patients seen in all general practice Medicare-claimed consultations for the same period. It is difficult to track and access in a timely fashion the multiple funding streams of Australian general practice; however, the MBS provides funding for most consultation types in Australia. Comparable age–sex data for general practice items of service (A1 services) were provided by the General Practice Branch of the DHAC and compared with the BEACH data (Table 4.2).

The BEACH data includes patient encounters that are paid by funding sources other than the MBS and includes indirect (and some direct) encounters that cannot be or are not (by GP choice) claimed against any funding body. The age and sex distributions of the patients at encounter may therefore differ from those distributions in the MBS encounter data. Further, the BEACH data counts only a single Medicare item number for each encounter covered by the MBS while, in reality, more than one Medicare claim can result from a single encounter. However, comparison of the BEACH patient profile with that of the MBS may provide further insight into the differences between the two databases.

Due to the large size of the data sets used, any statistical comparison (e.g. χ^2) would generate statistical significance for even the most minor differences between the two sources of data. Therefore, it is necessary to consider whether any difference is likely to have a strong influence on the results and whether the precision of any estimate from BEACH complies with statistical standards. In determining whether any estimate is reliable, power calculations use a precision of 0.2 or 20% of the true proportion (or value). For example, if the true value were 15% then it would be desirable that any estimate was in the range of 12% to 18% if it is to be considered to have 20% precision. Creating precision ratios (HIC %/BEACH %) for the age–sex distribution data contained in Table 4.2 revealed that the precision of the BEACH age–sex distribution was only outside the acceptable range of 0.8–1.2 for males 75 years and older. Simply, BEACH contained proportionally more encounters with men 75 years and older than did the national MBS data. It is likely that this was the result of having a greater proportion of older GPs in BEACH than for the national MBS GP data. However, it may also be influenced by the inclusion of encounters not covered by the MBS (e.g. Department of Veterans' Affairs). The post-stratification sample will however more closely reflect the national profile of patients (see Section 4.3).

4.3 Sample weights

Most research studies rely on random sampling to reduce the impact of any sampling bias. It is also unusual to have information on the underlying population, from which the sample is drawn, with which the sample can be compared. When such information is available it is important to consider the possible effect of any differences on the generalisability of the findings. Although there were significant differences between the MBS data and the BEACH sample in age of GPs and State only the most important factors thought to affect the profile of encounters were used in the weightings. These were GP age and GP activity level.

Table 4.2: Comparison of BEACH with age–sex distribution of patients at A1 services from the MBS

	BEACH [(a)]		Australia[(b)]		Precision
Variable	Number	%	Number	%	Ratio
Male	36,439	40.7	37,548,568	41.5	1.02
<1 year	1,123	1.3	1,138,265	1.3	1.00
1–4 years	2,423	2.7	2,859,056	3.2	1.17
5–14 years	3,106	3.5	3,660,191	4.0	1.17
15–24 years	3,332	3.7	3,495,839	3.9	1.04
25–44 years	8,293	9.3	8,920,376	9.9	1.06
45–64 years	9,035	10.1	9,688,685	10.7	1.06
65–74 years	4,807	5.4	4,789,781	5.3	0.99
75+ years	4,320	4.8	2,996,375	3.3	0.69
Female	53,154	59.3	52,968,496	58.5	0.99
<1 year	1,055	1.2	994,475	1.1	0.93
1–4 years	2,247	2.5	2,537,978	2.8	1.12
5–14 years	3,153	3.5	3,572,366	3.9	1.12
15–24 years	5,913	6.6	5,822,299	6.4	0.97
25–44 years	14,734	16.4	14,551,753	16.1	0.98
45–64 years	13,032	14.5	12,853,511	14.2	0.98
65–74 years	6,092	6.8	5,827,497	6.4	0.95
75+ years	6,928	7.7	6,808,617	7.5	0.97

(a) Unweighted data.
(b) Data provided by GP Branch, DHAC.
Note: A1 services include MBS item numbers: 1, 2, 3, 4, 13, 19, 20, 23, 24, 25, 33, 35, 36, 37, 38, 40, 43, 44, 47, 48, 50, 51, 601, 602; only encounters with a valid age and sex are included in the comparison.

4.3.1 GP age

Already we have shown (Table 4.1) that there was a difference in GP age between BEACH GPs and all GPs in Australia and this may influence any national estimates made from unweighted data. Therefore post-stratification weights were calculated for the BEACH GPs to match the age distribution of all GPs in Australia. Simply, the GPs aged less then 35 years were given greater weighting than GPs of other age groups. This increases the contribution of the encounters from these GPs to any national estimate. Weightings for age were stratified by sex, age weights being calculated separately for male and female GPs.

