Consumption of ultra-processed foods and risk of multimorbidity of cancer and cardiometabolic diseases: a multinational cohort study

Reynalda Cordova,[a,b] Vivian Viallon,[a] Emma Fontvieille,[a] Laia Peruchet-Noray,[a] Anna Jansana,[a] Karl-Heinz Wagner,[b] Cecilie Kyrø,[c] Anne Tjønneland,[c,d] Verena Katzke,[e] Rashmita Bajracharya,[e] Matthias B. Schulze,[f,g] Giovanna Masala,[h] Sabina Sieri,[i] Salvatore Panico,[j] Fulvio Ricceri,[k] Rosario Tumino,[l] Jolanda M. A. Boer,[m] W. M. Monique Verschuren,[m,n] Yvonne T. van der Schouw,[n] Paula Jakszyn,[o,p] Daniel Redondo-Sánchez,[q,r,s] Pilar Amiano,[s,t,u] José María Huerta,[s,v] Marcela Guevara,[s,w,x] Yan Borné,[y] Emily Sonestedt,[y] Konstantinos K. Tsilidis,[z,aa] Christopher Millett,[ab,ac] Alicia K. Heath,[aa] Elom K. Aglago,[aa] Dagfinn Aune,[aa,ad,ae] Marc J. Gunter,[a,aa] Pietro Ferrari,[a] Inge Huybrechts,[a] and Heinz Freisling[a,*]

[a]International Agency for Research on Cancer (IARC-WHO), Lyon, France
[b]Department of Nutritional Sciences, University of Vienna, Vienna, Austria
[c]Danish Cancer Institute Center, Copenhagen, Denmark
[d]Department of Public Health, University of Copenhagen, Copenhagen, Denmark
[e]Division of Cancer Epidemiology, German Cancer Research Center (DKFZ), Heidelberg, Germany
[f]Department of Molecular Epidemiology, German Institute of Human Nutrition Potsdam-Rehbruecke, Nuthetal, Germany
[g]Institute of Nutritional Science, University of Potsdam, Nuthetal, Germany
[h]Institute for Cancer Research, Prevention and Clinical Network (ISPRO), Florence, Italy
[i]Epidemiology and Prevention Unit, Fondazione IRCCS Istituto Nazionale dei Tumori di Milano, Milan, Italy
[j]Department of Clinical Medicine and Surgery, University of Naples Federico II, Naples, Italy
[k]Department of Clinical and Biological Sciences, Centre for Biostatistics, Epidemiology, and Public Health, University of Turin, Italy
[l]Hyblean Association for Epidemiological Research, AIRE ONLUS Ragusa, Italy
[m]Centre for Prevention, Lifestyle and Health, National Institute for Public Health and the Environment, Bilthoven, the Netherlands
[n]Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht University, Utrecht, the Netherlands
[o]Unit of Nutrition and Cancer, Cancer Epidemiology Research Programme, Catalan Institute of Oncology (ICO-IDIBELL), Barcelona, Spain
[p]Blanquerna School of Health Sciences, Ramon Llull University, Barcelona, Spain
[q]Escuela Andaluza de Salud Pública (EASP), Granada 18011, Spain
[r]Instituto de Investigación Biosanitaria ibs. Granada, Granada 18012, Spain
[s]Spanish Consortium for Research on Epidemiology and Public Health (CIBERESP), Instituto de Salud Carlos III, Madrid, Spain
[t]Ministry of Health of the Basque Government, Sub Directorate for Public Health and Addictions of Gipuzkoa, San Sebastian, Spain
[u]Bio Gipuzkoa Health Research Institute, Epidemiology of Chronic and Communicable Diseases Group, San Sebastián, Spain
[v]Department of Epidemiology, Murcia Regional Health Council-IMIB, Murcia, Spain
[w]Instituto de Salud Pública y Laboral de Navarra, Pamplona 31003, Spain
[x]Navarra Institute for Health Research (IdiSNA), Pamplona 31008, Spain
[y]Nutritional Epidemiology, Department of Clinical Sciences Malmö, The Faculty of Medicine, Lund University, Malmö, Sweden
[z]Department of Hygiene and Epidemiology, University of Ioannina School of Medicine, Ioannina, Greece
[aa]Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London, United Kingdom
[ab]Public Health Policy Evaluation Unit, School of Public Health, Imperial College London, London, United Kingdom
[ac]NOVA National School of Public Health, Public Health Research Centre, Comprehensive Health Research Center, CHRC, NOVA University Lisbon, Lisbon, Portugal
[ad]Department of Nutrition, Oslo New University College, Oslo, Norway
[ae]Department of Research, The Cancer Registry of Norway, Oslo, Norway

Summary

Background **It is currently unknown whether ultra-processed foods (UPFs) consumption is associated with a higher incidence of multimorbidity. We examined the relationship of total and subgroup consumption of UPFs with the risk of multimorbidity defined as the co-occurrence of at least two chronic diseases in an individual among first cancer at any site, cardiovascular disease, and type 2 diabetes.**

The Lancet Regional Health - Europe 2023;35: 100771

Published Online 14 November 2023
https://doi.org/10.1016/j.lanepe.2023.100771

*Corresponding author. International Agency for Research on Cancer (IARC-WHO), 25 Avenue Tony Garnier, Lyon 69366 CEDEX 07, France.
E-mail address: freislingh@iarc.who.int (H. Freisling).

Methods This was a prospective cohort study including 266,666 participants (60% women) free of cancer, cardiovascular disease, and type 2 diabetes at recruitment from seven European countries in the European Prospective Investigation into Cancer and Nutrition (EPIC) study. Foods and drinks consumed over the previous 12 months were assessed at baseline by food-frequency questionnaires and classified according to their degree of processing using Nova classification. We used multistate modelling based on Cox regression to estimate cause-specific hazard ratios (HR) and their 95% confidence intervals (CI) for associations of total and subgroups of UPFs with the risk of multimorbidity of cancer and cardiometabolic diseases.

Findings After a median of 11.2 years of follow-up, 4461 participants (39% women) developed multimorbidity of cancer and cardiometabolic diseases. Higher UPF consumption (per 1 standard deviation increment, ~260 g/day without alcoholic drinks) was associated with an increased risk of multimorbidity of cancer and cardiometabolic diseases (HR: 1.09, 95% CI: 1.05, 1.12). Among UPF subgroups, associations were most notable for animal-based products (HR: 1.09, 95% CI: 1.05, 1.12), and artificially and sugar-sweetened beverages (HR: 1.09, 95% CI: 1.06, 1.12). Other subgroups such as ultra-processed breads and cereals (HR: 0.97, 95% CI: 0.94, 1.00) or plant-based alternatives (HR: 0.97, 95% CI: 0.91, 1.02) were not associated with risk.

Interpretation Our findings suggest that higher consumption of UPFs increases the risk of cancer and cardiometabolic multimorbidity.

Funding Austrian Academy of Sciences, Fondation de France, Cancer Research UK, World Cancer Research Fund International, and the Institut National du Cancer.

Keywords: Ultra-processed foods; Diet; Multimorbidity; Cardiovascular diseases; Diabetes; Cancer

Research in context

Evidence before this study

We searched PubMed without language restrictions for longitudinal or population-based published studies between database inception and 16th October 2023 using combinations of search terms such as "ultra-processed foods", "food processing", "type 2 diabetes", "cancer", "cardiovascular diseases", and "multimorbidity".

Several studies have investigated associations between ultra-processed food consumption and the incidence of single diseases including type 2 diabetes, cardiovascular diseases, or cancer. However, existing studies have not investigated the co-occurrence of these long-term conditions in an individual, defined as multimorbidity, and with few exceptions did not investigate consumption of subgroups of ultra-processed foods and its relationship with these disease outcomes.

Added value of this study

To our knowledge, this study is the first to examine in a multinational cohort with long-term follow-up the relationship between ultra-processed food consumption and the incidence of multimorbidity of cancer and cardiometabolic diseases. This study contributes to the evidence base suggesting a potential role of a higher consumption of ultra-processed foods in the accumulation of chronic morbidity and multimorbidity. Additionally, this study provides evidence of a differential relationship of subgroups of ultra-processed foods and multimorbidity of cancer and cardiometabolic diseases. Artificially and sugar-sweetened beverages, animal-based products and sauces, spreads and condiments, but not other subgroups, were associated with increased risk, suggesting that more nuanced subgroup analyses of ultra-processed foods are warranted.

Implications of all the available evidence

Multimorbidity is a growing health challenge not only in Europe, but in many regions of the world. Our study adds important evidence that can inform risk reduction of multimorbidity of cancer and cardiometabolic diseases through dietary recommendations, public health policies, and interventions. Lowering consumption of certain ultra-processed foods by replacing them with similar but less processed foods may be beneficial for the prevention of cancer and cardiometabolic multimorbidity.

Introduction

In the last two decades, the prevalence of people who developed more than one chronic disease has drastically increased,[1] especially in high-income countries,[2] with similar trends emerging in low- and middle-income countries.[3] In Europe alone, around 50 million people

are affected by multimorbidity, which is defined as the co-occurrence of at least two chronic diseases in an individual.[2]

Multimorbidity can result in reduced quality of life along with disability, functional decline, and substantial health care costs.[4] Therefore, identifying preventable risk factors of multimorbidity is crucial to reduce its burden.[2] Multimorbidity can include many different combinations of chronic diseases and given the heterogeneity of disease combinations, it has been suggested to initially focus on determinants of the most common clusters.[2] In our study, we included cancer, cardiovascular disease, and type 2 diabetes to define multimorbidity because these conditions are among the leading causes of morbidity and mortality worldwide,[1] and they share common preventable risk factors including poor diet.[5]

The availability and consumption of ultra-processed foods (UPFs) has increased worldwide and represents nowadays 50–60% of the daily energy intake in some high-income countries, and middle-income and low-income countries are following suit.[6,7] Fresh or minimally processed foods are being increasingly replaced by higher proportions of UPFs in the diet,[6] raising concerns about their long-term health effects.[8] According to the Nova food classification, UPFs are industrially manufactured products comprising deconstructed and modified food components recombined with a variety of additives.[6] Typically, UPFs are mass-produced packaged breakfast cereals, biscuits, reconstituted meat products, instant noodles, as well as soft and/or sweetened carbonated drinks.[9]

Several prospective and cross-sectional studies have shown positive associations between UPF consumption and the risk of cardiovascular disease, type 2 diabetes, and cancer.[8,10–12] We, and others,[12] previously reported that a higher proportion of UPFs in the diet was associated with greater weight gain and a greater risk to develop overweight or obesity,[13] which is a potential risk factor for multimorbidity.[14] However, studies investigating the role of UPF consumption in the co-occurrence of cancer and cardiometabolic diseases are lacking.

The aim of this study was to investigate the associations of total and subgroup intake of UPFs with the risk of multimorbidity defined as the co-occurrence of at least two chronic diseases in an individual among cancer at any site, cardiovascular disease, and type 2 diabetes. A secondary aim was to assess associations of total UPF consumption with a first disease among cancer, cardiovascular disease, and type 2 diabetes.

Methods

Study population and design

The European Prospective Investigation into Cancer and Nutrition (EPIC) is an ongoing prospective cohort study investigating the associations of diet, lifestyle, genetic, and environmental risk factors with the incidence of cancer and other diseases. From 1992 to 2000 close to 520,000 participants (around 70% female) were recruited across 23 centers in 10 European countries (Denmark, France, Germany, Greece, Italy, Norway, Spain, Sweden, the Netherlands, and the United Kingdom). The sample size was informed by estimations for the incidence of specific cancer sites including less common cancers (e.g., gall bladder). The study populations were samples of convenience of volunteers agreeing to participate, where the age limits were set between 35 and 74 years. Participants were recruited from the general population with a few exceptions. In France, Norway, Utrecht (Netherlands) and Naples (Italy), only women were recruited. Also, in France state-school employees were recruited. Centers in Utrecht and Florence (Italy) included women attending a local population-based breast cancer screening program. Some centers in Italy and Spain recruited members of local blood donor associations. In Oxford (United Kingdom), half of the cohort were participants following a lacto-ovo vegetarian or vegan diet. Participant eligibility within each center/country was determined by geographic or administrative criteria and source populations were identified according to age and self-reported sex and, in Denmark and Turin/Italy prevalent cancer was an exclusion criteria.[15] After enrolment, participants were contacted every 3–4 years to obtain information on any major diseases.[15]

Data from France, Greece, and Norway were excluded, because incident events of cardiovascular disease and/or type 2 diabetes were not ascertained in these countries. After further exclusion of participants with prevalent cancer, myocardial infarction, angina, stroke, or type 2 diabetes at baseline, as well as those with any missing information on diet or lifestyle at baseline, a total of 266,666 participants (60% women) was available for the analyses. Participants with missing information on diet (n = 12,780) did not differ in the distribution of age, sex, and body mass index (BMI). More details on exclusions are given in the Supplementary Appendix (Supplementary Fig. S1).

Ethics

The EPIC study was approved by the Ethical Review Boards of the IARC and the Institutional Review Board of each participating EPIC center. Written informed consent was obtained from all study participants. Withdrawal from the study was possible at any time during follow-up. The current study was approved by the IARC Ethics Committee (No. 21-47).

Dietary assessment and estimation of UPF consumption

In the EPIC study, usual food intake in the previous 12 months was assessed at baseline using country-specific

validated food-frequency questionnaires (FFQs). In brief, three types of dietary assessment methods were applied to examine the consumed food over the previous 12 months; a) quantitative dietary questionnaires in northern Italy, Ragusa in Italy, the Netherlands, Germany, Spain and France, b) semi-quantitative FFQs in Denmark, Norway, Naples in Italy, and Umeå in Sweden, and c) a combination of semi-quantitative FFQs and 7- and 14-day records in Malmö (Sweden) and the UK, respectively. The food items reported in each FFQ/dietary questionnaire were classified in respective harmonized food groups common across questionnaires. In addition, the frequency of consumption, the portion size consumed on each occasion, and the applied standard portion sizes were stored in a central database at IARC, from which the total quantity of each food was estimated as grams per day.

To estimate UPF consumption, the Nova food classification system was incorporated into the EPIC database containing more than 11,000 food items. Generic or multi-ingredient foods were decomposed into ingredients and were then classified according to the Nova classification. Nova classifies each food item (or ingredient) into one of four groups: 1) unprocessed or minimally processed foods (e.g., fresh, dry or frozen fruits or vegetables, grains, flours and pasta); 2) processed culinary ingredients (e.g., table sugar, oils, salt); 3) processed foods (e.g., cheese, simple breads, fruits in syrup, canned fish); and group 4) ultra-processed foods (e.g., soft drinks, sweet or savory packaged snacks, processed meat, and pre-prepared frozen or shelf-stable dishes). Our exposure of interest was the Nova group 4, which comprises for each participant the sum of all reported food items that were classified as Nova 4 (i.e., UPFs) and was calculated as a composite variable. We decided a *priori* to exclude alcoholic beverages from our UPF exposure because moderate alcohol consumption may show inverse associations with myocardial infarction, a subtype of our cardiovascular disease outcome, and positive associations with several common cancers such as of the breast, colorectum, head and neck, and liver.[16] Importantly, risk associations for cancer are irrespective of the type of alcoholic drink consumed, because ethanol is the cancer-causing compound.[16]

Since dietary assessment was conducted in the 1990s at recruitment of participants and the food environment has changed over the years of their follow-up, three likely scenarios of the degree of food processing were considered when classifying food items and ingredients according to Nova. The "middle-bound" scenario represented the most likely scenario of food processing during the period of recruitment in the different countries of this study and was used in the main analysis. In case a given food or ingredient could have been also less processed compared to the middle-bound scenario, it was assigned into a less processed Nova group in the lower-bound scenario. The same applied to foods or ingredients that could have been more processed, resulting in being classified into a more processed Nova group in the upper-bound scenario. This means that, depending on the foods an individual consumed, the proportion of UPFs in the diet was lower or higher and the ranking of individuals within the study population in terms of UPF consumption was altered accordingly.[17]

Assessment of covariates

Data on socio-demographic, lifestyle, such as smoking status (never, former, current), and other factors including educational level (none, primary completed, technical/professional, and longer education including university degree), menopausal status in women (premenopausal, perimenopausal, postmenopausal, and surgical), and use of hormones in postmenopausal women (no, yes) were collected at recruitment through validated lifestyle questionnaires. Adherence to a healthy diet was assessed by the modified relative Mediterranean Diet Score (mrMDS),[18] a variation of the original MDS substituting olive oil with vegetable oil. Physical activity was assessed by the four-level categorical Cambridge index (inactive, moderately inactive, moderately active, and active), which is based on the EPIC physical activity questionnaire and combines occupational physical activity with time participating in physical exercise.[19] Weight and height were measured at recruitment following standardized processes, except for part of the Oxford cohort where weight and height were self-reported. Body mass index (BMI) was then computed as weight/height^2 (kg/m^2).

Missing covariate data affected 4.7% of the participants eligible for study inclusion. We used complete case analysis because the overall level of missing data was low and a complete case analysis will be unbiased if, conditional on model covariates, missingness is independent of the outcome.[20]

Outcome assessment

Incident events among participants who developed cancer at any site (excluding non-melanoma skin cancer) were ascertained by linkage to population cancer registries in Denmark, the Netherlands, Spain, Sweden, the UK, and Italy, except in Naples, where active follow-up of participants and their next-of-kin was used. In Germany, a combination of methods was used including active follow-up of participants and their next-of-kin as well as the use of health insurance records and cancer pathology registries. Data on cancer incidence were coded according to the International Classification of Diseases for Oncology (ICD-O-3) and the 10th Edition of the International Classification of Diseases (ICD-10).

Incident cardiovascular disease diagnoses included ischemic heart diseases (ICD-10, I20–I25), atrial fibrillation (I48), and cerebrovascular diseases (I60–I69), and were ascertained by active follow-up through questionnaires, medical records, hospital morbidity registers,

contact with medical professionals, retrieving and assessing death certificates, or verbal autopsy.

The ascertainment of type 2 diabetes diagnoses (ICD-10, E11) involved multiple sources across the different centers including self-report, linkage to primary care registers, secondary care registers, medication use (drug registers), hospital admission, and mortality data.

Mortality data were also obtained at the regional or national level and used for censoring.

Any two diseases ascertained on the same day (n = 80) were arbitrarily separated by one day with the following temporal order: type 2 diabetes, cancer, cardiovascular disease.

All events of interest in this analysis were validated and loss to follow-up was low (e.g., less than 2% for cancer).

Statistical methods

Habitual consumption of energy adjusted UPFs was modelled on a continuous scale per 1 standard deviation (SD)/day increment (corresponding to ~260 g/day). For energy adjustment, we calculated standardized residuals by regressing the consumption of UPFs (g/day) on total energy intake and center. These standardized residuals of UPF consumption are uncorrelated with total energy intake and account for residual variation of estimated food consumption across centers that is due to different dietary assessment instruments used. Second, to reduce measurement error in dietary intake estimates we additionally corrected for total energy intake (kcal/day) in the multivariable-adjusted models. This is an efficient approach to improve validity of energy-adjusted dietary intake.[21]

We applied a multi-state framework[22] to construct transitions from baseline to any first of the three conditions, i.e., cancer, cardiovascular disease, or type 2 diabetes and to any combination with a second condition defined as multimorbidity. Deaths were censored as competing events and not modelled as a separate outcome (Fig. 1). Additionally, we modelled a direct transition from baseline to multimorbidity, where follow-up was until any second condition after any first condition among cancer, cardiovascular disease, and type 2 diabetes.

Multivariable Cox proportional hazard models were used to estimate cause-specific HRs and 95% CIs for associations between UPF consumption per 1 SD increment of energy adjusted g/day and the outcomes of interest. Entry time was age at recruitment and exit time was either age at diagnosis of the event of interest (defined by the last date of center- and event-specific ascertainment of cancer, cardiovascular disease, or type 2 diabetes), death, or censoring date (lost or end of follow-up), whichever occurred first. Based on subject knowledge, models were adjusted for the following variables: total energy intake (continuous, kcal/day), baseline alcohol intake (g/day), height (cm), smoking status, physical activity, educational level as a proxy for socio-economic position, the mrMDS (continuous score), and a categorical indicator for plausibility of dietary energy reporting (under-reporting, acceptable reporting, over-reporting) to minimize dietary misreporting bias based on Goldberg cut-offs.[23] In women, models were further adjusted for menopausal status, and use of post-menopause hormone therapy. All models were also stratified by sex, age at recruitment (1-year categories), center, and transitions in a clock forward multi-state analysis with age as primary time variable. For continuous variables, in case of non-linearity, we used restricted cubic splines to account for it. An additional model was further adjusted for BMI (continuous, kg/m^2) to explore a potential mediating role of BMI. Assessment of Schoenfeld residuals did not indicate violations of the proportional hazard assumption in the Cox proportional hazard regression models.

UPF subgroups analyses

We further created nine mutually exclusive UPF subgroups (Supplementary Table S1) and examined the associations between the nine UPF subgroups in the transition from baseline to multimorbidity. Subgroups were simultaneously added in the model as distinct covariables. The model was otherwise adjusted for the same variables as the main model.

Sensitivity analyses

We performed the following sensitivity analyses to assess robustness of our findings and address potential biases (Supplementary Table S2). First, we also modelled the UPF variable without energy adjustment (g/day), as a caloric proportion of UPFs (% kcal/day), as a proportion in grams of UPFs (% g/day), and energy adjusted UPFs (g/day) with alcoholic beverages. Second, we removed (ultra-processed) soft drinks from the total UPF exposure and adjusted for its consumption in the main model. The same approach was used to adjust for the consumption of animal-based products. Third, we used the lower or upper bound scenario of UPFs. Fourth, we excluded over- and under-reporters of energy intake. Fifth, we adjusted for smoking intensity in addition to smoking status. Sixth, we estimated HRs for each transition separately for men and women. Seventh, we assessed associations in the direct transition from baseline to multimorbidity in never smokers only and by geographical region (North: Sweden, Denmark; Central: the United Kingdom, the Netherlands, and Germany; South: Italy and Spain). Lastly, we modelled a transition from an intermediate state, where we combined any of the first events, to multimorbidity. Statistical tests were two-sided, and p-values <0.05 were considered statistically significant. All analyses were performed using R version 4.1.2 and using the Lexis class in the Epi R package.

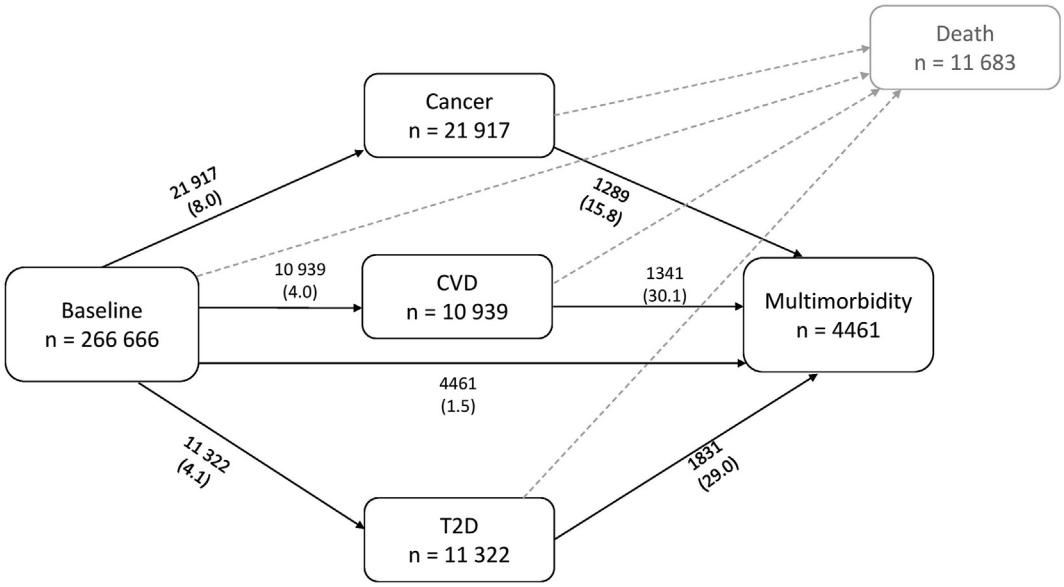


***Fig. 1:* Transitions from baseline to cancer, cardiovascular disease, type 2 diabetes, and subsequent cancer-cardiometabolic multimorbidity.** Cancer refers to first malignant tumour at any site excl. non-melanoma skin cancer. Deaths were censored and not modelled as a separate outcome. State-specific number of events is reported in boxes, and transition-specific number of events and incidence rates per 1000 person-years (within brackets) are reported on arrows. Abbreviations: CVD, cardiovascular disease; T2D, type 2 diabetes.

Patient and public involvement

This study used pseudo-anonymized data meaning that we had no means to contact study participants. Participants of this study were therefore not involved in setting the research question or the outcome measures, nor were they involved in developing plans for design, or implementation of the study, nor were they asked for advice on interpreting or writing up of results. However, we intend to engage the public to disseminate the results of our study.

Results

A total of 266,666 (60% women) participants were included in this study. Country- and sex-specific baseline characteristics of the study population are reported in Tables 1 and 2. The mean (SD) consumption of UPF (without alcoholic drinks) for men and women was 413 g/day (292) and 326 g/day (242), respectively. This corresponded to a proportion of 34% kcal and 32% kcal of UPFs in the daily diet among men and women, respectively. After a median follow-up time of 11.2 years (IQR 9.8–12.7), 4461 participants (39% women) developed multimorbidity of cancer and cardiometabolic diseases. The number of first incident events ascertained for each non-communicable disease (NCD) were 21,917 primary cancers, 10,939 cardiovascular events, and 11,322 type 2 diabetes events (Fig. 1). The most common multimorbidity pattern was cancer among persons with cardiovascular disease with a crude incidence rate of 17.1 events per 1000 person-years, followed by cancer among persons with type 2 diabetes (16.1/1000 person-years) and then type 2 diabetes among persons with cardiovascular disease (13.0/1000 person-years) (Supplementary Fig. S2).

Associations with multimorbidity of cancer and cardiometabolic diseases

In the multivariable-adjusted Cox model for the direct transition from baseline to multimorbidity, a positive association was observed between higher consumption of UPF (per 1 SD increment [~260 g/day]) and the risk of multimorbidity ($\text{Multimorbidity}_{\text{direct}}$ hazard ratio $(\text{HR})_{1\text{SD}}$ 1.09; 95% confidence interval (CI): 1.05–1.12) as well as after further adjustment for BMI ($\text{Multimorbidity}_{\text{direct}}$ $\text{HR}_{1\text{SD}}$ 1.06; 95% CI: 1.03–1.09) (Fig. 2).

The multivariable-adjusted HRs and 95% CIs for associations of the transitions from having developed a first NCD to multimorbidity of cancer and cardiometabolic diseases are displayed in Fig. 2. All transitions showed positive risk estimates between higher consumption of UPF (per 1 SD) and the risk of multimorbidity ($\text{Cancer}_{\text{MM}}$: $\text{HR}_{1\text{SD}}$ 1.05; 95% CI: 0.99–1.11, Cardiovascular $\text{disease}_{\text{MM}}$: $\text{HR}_{1\text{SD}}$ 1.02; 95% CI: 0.97–1.08, Type 2 $\text{diabetes}_{\text{MM}}$: $\text{HR}_{1\text{SD}}$ 1.02; 95% CI: 0.98–1.06, respectively), albeit associations included the null. These associations remained almost unchanged after controlling for BMI (Fig. 2).

Associations with first NCDs

Associations of the transitions from baseline UPF consumption and the risk of developing a first NCD are

	Italy	Spain	United Kingdom	The Netherlands	Germany	Sweden	Denmark	Overall
	(N = 29,239)	(N = 21,304)	(N = 17,925)	(N = 21,399)	(N = 24,042)	(N = 19,986)	(N = 26,655)	(N = 160,550)
UPF intake, g/day	183 (138)	144 (123)	479 (264)	378 (198)	417 (254)	297 (175)	424 (275)	326 (242)
UPF intake, % kcal/day	16.4 (7.9)	17.1 (9.9)	44.8 (11.1)	32.9 (8.0)	34.1 (10.5)	34.3 (9.8)	45.2 (10.0)	31.5 (14.6)
Cancer[a], n	1962	1361	1622	2111	1261	2093	2967	13,377
Cardiovascular disease[a], n	455	412	879	1168	238	950	913	5015
Type 2 diabetes[a], n	758	1127	340	499	540	828	1817	5909
Multimorbidity[b], n	147	203	222	235	87	305	526	1725
Age at recruitment, years	50.5 (8.1)	48.0 (8.3)	53.3 (11.7)	52.0 (11.2)	48.7 (8.9)	52.3 (11.2)	56.7 (4.4)	51.6 (9.6)
Follow-up, years	10.2 (2.1)	13.5 (1.3)	11.1 (1.7)	12.0 (1.8)	8.7 (1.7)	12.2 (2.1)	10.8 (1.7)	11.1 (2.3)
Alcohol at recruitment, g/day	8.6 (12.4)	4.3 (8.4)	6.7 (9.1)	8.7 (12.0)	9.5 (12.3)	5.3 (7.1)	13.8 (14.8)	8.4 (11.8)
Body mass index, kg/m^2	25.6 (4.2)	27.9 (4.6)	24.8 (4.1)	25.1 (4.0)	25.3 (4.4)	24.8 (4.2)	25.5 (4.3)	25.6 (4.4)
Smoking status, %								
Never	53.5	70.5	60.4	41.5	55.8	52.5	44.1	53.6
Former	20.2	10.2	30.4	31.8	25.8	23.3	24.5	23.5
Current	26.4	19.3	9.2	26.7	18.3	24.1	31.4	22.9
Education, %								
None	1.6	37.2	0	0	0.5	0.4	0	5.3
Primary school compl.	50.3	41.6	34.7	17.6	21.4	32.7	30.8	33.3
Tech/professional school	11.1	5.6	31.6	32.8	42.1	26.2	46.8	28.0
Secondary school	23.4	5.8	10.4	31.1	8.2	16.5	12.0	15.6
Longer education (incl. uni. deg.)	13.6	9.8	23.3	18.5	27.8	24.1	10.5	17.7
Physical activity, %								
Inactive	36.3	47.6	27.8	7.1	16.4	19.7	10.2	23.6
Moderately inactive	39.3	35.6	36.2	26.0	37.8	35.8	32.2	34.8
Moderately active	15.0	12.5	22.3	27.1	26.5	26.9	25.1	22.0
Active	9.4	4.3	13.7	39.8	19.3	17.7	32.5	19.6
mrMediterranean Diet Score	10.9 (2.4)	10.9 (2.2)	9.5 (2.5)	6.8 (2.5)	7.8 (2.5)	6.6 (2.4)	7.5 (2.7)	8.6 (3.0)
Dietary misreporting status[c], %								
Underreporting	6.3	18.2	13.4	15.4	21.4	19.6	12.9	14.9
Acceptable	74.4	75.1	76.9	81.8	73.2	74.6	79.8	76.5
Overreporting	19.3	6.7	9.7	2.9	5.4	5.8	7.2	8.6
Postmenopause hormone therapy, %								
No	93.1	94.8	81.0	89.7	76.4	85.5	70.8	84.4
Yes	6.9	5.2	19.0	10.3	23.6	14.5	29.2	15.6
Menopausal status, %								
Premenopausal	39.9	54.8	32.7	28.1	48.1	21.4	7.4	33.0
Postmenopausal	41.0	30.9	50.7	50.8	35.9	51.9	72.5	47.9
Perimenopausal	15.3	9.6	12.8	18.1	13.2	26.6	15.7	15.8
Surgical postmenopausal	3.7	4.8	3.7	3.0	2.8	0	4.4	3.3

Data are expressed as arithmetic mean ± standard deviation (SD) if not stated otherwise. Abbreviations: EPIC, European Prospective Investigation into Cancer and Nutrition; UPF, ultra-processed food; mr, modified relative. [a]Frequency of total incident events among first cancer at any site (excl. non-melanoma skin cancer), cardiovascular disease, and type 2 diabetes. [b]Frequency of participants developing at least two conditions among first cancer at any site, cardiovascular disease, and type 2 diabetes. [c]Plausibility of dietary intake reporting based on Goldberg's cut-off points to minimize dietary misreporting bias.

Table 1: **Country-specific characteristics of 160,550 women in the EPIC study.**

shown in Fig. 2. Higher consumption of UPF (per 1 SD) showed positive associations with each of the three NCDs (Cancer: HR_{1SD} 1.01; 95% CI: 1.00–1.03, Cardiovascular disease: HR_{1SD} 1.06; 95% CI: 1.04–1.08, Type 2 diabetes: HR_{1SD} 1.11; 95% CI: 1.10–1.13). After further adjustment for BMI, associations remained nearly unchanged, except for the transition to type 2 diabetes, which was attenuated (Type 2 diabetes: HR_{1SD} 1.07; 95% CI: 1.05–1.08) (Fig. 2).

UPF subgroup analyses

Among the nine UPF subgroups (Supplementary Table S1) after mutual adjustment, consumption of animal-based products, and artificially and sugar-sweetened beverages showed positive associations (HR_{1SD} 1.09; 95% CI: 1.05–1.12, HR_{1SD} 1.09; 95% CI: 1.06–1.12, respectively) in the direct transition from baseline to multimorbidity (Fig. 3). Sauces, spreads and condiments showed a positive association with the risk

	Italy (N = 12,892)	Spain (N = 13,156)	United Kingdom (N = 11,017)	The Netherlands (N = 6624)	Germany (N = 17,971)	Sweden (N = 20,354)	Denmark (N = 24,102)	Overall (N = 106,116)
UPF intake, g/day	207 (157)	163 (154)	522	544 (284)	522 (329)	382 (222)	517 (293)	413 (292)
UPF intake, % kcal/day	14.7 (7.1)	13.9 (8.4)	48.6 (11.0)	33.8 (8.0)	35.7 (10.0)	34.3 (9.2)	47.8 (9.5)	34.1 (15.7)
Cancer[a], n	891	1381	1241	369	1320	2480	2860	10,542
Cardiovascular disease[a], n	492	941	1301	455	541	1981	1825	7536
Type two diabetes[a], n	465	1247	418	122	824	1189	2350	6615
Multimorbidity[b], n	137	416	305	80	204	701	895	2738
Age at recruitment, years	49.9 (7.5)	50.4 (7.1)	56.8 (10.3)	43.0 (11.0)	51.8 (7.5)	51.3 (11.0)	56.5 (4.3)	52.3 (9.0)
Follow-up, years	10.3 (2.2)	13.5 (1.7)	10.7 (2.0)	11.7 (1.9)	8.74 (1.9)	12.1 (2.5)	10.7 (2.1)	11.0 (2.5)
Alcohol at recruitment, g/day	24.4 (22.5)	28.5 (28.7)	12.1 (14.9)	18.5 (21.0)	24.3 (24.2)	9.2 (11.4)	28.2 (24.9)	21.2 (23.1)
Body mass index, kg/m^2	26.3 (3.3)	28.4 (3.4)	25.7 (3.3)	25.4 (3.4)	26.7 (3.5)	25.5 (3.4)	26.5 (3.5)	26.4 (3.5)
Smoking status, %								
Never	27.6	30.1	39.0	31.1	33.8	45.7	26.4	33.6
Former	41.1	30.1	44.7	30.3	42.0	31.4	36.4	36.6
Current	31.3	39.8	16.3	38.6	24.2	22.9	37.3	29.8
Education, %								
None	0.4	25.1	0	0	0.5	0.3	0	3.3
Primary school compl.	41.6	38.1	30.6	9.5	22.3	35.2	33.8	31.8
Tech/professional school	14.9	13.4	35.8	41.6	27.4	21.7	29.4	25.3
Secondary school	28.9	8.1	9.8	20.7	5.4	21.9	7.8	13.7
Longer education (incl. uni. deg.)	14.1	15.2	23.9	28.2	44.4	20.8	28.9	25.9
Physical activity, %								
Inactive	12.9	20.7	30.7	8.3	15.1	20.4	10.9	16.8
Moderately inactive	35.5	29.8	28.5	22.5	35.0	35.1	28.8	31.6
Moderately active	23.8	27.7	21.8	24.7	27.0	26.3	23.9	25.2
Active	27.8	21.8	19.0	44.6	22.9	18.2	36.4	26.5
mrMediterranean Diet Score	10.8 (2.1)	11.5 (2.3)	8.50 (2.5)	6.2 (2.3)	7.3 (2.3)	5.6 (2.3)	6.4 (2.6)	7.8 (3.2)
Dietary misreporting status[c], %								
Underreporting	8.1	9.3	25.1	12.7	22.4	23.4	12.2	16.6
Acceptable	80.3	82.4	71.4	81.9	72.8	71.3	82.6	77.3
Overreporting	11.6	8.4	3.5	5.4	4.9	5.3	5.2	6.2

Data are expressed as arithmetic mean ± standard deviation (SD) if not stated otherwise. Abbreviations: EPIC, European Prospective Investigation into Cancer and Nutrition; UPF, ultra-processed food; mr, modified relative. [a]Frequency of total incident events among first cancer at any site (excl. non-melanoma skin cancer), cardiovascular disease, and type 2 diabetes. [b]Frequency of participants developing at least two conditions among first cancer at any site, cardiovascular disease, and type 2 diabetes. [c]Plausibility of dietary intake reporting based on Goldberg's cut-off points to minimize dietary misreporting bias.

Table 2: **Country-specific characteristics of 106,116 men in the EPIC study.**

of multimorbidity (HR_{1SD} 1.03; 95% CI: 1.00–1.06), although the CI reflected a borderline certainty. Ultra-processed breads and cereals were inversely associated with risk of multimorbidity (HR_{1SD} 0.97; 95% CI: 0.94–1.00) with similar uncertainty given the CI. The remaining groups—sweets and desserts, savory snacks, plant-based alternatives, ready-to-eat/heat mixed dishes and other unspecified ultra-processed foods—showed no association with the risk of multimorbidity (Fig. 3).

Sensitivity analyses

Our findings were robust among men and women, across geographic regions, and to a range of sensitivity analyses (Supplementary Table S2). For example, we observed similar results when using the proportion in grams of UPFs (% g/day), energy-adjusted UPFs (g/day) that included ultra-processed alcoholic beverages, or after adjusting for animal-based products. However, associations in all transitions were attenuated after adjusting for soft drinks or when using the daily caloric proportion of UPFs (% kcal/day). The results of all sensitivity analyses are shown in the Supplementary Table S2.

Role of the funding source

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Discussion

In this multinational European prospective cohort study, we found that higher consumption of UPF was associated with a higher risk of multimorbidity of cancer and

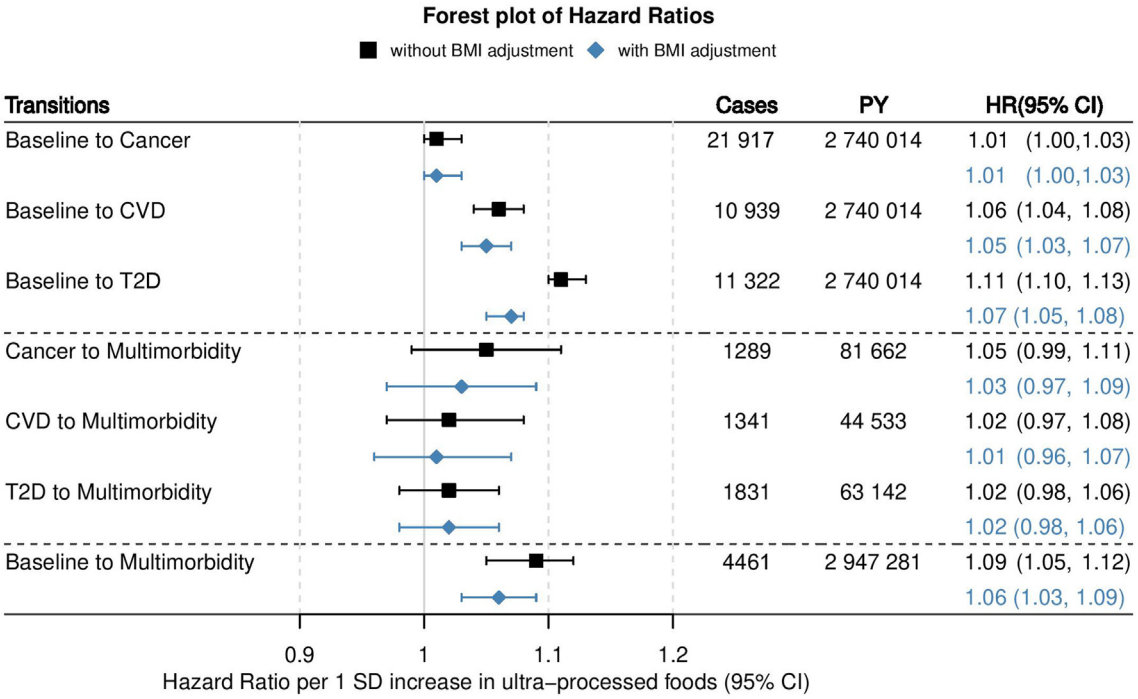


Fig. 2: **Associations between ultra-processed food consumption[a] and risk of cancer, cardiovascular disease, type 2 diabetes, and subsequent cancer-cardiometabolic multimorbidity.** Cancer refers to first malignant tumour at any site excl. non-melanoma skin cancer. [a]Energy-adjusted baseline UPF without alcoholic drinks (g/day) using residual method. Standardized residuals were computed by a linear regression of baseline UPF (g/day) adjusted for energy intake and center. Cox proportional hazard model, stratified by age at inclusion (1-year categories), sex, center, and transition in a clock forward multi-state analysis with age as primary time variable. Models were adjusted for total energy intake (continuous, kcal/day), baseline alcohol intake (g/day), height (cm), smoking status (never, former, current), the Cambridge physical activity index (inactive, moderately inactive, moderately active, active), highest attained educational level (none, primary completed, technical/professional, longer education including university degree), plausibility of dietary energy reporting (under-reporter, acceptable, over-reporter), and the modified relative Mediterranean Diet Score (mrMDS), post-menopause hormone therapy (yes, no), and menopausal status (premenopausal, perimenopausal, postmenopausal, surgical) in women. Abbreviations: CVD, cardiovascular disease; T2D, type 2 diabetes; BMI, body mass index; HR, hazard ratio; CI, confidence interval; SD, standard deviation.

cardiometabolic diseases. Among UPF subgroups, higher intakes of artificially and sugar-sweetened beverages, and animal-based products were associated with higher risk of multimorbidity, as was higher consumption of sauces, spreads and condiments, but with less certainty. In contrast, ultra-processed breads and cereals showed an inverse association with the risk of multimorbidity, but with a borderline certainty. Sweets and desserts, savory snacks, plant-based alternatives, ready-to eat/heat and mixed dishes were not associated with risk of multimorbidity.