4.3.2 GP activity level

The BEACH process requires that each GP provide details of 100 consecutive encounters. The assumption based on previous research is that 100 encounters provide a reliable sample of the GP's patients and practice style (Meza et al. 1995). However, there is considerable variation in the number of services that GPs provide in a given year. This may impact on the reliability of any estimate due to the differences in the sampling fraction for each GP, as a GP who provides 6,000 services in a given year should make a greater contribution to any national estimate than a GP who provides 3,000 services. Therefore it was also necessary to calculate post-stratification weights reflecting the different sampling fractions. This means that the BEACH encounter details from the GP who had claimed 6,000 Medicare services in the previous 12 months should have greater weighting than those encounters from the GP who had claimed 3,000 services, when estimating national activity in general practice. It was therefore possible to calculate sample weighting that reflected the contribution that each GP made to the total number of services for the sample.

The final sample weights were a multiplicative function of the GP age weighting and GP sampling fraction of services in the previous 12 months.

4.4 The weighted dataset

The final unweighted dataset from the second year of collection contained 104,700 encounters, 156,386 reasons for encounters, 156,576 problems managed and 113,555 medications. After stratification, the apparent number of encounters, reasons for encounter, problems managed and medications increased. However, the numbers of referrals, imaging and pathology were fewer after weighting.

Table 4.3: The BEACH dataset

Variable	Raw	Weighted
GPs	1,047	1,047
Encounters	104,700	104,856
Reasons for encounter	156,386	155,690
Problems managed	156,576	153,857
Medications	113,555	115,432
Other treatments	50,540	48,194
Referrals	12,651	11,760
Imaging	8,158	7,841
Pathology	29,836	27,613

5 The encounters

5.1 Overview of the dataset

Using weighted data there were 104,856 encounters from 1,048 GPs. An average of 149 patient reasons for encounter were described per 100 encounters. Of the 147 problems managed per 100 encounters, 45.3% were considered new problems to the patient. Problems regarded by the GP as likely to be work-related (irrespective of whether the encounter was covered by workers' compensation) occurred at a rate of 3.2 per 100 encounters.

Medications were prescribed, advised or supplied at a rate of 110.1 per 100 encounters. The prescription rate (93.8 per 100 encounters) does not take into account the number of repeats provided as part of a prescription. Patients were advised to use over-the-counter medications more frequently (9.4 per 100 encounters) than being given medications directly by the GP (6.9 per 100 encounters).

Non-pharmacological treatments were recorded less often than medications, with clinical non-procedural treatments (e.g. counselling, advice or psychotherapy) being recorded at a higher rate (33.5 per 100 encounters) than procedural treatments such as excisions and physical therapies (12.5 per 100 encounters).

Approximately 11 referrals were made per 100 encounters. These were to emergency departments, hospitals, specialists or allied health services. Specialist referrals were the most common (7.3 per 100 encounters), followed by those to allied health professionals (3.1 per 100 encounters). Referrals to hospitals and emergency departments were relatively rare.

Orders for a pathology test (or batch of tests, e.g. FBC, HIV) were recorded more frequently (26.3 per 100 encounters) than were referrals, while orders for imaging (e.g. x-rays, scans) occurred less often (7.5 per 100 encounters) (Table 5.1).

Table 5.1: Summary of morbidity and management

Variable	Number	Rate per 100 encounters	95% LCI	95% UCI	Rate per 100 problems	95% LCI	95% UCI
General practitioners	1,048	. .	. .	. .	. .	. .	. .
Encounters	104,856	. .	. .	. .	. .	. .	. .
Reasons for encounter	155,690	148.5	146.7	150.2	. .	. .	. .
Problems managed	153,857	146.7	144.9	148.6	. .	. .	. .
New problems	47,458	45.3	43.6	46.9	30.9	29.7	32.0
Old problems	106,399	101.5	99.0	103.9	69.2	68.0	70.3
Work-related	3,350	3.2	2.9	3.5	2.2	2.0	2.4
Medications	115,432	110.1	107.8	112.4	75.0	73.6	76.4
Prescribed	98,372	93.8	91.5	96.2	63.94	62.5	65.4
Advised OTC	9,842	9.4	8.6	10.2	6.4	5.8	7.0
GP supplied	7,218	6.9	5.8	7.9	4.7	4.0	5.4
Other treatments	48,194	46.0	44.1	47.8	31.3	30.1	32.5
Clinical	35,102	33.5	31.8	35.2	22.8	21.7	23.9
Procedural	13,092	12.5	11.9	13.0	8.5	8.1	8.9
Referrals	11,760	11.2	10.8	11.7	7.6	7.4	7.9
Emergency department	87	0.1	0.0	0.4	0.0	0.0	0.3
Hospital	744	0.7	0.5	0.9	0.5	0.4	0.6
Specialist	7,639	7.3	7.0	7.6	5.0	4.8	5.2
Allied health services	3,290	3.1	2.9	3.4	2.1	2.0	2.3
Pathology	27,613	26.3	25.2	27.5	18.0	17.2	18.7
Imaging	7,841	7.5	7.1	7.8	5.1	4.9	5.3

Note: UCI–upper confidence interval, LCI–lower confidence interval, OTC—over-the-counter.