Few studies to date investigated dietary exposures as determinants of multimorbidity.[2,24–27] The available evidence from prospective cohort studies suggests that adherence to a healthy dietary pattern such as the Mediterranean diet[27] or similar healthy eating patterns,[26] are associated with a reduced risk of different clusters of multimorbidity. While there is a lack of studies investigating the association between UPF consumption and multimorbidity of cancer and cardiometabolic diseases specifically, one prospective cohort study reported that a higher consumption of UPFs was associated with higher risk of multimorbidity of cardiovascular and respiratory diseases.[28]

Several more prospective studies assessed individually the associations between UPFs and the three major NCDs that defined our multimorbidity cluster, i.e., cancer, cardiovascular disease, and type 2 diabetes.[29–33] Three prospective cohort studies reported that higher consumption of UPFs was associated with an increased risk of cancer, overall, as well as for breast,[29] ovarian,[33] and head and neck[32] cancer, which is congruent with our findings for the transition from baseline to overall cancer. Further, in the French prospective population-based NutriNet-Santé cohort, higher consumption of UPFs was associated with higher risks of cardiovascular disease and type 2 diabetes.[30,31] Finally, a study using data from 3 large U.S. cohorts also reported that higher UPFs consumption was associated with a higher risk of type 2 diabetes.[11] These results are in line with our

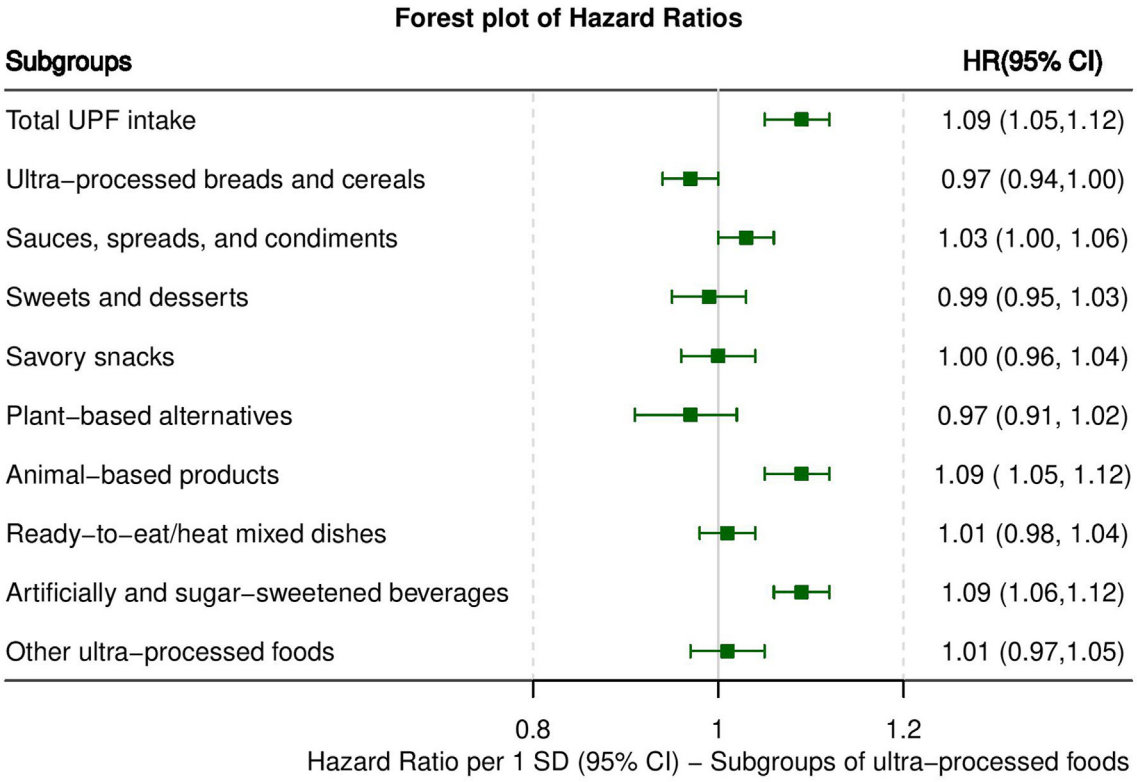


***Fig. 3*: Associations between subgroups of ultra-processed food consumption[a] and risk of cancer-cardiometabolic multimorbidity.** Cancer refers to first malignant tumour at any site excl. non-melanoma skin cancer. [a]Energy-adjusted subgroups of baseline UPF without alcoholic drinks (g/day) using residual method. Standardized residuals were computed by a linear regression of subgroups of baseline UPF (g/day) adjusted for energy intake and center. Cox proportional hazard model, stratified by age at inclusion (1-year categories), sex, center, and transition in a clock forward multi-state analysis with age as primary time variable. Subgroups were simultaneously added in the model as distinct covariables. Models were adjusted for total energy intake (continuous, kcal/day), baseline alcohol intake (g/day), height (cm), smoking status (never, former, current), the Cambridge physical activity index (inactive, moderately inactive, moderately active, active), highest attained educational level (none, primary completed, technical/professional, longer education including university degree), plausibility of dietary energy reporting (under-reporter, acceptable, over-reporter), and the modified relative Mediterranean Diet Score (mrMDS), post-menopause hormone therapy (yes, no), and menopausal status (premenopausal, perimenopausal, postmenopausal, surgical) in women. Abbreviations: HR, hazard ratio; CI, confidence interval; SD, standard deviation.

findings for the transitions from baseline to cardiovascular disease and type 2 diabetes.

These studies together with our findings that these NCDs can also co-occur in an individual, substantiate the hypothesis of common aetiological risk factors, from which cancer and cardiometabolic diseases originate. In the context of the role of UPF consumption in the aetiology of these NCDs, our study adds important evidence that can inform risk reduction of multimorbidity of cancer and cardiometabolic diseases through dietary recommendations, public health policies, and interventions.

We acknowledge that the Nova group 4 (i.e., UPFs) consists of very heterogeneous foods representing virtually all major food groups.[6] Although UPFs have on average a higher energy density compared to minimally processed foods,[34] they are not equally high in their energy-density, nutrition profile and intake rate,[6] raising the question about whether various types of UPFs contribute differently to the risk of developing a first NCD and multimorbidity. To explore this further we adjusted for the consumption of soft drinks in our main models for multimorbidity. Consuming sugar and artificially sweetened beverages is well-known for negative impacts on cardiometabolic diseases.[35] After accounting for soft drink consumption, the positive association with multimorbidity remained, although it was attenuated (Supplementary Table S2). Also, the analyses of nine different subgroups of UPFs in our main model indicated positive associations for the consumption of sugar sweetened and artificially sweetened beverages, and animal-based products with risk of multimorbidity. Conversely, consumption of ultra-processed breads and cereals was associated with lower risk, although with a

borderline certainty (Fig. 3), which might be explained by the fibre content of such products. Our findings regarding UPF subtypes are partly consistent with recent studies that showed some heterogeneity in the results for subtypes of UPFs, with positive associations observed between consumption of artificially and sugar-sweetened beverages,[11,36,37] animal-based products,[11,36–38] sauces spreads and condiments[11,36] and the risk of type 2 diabetes,[11] cardiovascular disease,[36] and/or certain cancers,[37,38] but inverse associations for UPF cereals and whole grain breads and type 2 diabetes.[11]

Mechanisms by which UPFs may influence the risk of chronic diseases and multimorbidity are not completely understood. One explanation would be their effect on increased weight gain.[13,39] Obesity represents an important risk factor for morbidity and may initiate and promote progression to multimorbidity.[13,40] Many UPFs have higher energy density (calories per weight or volume)[34] in combination with an altered food matrix which leads to a softer texture for less chewing and delays satiety signalling.[6,39] However, adjusting for BMI in our main model did attenuate but not annul the association between UPFs and multimorbidity implying additional mechanistic pathways. Diets with a high proportion of UPFs have been associated with a lower nutritional quality such as lower intake of dietary fiber and vitamins, and a higher intake of free sugars and saturated fat.[41] However, nutritional characteristics of UPFs may again only partially explain mechanistic pathways leading to health outcomes. For example, in a prospective cohort study from Italy, adjustment for nutritional composition of the diet using the Food Standards Agency Nutrient Profiling System (FSAm-NPS) did not attenuate associations between UPF consumption and all cause and cardiovascular mortality.[42] Similarly, the adjustment for diet quality in our study, using the Mediterranean diet score, suggests that UPF consumption plays a role in the development of cancer and cardiometabolic disease multimorbidity beyond the nutritional characteristics of UPFs. Furthermore, the Mediterranean diet score indirectly also accounted for red meat (and dairy) consumption because higher consumption of these leads to a lower Mediterranean diet score and vice versa.[18] The positive association of ultra-processed animal-based products with multimorbidity in our study are therefore likely explained by non-nutritional aspects of this subgroup of UPFs. Non-nutritional mechanisms through which UPFs could be hazardous for health include, but are not limited to, alteration of the food matrix, inclusion of certain food additives during processing (e.g., aspartame),[43] and contaminants from packaging material (e.g., bisphenol A).[44] Any of these may affect endocrine pathways or the gut microbiome,[8,39] and contribute to subsequent disease risk.

Strengths and limitations

Strengths of our study include access to individual-level data from a prospective cohort of adults from 7 European countries with validated assessments of cancer, cardiovascular disease, and type 2 diabetes. Second, the observed associations were modelled in a multi-state framework accounting for the sequence of incident chronic conditions. Furthermore, to the best of our knowledge, this is the first study that investigated the association between consumption of UPF and the risk of multimorbidity in a multinational setting.

The results of our study should be interpreted with the following limitations in mind. First, the Nova classification was implemented on dietary data captured more than 20 years ago at recruitment of participants into EPIC. However, three scenarios were considered when classifying food items and ingredients according to Nova to evaluate the impact of possible exposure misclassification, and results were similar. In addition, Nova misclassification might have occurred due to missing food processing information in the FFQs and assumptions were necessary while classifying the foods. However, data collected via 24-h dietary recalls in a subsample of individuals in all countries were used to inform assumptions and minimize misclassification.[32] Second, we collected diet and other lifestyle exposure data at recruitment, and potential changes in modifiable behaviors during follow-up, especially after the diagnosis of NCDs, were not possible to account for in our study. However, our results suggest that pre-diagnostic lifestyle habits are associated with the risk of NCDs and multimorbidity, assuming that exposure characteristics before the onset of a disease can influence subsequent health outcomes. Therefore, possible improvements in health behaviors after the diagnosis of a first NCD would most likely have resulted in an underestimation of the observed relative risks. Third, we were unable to account for treatment information after the first NCD. Among persons with type 2 diabetes, a common first-line medication is metformin, which is linked to a decreased risk of cardiovascular events and possibly some cancers.[45,46] In contrast, cancer therapy can increase the risk of cardiac diseases[47] and diabetes.[48] Nevertheless, if treatment alone does not influence diet habits, the observed result should not be affected by the lack of treatment information. Furthermore, we cannot exclude the possibility that unmeasured confounding, such as family history of (premature) cancer and cardiometabolic disease, could have affected the results. Lastly, our findings should be generalized with caution because study participants may not always be representative of the general population and only seven of the 10 countries in the EPIC study were included.

Conclusion

A higher consumption of UPFs was associated with a higher risk of multimorbidity of cancer and cardiometabolic diseases. Artificially and sugar-sweetened beverages, animal-based products and sauces, spreads and condiments, but not other items, were associated

with increased risk of multimorbidity, suggesting that more nuanced subgroup analyses of UPFs are warranted. Multimorbidity represents a continuum which starts when a healthy individual develops a chronic disease. Therefore, higher consumption of UPFs prior to a first NCD might contribute to unfavourable prognosis of these diseases by increasing the risk of multimorbidity.

Contributors

Conceived and designed the study: HF. Analysed the data: RC and HF. Supported data analysis: VV and EM. Wrote the manuscript: RC and HF. Has primary responsibility for the final content of the manuscript: HF. Had full access and verified all the data: RC, VV, and HF. Had final responsibility to submit for publication: HF. Critically reviewed the manuscript for important intellectual content and approved the final version: all authors.

Data sharing statement

Data access can be requested via https://epic.iarc.fr/access/index.php. The request will be assessed by the EPIC working groups and the EPIC Steering Committee. After approval by the EPIC Steering Committee, deidentified data will be made available. An agreement will be signed specifying the study protocol, variables, statistical analysis plan, researchers involved, and length of time that the data will be available.

Declaration of interests

None of the authors declared a competing interest.

Acknowledgements

The authors would like to thank the EPIC study participants and staff for their valuable contribution to this research. The authors would also like to especially thank Fernanda Rauber, Eszter P. Vamos, and Kiara Chang for their contribution to implement the Nova classification in the EPIC study, and Bertrand Hemon and Corinne Casagrande for preparing the EPIC databases. We acknowledge the use of data from the EPIC-Aarhus cohort, PI Kim Overvad; the EPIC-Asturias cohort, PI J. Ramón Quirós; the EPIC-Umea cohort, PIs Mattias Johansson und Malin Sund; the EPIC-Norfolk cohort; and the National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands, for their contribution and ongoing support to the EPIC Study.

Funding: Reynalda Cordova is a recipient of a DOC Fellowship of the Austrian Academy of Sciences. This study was financially supported by the Fondation de France (FDF, grant no. 00081166, HF). This work was also supported by Cancer Research UK (C33493/A29678), the World Cancer Research Fund International (IIG_FULL_2020_033), and the Institut National du Cancer (INCa no. 2021–138).

The coordination of EPIC is financially supported by International Agency for Research on Cancer (IARC) and also by the Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London which has additional infrastructure support provided by the NIHR Imperial Biomedical Research Centre (BRC). The national cohorts are supported by: Danish Cancer Society (Denmark); Ligue Contre le Cancer, Institut Gustave-Roussy, Mutuelle Générale de l'Education Nationale, Institut National de la Santé et de la Recherche Médicale (INSERM) (France); German Cancer Aid, German Cancer Research Center (DKFZ), German Institute of Human Nutrition Potsdam-Rehbruecke (DIfE), Federal Ministry of Education and Research (BMBF) (Germany); Associazione Italiana per la Ricerca sul Cancro-AIRC-Italy, Compagnia di SanPaolo and National Research Council (Italy); Dutch Ministry of Public Health, Welfare and Sports (VWS), Netherlands Cancer Registry (NKR), LK Research Funds, Dutch Pittsburgh Foundation, Dutch ZON (Zorg Onderzoek Nederland), World Cancer Research Fund (WCRF), Statistics Netherlands (The Netherlands); Health Research Foundation (FIS)–Instituto de Salud Carlos III (ISCIII), Regional Governments of Andalucía, Asturias, Basque Country, Murcia and Navarra, and the Catalan Institute of Oncology–ICO (Spain); Swedish Cancer Society, Swedish Research Council and County Councils of Skåne and Västerbotten (Sweden); Cancer Research UK (14136 to EPIC-Norfolk; C8221/A29017 to EPIC-Oxford), Medical Research Council (1000143 to EPIC-Norfolk; MR/M012190/1 to EPIC-Oxford). (United Kingdom).

Disclaimer: Where authors are identified as personnel of the International Agency for Research on Cancer/World Health Organization, the authors alone are responsible for the views expressed in this article and they do not necessarily represent the decisions, policy or views of the International Agency for Research on Cancer/World Health Organization.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lanepe.2023.100771.

References

1 Mendis S. *Global status report on noncommunicable diseases 2014*. Geneva, Switzerland: World Health Organization; 2014.
2 Academy of Medical Sciences (Royaume uni). *Multimorbidity: a priority for global health research*. Academy of Medical Sciences; 2018.
3 Chowdhury SR, Chandra Das D, Sunna TC, Beyene J, Hossain A. Global and regional prevalence of multimorbidity in the adult population in community settings: a systematic review and meta-analysis. *EClinicalMedicine*. 2023;57:101860. https://doi.org/10.1016/j.eclinm.2023.101860.
4 Makovski TT, Schmitz S, Zeegers MP, Stranges S, van den Akker M. Multimorbidity and quality of life: systematic literature review and meta-analysis. *Ageing Res Rev*. 2019;53:100903. https://doi.org/10.1016/j.arr.2019.04.005.
5 Ezzati M, Riboli E. Can noncommunicable diseases be prevented? Lessons from studies of populations and individuals. *Science*. 2012;337:1482–1487. https://doi.org/10.1126/science.1227001.
6 Scrinis G, Monteiro C. From ultra-processed foods to ultra-processed dietary patterns. *Nat Food*. 2022;3:671–673. https://doi.org/10.1038/s43016-022-00599-4.
7 Cattafesta M, Petarli GB, Zandonade E, Bezerra OMPA, Abreu SMR, Salaroli LB. Energy contribution of NOVA food groups and the nutritional profile of the Brazilian rural workers' diets. *PLoS One*. 2020;15:e0240756. https://doi.org/10.1371/journal.pone.0240756.
8 Srour B, Kordahi MC, Bonazzi E, Deschasaux-Tanguy M, Touvier M, Chassaing B. Ultra-processed foods and human health: from epidemiological evidence to mechanistic insights. *Lancet Gastroenterol Hepatol*. 2022;7:1128–1140. https://doi.org/10.1016/S2468-1253(22)00169-8.
9 Moubarac J-C, Parra DC, Cannon G, Monteiro CA. Food classification systems based on food processing: significance and implications for policies and actions: a systematic literature review and assessment. *Curr Obes Rep*. 2014;3:256–272. https://doi.org/10.1007/s13679-014-0092-0.
10 Pagliai G, Dinu M, Madarena MP, Bonaccio M, Iacoviello L, Sofi F. Consumption of ultra-processed foods and health status: a systematic review and meta-analysis. *Br J Nutr*. 2021;125:308–318. https://doi.org/10.1017/S0007114520002688.
11 Chen Z, Khandpur N, Desjardins C, et al. Ultra-processed food consumption and risk of type 2 diabetes: three large prospective U. S. cohort studies. *Diabetes Care*. 2023;46(7):1335–1344. https://doi.org/10.2337/dc22-1993.
12 Lane MM, Davis JA, Beattie S, et al. Ultraprocessed food and chronic noncommunicable diseases: a systematic review and meta-analysis of 43 observational studies. *Obes Rev*. 2021;22:e13146. https://doi.org/10.1111/obr.13146.
13 Cordova R, Kliemann N, Huybrechts I, et al. Consumption of ultra-processed foods associated with weight gain and obesity in adults: a multi-national cohort study. *Clin Nutr*. 2021;40:5079–5088. https://doi.org/10.1016/j.clnu.2021.08.009.
14 The Lancet. Making more of multimorbidity: an emerging priority. *Lancet*. 2018;391:1637. https://doi.org/10.1016/S0140-6736(18)30941-3.
15 Riboli E, Kaaks R. The EPIC project: rationale and study design. European Prospective Investigation into Cancer and Nutrition. *Int J Epidemiol*. 1997;26(Suppl 1):S6–S14. https://doi.org/10.1093/ije/26.suppl_1.s6.

16 World Cancer Research Fund/American Institute for Cancer Research. *Continuous update project expert report 2018. Alcoholic drinks and the risk of cancer*; 2018. Available at: https://dietandcancerreport.org.
17 Huybrechts I, Rauber F, Nicolas G, et al. Characterization of the degree of food processing in the European Prospective Investigation into Cancer and Nutrition: application of the Nova classification and validation using selected biomarkers of food processing. *Front Nutr*. 2022;9:1035580. https://doi.org/10.3389/fnut.2022.1035580.
18 Buckland G, González CA, Agudo A, et al. Adherence to the Mediterranean diet and risk of coronary heart disease in the Spanish EPIC cohort study. *Am J Epidemiol*. 2009;170:1518–1529. https://doi.org/10.1093/aje/kwp282.
19 Wareham NJ, Jakes RW, Rennie KL, et al. Validity and repeatability of a simple index derived from the short physical activity questionnaire used in the European Prospective Investigation into Cancer and Nutrition (EPIC) study. *Public Health Nutr*. 2003;6:407–413. https://doi.org/10.1079/PHN2002439.
20 White IR, Carlin JB. Bias and efficiency of multiple imputation compared with complete-case analysis for missing covariate values. *Stat Med*. 2010;29:2920–2931. https://doi.org/10.1002/sim.3944.
21 Kipnis V, Subar AF, Midthune D, et al. Structure of dietary measurement error: results of the OPEN biomarker study. *Am J Epidemiol*. 2003;158:14–21. discussion 22–26. https://doi.org/10.1093/aje/kwg091.
22 Putter H, Fiocco M, Geskus RB. Tutorial in biostatistics: competing risks and multi-state models. *Stat Med*. 2007;26:2389–2430. https://doi.org/10.1002/sim.2712.
23 Black AE. Critical evaluation of energy intake using the Goldberg cut-off for energy intake: basal metabolic rate. A practical guide to its calculation, use and limitations. *Int J Obes Relat Metab Disord*. 2000;24:1119–1130. https://doi.org/10.1038/sj.ijo.0801376.
24 Wikström K, Lindström J, Harald K, Peltonen M, Laatikainen T. Clinical and lifestyle-related risk factors for incident multimorbidity: 10-year follow-up of Finnish population-based cohorts 1982-2012. *Eur J Intern Med*. 2015;26:211–216. https://doi.org/10.1016/j.ejim.2015.02.012.
25 Ruel G, Shi Z, Zhen S, et al. Association between nutrition and the evolution of multimorbidity: the importance of fruits and vegetables and whole grain products. *Clin Nutr*. 2014;33:513–520. https://doi.org/10.1016/j.clnu.2013.07.009.
26 Xie H, Li J, Zhu X, et al. Association between healthy lifestyle and the occurrence of cardiometabolic multimorbidity in hypertensive patients: a prospective cohort study of UK Biobank. *Cardiovasc Diabetol*. 2022;21:199. https://doi.org/10.1186/s12933-022-01632-3.
27 Freisling H, Viallon V, Lennon H, et al. Lifestyle factors and risk of multimorbidity of cancer and cardiometabolic diseases: a multinational cohort study. *BMC Med*. 2020;18:5. https://doi.org/10.1186/s12916-019-1474-7.
28 Li H, Li S, Yang H, et al. Association of ultra-processed food intake with cardiovascular and respiratory disease multimorbidity: a prospective cohort study. *Mol Nutr Food Res*. 2023;67:e2200628. https://doi.org/10.1002/mnfr.202200628.
29 Fiolet T, Srour B, Sellem L, et al. Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort. *BMJ*. 2018;360:k322. https://doi.org/10.1136/bmj.k322.
30 Srour B, Fezeu LK, Kesse-Guyot E, et al. Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study (NutriNet-Santé). *BMJ*. 2019;365:l1451. https://doi.org/10.1136/bmj.l1451.
31 Srour B, Fezeu LK, Kesse-Guyot E, et al. Ultraprocessed food consumption and risk of type 2 diabetes among participants of the NutriNet-Santé prospective cohort. *JAMA Intern Med*. 2020;180:283–291. https://doi.org/10.1001/jamainternmed.2019.5942.
32 Kliemann N, Rauber F, Bertazzi Levy R, et al. Food processing and cancer risk in Europe: results from the prospective EPIC cohort study. *Lancet Planet Health*. 2023;7:e219–e232. https://doi.org/10.1016/S2542-5196(23)00021-9.
33 Chang K, Gunter MJ, Rauber F, et al. Ultra-processed food consumption, cancer risk and cancer mortality: a large-scale prospective analysis within the UK Biobank. *EClinicalMedicine*. 2023;56:101840. https://doi.org/10.1016/j.eclinm.2023.101840.
34 Rolls BJ, Cunningham PM, Diktas HE. Properties of ultraprocessed foods that can drive excess intake. *Nutr Today*. 2020;55:109–115. https://doi.org/10.1097/NT.0000000000000410.
35 Malik VS, Hu FB. Sugar-sweetened beverages and cardiometabolic health: an update of the evidence. *Nutrients*. 2019;11:1840. https://doi.org/10.3390/nu11081840.
36 Zhong G-C, Gu H-T, Peng Y, et al. Association of ultra-processed food consumption with cardiovascular mortality in the US population: long-term results from a large prospective multicenter study. *Int J Behav Nutr Phys Act*. 2021;18:21. https://doi.org/10.1186/s12966-021-01081-3.
37 Wang L, Du M, Wang K, et al. Association of ultra-processed food consumption with colorectal cancer risk among men and women: results from three prospective US cohort studies. *BMJ*. 2022;378:e068921. https://doi.org/10.1136/bmj-2021-068921.
38 Zhong G-C, Zhu Q, Cai D, et al. Ultra-processed food consumption and the risk of pancreatic cancer in the prostate, lung, colorectal and ovarian cancer screening trial. *Int J Cancer*. 2023;152:835–844. https://doi.org/10.1002/ijc.34290.
39 Crimarco A, Landry MJ, Gardner CD. Ultra-processed foods, weight gain, and co-morbidity risk. *Curr Obes Rep*. 2022;11:80–92. https://doi.org/10.1007/s13679-021-00460-y.
40 Agborsangaya CB, Ngwakongnwi E, Lahtinen M, Cooke T, Johnson JA. Multimorbidity prevalence in the general population: the role of obesity in chronic disease clustering. *BMC Public Health*. 2013;13:1161. https://doi.org/10.1186/1471-2458-13-1161.
41 Da Louzada MLC, Ricardo CZ, Steele EM, Levy RB, Cannon G, Monteiro CA. The share of ultra-processed foods determines the overall nutritional quality of diets in Brazil. *Public Health Nutr*. 2018;21:94–102. https://doi.org/10.1017/S1368980017001434.
42 Bonaccio M, Di Castelnuovo A, Ruggiero E, et al. Joint association of food nutritional profile by Nutri-Score front-of-pack label and ultra-processed food intake with mortality: Moli-sani prospective cohort study. *BMJ*. 2022;378:e070688. https://doi.org/10.1136/bmj-2022-070688.
43 Riboli E, Beland FA, Lachenmeier DW, et al. Carcinogenicity of aspartame, methyleugenol, and isoeugenol. *Lancet Oncol*. 2023;24:848–850. https://doi.org/10.1016/S1470-2045(23)00341-8.
44 Juul F, Vaidean G, Parekh N. Ultra-processed foods and cardiovascular diseases: potential mechanisms of action. *Adv Nutr*. 2021;12:1673–1680. https://doi.org/10.1093/advances/nmab049.
45 Mallik R, Chowdhury TA. Metformin in cancer. *Diabetes Res Clin Pract*. 2018;143:409–419. https://doi.org/10.1016/j.diabres.2018.05.023.
46 Zilov AV, Abdelaziz SI, AlShammary A, et al. Mechanisms of action of metformin with special reference to cardiovascular protection. *Diabetes Metab Res Rev*. 2019;35:e3173. https://doi.org/10.1002/dmrr.3173.
47 Aleman BMP, Moser EC, Nuver J, et al. Cardiovascular disease after cancer therapy. *Eur J Cancer Suppl*. 2014;12:18–28. https://doi.org/10.1016/j.ejcsup.2014.03.002.
48 Baek JY, Lim DH, Oh D, et al. Increased risk of diabetes after definitive radiotherapy in patients with indolent gastroduodenal lymphoma. *Cancer Res Treat*. 2022;54:294–300. https://doi.org/10.4143/crt.2021.073.

Hindawi
Journal of Diabetes Research
Volume 2022, Article ID 1566408, 11 pages
https://doi.org/10.1155/2022/1566408

Research Article

Diabetes Mellitus Diagnosis and Screening in Australian General Practice: A National Study

Mingyue Zheng[1,2] **Carla De Oliveira Bernardo**[1] **Nigel Stocks**[1,3,4] **and David Gonzalez-Chica**[1,5]

[1]*Discipline of General Practice, Adelaide Medical School, The University of Adelaide, Adelaide, Australia*
[2]*School of Health and Rehabilitation, Chengdu University of Traditional Chinese Medicine, Chengdu, China*
[3]*Australian Partnership for Preparedness Research on Infectious Disease Emergencies (APPRISE) Centre of Research Excellence, NHMRC, Adelaide, Australia*
[4]*EMPOWER: Health Systems, Adversity and Child Well Being Centre of Research Excellence, NHMRC, Adelaide, Australia*
[5]*Adelaide Rural Clinical School, The University of Adelaide, Adelaide, Australia*

Correspondence should be addressed to David Gonzalez-Chica; david.gonzalez@adelaide.edu.au

Received 15 October 2021; Revised 1 March 2022; Accepted 2 March 2022; Published 23 March 2022

Academic Editor: Eusebio Chiefari

Aims. To investigate the epidemiology of diabetes diagnosis and screening in Australian general practice. *Methods*. Cross-sectional study using electronic health records of 1,522,622 patients aged 18+ years attending 544 Australian general practices (MedicineInsight database). The prevalence of diagnosed diabetes and diabetes screening was explored using all recorded diagnoses, laboratory results, and prescriptions between 2016 and 2018. Their relationship with patient sociodemographic and clinical characteristics was also investigated. *Results*. Overall, 7.5% (95% CI 7.3, 7.8) of adults had diabetes diagnosis, 0.7% (95% CI 0.6, 0.7) prediabetes, and 0.3% (95% CI 0.3, 0.3) unrecorded diabetes/prediabetes (elevated glucose levels without a recorded diagnosis). Patients with unrecorded diabetes/prediabetes had clinical characteristics similar to those with recorded diabetes, except for a lower prevalence of overweight/obesity (55.5% and 69.9%, respectively). Dyslipidaemia was 1.8 times higher (36.2% vs. 19.7%), and hypertension was 15% more likely (38.6% vs. 33.8%) among patients with prediabetes than with diabetes. Diabetes screening (last three years) among people at high risk of diabetes was 55.2% (95% CI 52.7, 57.7), with lower rates among young or elderly males. *Conclusions*. Unrecorded diabetes/prediabetes is infrequent in Australian general practice, but prediabetes diagnosis was also lower than expected. Diabetes screening among high-risk individuals can be improved, especially in men, to enhance earlier diabetes diagnosis and management.

1. Introduction

Diabetes mellitus is a major global health problem and one of the fastest-growing chronic conditions [1]. In Australia, the age-standardised ratio of self-reported diabetes has increased from 3.3% in 2001 to 4.4% in 2017-2018 [2]. However, diabetes is not always medically diagnosed. Globally, it is estimated that one in two people living with diabetes is unaware of their condition [3]. Several nationwide studies have investigated the actual magnitude of undiagnosed diabetes, either using electronic health records (EHRs) [4] or through laboratory tests used as part of national surveys [5–7]. The prevalence of unreported diabetes in the United States (US) was estimated at 0.9% in 1988-1994 and 1.2% in 2011-2014 [5], while a French national study found a prevalence of 1.7% in 2014-2016 [7].

Moreover, prediabetes (a condition where the glycaemic parameters are above normal but below the threshold for diabetes [8]) increases the burden of diabetes, with a conversion rate to diabetes of 5%-10% per year [9]. Globally, the estimated prevalence of prediabetes was 7.5% in 2019 (~374 million people) and is projected to reach 8.6% (~548 million people) by 2045 [3]. In Australia, prediabetes affects 3.1% of adults [10]. Undiagnosed prediabetes is an additional concern, as these

individuals are at a higher risk of complications, including chronic kidney disease (CKD), diabetic retinopathy, and macrovascular disease [11].

Therefore, early detection of prediabetes and diabetes is crucial for appropriate management and prevention of disease progression [12, 13]. According to the Australian Guidelines for Preventive Activities in General Practice [14], regular (within three years) diabetes screening is recommended for those with a clinical history of gestational diabetes mellitus or polycystic ovary syndrome (PCOS) and those treated with antipsychotics or at higher risk of cardiovascular disease (CVD). Screening among these individuals should be performed regularly, either through fasting blood glucose (FBG) or haemoglobin A1c (HbA1c) tests [14–17]. Beyond these groups, noninvasive and straightforward tools such as the Australian Type 2 Diabetes Risk (AUSDRISK) Assessment Tool questionnaire have been developed to identify other individuals at risk of diabetes who require further assessment [11, 18, 19]. For example, the AUSDRISK is a questionnaire that scores the probability of a person developing diabetes mellitus within five years or with undiagnosed diabetes [20]. People with a score ≥ 12 points should then have their blood glucose levels tested [14].

Diabetes screening in a primary care setting is widely recommended, considering that more than 83% of the population use these services every year [21], making it an ideal environment for early diabetes diagnosis and management. Despite this, population-based national studies or data on whether diabetes screening activities are being performed in primary care following current recommendations are scarce [18]. In this sense, EHRs generated by general practitioners (GPs) during medical appointments represent a unique data source for investigating the prevalence of diabetes and prediabetes diagnoses, screening activities, and management of these conditions. In addition, data extracted from EHR databases has been found a cost-effective method for exploring different health outcomes with appropriate accuracy [4, 22–25].

In Australia, EHRs have been used in the last decade to estimate the burden of various chronic conditions, but only a few have focused on diabetes [24, 26–30]. Data from the Bettering the Evaluation and Care of Health program (BEACH), a national study of general practice activity that included GP-reported data (Nov/2012 to Mar/2016), showed a prevalence of type 2 diabetes of 9.6% among adults [31]. In Victoria, the Outcome Health's Population Level Analysis & Reporting (POLAR) used recorded pathology results to explore the prevalence of type 2 diabetes among adults (4.9%), showing results comparable to Australian population-based estimates (5.2%) and with a similar distribution according to sociodemographic characteristics [24]. Finally, MedicineInsight, a large general practice Australian database, has been used to explore diabetes mellitus, prescriptions, and associated comorbidities [26, 27, 29]. However, none of these studies investigated prediabetes, the magnitude of undiagnosed diabetes/prediabetes, or diabetes screening at a national level.

Therefore, this study is aimed at (1) identifying the prevalence of recorded or unrecorded diabetes and prediabetes among adults in Australian general practice, (2) comparing these groups according to sociodemographic and clinical characteristics, and (3) assessing if diabetes screening was more likely among people at high risk of diabetes.

2. Material and Methods

2.1. Data Source. This is a cross-sectional study using MedicineInsight, a large national general practice database managed by NPS MedicineWise. The database contains deidentified EHRs from more than 650 general practices (8.2% of all practices in the country) and over 2,700 GPs from all Australian states and regions. This ongoing longitudinal database includes practices varying in size, billing methods, and type of services [32]. Details of the data collection process and characteristics of the database have been published elsewhere [33].

Routinely collected data available in MedicineInsight include sociodemographic (i.e., gender, year of birth, and postcode of residence) and clinical data (i.e., diagnoses, reasons for consultation, and smoking status), prescribed medications and reasons for these prescriptions, laboratory/pathology test results (e.g., blood glucose levels and lipid profile), and clinical measurements (e.g., blood pressure, weight, and height).

2.2. Study Population. Following recommendations for improving data quality [23, 34, 35], only data from practices established at least two years before the end of the analysis period and without interruptions in data greater than six weeks was included in the study. Moreover, analysis was restricted to adults (18+ years) considered "regular" patients (at least three consultations in any two consecutive years (i.e., "active" patient, as defined by the Royal Australian College of General Practitioners to identify frequent users of the service and for reporting purposes) [36] and at least one consultation in each of these two years) and attending a MedicineInsight general practice between Jan/2016 and Dec/2018. Our definition of "regular" patients takes into account recommendations for improving diagnosis accuracy when using EHR and the specificities of diabetes diagnosis that requires multiple encounters to request the tests and discuss diagnosis/management with the patient [23, 34, 35]. Administrative contacts (e.g., "email," "reminder," "letter," and "filling forms") were excluded as encounters.

2.3. Data Extraction. Different fields in MedicineInsight (i.e., "diagnosis," "reason for encounter," and "reason for prescription") were searched to identify patients with a recorded diagnosis of diabetes mellitus (either type 1 or type 2) or prediabetes (also recorded as impaired glucose tolerance or impaired fasting glucose), using standard clinical terminology, abbreviations, and misspellings of these words. The algorithm for data extraction also identified all prescriptions of insulin (Anatomical Therapeutic Chemical Classification (ATC) code A10A) and/or oral antidiabetic medications (ATC code A10B: metformin, glibenclamide, gliclazide, glimepiride, glipizide, acarbose, pioglitazone, alogliptin, linagliptin, saxagliptin, sitagliptin, vildagliptin, dulaglutide, exenatide, dapagliflozin, empagliflozin, and ertugliflozin) during the study period. FBG (mmol/L), random blood glucose (mmol/L), HbA1c

(mmol/L or %) and 2-hour oral glucose tolerance test (OGTT) (mmol/L), and date of these tests were obtained from all recorded laboratory results using Logical Observation Identifiers Names and Codes [32]. The use of medications and laboratory results combined with recorded diabetes diagnosis improves the data quality and accuracy of estimates based on EHRs [23].

Patients were considered as having diabetes when (1) diabetes diagnosis was recorded ("diagnosis," "reason for encounter," and "reason for prescription") on two different occasions between 2016 and 2018, or (2) a patient was prescribed antidiabetic medication (ATC A10A or A10B, metformin considered only in the absence of PCOS diagnosis), or (3) diabetes diagnosis was recorded only once but the patient had in the preceding 24 months at least one laboratory result (FBG, HbA1c, or OGTT) above the threshold for diabetes diagnosis [14] (Supplementary Table 1). A similar approach was used to identify patients with prediabetes, considering a combination of (1) two records of prediabetes diagnosis or (2) only one record plus metformin prescription (i.e., in the absence of PCOS or diabetes diagnosis) or laboratory results consistent with impaired glucose levels. Patients with at least two laboratory results above recommended thresholds (either FBG or HbA1c) and/or a positive OGTT, but without any record of diabetes or prediabetes diagnosis or any prescribed antidiabetic medication were classified as "unrecorded" diabetes or "unrecorded" prediabetes. When only one abnormal FBG or HbA1c laboratory result was recorded, but not diabetes/prediabetes diagnosis was recorded or antidiabetic medication prescribed, patients were classified as "insufficient data" (Figure 1 and Supplementary Table 1).

Additional data extracted from the dataset included risk factors for diabetes (age 40+ years and overweight/obesity, AUSDRISK score ≥12 points, clinical history of CVD (including ischaemic heart disease and stroke), gestational diabetes, PCOS, or current use of antipsychotics (ATC N05A; 2018 only)) and other clinical conditions related to diabetes or prediabetes (hypertension, dyslipidaemia, CKD, atrial fibrillation, and heart failure) [14]. Data extraction was performed based on algorithms used in previous studies [25, 30, 33]. Overweight/obesity diagnosis used records of these terms as a "diagnosis," "reason for encounter," or "reason for prescription," and body mass index data (i.e., ≥25.0 kg/m^2) recorded in the same fields or as a clinical measure in the "observation" field. The AUSDRISK score among patients without recorded diabetes diagnosis was calculated based on six of the 13 recommended variables: age, gender, Aboriginal status, smoking status, the antecedent of high blood glucose (i.e., FBG levels), and the prescription of antihypertensive medications (Supplementary Table 2) [20]. Vegetable or fruit intake, physical activity levels, a family history of diabetes, or waist circumference values were not used to estimate the AUSDRISK score as they are not consistently recorded in MedicineInsight [33]. Data extraction algorithms used in this study are available under request.

2.4. Outcomes and Covariates. The first investigated outcome was the prevalence of recorded diabetes, recorded prediabetes, and unrecorded diabetes/prediabetes, presented as a proportion of "regular" adult patients in the database. The second outcome was the prevalence of recorded diabetes screening (i.e., at least one laboratory result of any blood glucose test recorded between 2016 and 2018) among patients at high risk of diabetes (i.e., patients without a diabetes diagnosis, but with some of the conditions listed above, including prediabetes). Current guidelines recommend that individuals at high risk of diabetes should have their glucose levels checked at least every three years (every 12 months for prediabetes), preferably by testing FBG or HbA1c [14]. Diabetes screening was defined as having at least one recorded blood glucose test result (FBG, HbA1c, random levels, OGTT, or finger-prick test), irrespective of the reported value.

Covariates included patient data (gender (male and female), age (categorised as 18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, and 90+ years), comorbidities, and median number of consultations) and practice data (practice remoteness (major cities, inner regional, or outer regional/remote) and Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD, in quintiles)). IRSAD is a macroeconomic indicator of socioeconomic status based on postcodes and generated by the Australian Bureau of Statistics based on a range of census variables [37]. A higher IRSAD score indicates the practice is located in a more advantaged area. The investigated comorbidities included overweight/obesity, hypertension, dyslipidaemia, CKD, ischaemic heart disease, atrial fibrillation, heart failure, and stroke [14].

2.5. Statistical Analyses. All analyses were conducted in Stata MP 16.1 (StataCorp, Texas, USA), with the practice as a cluster, using robust standard errors and conditioned to the number of visits to the practice. The sociodemographic profile of those with unrecorded prediabetes/diabetes was compared to those with recorded diabetes or recorded prediabetes using Chi-square test. The same procedure was used to compare the prevalence of risk factors (i.e., overweight/obesity, hypertension, dyslipidaemia, and CKD) and coexisting CVD (i.e., ischaemic heart disease, atrial fibrillation, heart failure, and stroke) among those with recorded or unrecorded diabetes/prediabetes. The results were presented graphically with the corresponding 95% confidence intervals (95% CI).

The prevalence of diabetes screening among those at high risk of diabetes was estimated overall (at least one of these risk factors) and for each risk factor. Furthermore, to assess how screening was performed over the lifespan, the prevalence of diabetes screening according to age and gender was presented graphically, separately for those at high-risk (i.e., at least one risk factor) or not at high risk of diabetes. Differences in diabetes screening according to age, gender, and risk status were assessed using Chi-square tests.

This study followed the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement [35]. The independent MedicineInsight Data Governance Committee approved the study (protocol 2016-007). The Human Research Ethics Committee of the University of Adelaide exempted the study of an ethical review as it used only existing and nonidentifiable data.

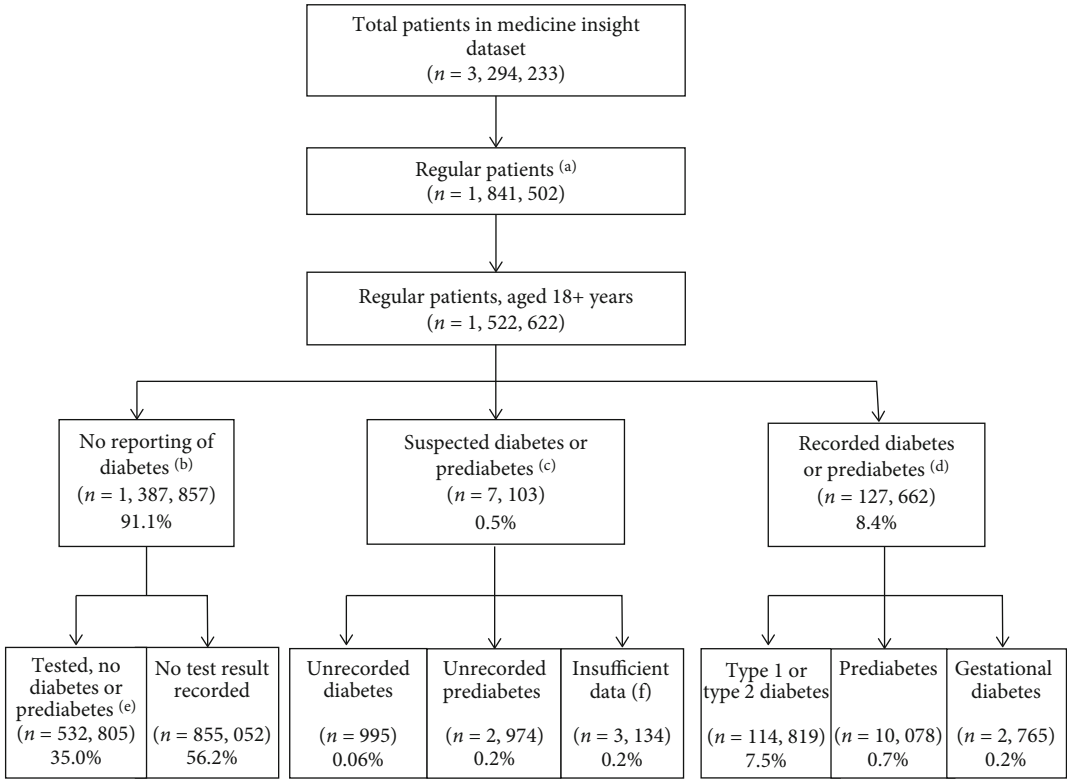


Figure 1: Flowchart of the distribution of patients included in the study, their screening status, and diagnosis of diabetes or prediabetes in Australian general practice. MedicineInsight, 2016-2018. (a) At least three consultations in two consecutive years and at least one in each year. (b) No recording of diabetes, either as a diagnosis, reason for encounter, reason for prescription, or receiving an antidiabetic medication over the three-year period. (c) One or more positive laboratory results for diabetes or prediabetes (details in Supplementary Table 1) but no recorded diagnosis of diabetes or prediabetes or prescription of antidiabetic medication. (d) Diagnosis (diabetes, prediabetes, and gestational diabetes) recorded in at least two different occasions either as a diagnosis, reason for encounter, reason for prescription, or patient was prescribed antidiabetic medication, or the diagnosis was recorded only once but the patient had a positive laboratory result consistent with diabetes or prediabetes. (e) At least one laboratory test recorded, all results negative for diabetes or prediabetes. (f) Only one positive blood test for diabetes or prediabetes recorded, but no recorded diagnosis or prescription for diabetes/prediabetes.

3. Results

The sample included 1,522,622 "regular" patients aged 18+ years (41.9% males, mean age 49.8 ± 19.1 years) attending 544 general practices (Figure 1 and Table 1). The prevalence of recorded diabetes was 7.5% (95% CI 7.3, 7.8), recorded prediabetes 0.7% (95% CI 0.6, 0.7), and unrecorded diabetes/prediabetes 0.3% (95% CI 0.3, 0.3). Supplementary Figures 1 and 2 show the prevalence of these outcomes according to sociodemographic characteristics.

Table 1 shows that the median number of consultations was lower among those with recorded prediabetes than in the other two groups. The mean age of patients with unrecorded diabetes/prediabetes (68.5 ± 13.3 years) was higher than those with recorded diabetes (63.5 ± 15.6 years) or recorded prediabetes (60.3 ± 13.4 years). Still, the distribution according to gender, practice remoteness, and practice IRSAD quintile was similar. Supplementary Table 3 presents further details on these comparisons (i.e., proportions with the corresponding 95% CI).

Figure 2 shows the prevalence of risk factors for CVD (Figure 2(a)) or established CVD (Figure 2(b)) according to diabetes/prediabetes diagnosis status. Overweight/obesity was the most prevalent risk factor, affecting 69.9% of patients with diabetes, 63.8% of those with prediabetes, and 55.5% of those with unrecorded diabetes/prediabetes. Dyslipidaemia was around twice higher (36.2% vs. 19.7%), and hypertension was 15% more likely (38.6% vs. 33.8%) among patients with prediabetes than with diabetes. In contrast, all cardiovascular conditions were less frequent among those with recorded prediabetes. Except for the lower prevalence of overweight/obesity, patients with unrecorded diabetes/prediabetes had a similar clinical profile to those with recorded diabetes.

Table 2 presents the results for diabetes screening among patients with no diabetes diagnosis. The prevalence of diabetes screening was 71% more likely among those with at least one risk factor for diabetes (55.2%, 95% CI 52.7, 57.7) than those not at high risk of diabetes (32.3%, 95% CI 30.5, 34.1). In addition, diabetes screening was slightly higher among those with a higher AUSDRISK score (61.3%), CVD (57.1%), or aged 40+ years and overweight/obese (56.6%). The lowest prevalence of diabetes screening was for those treated with antipsychotic (27.0%) or with prediabetes diagnosis (45.5%).