5.2 Encounter type

The distribution of encounter types shows the varied nature of general practice (Table 5.2). The funding of Australian general practice reflects this variety, with a mixture of patient contribution, government rebate scheme (MBS) through Medicare, payment by other government programs (e.g. Department of Veterans' Affairs, Correctional Services) and insurance schemes (e.g. workers' compensation).

Encounters can be direct consultations (the patient was seen by the GP) or indirect consultations (the patient was not seen but a clinical service was provided). Direct consultations represented 96.7% of all encounters. These could result in no charge, a claim to Medicare, a workers' compensation claim, or a charge to another government funding program. By far the majority (93.0%) of consultations and 96.2% of direct consultations were claimable on Medicare. This is not to say that in all cases the Medicare claim was 'bulk billed', nor does it mean that no additional amount (above the Medicare rebate) was paid by the patient.

At least 94% of Medicare-paid consultations (88.1% of consultations) took place in the GP's consultation rooms. (Note that some items grouped under 'other items' could also have taken place in the GP's rooms). Standard surgery consultations were the most frequent

Medicare item recorded (78.1% of total encounters, and 84.0% of Medicare-claimable encounters). Hospital, nursing home and home visits were relatively rare, accounting for only 2.7% of all encounters and for 2.9% of Medicare-paid encounters. Workers' compensation claims represented 2.0% of all recorded encounters (2.1% of paid encounters). This appears lower than would be expected if all work-related problems (3.2 per 100 encounters and 2.2 per 100 problems) were being managed at encounters paid by workers' compensation (Table 5.1).

Indirect consultations (3.3 per 100 encounters) are those at which the patient is not seen by the GP but which generate a prescription, a referral, a certificate or other service. They are usually the result of a phone call by a patient. Indirect consultations are a free service provided by the GP (as they do not qualify for payment by Medicare), although they clearly generate costs to the health sector (prescriptions, referrals, etc.) and contribute to patient care and problem management. Prescriptions were the most common result of an indirect consultation, occurring at 53.8 per 100 indirect consultations.

These results suggest that GP services provided free to patients (no charge and indirect consultations) make up approximately 4.6% of total GP clinical services in Australia. Further, they suggest that any count of A1 general practice item numbers from Medicare data would understate the true number of GP clinical services in Australia.

Table 5.2: Type of encounter

Variable	Number	Rate per 100 encs[(a)]	95% LCI	95% UCI	Source as % of direct encs	Per cent of Medicare-paid
General practitioners	1,048	. .	. .	. .	. .	. .
Direct consultations	97,436	96.7	96.3	97.0	100.0	. .
No charge	1,345	1.3	0.9	1.7	1.4	. .
Medicare-claimable	93,698	93.0	92.4	93.5	96.2	100.0
Short surgery consultations	1,351	1.3	0.6	2.1	. .	1.4
Standard surgery consultations	78,761	78.1	77.1	79.1	. .	84.0
Long surgery consultations	8,137	8.1	7.4	8.7	. .	8.7
Prolonged surgery consultations	554	0.6	0.1	1.0	. .	0.6
Home visits	1,402	1.4	0.8	1.9	. .	1.5
Hospital	448	0.4	0.0	2.2	. .	0.5
Nursing home	906	0.9	0.0	1.8	. .	1.0
Other items	2,140	2.1	1.6	2.6	. .	2.2
Workers' compensation	2,005	2.0	1.7	2.3	2.1	. .
Other paid (hospital, State, etc.)	1,236	1.2	0.0	2.8	1.3	. .
Indirect consultations	3,367	3.3	2.8	3.8	. .	. .
Prescription	1,810	1.8	1.4	2.2	. .	. .
Referral	467	0.5	0.2	0.8	. .	. .
Certificate	113	0.1	0.0	0.4	. .	. .
Other	1,094	1.1	0.7	1.5	. .	. .
Missing	4,054	. .	. .	. .	. .	. .
Total encounters	104,856	. .	. .	. .	. .	. .

(a) Missing data for 4,054 encounters removed. Per cent base (N)=100,802.
(b) *Note:* Encs–encounters, UCI–upper confidence interval, LCI–lower confidence interval.