Table 1: Sociodemographic profile of the study population (regular patients aged 18+ years) according to diabetes diagnosis status (2016-2018).

Characteristics	All patients, aged 18+ years (%)	Recorded diabetes (%)	Recorded prediabetes (%)	Unrecorded diabetes/ prediabetes (%)
Number of consultations in 2018, median (IQR)	3 (2-7)	7 (3-13)[b**]	5 (3-10)[c**]	7 (3-12)
Age, mean ± SD	49.8 ± 19.1	63.5 ± 15.6[b**]	60.3 ± 13.4[c**]	68.5 ± 13.3
Gender: males	41.9	52.2	54.8	53.7
Age group				
18-29	17.9	3.1[b**]	1.5[c**]	0.5
30-39	17.1	5.6[b**]	6.2[c**]	2.8
40-49	16.1	9.7[b**]	13.6[c**]	5.4
50-59	16.0	17.1[b**]	23.8[c**]	14.0
60-69	15.1	25.6[b*]	29.4	27.5
70-79	11.2	24.8[b**]	19.5[c**]	29.6
80-89	5.5	12.4[b**]	5.6[c**]	17.1
90+	1.1	1.7[b**]	0.4[c**]	3.0
Practice remoteness				
Major cities	64.5	60.3	64.5	57.9
Inner regional	23.5	26.2	23.7	27.2
Outer regional/remote	12.0	13.5	11.8	14.9
Practice IRSAD quintile[a]				
Very high	25.3	19.1[b**]	23.0	23.1
High	19.4	17.0	19.3	17.3
Middle	22.8	24.6	23.2	23.1
Low	16.3	18.3	16.2	15.9
Very low	15.5	20.3	17.6	20.1

IQR: interquartile range; SD: standard deviation; IRSAD: Index of Relative Socioeconomic Advantage and Disadvantage. [a]IRSAD had 0.8% of missing data; high quintiles indicate greater advantage, and low quintiles indicate greater disadvantage. [b]P value for the difference between people with recorded diabetes and unrecorded diabetes/prediabetes. [c]P value for the difference between people with recorded prediabetes and unrecorded diabetes/prediabetes. *$P < 0.01$; **$P < 0.001$.

The prevalence of diabetes screening according to gender, age, and presence of risk factors for diabetes is shown in Figure 3. Overall, the prevalence of diabetes screening increased with the age of the patients, but the association with gender varied across age groups. Diabetes screening was less frequent in younger males (18-39 years) than females, with a more pronounced difference among those at high risk of diabetes. However, gender differences were less evident among those aged 40-69 years, whether they were or were not at high risk of diabetes. After that age, diabetes screening was again less frequent in men, showing a decline among those not at high risk of diabetes.

4. Discussion

Five main findings can be highlighted based on our results. First, the prevalence and distribution of diabetes according to age and gender were consistent with national figures. Second, patients with prediabetes showed a higher prevalence of hypertension and dyslipidaemia than those with diabetes. Third, the prevalence of prediabetes diagnosis was lower than expected, but unrecorded diabetes/prediabetes was also infrequent. Fourth, the last finding probably underrepresents actual figures, as 45% of patients at high risk of diabetes were not screened for diabetes over three years. Those treated with antipsychotics had the lowest frequency of diabetes screening. Finally, diabetes screening increased with age and was lower in males. Still, the gender difference lessened among those aged 40-69 years, whether they were or were not at high-risk of diabetes.

According to Australian National Health Survey (NHS), the prevalence of diabetes among adults was 5.1% in 2011-2012 (combining self-reported and laboratory results) and 6.2% in 2017-2018 (self-reported data only) [10, 38]. The lower prevalence observed in the most recent NHS compared to our study (7.5%) may reflect the use of a community-based sample in that survey compared to people seeking medical care in MedicineInsight, as well as the use of self-reported data and misclassification error of those with undiagnosed diabetes [38].

Globally, it is estimated that one in two people living with diabetes does not know he/she has diabetes [3]. However, these proportions are lower in high-income countries. In the US, data from the National Health and Nutrition

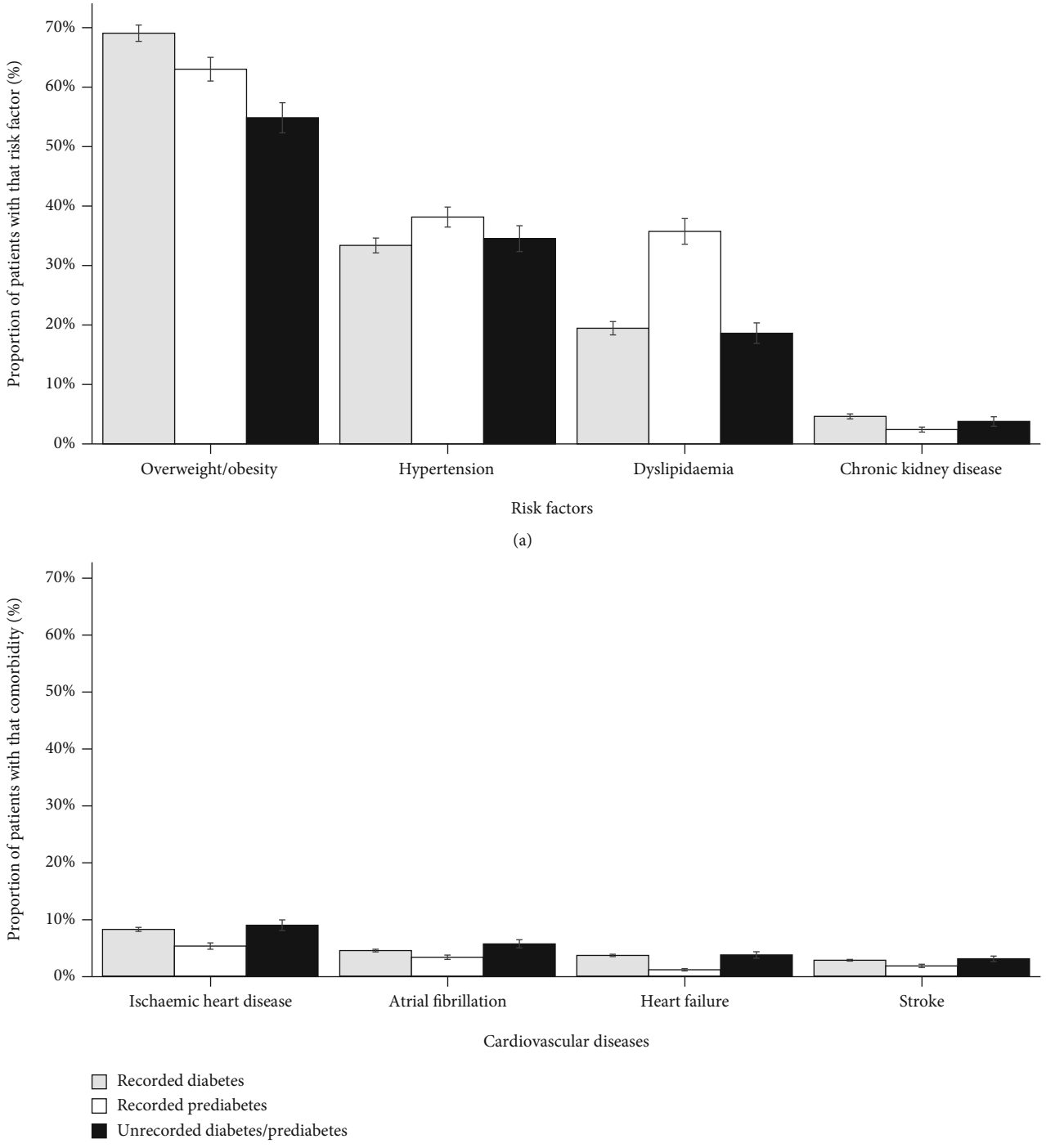


Figure 2: Prevalence of diabetes-related comorbidities ((a) risk factors for cardiovascular disease; (b) cardiovascular disease) among regular patients (aged 18+ years) with recorded diabetes, recorded prediabetes, and unrecorded diabetes/prediabetes (Australia, 2016-2018).

Examination Survey (NHANES, 2011-2014) showed that between 23% and 35% of people with diabetes were undiagnosed (using either FBG/HbA1c or 2-hour plasma glucose tolerance test, respectively) [12]. A French national survey conducted between 2014 and 2016 found that 23% of people living with diabetes were undiagnosed (FPG results), with a prevalence three times higher in males than females [7]. In Australia, data from the NHS in 2011-2012 showed that 18% of adults living with diabetes were undiagnosed (FPG and HbA1c results), increasing the estimated prevalence of diabetes from 4.2% (known diabetes) to 5.1% (total diabetes) [10].

According to our findings, once a patient has tested positive for diabetes or prediabetes, it is more likely their status will be updated in the EHRs (i.e., only 0.26% of adults had unrecorded diabetes/prediabetes). As well as reducing

Table 2: Proportion of diabetes screening[a] according to the presence or not of risk factors for diabetes. Regular patients aged 18+ years (n = 1,407,803).

Risk factor for diabetes	N[a]	Screened for diabetes (2016-2018)		Consultations in 2018 median (IQR)
		n[b]	% (95% CI)	
None of them	999,352	322,302	32.3 (30.5-34.1)	2 (1-5)
At least one risk factor	408,451	225,620	55.2 (52.7-57.7)	5 (2-10)
Aged 40+ years and overweight/obesity	300,939	170,352	56.6 (53.9-59.2)	5 (2-10)
AUSDRISK score ≥ 12	117,406	71,921	61.3 (58.8-63.7)	6 (3-11)
Prediabetes[c]	10,078	4,582	45.5 (42.8-48.2)	5 (3-10)
Cardiovascular disease	40,542	23,142	57.1 (54.4-59.7)	8 (3-14)
History of gestational diabetes mellitus	2,765	1,505	54.4 (49.7-59.1)	4 (2-9)
Polycystic ovary syndrome	6,253	2,885	46.1 (42.9-49.4)	3 (2-7)
Antipsychotics[c]	27,692	7,492	27.0 (25.3-28.8)	8 (4-16)

95% CI: 95% confidence interval; IQR: interquartile range; AUSDRISK: Australian Type 2 Diabetes Risk Assessment Tool. [a]Regular patients aged 18+ years in each subgroup, excluding those with recorded diabetes diagnosis (n = 114,819). [b]Patients with at least one record of any blood glucose test in the last three years (2016-2018). [c]Patients with at least one record of any blood glucose test in the last 12 months (2018).

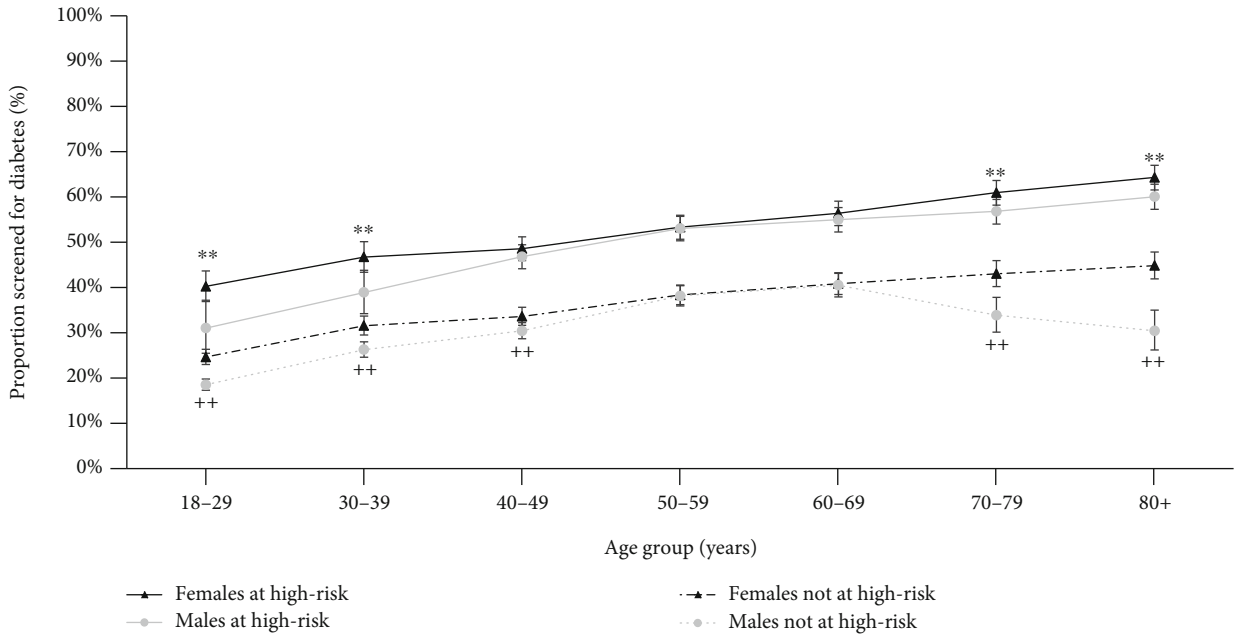


Figure 3: Prevalence of having a record of diabetes screening in males and females according to age and presence or not of risk factors for diabetes. P value for the difference between males and females at high risk: *<0.01 and **<0.001; P value for the difference between males and females not at high risk: $^{+}$<0.01 and $^{++}$<0.001.

misclassification bias due to undiagnosed diabetes, another advantage of studies based on EHRs is that they can help monitor annual changes in the prevalence of diabetes and other chronic conditions [33].

Our results are slightly different from other Australian studies that used medical records. POLAR found 4.9% of adults attending practices in urban Victoria had diabetes in 2016 (recorded diagnosis only) [24]. Still, using GP-reported data, BEACH found 10.4% of adults in Australia had a diagnosis of diabetes (2012-2016) [31]. The discrepancy across studies is probably related to the different methodological approaches used to identify patients with diabetes.

In this regard, analyses based on EHR databases rely on proper data recording and data extraction. In our study, one result that is lower than expected is the prevalence of prediabetes (0.7% compared to 3.1% in the Australian NHS from 2011-2012) [10]. Most Australian general practices use automatic methods to download the laboratory results (Logical Observation Identifiers Names and Codes, values, date, and limits of the results) into the EHRs [32], making data extraction a less likely source of information bias. Nonetheless, four in ten patients at risk of diabetes had no record of a glucose test in the last three years, suggesting the prevalence of prediabetes and undiagnosed diabetes is higher than observed.

Current Australian guidelines recommend regular laboratory diabetes screening only for those at high risk of diabetes [14, 19]. Nonetheless, compliance with these recommendations was suboptimal, as one-half of individuals at increased risk of diabetes were screened for diabetes in three years (one-third among those not at high risk of diabetes). This finding is consistent with results from the NHANES in the US, where 46% of adults at high-risk of diabetes reported diabetes screening, compared to 30% among those for whom screening was not recommended [39]. In a recent South Australian survey including a population-based sample of individuals aged 35+ years, diabetes screening in the last 12 months was reported by 69% of those with cardiometabolic conditions, 75% of those with CVD and 51% of those with none of these conditions [40].

In our study, less than half of patients with prediabetes were screened for diabetes in the last 12 months, which is a concern, as the conversion rate to diabetes among them is 5%-10% per year [9, 14]. Moreover, patients with recorded prediabetes showed a higher prevalence of dyslipidaemia and hypertension than those with diabetes. The last finding is counterintuitive, as we expected a better metabolic profile among patients with prediabetes when compared to those with diabetes, as the former were younger (mean age of 60.3 vs. 63.5 years) and had a lower prevalence of obesity (63.8% vs. 69.9%). Moreover, a national cross-sectional study involving 69,974 middle-aged Chinese people showed the prevalence of dyslipidaemia was higher in patients with type 2 diabetes than with prediabetes (59.3% vs. 46.8%) [41]. It is possible the worst metabolic profile observed among patients with prediabetes resulted from different sources of error, including detection bias (i.e., GPs were more likely to test, diagnose, and/or record hypertension and dyslipidaemia to reduce diabetes progression; hypertension/dyslipidaemia diagnosis leading to the diagnosis of "asymptomatic" prediabetes), survival bias (i.e., patients with diabetes in the database represent "survivor" cases with a better metabolic profile), and/or underdiagnosis of patients with less complicated forms of prediabetes. Therefore, our findings require cautious interpretation, and further longitudinal studies using primary data collection would be necessary to verify these results.

An even lower screening rate was found for patients treated with antipsychotics, at just over a quarter in 2018, which is worrying as antipsychotics have severe effects on blood glucose levels [42]. Tests outside general practice (i.e., hospital or mental health services) are not captured in MedicineInsight, which may explain these lower numbers. However, a large retrospective cohort study in the US using comprehensive data of all performed tests (FBG or HbA1c, either in primary care or mental health services) found that only 30% of nondiabetic patients treated with antipsychotics were screened for diabetes over 12 months [43]. Moreover, that study also reported that patients that had visited a primary care doctor in addition to mental health services were twice more likely to be screened than those who did not. Another possible explanation for the lower screening rates among patients treated with antipsychotics in our study is their younger age (median 50 years and interquartile range 37-67 years) compared to those with other risk factors for diabetes (median 63 years and interquartile range 51-73 years). The lower prevalence of diabetes screening among younger individuals has been reported in other studies [39, 40, 43, 44].

Regardless of being at risk or not of diabetes, screening was lower among males, which is also consistent with previous studies [39, 43]. This finding is likely related to more frequent health-service seeking behaviour in females [45, 46]. Nonetheless, men and women aged 40-69 years showed similar diabetes screening rates, which may reflect the influence of current chronic disease screening programs in midlife (e.g., 45-49 Year Old Health Check program) [14, 47].

This study used a large national database including general practices from all states and geographic regions to provide a comprehensive profile of diabetes diagnosis and screening in Australia. The study design incorporated methodological recommendations from previous studies using large datasets to improve data quality [23, 34, 35].

However, this study is not free of limitations. First, data in MedicineInsight was recorded by GPs as part of their daily clinical activities, which may affect the completeness and accuracy of recorded data. Second, patients who visit multiple general practices or who are not "regular" patients may have had their blood glucose levels tested in other settings (e.g., hospitals or specialists) or not tested at all. This selection bias is an additional limitation that probably contributed to the low prevalence of prediabetes and unrecorded diabetes/prediabetes when compared to national figures. Third, due to ethical issues that restrict the access to fields with potentially identifiable information, it was not possible to get access to the "progress notes" of an appointment, which may contain relevant clinical data. Moreover, the accuracy of the extracted information is another limitation. This limitation is mitigated by data checking: compared to the original EHRs available at the participating practices, data extracted from MedicineInsight had a sensitivity of 89% and specificity of 100% in identifying patients with diabetes [25].

5. Conclusions

MedicineInsight represents a valuable resource for monitoring and providing a comprehensive diabetes diagnosis and diabetes screening profile in Australian general practice, considering that unrecorded diagnosis among those tested is uncommon. However, the rate of diabetes screening among patients at high risk of diabetes can be substantially improved, as these individuals have an average of five encounters per year with their GP. Specific interventions should target diabetes screening among patients with prediabetes and those treated with antipsychotics. National strategies such as the 45-49 Year Old Health Check program [47] seem to have reduced gender disparities for diabetes screening in midlife. Expanding that program to younger and older individuals at high risk of diabetes may be beneficial for improving early diagnosis and reducing further complications, especially in men.

Data Availability

Data used in this study was obtained from a third party (MedicineInsight) for this specific project and cannot be released. Information about MedicineInsight data and how they can be accessed is available on the website (https://www.nps.org.au/medicine-insight). The data extraction algorithms used in this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

Authors' Contributions

MZ and DGC contributed to the conception and design of the study. MZ performed the statistical analysis and prepared the manuscript. COB and DGC assisted in data extraction, analysis, and writing the manuscript. NS contributed to the design and structure of the manuscript. All authors contributed to critically revising the text and provided intellectual contributions to strengthen the manuscript. All authors approved the final version for publication.

Acknowledgments

MZ received a PhD Scholarship from the University of Adelaide to complete this study. We thank NPS MedicineWise for providing the MedicineInsight data for this study. In addition, we are grateful to all general practices and general practitioners that participate in MedicineInsight and the patients who allow the use of their deidentified information. We also thank all colleagues at the Discipline of General Practice for their support, especially Dr. Mumtaz Begum and Dr. Jessica Edwards. We also thank Dr. Peng Hu for his support.

Supplementary Materials

Supplementary 1. Supplementary Table 1: definitions of recorded diabetes, recorded prediabetes, and unrecorded diabetes/prediabetes.

Supplementary 2. Supplementary Table 2: calculation of the Australian Type 2 Diabetes Risk (AUSDRISK) Assessment Tool score using variables available in the MedicineInsight database.

Supplementary 3. Supplementary Table 3: sociodemographic profile of the study population (regular patients aged 18+ years) with 95% CI according to diabetes diagnosis status (2016-2018).

Supplementary 4. Supplementary Figure 1: prevalence of recorded diabetes (A), recorded prediabetes (B), and unrecorded diabetes/prediabetes (C) among all adults aged 18+ years, by age group and gender, Australia, 2016-2018.

Supplementary 5. Supplementary Figure 2: proportion of recorded diabetes, recorded prediabetes, and unrecorded diabetes/prediabetes among regular patients aged 18+ years, by gender (A), age (B), practice remoteness (C), and practice IRSAD (D), Australia, 2016-2018.

References

[1] C. Bommer, V. Sagalova, E. Heesemann et al., "Global economic burden of diabetes in adults: projections from 2015 to 2030," *Diabetes Care*, vol. 41, no. 5, pp. 963–970, 2018.

[2] Australian Institute of Health and Welfare, 2020, https://www.aihw.gov.au/reports/diabetes/diabetes/contents/how-many-australians-have-diabetes.

[3] P. Saeedi, I. Petersohn, P. Salpea et al., "Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas," *Diabetes Research and Clinical Practice*, vol. 157, 2019.

[4] T. M. Dall, W. Y. Yang, K. Gillespie et al., "The economic burden of elevated blood glucose levels in 2017: diagnosed and undiagnosed diabetes, gestational diabetes mellitus, and prediabetes," *Diabetes Care*, vol. 42, no. 9, pp. 1661–1668, 2019.

[5] E. Selvin, D. Wang, A. K. Lee, R. M. Bergenstal, and J. Coresh, "Identifying trends in undiagnosed diabetes in US adults by using a confirmatory definition a cross-sectional study," *Annals of Internal Medicine*, vol. 167, no. 11, pp. 769–776, 2017.

[6] E. W. Gregg, B. L. Cadwell, Y. J. Cheng et al., "Trends in the prevalence and ratio of diagnosed to undiagnosed diabetes according to obesity levels in the U.S," *Diabetes Care*, vol. 27, no. 12, pp. 2806–2812, 2004.

[7] G. Lailler, C. Piffaretti, S. Fuentes et al., "Prevalence of prediabetes and undiagnosed type 2 diabetes in France: results from the national survey ESTEBAN, 2014-2016," *Diabetes Research and Clinical Practice*, vol. 165, article 108252, 2020.

[8] A. G. Tabák, C. Herder, W. Rathmann, E. J. Brunner, and M. Kivimäki, "Prediabetes: a state for diabetes development," *The Lancet*, vol. 379, no. 9833, pp. 2279–2290, 2012.

[9] N. Bansal, "Prediabetes diagnosis and treatment: a review," *World Journal of Diabetes*, vol. 6, no. 2, pp. 296–303, 2015.

[10] Australian Bureau of Statistics, "Australian health survey: biomedical results for chronic diseases. Australian Bureau of Statistics," 2013, https://www.abs.gov.au/statistics/health/health-conditions-and-risks/australian-health-survey-biomedical-results-chronic-diseases/latest-release#data-download.

[11] American Diabetes Association, "Standards of medical care in diabetes," *Diabetes Care*, vol. 28, no. 1, article S4, 2021.

[12] C. C. Cowie, "Diabetes diagnosis and control: missed opportunities to improve health: the 2018 Kelly West Award Lecture," *Diabetes Care*, vol. 42, no. 6, pp. 994–1004, 2019.

[13] M. Shimodaira, S. Okaniwa, N. Hanyu, and T. Nakayama, "Optimal hemoglobin A1c levels for screening of diabetes and prediabetes in the Japanese population," *Journal Diabetes Research*, vol. 2017, pp. 1-2, 2017.

[14] The Royal Australian College of General Practitioners, *Guidelines for Preventive Activities in General Practice*, RACGP, East Melbourne, 9th edition, 2016.

[15] E. Sainsbury, Y. Shi, J. Flack, and S. Colagiuri, *Burden of Diabetes in Australia Its Time for More Action Report*, 2018.

[16] K. Bell, J. E. Shaw, L. Maple-Brown et al., "A position statement on screening and management of prediabetes in adults in primary care in Australia," *Diabetes research and clinical practice*, vol. 164, article 108188, 2020.

[17] The Royal Australian College of General Practitioners, *General practice management of type 2 diabetes 2016-18*, RACGP, East Melbourne, 2016.

[18] T. Dhippayom, N. Chaiyakunapruk, and I. Krass, "How diabetes risk assessment tools are implemented in practice: a systematic review," *Diabetes research and clinical practice*, vol. 104, no. 3, pp. 329–342, 2014.

[19] N. Peer, Y. Balakrishna, and S. Durao, "Screening for type 2 diabetes mellitus," *Cochrane Database of Systematic Reviews*, no. 5, article Cd005266, 2020.

[20] L. Chen, D. J. Magliano, B. Balkau et al., "AUSDRISK: an Australian Type 2 Diabetes Risk Assessment Tool based on demographic, lifestyle and simple anthropometric measures," *Medical Journal of Australia*, vol. 192, no. 4, pp. 197–202, 2010.

[21] Australian Bureau of Statistics, *Patient experiences in Australia: summary of findings*, Australian Bureau of Statistics, 2020, August 2021, https://www.abs.gov.au/statistics/health/health-services/patient-experiences-australia-summary-findings/latest-release.

[22] E. Longato, B. Di Camillo, G. Sparacino, C. Saccavini, A. Avogaro, and G. P. Fadini, "Diabetes diagnosis from administrative claims and estimation of the true prevalence of diabetes among 4.2 million individuals of the Veneto region (North East Italy)," *Nutrition, Metabolism, and Cardiovascular Diseases*, vol. 30, no. 1, pp. 84–91, 2020.

[23] K. Tu, D. Manuel, K. Lam, D. Kavanagh, T. F. Mitiku, and H. Guo, "Diabetics can be identified in an electronic medical record using laboratory tests and prescriptions," *Journal of Clinical Epidemiology*, vol. 64, no. 4, pp. 431–435, 2011.

[24] C. Imai, R. A. Hardie, G. S. Franco et al., "Harnessing the potential of electronic general practice pathology data in Australia: an examination of the quality use of pathology for type 2 diabetes patients," *International Journal of Medical Informatics*, vol. 141, p. 104189, 2020.

[25] A. Havard, J. A. Manski-Nankervis, J. Thistlethwaite et al., "Validity of algorithms for identifying five chronic conditions in MedicineInsight, an Australian national general practice database," *BMC Health Services Research*, vol. 21, no. 1, p. 551, 2021.

[26] J. A. Manski-Nankervis, S. Thuraisingam, J. K. Sluggett et al., "Prescribing of diabetes medications to people with type 2 diabetes and chronic kidney disease: a national cross-sectional study," *BMC Family Practice*, vol. 20, no. 1, p. 29, 2019.

[27] J. E. Manski-Nankervis, S. Thuraisingam, P. Lau et al., "Screening and diagnosis of chronic kidney disease in people with type 2 diabetes attending Australian general practice," *Australian Journal of Primary Health*, vol. 24, no. 3, pp. 280–286, 2018.

[28] C. Bayram, H. Britt, G. Miller, and L. Valenti, "Evidence-Practice Gap in GP Pathology Test Ordering: A Comparison of BEACH Pathology Data and Recommended Testing," *Bettering the Evaluation And Care of Health*, 2009, https://www1.health.gov.au/internet/main/publishing.nsf/Content/9C300FE48F876E95CA257BF0001ACE0E/$File/Evidence-practice%20gap%20in%20GP%20pathology%20test%20ordering.pdf.

[29] J. I. Chiang, J. Furler, F. Mair et al., "Associations between multimorbidity and glycaemia (HbA1c) in people with type 2 diabetes: cross-sectional study in Australian general practice," *BMJ Open*, vol. 10, no. 11, p. e039625, 2020.

[30] J. Roseleur, D. A. Gonzalez-Chica, C. O. Bernardo, B. P. Geisler, J. Karnon, and N. P. Stocks, "Blood pressure control in Australian general practice," *Journal of Hypertension.*, vol. 39, no. 6, pp. 1134–1142, 2021.

[31] C. Harrison, J. Henderson, G. Miller, and H. Britt, "The prevalence of diagnosed chronic conditions and multimorbidity in Australia: a method for estimating population prevalence from general practice patient encounter data," *PLoS One*, vol. 12, no. 3, article e0172935, 2017.

[32] NPS Medicine Wise, *General practice insights report July 2018-June 2019*, NPS Medicine Wise, Sydney, 2020.

[33] D. Busingye, C. Gianacas, A. Pollack et al., "Data resource profile: MedicineInsight, an Australian national primary health care database," *International journal of epidemiology*, vol. 48, p. 1741, 2019.

[34] L. Horsfall, K. Walters, and I. Petersen, "Identifying periods of acceptable computer usage in primary care research databases," *Pharmacoepidemiology and Drug Safety*, vol. 22, no. 1, pp. 64–69, 2013.

[35] E. I. Benchimol, L. Smeeth, A. Guttmann et al., "The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement," *PLoS Medicine*, vol. 12, no. 10, article e1001885, 2015.

[36] The Royal Australian College of General Practitioners, *The RACGP Standards for general practices*, 2015, https://www.racgp.org.au/FSDEDEV/media/documents/Running%20a%20practice/Practice%20standards/4th%20edition/Standards-4th-edtion.pdf.

[37] Australian Bureau of Statistics, *Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia. Cat. No. 2033.0.55.001*, Canberra, 2018August 2021, http://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001.

[38] Australian Bureau of Statistics, *National Health Survey: first results. Presents key findings for health statistics including long-term health conditions; mental wellbeing; and health risk factors. Canberra 2018*August 2021, https://www.abs.gov.au/statistics/health/health-conditions-and-risks/national-health-survey-first-results/latest-release.

[39] M. M. Kiefer, J. B. Silverman, B. A. Young, and K. M. Nelson, "National patterns in diabetes screening: data from the National Health and Nutrition Examination Survey (NHANES) 2005-2012," *Journal of General Internal Medicine*, vol. 30, no. 5, pp. 612–618, 2015.

[40] D. A. Gonzalez-Chica, J. Bowden, C. Miller et al., "Patient-reported GP health assessments rather than individual cardiovascular risk burden are associated with the engagement in lifestyle changes: population-based survey in South Australia," *BMC Family Practice*, vol. 20, no. 1, p. 173, 2019.

[41] Y. R. Li, L. Y. Zhao, D. M. Yu, and G. Ding, "The prevalence and risk factors of dyslipidemia in different diabetic progression stages among middle-aged and elderly populations in China," *PLoS One*, vol. 13, no. 10, p. e0205709, 2018.

[42] Y. Y. Zhang, Y. Y. Liu, Y. Y. Su et al., "The metabolic side effects of 12 antipsychotic drugs used for the treatment of schizophrenia on glucose: a network meta-analysis," *BMC Psychiatry*, vol. 17, no. 1, p. 373, 2017.

[43] C. Mangurian, J. W. Newcomer, E. Vittinghoff et al., "Diabetes screening among underserved adults with severe mental illness who take antipsychotic medications," *JAMA Internal Medicine*, vol. 175, no. 12, pp. 1977–1979, 2015.

[44] M. Greiver, B. Aliarzadeh, R. Moineddin, C. Meaney, and N. Ivers, "Diabetes screening with hemoglobin A1c prior to a

change in guideline recommendations: prevalence and patient characteristics," *BMC Family Practice*, vol. 12, no. 1, 2011.

[45] H. Britt, G. C. Miller, J. Henderson et al., *General Practice Activity in Australia 2015-16*, Sydney University Press, 2016.

[46] O. Yousaf, E. A. Grunfeld, and M. S. Hunter, "A systematic review of the factors associated with delays in medical and psychological help-seeking among men," *Health Psychology Review*, vol. 9, no. 2, pp. 264–276, 2015.

[47] S. Si, J. Moss, J. Karnon, and N. Stocks, "Cost-effectiveness evaluation of the 45-49 year old health check versus usual care in Australian general practice: a modelling study," *PLoS One*, vol. 13, no. 11, article e0207110, 2018.

THE UNIVERSITY OF SYDNEY

General practice activity in Australia

2015–16

Family Medicine Research Centre

GENERAL PRACTICE SERIES **N°40**

General practice activity in Australia 2015–16

Bettering the Evaluation and Care of Health

Helena Britt, Graeme C Miller, Joan Henderson, Clare Bayram, Christopher Harrison, Lisa Valenti, Ying Pan, Janice Charles, Allan J Pollack, Carmen Wong, Julie Gordon

Family Medicine Research Centre
Sydney School of Public Health
The University of Sydney

GENERAL PRACTICE SERIES NUMBER 40
September 2016

SYDNEY UNIVERSITY PRESS

Published 2016 by Sydney University Press
SYDNEY UNIVERSITY PRESS
The University of Sydney Library
sydney.edu.au/sup

Any enquiries about or comments on this publication should be directed to:

Christopher Harrison, Menzies Centre for Health Policy
Sydney School of Public Health, University of Sydney
Email: christopher.harrison@sydney.edu.au or helena.britt@sydney.edu.au
Phone: 0411 197 938

This publication is part of the General practice series based on results from the BEACH program conducted by the Family Medicine Research Centre (FMRC). A complete list of the Centre's publications is available from the FMRC's website <sydney.edu.au/medicine/fmrc/>.

ISSN 1442-3022
ISBN 9781743325131 (print)
ISBN 9781743325148 (online)

Suggested citation
Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L, Pan Y, Charles J, Pollack AJ, Wong C, Gordon J. General practice activity in Australia 2015–16. General practice series no. 40. Sydney: Sydney University Press, 2016.
Available at <purl.library.usyd.edu.au/sup/9781743325131>

Keywords
Australia, delivery of health care/statistics and numerical data, family practice/statistics and numerical data, general practice, health services utilization, healthcare surveys/methods.

Companion publication
Britt H, Miller GC, Bayram C, Henderson J, Valenti L, Harrison C, Pan Y, Charles J, Pollack AJ, Chambers T, Gordon J, Wong C. A decade of Australian general practice activity 2006–07 to 2015–16. General practice series no. 41. Sydney: Sydney University Press, 2016
Available at <purl.library.usyd.edu.au/sup/9781743325155>

Cover design by Miguel Yamin

Printed in Australia

Preface

This report and its companion volume *A decade of Australian general practice activity 2006–07 to 2015–16* are the last annual reports from the Bettering the Evaluation and Care of Health (BEACH) program.

The BEACH program was born in the late 1990s out of the growing perceived need for the development and collection of standardised data on primary medical care encounters in Australia. While sections of the Commonwealth Department of Health (DoH) clearly recognised the need for ongoing up-to-date information about the clinical activities of GPs, the DoH was not willing or able to fund a continuous program in full. However, it did agree to consider a contribution to its costs.

After about 20 years of methods development, largely funded by NHMRC grants, in 1997 the Family Medicine Research Unit (FMRU) in the Department of General Practice at the University of Sydney was ready to launch a continuing data collection program, and approached the Australian Institute of Health and Welfare (AIHW) as a collaborator. This led to the establishment of the General Practice Statistics and Classification Unit (GPSCU), a collaborating unit of the AIHW located within the FMRU at the University of Sydney.

We sought funding from the pharmaceutical industry, and approached a range of other Government Departments and instrumentalities. Sufficient research contracts were established for the GPSCU to start the BEACH program on 1st April 1998 and data collection continued uninterrupted until 30 March 2016. The FMRU became a recognised Centre (FMRC) of the University in 1999.

The BEACH program built on the lessons learned in the Australian Morbidity and Treatment Survey and Country Metropolitan Study conducted by the FMRU in 1990 and on further methods using that data as the basis for modelling the required sample size to represent Australia, developing more specific coding systems for pharmaceutical and clinical treatments, and new analytical tools to deal with the complex relationships between patients, GPs, patient's reasons for encounter, problems managed, and management actions provided by GPs in management of each individual problem.

In BEACH we also added a new concept of patient based sub-studies (called Supplementary Analysis of Nominated Data (SAND) studies) conducted in conjunction with the collection of GP–patient encounter data. BEACH was designed as a continuous ongoing program rather than the 'snapshot' approach used in previous Australian studies and virtually all overseas GP data collection programs.

Over 18 years BEACH has provided an invaluable source of timely data to describe general practice activity and inform improvements in primary health care service provision. BEACH and the associated SAND studies have also provided a rich source of data for analysis by the BEACH research team, frequently in collaboration with other stakeholders and academics across Australia.

The FMRC research outputs include:

- 41 BEACH books, 7 other books and contributions to a further 10 books
- about 178 refereed articles in recognised journals (with 3 in press, 5 under review and more about to be submitted),
- 140 unrefereed articles in recognised journals
- 71 papers in other journals and publications (e.g. 'Bytes from BEACH' FMRC web site, articles in *The Conversation*, etc.)
- 16 theses and treatises (incl. 5 PhDs)
- 223 SAND sub-studies on a wide range of topics (all published as Abstracts)
- hundreds of conference presentations
- over 1000 bespoke reports for stakeholders, researchers, governments and industry.

Funding for BEACH has never been certain throughout the 18 years of the program and the team have lived with annual renewable appointment (dependent on funding availability) throughout. BEACH and the FMRC have now closed due to lack of direct support from the Australian Government and dwindling support from a health industry plagued by a lack of research resources.

The BEACH resource is unique in its ability to inform research, policy and practice and it is of deep concern that there is currently nothing to replace it. Its demise will leave a large gap in our understanding of the care provided by GPs to the community.

The FMRC was not the only casualty of the withdrawal of government support – the Australian Primary Health Care Research Institute and its associated research centres have closed and the Primary Health Care Research and Information Service is on borrowed time. This brings to an end 25 years of high quality general practice research, funding for which was initiated by the recommendations of the Senate Select Committee on vocational registration in 1989 and long supported by the Commonwealth Government.

In this new era, download of data collected by GPs in patient's electronic health records (EHRs) is the flavour of the month. Basic methodological processes developed by the BEACH team – such as standardised coding and classification, and mandatory recorded relationships between problem management and the management actions taken – are being ignored.

'Big data' is seen as the solution – people seem to believe that sheer size overrides the need for data quality. Based on our experience, big data will not be better than 'small data' until standards are applied to the core information in the EHRs, including standardised data elements and data definitions, specified data element relationships (e.g. management actions linked to a problem managed), minimum data sets for 'patient' and 'encounter', standardised classifications and terminologies and a standard definition of what constitutes 'chronic'.[1] Currently, NPS MedicineWise, almost all the Primary Health Networks, multiple university departments, state governments and commercial consulting organisations all collect and analyse data in their own way, and so none of the results can be comparable with the other. This work is being done at massive cost, and yet we have yet to see published reports of findings. We can only conclude that in the foreseeable future, without BEACH there will be very little reliable, independent national information publicly available about GP clinical activity.

The care of accumulated BEACH databases has been transferred within the University of Sydney, to the Menzies Centre for Health Policy, and will continue to be a rich resource of data for research into general practice. Researchers, government, and industry are encouraged to visit the FMRC website for further contact details to request reports from the BEACH data. The website will remain a source of information about a wide range of topics related to general practice in Australia.

Helena Britt BA, PhD
(Then) Director, Family Medicine Research Centre
Professor of Primary Care Research
School of Public Health
University of Sydney

Graeme Miller MB BS, FRACGP, PhD
(Then) A/Professor & Medical Director
Honorary Associate Professor
School of Public Health
University of Sydney

1. Gordon J, Miller G, Britt H. Reality check – reliable national data from general practice EHRs. Deeble Institute Issues Brief No 18. Canberra: Deeble Institute, 2016. Viewed 14 July 2016, https://ahha.asn.au/publication/issue-briefs

Acknowledgments

The BEACH program 2015–16 was conducted by the Family Medicine Research Centre, University of Sydney. The Family Medicine Research Centre thanks the 965 general practitioners who participated in BEACH between April 2015 and March 2016. This report would not have been possible without their valued cooperation and effort in providing the data.

This report was made possible through by a grant from the Deputy Vice-Chancellor (Research) (coordinated by Professor Lyndal Trevena, Co-Head, Discipline of General Practice).

We thank the following organisations for their financial support and their contribution to the development of the BEACH program in 2015–16.

- Australian Government Department of Health
- AstraZeneca Pty Ltd (Australia)
- Novartis Pharmaceuticals Australia Pty Ltd
- Seqirus (Australia) Pty Ltd
- Sanofi-Aventis Australia Pty ltd

Some financial support for the program was also provided by the Australian Government Department of Veterans' Affairs.

We acknowledge the support of the Royal Australian College of General Practitioners, the Australian Medical Association, the contribution of their representatives and those from the Australian Medicare Local Alliance, the Australian College of Rural and Remote Medicine, the National Health Performance Authority, and the Consumers Health Forum, to the BEACH Advisory Board.

We thank Professor Richard Madden, Faculty of Health Sciences, University of Sydney, for his independent review of the report. We thank Clare Bayram for her contribution in editing this report. We recognise the valuable contribution of Timothy Chambers (IT support), Denise Barratt and Gervaise Woods (administrative support), the GP recruitment staff (Jan Fitzgerald, Katherine Shearer, Jacqueline Taylor and Stephen Carnell) and data entry staff (Julia Leahy, Heather Oesterheld, Lachlan Camp, Ryen Sadeque, and Nathan Kelly). We appreciate the cooperation of the Australian Government Department of Health in regularly supplying general practitioner random samples and national Medicare statistics.

Contents

List of tables

List of figures

Summary

This report describes clinical activity at, or associated with, general practitioner (GP) encounters from April 2015 to March 2016 inclusive. It summarises results from the 18th year of the Bettering the Evaluation and Care of Health (BEACH) program, using a nationally representative sample of 96,500 patient encounters with 965 randomly selected GPs, each of whom recorded details of 100 patient encounters. After post-stratification weighting, 97,398 encounters were analysed in this report (see Chapter 2, Methods).

The companion report highlighting major changes over the most recent 10 years of BEACH, *A decade of Australian general practice activity 2006–07 to 2015–16*,[1] is available at <purl.library.usyd.edu.au/sup/9781743325155>.

The general practitioners (Chapters 3 and 4)

Of the 965 participating GPs:

- 55% were male, 45% were aged 55 years and over, 61% had graduated in Australia
- 63% were Fellows of the Royal Australian College of General Practitioners (RACGP), and 7% Fellows of the Australian College of Rural and Remote Medicine (ACRRM)
- 69% practised in major cities
- the average hours per week in direct patient care was 37
- the vast majority (84%) worked in a practice employing practice nurses, and 81% in practices with co-located pathology collection services
- less than half (38%) worked in practices that supplied their own or cooperative after-hours care.

The mean number of Medicare Benefits Schedule (MBS) GP service items claimed by participants over the previous year did not differ from the average for all GPs in the sample frame. The BEACH GP sample had slight over-representation of GPs aged 55 years or over. Statistical weighting was applied to correct this. After weighting, the age–sex distribution of patients at BEACH encounters had an excellent fit (precision ratios 0.87–1.08), with that of patients at all GP services claimed through the MBS.

The encounters (Chapter 5)

The patient was seen by the GP (direct encounters) at 99% of all encounters at which a payment source was recorded: 97% of these were claimable through the MBS or the Department of Veterans' Affairs (DVA), of which 77% were designated standard surgery consultations (Item 23). In a subsample of 32,191 MBS/DVA-claimable encounters at which start and finish times were recorded, the mean length of consultation was 14.9 minutes, and the median was 13.0 minutes.

Clinical content of the GP–patient encounters (Chapters 5 and 8)

Chapter 5 shows that at an average 100 encounters, patients gave 153 reasons for encounter (RFEs), and GPs managed 154 problems, including 53 chronic and 60 new problems.

They prescribed 82 medications, supplied a further 9 and advised purchase of 11 over-the-counter medications. They provided 39 clinical treatments, undertook 18 procedures, made 10 referrals to medical specialists and 6 to allied health services, placed 48 pathology test orders and 11 imaging test orders.

Chapter 8 shows that on average for every 100 problems they managed, GPs provided 53 prescriptions and 25 clinical treatments, undertook 11 procedures, made 6 referrals to medical specialists and 4 to allied health services, and placed 31 pathology test orders and 7 imaging test orders.

At least one management action occurred at 92% of encounters, for 86% of problems managed.

When extrapolated to all MBS-claimed GP consultations:

- at least one medication was prescribed, advised for over-the-counter purchase, or supplied at about 90 million GP–patient encounters in 2015–16
- at least one procedure was undertaken at 23 million encounters
- at least one referral to a specialist, allied health professional, hospital or emergency department was provided by GPs at 21 million encounters nationally
- one or more pathology, imaging or other test was ordered at 37 million encounters.

Who were the patients and why did they see the GP? (Chapter 6)

Female patients accounted for 57% of encounters, and the greater proportion of encounters in all adult age groups. Patients aged less than 25 years accounted for 19% of encounters; those aged 25–44 years for 23%; 45–64 years for 27%; and those aged 65 years and over for 31% of encounters.

- The patient was new to the practice at 7% of encounters.
- Nearly half the encounters were with patients who held a Commonwealth concession card (46%) and/or a Repatriation Health Card (2%).
- One in ten encounters was with a patient from a non-English-speaking background.
- At 2% of encounters the patient identified themselves as an Aboriginal and/or Torres Strait Islander person.

At an average 100 encounters, patients presented 153 RFEs including 64 symptoms/complaints, 28 diagnosed diseases, 24 procedural needs and 16 requests for treatment. At 59% of encounters only one RFE was recorded, at 30% two and at 12% three. The most common RFEs were requests for prescriptions, test results and check-ups.

What problems do GPs manage at patient encounters? (Chapter 7)

There were 150,279 problems managed, an average 154 problems per 100 encounters: one problem was managed at 61% of encounters, two at 26%, three at 9%, and four at 3%. The number of problems increased steadily with patient age from young adulthood.

Two-thirds (65%) of problems were described as diagnoses or diseases, but 19% remained undiagnosed symptoms or complaints, and 10% were labelled procedures (for example, check-ups).

- The most commonly managed were those of a general and unspecified nature (20 per 100 encounters), respiratory (20), musculoskeletal (18), skin (17), and circulatory (15) problems.
- Individual problems most often managed were hypertension (8 per 100 encounters), check-ups (6), upper respiratory tract infection (6), immunisation/vaccination (5) and depression (4).
- At least one chronic problem was managed at 40% of encounters. More than half of all chronic problems managed were accounted for by: non-gestational hypertension (14% of chronic conditions), depressive disorder (8%), non-gestational diabetes (8%), chronic arthritis (7%), lipid disorder (6%), oesophageal disease (5%), and asthma (4%).

Extrapolation of these results suggests that nationally in 2015–16, 11 million encounters involved management of non-gestational hypertension, 6 million involved depression and 6 million involved non-gestational diabetes.

Medications (Chapter 9)

One or more medications were prescribed at 52% of encounters, for 42% of the problems managed. There were 79,871 prescriptions recorded, at rates of 82 per 100 encounters or 53 per 100 problems managed. Extrapolated results suggest GPs prescribed at least one medication at 74 million encounters nationally.

GPs recorded 76% of prescribed medications by brand (proprietary) name and 24% by their generic (non-proprietary) name. For 37% of prescriptions, no repeats were prescribed, and for 36% five repeats were ordered. Ordering one repeat was also quite common (14%).

Medications most often prescribed were those acting on the nervous system (accounting for 24% of all prescribed medications), particularly opioids and antidepressants; anti-infectives for systemic use (18%), including antibiotics and antivirals and medications for the cardiovascular system (18%), particularly anti-hypertensives and lipid lowering agents. However, the 10 individual drugs most frequently prescribed (accounting for 20% of all), included three antibiotics, paracetamol and paracetamol/codeine, oxycodone and three lipid-lowering agents.

GPs supplied 9 medications direct to the patients per 100 encounters, or 6 per 100 problems managed. The most frequently supplied were largely vaccines.

Over-the-counter medication was advised at 9% of encounters, (paracetamol accounting for 28% of these medications), equivalent to an estimated 13 million encounters nationally in 2015–16.

Other treatments (Chapter 10)

The GP provided other treatments at 42% of encounters, for 36% of all problems managed.

Clinical treatments accounted for two-thirds of all other treatments, and were provided at a rate of 39 per 100 encounters, or 25 per 100 problems managed. General advice and education (16% of clinical treatments) and counselling about the problem being managed (13%) were the most common treatments recorded. Preventive counselling/advice about nutrition and weight, exercise, smoking, lifestyle, prevention, and/or alcohol, were together given at a rate of 8 per 100 encounters.

One in five problems was managed with a clinical treatment. Upper respiratory tract infection, depression, diabetes and hypertension represented the largest proportion of problems managed with a clinical treatment.

Procedural treatments were recorded at a rate of 18 per 100 encounters, or 11 per 100 problems managed. Excision (17% of procedural treatments), local injection (14%) and dressing (14%) accounted for almost half of these. One in ten problems were managed with a procedure. Laceration/cut (5%), female genital check-up/Pap smear (5%) and solar keratosis/sunburn (4%) accounted for the largest proportion of problems managed with a procedure.

Referrals and admissions (Chapter 11)

GPs made 16 referrals per 100 encounters, or 10 per 100 problems managed. The most frequent were to medical specialists (10 per 100 encounters, 6 per 100 problems managed), and to allied health services (6 per 100 encounters, 4 per 100 problems managed). Very few patients were referred to hospitals or emergency departments (0.6 per 100 encounters).

Referrals to specialists were most often to orthopaedic surgeons (9% of specialist referrals), dermatologists (8%), surgeons (8%) and cardiologists (8%). Malignant skin neoplasms, osteoarthritis, sleep disturbance and diabetes were the problems most often referred to medical specialists. The five problems most frequently referred to each of 10 medical specialties are described in Chapter 11.

Referrals to allied health services were most often to physiotherapists (29% of allied health referrals), psychologists (22%), podiatrists/chiropodists (12%) and dietitians/nutritionists (9%). Problems most likely to be referred to allied health services were depression, diabetes and back complaint.

Tests and investigations (Chapter 12)

Pathology tests ordered: GPs recorded 48 orders for pathology tests (or batteries of tests) per 100 encounters (31 per 100 problems managed). At least one pathology test was recorded at 18% of encounters, or 14% of problems managed.

- Chemistry tests accounted for 59% of pathology test orders. Lipid tests, electrolytes, urea and creatinine tests, thyroid function tests, and multi-biochemical analysis were the most common (each ordered at a rate of 2 per 100 problems managed).

- Haematology tests accounted for 17% of pathology tests ordered and included full blood count, the most frequently ordered individual test (14% of all pathology).
- Microbiology accounted for 14% of pathology orders; urine microscopy, culture and sensitivity was the most commonly ordered.
- Almost 40% of all pathology tests ordered were generated in the management of 10 problems. The problems generating the highest volumes of testing were diabetes, hypertension, general check-ups, and weakness/tiredness.

Imaging ordered: 11 imaging tests were ordered per 100 encounters, and 7 per 100 problems managed. At least one was ordered at 9% of encounters (for 6% of problems managed). Ultrasound accounted for 44% and diagnostic radiology for 39% of all imaging orders.

Patient risk factors (Chapter 13)

Overweight and obesity in adults (18 years and over): Of 31,662 adults, 63% (70% of males and 59% of females) were overweight (35%) or obese (29%). Estimated prevalence in adults who attended general practice at least once in 2015–16 was 34% overweight and 28% obese.

Overweight and obesity in children (2–17 years): Of 3,077 children, 28% were overweight (18%) or obese (10%). Prevalence pattern by age did not differ between the sexes.

Smoking status (adults 18 years and over): Of 32,664 adults, 13% (16% of males and 12% of females) were daily smokers. For the population attending one or more times, an estimated 16% were daily smokers, 3% occasional, 25% previous smokers and 56% had never smoked.

Alcohol consumption in adults (18 years and over): Of 31,720 adult patients, 23% (27% of males, 20% of females) reported at-risk alcohol consumption. Adjusted data suggested 25% of the attending population are consuming at-risk levels of alcohol.

Adult risk profile (18 years and over): Of the 30,672 patients providing all risk factor data: 25% had none, 54% one and 21% two or three risk factors. Adjusted to the attending population, 24% had no risk factors, 52% had one, 20% two and 4% had all three risk factors.

Care of middle-aged people in general practice (Chapter 14)

This feature chapter explores the care of people aged 45–64 years in general practice between April 2000 and March 2016 using data from the BEACH study and several of its substudies. We examine GP services provided, the content of the encounters, and the prevalence of chronic problems and multimorbidity. We also examine lifestyle risk factors (smoking, alcohol consumption and overweight) for patients in this age group.

By examining this group of patients we may identify areas where interventions delivered now could prevent some of the complex morbidity found in older patients, and potentially improve and enhance their long term health.

Supplementary Analysis of Nominated Data (SAND) substudies (Chapter 15)

Abstracts are provided for each of 13 recent SAND substudies which investigated aspects of the health of subsamples of patients at the encounter that are not captured in the encounter data.

Changes in general practice activity over the decade, 2006–07 to 2015–16

The companion publication *A decade of Australian general practice 2006–07 to 2015–16* reports the results of each of the most recent 10 years of BEACH data and identifies changes in practice over the decade based on almost one million GP–patient encounter records, from 9,721 participating GPs. Estimates of the national effect of changes in activity are made through extrapolation to total Medicare GP consultation items claimed in the first and last year of the decade.

Over the decade, Australia's population rose by 17% and the proportion aged 65 years and over rose by one-third. About 83% of the population claimed one or more GP services from Medicare in 2006–07 and compared with 87% in 2015–16. However, the number of Medicare-claimed GP

consultations grew by 38%, from 103 million to 143 million. The average GP visits per capita rose from 5.0 to 6.0, and for those who saw a GP at least once, from 6.0 to 6.9 visits.

The general practice profession became more feminised, were older, were less likely to be Australian graduates, and worked fewer hours per week. The average length of MBS-claimed consultations increased from 14.1 to 14.9 minutes and the median length from 12 to 13 minutes. Patients aged 65 years or more accounted for an increasing proportion of GPs' workload.

In 2015–16, GPs managed 154 problems per 100 encounters, significantly more than a decade earlier (149). This increase and the increased visit rate has had a huge national effect on the complexity of GP services. When the growth in problems managed is combined with increase in actions per 100 problems managed, even larger national growth occurs. The management rate of chronic conditions did not change over the decade, but there were increases in depressive disorder, hypothyroidism/myxoedema, chronic back pain and unspecified chronic pain. Extrapolation of results to all MBS-claimed GP consultations suggests that nationally, GPs managed 67 million more problems, including 21 million more chronic problems, in 2015–16 than a decade earlier.

The major changes that occurred from 2006–07 to 2015–16 are summarised below.

- Prescribed medications decreased from 56 to 53 per 100 problems. However, due to the increase in problems managed and the higher attendance rate, we estimate 31 million more prescriptions were given in 2015–16 than in 2006–07.
- The rate of GP-supplied medications did not change significantly but supplied childhood vaccines increased.
- Clinical treatments increased (from 20 and 25 per 100 problems managed). Combined with the increase in problems managed and higher attendance rates, this equated to 25 million more clinical treatments given nationally.
- Procedural treatments increased significantly, from 10 to 11 per 100 problems managed, with a national extrapolated effect of about 10 million more procedures in 2015–16.
- The rate of referrals to both medical specialists and allied health services increased. These results suggest 5 million more referrals were made to medical specialists and 5 million more to allied health.
- Orders for pathology tests/test batteries increased by 8%, from 29 to 31 per 100 problems, with a national extrapolated effect of about 24 million more tests/batteries ordered by GPs in 2015–16.
- Orders for imaging tests increased significantly from 6 to 7 per 100 problems managed, suggesting 6 million more tests were ordered nationally in 2015–16 than in 2006–07.

Patient risk factor data are presented in the companion report for each year from 2007–08 to 2015–16. Prevalence of obesity, smoking and alcohol consumption among the adult patient population who attended general practice at least once in each year showed:

- obesity increased from 23% to 28%
- daily smoking decreased from 19% to 16%
- at-risk alcoholic consumption decreased from 29% to 25%.

1 Introduction

This is the 18th annual report and the 40th book in the General practice series from the BEACH (Bettering the Evaluation and Care of Health) program, a continuous national study of general practice activity in Australia. It provides the annual results for the period April 2015 to March 2016 inclusive, using details of 965,000 encounters between general practitioners (GPs) and patients from a random sample of 965 practising GPs across the country.

Released in parallel with this report is a summary of results from the most recent 10 years of the BEACH program, *A decade of Australian general practice activity 2006–07 to 2015–16*,[1] available at <purl.library.usyd.edu.au/sup/9781743325155>. The major changes that occurred over the decade are summarised at the end of each chapter of this annual report.

BEACH began in April 1998 and closed in June 2016 after 18 years of continuous data collection. BEACH was supported financially by government and private industry (see Acknowledgments).

BEACH was a continuous national study in which ever-changing random samples of about 1,000 individual general practitioners (GPs) participated each year. Each participating GP recorded details of 100 consecutive GP–patient encounters with consenting patients.

BEACH was the only study of its kind in the world, and the only national program that provides direct linkage of management actions (such as prescriptions, referrals, investigations) to the problem under management. The BEACH database now includes information for almost 1.8 million encounters from 17,707 participating GPs representing 10,789 individual GPs. Researchers and the public can continue to access reports from the BEACH data set (see Section 1.4). A discussion of principles for consideration in future general practice data collection is included in the Preface of this report.

1.1 Background

General practitioners (GPs) are usually the first port of call in the Australian healthcare system, generally receiving payment on a fee-for-service basis. There are no formal patient lists or registration. People are free to see multiple practitioners and visit multiple practices of their choice. A universal medical insurance scheme (managed by Medicare Australia) covers all, or part of a person's costs for a GP visit.

From June 2006 to June 2015, the population of Australia rose by 17%, from 20.6 million to 24.1 million.[2] At least one GP consultation was claimed from Medicare by 82.7% of the population in 2006–07[3] and this increased to 86.9% in 2015–16 (personal communication, Australian Government Department of Health [DoH], May 2016). The number of Medicare-claimed GP consultation items (total non-referred attendances excluding practice nurse items) grew by 38% from 103.4 million to 143.0 million.[3,4] This equates to about 760,000 more Medicare-claimable GP consultations provided nationally per week than a decade earlier.

In 2006–07, the average number of GP visits per capita was 5.0, and those who visited at least once claimed an average 6.0 visits.[3] For the 2015–16 BEACH year, the average number of GP visits per capita was 6.0 or 6.9 visits per person who visited at least once (personal communication, Australian Government DoH, May 2016).

Australia's health expenditure in 2013–14 was $154.6 billion, $6,639 per capita, and accounted for 9.8% of gross domestic product (GDP). Governments funded 60.8% of the total, with the remainder (39.2%) paid by the non-government sector and by individuals.[5] In the 2015–16 financial year, government expenditure on general practice services (total non-referred attendances including GP/vocationally recognised GP, Enhanced Primary Care, other, and practice nurse items) was almost $6.8 billion.[3]

According to reports from the Australian Institute of Health and Welfare (AIHW), in Australia in 2014 there were 26,885 medical practitioners self-identifying as GPs, making up 110.6 full-time equivalents (FTE, based on a 40-hour week) per 100,000 population.[6] In contrast, general practice workforce statistics from DoH indicate that in 2013–14 there were 32,401 GPs (defined as GPs or Other Medical Practitioners who provided at least one Medicare-claimed GP service during that year), making up 19,365 FTE.[7]

While Medicare statistics provide information about frequency and cost of visits claimed from Medicare for GP service items, they cannot tell us about the content of these visits. The BEACH program has filled this gap by providing an understanding of this content.

1.2 The BEACH program

In summary, the BEACH program was a continuous national study of general practice activity in Australia. Each year, an ever-changing random sample of about 1,000 practising GPs participated, each recording details of 100 patient encounters on structured paper-based recording sheets (Appendix 1). This provided details of about 100,000 GP–patient encounters per year. The GPs also provided information about themselves and their major practice (Appendix 2). The BEACH methods are described in Chapter 2 of this report.

Aims

The three main aims of the BEACH program were to:

- provide a reliable and valid data collection process for general practice that is responsive to the ever-changing needs of information users, and provides insight into the evolving character of GP–patient encounters in Australia
- provide an ongoing database of GP–patient encounter information
- assess patient risk factors and health states, and the relationship these factors have with health service activity.

Current status of BEACH

BEACH began in April 1998 and closed in 2016 at the end of its 18th year. The BEACH database now includes records for almost 1.8 million GP–patient encounters from 17,707 participating GPs.
Each year we have published an annual report of BEACH results collected in the previous 12 months. This year's publication reports results from April 2015 to March 2016. The companion publication *A decade of Australian general practice activity 2006–07 to 2015–16*[1] provides summaries of the changes observed in general practice over the most recent decade.

The strengths of the BEACH program

- BEACH was the only national study of general practice activity in the world that was continuous, relying on a random ever-changing sample of GPs. The ever-changing nature of the sample (where each GP can participate only once per triennium) ensured reliable representation of what was happening in general practice across the country.
- The sheer size of the GP sample (1,000 per year) and the relatively small cluster of encounters around each GP, provided more reliable estimates than a smaller number of GPs with large clusters of patients and/or encounters.[8] Our access to a regular random sample of recognised GPs in active practice, through DoH, ensured that the GP sample was drawn from a very reliable sample frame of currently active GPs.

- The sampling methods ensured that new entrants to the profession were available for selection because the sample frame was based on the most recent Medicare data. Where data collection programs use a fixed set of GPs over a long period, measuring what that group is doing at any one time or how that group has changed over time, there may well be a 'training effect' inherent in longer-term participation. Such measures cannot be generalised to the whole of general practice. Further, where GPs in the group have a particular characteristic in common (for example, all belong to a professional organisation to which not all GPs belong; all use a selected software system which is not used by all GPs), the group is biased and cannot represent all GPs.
- We have sufficient details about the characteristics of all GPs in the sample frame to test the representativeness of the final BEACH GP sample, and to apply post-stratification weighting to correct for any under-representation or over-representation in the sample when compared with the sample frame.
- Each GP recorded for a set number of encounters (100), but there is wide variance among them in the number of patient consultations they conduct in any one year. DoH therefore provided an individual count of activity level (that is, number of Medicare GP service items claimed in the previous period) for all randomly sampled GPs, allowing us to give a weighting to each GP's set of encounters commensurate with his or her contribution to total general practice encounters. This ensured that the final encounters represent encounters with all GPs.
- BEACH included all patient encounters and management activities provided at these encounters, not just those encounters and activities funded by Medicare.
- The structured paper encounter form leads the GP through each step in the encounter, encouraging entry of data for each element (see Appendix 1), with instructions and an example of a completed form. The structure itself forces linkage of actions to the problem being managed. In contrast, systems such as electronic health records rely on the GP to complete fields of interest without guidance.
- BEACH was the only continuous national study in the world in which management actions at encounter are directly linked by the GP to the problems under management. This provided a measure of the 'quality' of care rather than just a count of the number of times an action occurred (for example, how often a specific drug was prescribed).
- The medication data include all prescriptions, rather than being limited to only those prescribed medications covered by the Pharmaceutical Benefits Scheme (PBS). BEACH is the only source of information on medications supplied directly to the patient by the GP, about the medications GPs advised for over-the-counter (OTC) purchase, the patients to whom they provide such advice and the problems managed in this way.
- The inclusion of other (non-pharmacological) treatments such as clinical counselling and procedural treatments, provides provide a broader view of the interventions used by GPs in the care of their patients than other data sources.
- The use of an internationally standard well-structured classification system (ICPC-2)[9] designed specifically for general practice, together with the use of a clinical interface terminology, facilitates reliable classification of the data by trained secondary coders, and removes the guesswork often applied in word searches of available records (in free text format) and in classification of a concept.
- The use of the World Health Organization's (WHO) Anatomical Therapeutic Chemical (ATC) classification for pharmaceuticals at the generic level ensures reporting of medications data are in accordance with the international standard.
- The analytical techniques applied to the BEACH data ensure that the clustering inherent in the sampling methods is dealt with. Results are reported with 95% confidence intervals. Users are therefore aware of the level of reliability of any estimate.
- Reliability of the methods has been demonstrated by the consistency of results over time where change is not expected, and by the measurement of change when it might be expected.

1.3 Using BEACH data with other national data

Users of the BEACH data might wish to integrate information from multiple national data sources to gain a more comprehensive picture of the health and health care of the Australian community. It is therefore important that readers are aware of how the BEACH data differ from those drawn from other sources. This section summarises differences between BEACH and other national sources of data about general practice in Australia.

The Pharmaceutical Benefits Scheme

Prescribed medications, for which a PBS subsidy has been paid when they are dispensed, are recorded by Medicare Australia.

The PBS data:

- count the prescription each time it crosses the pharmacist's counter (so that one GP prescription written with five repeats in BEACH would be counted by the PBS six times if the patient filled all repeats)
- count only prescribed medications that cost:
  - more than the minimum PBS subsidy for those holding a Commonwealth concession card and/or who have reached the safety net threshold
  - more than the PBS threshold (which is far higher) for non-concession card holders
- will change with each change in the PBS co-payment level for non-Commonwealth concession cardholders – when the co-payment level increases, those medications that then fall under the new level will no longer be counted in the PBS for non-Commonwealth concession cardholders[10]
- hold no record of the problem being managed (with the exception of authority prescriptions, which require an indication and account for a small proportion of PBS data). Morbidity cannot be reliably assumed on the basis of medication prescribed.[11,12]

In BEACH:

- total medications include those prescribed (whether covered by the PBS or not), those supplied to the patient directly by the GP, and those advised for OTC purchase
- each prescription recorded reflects the GP's intent that the patient receives the prescribed medication, and the specified number of repeats; the prescription, irrespective of the number of repeats ordered, is counted only once
- the medication is directly linked to the problem being managed by the GP
- there is no information on the number of patients who do not present their prescription to be filled (this also applies to the PBS).

These differences have a major impact on the numbers of prescriptions counted and also affect their distribution. For example, the majority of broad spectrum antibiotics, such as amoxycillin, fall under the non-concessional card holders' minimum subsidy level and would not be counted in the PBS data. The PBS data only include those filled under the PBS by a Commonwealth concession card holder or by people who had reached the annual safety net threshold.[10]

Medicare Benefits Schedule

Pathology data from the MBS

Pathology tests undertaken by pathologists that are charged to Medicare are recorded by Medicare Australia. However, these Medicare data are not comparable with BEACH data.

- MBS pathology data reflect pathology orders made by GPs and other medical specialists. About 70% of the volume of MBS pathology claims are for pathology ordered by GPs.[13]
- Each pathology company can respond differently to a specific test order label recorded by the GP. For example, the tests completed by a pathologist in response to a GP order for a full blood count, may differ between companies.
- The pathology companies can charge through the MBS only for the three most expensive items undertaken, even when more were actually done. This is called 'coning' and is part of the DoH pathology payment system. This means that the tests recorded in the MBS include only those charged for, not all those that were done. Coning applies only to GP pathology orders, not to those generated by other medical specialists.
- Pathology MBS items contain pathology tests that have been grouped on the basis of cost (for example, 'any two of the following … tests'). Therefore, an MBS item often does not give a clear picture of the precise tests performed.
- This means that the MBS data reflect those tests billed to the MBS after interpretation of the order by the pathologist, and after selection of the three most expensive MBS items.

In BEACH, the pathology data:

- include details of pathology tests ordered by the participating GPs; however, each GP was limited to recording five tests or batteries of tests at each encounter. The number of tests/batteries ordered on any single occasion has been increasing.[14] However, this measure is likely to be an underestimate because no more than five tests/batteries can be recorded per encounter in BEACH.
- reflect the terms used by GPs in their orders to pathologists, which for reporting purposes have been grouped by the MBS pathology groups for comparability.

The distributions of the two data sets will therefore differ, reflecting on the one hand the GP order, and on the other the MBS-billed services from the pathologist.

Pathology ordering by GPs is described in Chapter 12 of this report. Those interested in pathology test ordering by GPs should also view the following publications:

- *Evaluation of pathology ordering by general practitioners in Australia* (Doctoral thesis).[15]
- *Are rates of pathology test ordering higher in general practices co-located with pathology collection centres?*[16] This publication investigated the independent effect of general practice co-location with pathology collection centres on GP pathology test ordering in Sydney and Melbourne metropolitan areas.
- *Evidence-practice gap in GP pathology test ordering: a comparison of BEACH pathology data and recommended testing*.[17]

Imaging data from the MBS

Some of the issues discussed regarding pathology data also apply to imaging data. Although coning is not an issue for imaging, radiologists can decide whether the test ordered by the GP is the most suitable and whether to undertake other or additional tests of their choosing. The MBS data therefore reflect the tests that are actually undertaken by the radiologist, whereas the BEACH data reflect those ordered by the GP. Those interested in GP ordering of imaging tests should also see *Evaluation of imaging ordering by general practitioners in Australia.*[18]

The Australian Health Survey

The 2011–13 Australian Health Survey, conducted by the Australian Bureau of Statistics (ABS), includes the National Health Survey, the National Nutrition and Physical Activity Survey and the National Health Measures Survey. The National Health Survey provides estimates of population prevalence of some diseases, and a measure of the problems taken to the GP by people in the two weeks before they were surveyed. The National Health Measures Survey includes biomedical measures related to chronic disease and nutritional biomarkers.[19]

- Prevalence estimates from the National Health Survey are based on self-reported morbidity from a representative sample of the Australian population, using a structured interview to elicit health-related information from participants. Prevalence estimates from the National Health Measures Survey are based on biomedical measures of diagnosed and undiagnosed disease.
- The National Health Survey has the advantage of accessing people who do not go to a GP as well as those who do. They can, therefore, provide an estimate of population prevalence of disease and a point estimate of incidence of disease. However, self-report has been demonstrated to be susceptible to misclassification because of a lack of clinical corroboration of diagnoses.[20]
- Prevalence estimates based on biomedical measures have the advantage of measuring diagnosed and undiagnosed disease.

Management rates of health problems in general practice represent GP workload for a health problem. BEACH can be used to estimate the period incidence of diagnosed disease presenting in general practice through the number of new cases of that disease. The management rates of individual health problems and management actions can be extrapolated to national management rates.

The general practice patient population sits between the more clinical hospital-based population and the general population, with 86.9% of Australians visiting a GP at least once in in 2015–16 (personal communication, Australian Government DoH, May 2016]). Disease management rates are a product of both the prevalence of the disease/health problem in the population and the frequency with which patients visit GPs for the treatment of that problem. Those who are older and/or have more chronic disease are, therefore, likely to visit more often, and have a greater chance of being sampled in the encounter data.

Prevalence of selected diseases among the patient population seen at least once in general practice can be investigated using the Supplementary Analysis of Nominated Data method (see Section 2.6). Those interested in the prevalence of disease and multimorbidity should refer to the following papers: *Estimating prevalence of common chronic morbidities in Australia*,[21] *Prevalence and patterns of multimorbidity in Australia*,[22] *Prevalence of chronic conditions in Australia*,[23] *Examining different measures of multimorbidity, using a large prospective cross-sectional study in Australian general practice,*[24] and *The prevalence of complex multimorbidity in Australia*.[25]

1.4 Access to BEACH data

Public domain

This annual publication provides a comprehensive view of general practice activity in Australia. The BEACH program has generated many papers on a wide variety of topics in journals and professional magazines. All published material from BEACH is available at <sydney.edu.au/medicine/fmrc/publications>.

Throughout the 18 years of the program, a section at the bottom of each encounter form has been used to investigate aspects of patient health or healthcare delivery not covered by general practice consultation-based information. These substudies are referred to as SAND (Supplementary Analysis of Nominated Data). The SAND methods are described in Section 2.6. Abstracts of results and the

research tools used in all SAND substudies from April 1998 to March 2016 have been published. Those from:

- April 1998 to March 1999 were published in *Measures of health and health care delivery in general practice in Australia*[26]
- April 1999 to July 2006 were published in *Patient-based substudies from BEACH: abstracts and research tools 1999–2006*[27]
- August 2006 to March 2015 were published in each of the BEACH annual reports[28-36]
- April 2015 to March 2016 are included in Chapter 15 of this report.

Abstracts of results for all SAND substudies are also available on the Family Medicine Research Centre's (FMRC) website <sydney.edu.au/medicine/fmrc/publications/sand-abstracts> where you can search by topic.

Purchasing reports

Following closure of the BEACH program, individuals and organisations will continue to be able to purchase standard reports or other ad hoc analyses. Charges are outlined at <sydney.edu.au/medicine/fmrc/beach/data-reports/for-purchase>. Contact details are provided at the front of this publication.

Analysis of the BEACH data is a complex task. The FMRC designed standard reports that cover most aspects of a subject under investigation. Examples of a problem-based standard report, a group report and a pharmacological-based standard report for a single year's data, are available at <sydney.edu.au/medicine/fmrc/beach/data-reports/for-purchase>. Customised data analyses can be done where the specific research question is not adequately answered through standard reports.

2 Methods

In summary:

- each year, BEACH involved a new random sample of about 1,000 GPs
- each GP recorded details of about 100 doctor–patient encounters of all types
- the GP sample was a rolling (ever-changing) sample, with about 20 GPs participating in any one week, 50 weeks a year (with two weeks break over Christmas)
- each GP could be selected only once per Quality Improvement & Continuing Professional Development (QI & CPD) Program triennium (that is, once in each 3-year period)
- the encounter information was recorded by the GPs on structured paper encounter forms (Appendix 1)
- GP participants also completed a questionnaire about themselves and their practice (Appendix 2).

2.1 Sampling methods

The source population included all vocationally registered GPs and all general practice registrars who claimed a minimum of 375 Medicare general practice items of service in the most recently available 3-month Medicare data period (which equates to 1,500 such claims in a year). This ensured inclusion of the majority of part-time GPs, while excluding those who are not in private practice but claim for a few consultations a year.

The Medicare statistics section of the Department of Health (DoH) updated the sample frame quarterly from the Medicare claims data. They then removed from the sample frame any GPs already randomly sampled in the current triennium, and drew a new sample from those remaining in the sample frame. This ensured the timely addition of new entries to the profession, and timely exclusion of those GPs who have stopped practising, have already participated or been approached in the current triennium.

2.2 Recruitment methods

The randomly selected GPs were approached by letter, posted to the address provided by DoH.

- Over the following 10 days, the telephone numbers generated from the Medicare data were checked using the electronic white and yellow pages. This was necessary because many of the telephone numbers provided from the Medicare data were incorrect.
- The GPs were then telephoned in the order they were approached and, referring to the approach letter, asked whether they will participate.
- This initial telephone contact with the practice often indicated that the selected GP had moved elsewhere, but was still in practice. Where a new address and/or telephone number could be obtained, these GPs were followed up at their new address.
- GPs who agreed to participate were set an agreed recording date several weeks ahead.
- A research pack was sent to each participant before the planned start date.
- Each GP received a telephone reminder early in the agreed recording period – this also provided the GP with an opportunity to ask questions about the recording process.
- GPs could use a ‘freecall’ (1800) number to ring the research team with any questions during their recording period.
- Non-returns were followed up by regular telephone calls for 3 months.

- Participating GPs earned clinical audit points towards their QI & CPD requirements through the Royal Australian College of General Practitioners (RACGP) and/or the Australian College of Rural and Remote Medicine (ACRRM). As part of this QI process, each GP received an analysis of his or her results compared with those of nine other de-identified GPs who recorded at about the same time. Comparisons with the national average and with targets relating to the National Health Priority Areas were also provided. In addition, GPs received some educational material related to the identification and management of patients who smoke or consume alcohol at hazardous levels. Additional points could be earned if the participant chose to do a follow-up audit of smoking and alcohol consumption among a sample of patients about 6 months later.

2.3 Ethics approval and informed patient consent

Ethics approval for this study in 2015–16 was obtained from the Human Ethics Committee of the University of Sydney.

Although the data collected by the GPs were not sufficient to identify an individual patient, informed consent for GP recording of the encounter details was required from each patient. GPs were instructed to ensure that all patients who presented during their recording period were provided with a Patient Information Card (Appendix 3), and asked if they were happy for their data to be included in the study. If the patient refused, details of the encounter were not recorded. This is in accordance with the ethics requirements for the BEACH program.

2.4 Data elements

BEACH includes three interrelated data collections: GP characteristics, encounter data and patient health status. An example of the form used to collect the encounter data and the data on patient health status is included in Appendix 1. The GP characteristics questionnaire is provided in Appendix 2. The GP characteristics and encounter data collected are summarised below. Patient health status data are described in Section 2.6.

GP profile form (Appendix 2)

- **GP characteristics:** age and sex, years in general practice, number of direct patient care hours worked per week, country of graduation, general practice registrar status, Fellow of the RACGP status, Fellow of the ACRRM status, use of computers at work for clinical purposes, work undertaken in other clinical settings, number of practice locations worked in a regular week.
- **Practice characteristics:** postcode of major practice, number of individual and number of full-time equivalent (FTE) GPs working in the practice, number of individual and number of FTE practice nurses working in the practice, usual after-hours care arrangements, other health services located at the major practice.

Encounter recording form (Appendix 1)

- **Encounter data:** date of consultation, type of consultation (direct/indirect) (tick box options), up to three Medicare Benefits Schedule (MBS)/Department of Veterans' Affairs (DVA) item numbers (where applicable), and other payment source (where applicable) (tick box options).
- **Patient data:** date of birth, sex and postcode of residence. Tick boxes (yes/no options) were provided for Commonwealth concession card holders, holders of a Repatriation Health Card (from DVA), non-English-speaking background (patient self-reported that a language other than English is the primary language at home), Aboriginal person (self-identification), and Torres Strait Islander person (self-identification). Space is provided for up to three patient reasons for encounter (RFEs) (see Glossary).

- The **problems managed** at encounter (at least one and up to four). Tick boxes were provided to denote the status of each problem as new or continuing for the patient.
- **Management of each problem**, including:
  - medications prescribed, supplied by the GP and advised for over-the-counter (OTC) purchase including brand name, form (where required), strength, regimen, status (new or continuing medication for this problem), number of repeats
  - other treatments provided for each problem, including counselling, advice and education, and procedures undertaken, and whether the recorded other treatment was provided by a practice nurse (tick box)
  - new referrals to medical specialists, allied health services, emergency departments, and hospital admissions
  - investigations, including pathology tests, imaging, and other investigations ordered.

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 the encounter, the GP and the patient characteristics
- all types of management are directly related to the problem being managed
- RFEs have only an indirect relationship with problems managed, as a patient may have described one RFE (such as ‘repeat prescriptions’) that relates to multiple problems managed, or several RFEs (such as ‘runny nose’ and ‘cough’) that relate to a single problem managed (such as upper respiratory tract infection) (see Section 6.3).

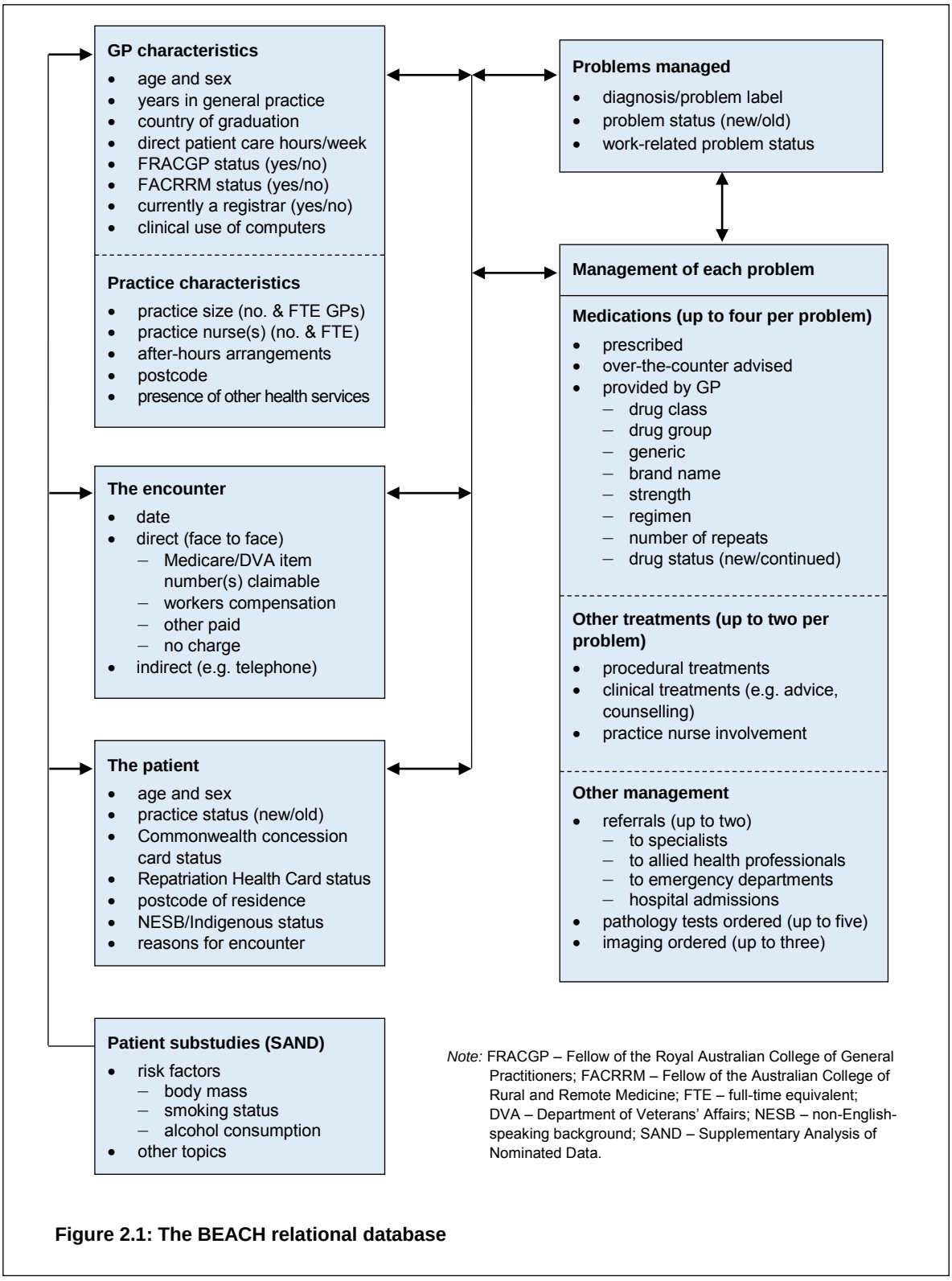


Figure 2.1: The BEACH relational database

2.6 Supplementary Analysis of Nominated Data

A section at the bottom of each recording form investigated aspects of patient health or health care delivery in general practice not covered by the consultation-based data. These additional substudies are referred to as SAND, Supplementary Analysis of Nominated Data.

- Each year, the 12-month data period was divided into 10 blocks, each of 5 weeks, with three substudies per block. The research team aimed to include data from about 100 GPs in each block.
- Each GP's pack of 100 forms included 40 forms that ask for the start and finish times of the encounter, and included questions about patient risk factors: patient height and weight (used to calculate body mass index, BMI), alcohol intake and smoking status (patient self-report). The methods and results of topics in the SAND substudies for alcohol consumption, smoking status and BMI are reported in Chapter 13. The start and finish times collected for these encounters are used to calculate length of consultation. The length of consultation for Medicare-claimable encounters is reported in Section 5.3.
- The remaining 60 forms in each pack were divided into two blocks of 30, so each of these other SAND studies includes about 3,000 records (30 x 100 GPs). Different questions were asked of the patient in each block and these varied throughout the year. Some topics were repeated to increase sample size.
- The order of SAND sections was rotated in the GP recording pack, so that 40 patient risk factor forms may appear first, second or third in the pad. Rotation of ordering ensures there was no order effect on the quality of the information collected.

Abstracts of results and the research tools used in all SAND substudies from April 1998 to March 2016 have been published. Those:

- from April 1998 to March 1999 were published in *Measures of health and health care delivery in general practice in Australia*[26]
- from April 1999 to July 2006 were published in *Patient-based substudies from BEACH: abstracts and research tools 1999–2006*[27]
- conducted between August 2006 and March 2015 have been published in each of the general practice activity annual reports[28-36]
- conducted in the 2015–16 BEACH year are provided in Chapter 15 of this publication.

Abstracts of results for all SAND substudies are also available on the FMRC's website <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

2.7 Statistical methods

The analysis of the 2015–16 BEACH data was conducted with Statistical Analysis System (SAS) version 9.3,[37] and the encounter is the primary unit of inference. Proportions are used only when describing the distribution of an event that can arise only once at a consultation (for example, patient or GP age and sex), or to describe the distribution of events within a class of events (for example, problem A as a percentage of total problems). Due to rounding, proportions may not always add to exactly 100%.

Calculations are made in SAS using the precise data with multiple decimal points. Therefore, if a reader recalculates the result from the reported rounded numbers presented in tables, their result may differ from that presented by 0.1.

Rates per 100 encounters are used when an event can occur more than once at the consultation (for example, RFEs, problems managed or medications).

Rates per 100 problems are also used when a management event can occur more than once per problem managed. In general, the results present the number of observations (*n*), the rate per 100 encounters, and (in the case of management actions) the rate per 100 problems managed, and the 95% confidence interval.

BEACH is a single stage cluster sample study design, each 100 encounters forming a cluster around each GP participant. In cluster samples, variance needs to be adjusted to account for the correlation between observations within clusters. Procedures in SAS version 9.3 were used to calculate intracluster correlation, and adjust the confidence intervals accordingly.[37]

Post-stratification weighting of encounter data adjusts for: any difference in the age–sex distribution of the participating GPs and those GPs in the sample frame from which the samples were drawn; and for the varying activity level of each GP (measured by the number of claims each has made in the previous 12 months from Medicare Australia) (see Chapter 3).

Statistical significance is tested by chi-square statistic for GP characteristics. However, where changes over time are investigated in the companion report, the significance of differences in rates is judged by non-overlapping confidence intervals (CIs) of the results being compared. The magnitude of this difference can be described as at least $p < 0.05$. Assessment using non-overlapping confidence intervals is a conservative measure of significance,[38-40] particularly when differences are assessed by comparing results from independent random samples, as is the case when changes over time are investigated using BEACH data. Due to the number of comparisons made, we believe this conservative approach is warranted.

2.8 Classification of data

The following data elements are classified according to the International Classification of Primary Care – Version 2 (ICPC-2), of the World Organization of Family Doctors (Wonca):[9]

- patient reasons for encounter (RFEs)
- problems managed
- clinical treatments (for example, counselling, advice)
- procedural treatments
- referrals
- investigations ordered (including pathology, imaging and other investigations).

The ICPC-2 is used in more than 45 countries as the standard for data classification in primary care. It is accepted by the WHO in the WHO Family of International Classifications,[41] and is the declared national standard in Australia for reporting of health data from general practice and patient self-reported health information.[42]

The ICPC-2 has a biaxial structure, with 17 chapters on one axis (each with an alphabetic code) and seven components on the other (numeric codes) (Figure 2.2). Chapters are based on body systems, with additional chapters for psychological and social problems. Component 1 includes symptoms and complaints. Component 7 covers diagnoses – it can also be expanded to provide data about infections, injuries, neoplasms, congenital anomalies and 'other' diagnoses.

Component 2 (diagnostic, screening and prevention) is often applied in describing the problem managed (for example, check-up, immunisation). Components 3 to 6 cover other processes of care, including referrals, other (non-pharmacological) treatments and orders for pathology and imaging. The components are standard and independent throughout all chapters. The updated component groupings of ICPC-2 codes, released by the Wonca International Classification Committee in 2004[43] have been used in this report.

The ICPC-2 is an excellent epidemiological tool. The diagnostic and symptom rubrics have been selected for inclusion on the basis of their relative frequency in primary care settings, or because of

their relative importance in describing the health of the community. ICPC has about 1,370 rubrics and these are sufficient for meaningful analyses. However, reliability of data entry, using ICPC-2 alone, requires a thorough knowledge of the classification for correct classification of a concept to be ensured.

In 1995, recognising a need for a coding and classification system for general practice electronic health records, the FMRC (then the Family Medicine Research Unit, FMRU) developed an extended clinical terminology classified according to the ICPC, now called ICPC-2 PLUS.[44] This is an interface terminology, developed from all the terms used by GPs in studies such as *The Australian Morbidity and Treatment Survey 1990–91* (113,468 encounters),[45] *A comparison of country and metropolitan general practice 1990–91* (51,277 encounters),[46] *The Morbidity and Therapeutic Index 1992–1998* (a clinical audit tool that was available to GPs; approximately 400,000 encounters), and *BEACH 1998–2016* (about 1.8 million encounters). Together, these make up about 2.4 million encounter records, involving about 3.5 million free text descriptions of problems managed and a further 3.5 million descriptions of patient reasons for encounter. These terms are classified according to ICPC-2 to ensure data can be compared internationally. Readers interested in seeing how coding works can download the ICPC-2 PLUS Demonstrator at <sydney.edu.au/health-sciences/ncch/icpc-2-plus/demonstrator.shtml>.

When the free-text data are received from the GPs, trained secondary coders (who are undergraduate students), code the data in specific terms using ICPC-2 PLUS. This ensures high coder reliability and automatic classification of the concept, and allows us to 'ungroup' such ICPC-2 rubrics as 'other diseases of the circulatory system' and select a specific disease from the terms within it.

Components	A	B	D	F	H	K	L	N	P	R	S	T	U	W	X	Y	Z
1. Symptoms, complaints																	
2. Diagnostic, screening, prevention																	
3. Treatment, procedures, medication																	
4. Test results																	
5. Administrative																	
6. Other																	
7. Diagnoses, disease																	

A	General and unspecified	L	Musculoskeletal	U	Urinary
B	Blood & blood-forming organs	N	Neurological	W	Pregnancy, family planning
D	Digestive	P	Psychological	X	Female genital
F	Eye	R	Respiratory	Y	Male genital
H	Ear	S	Skin	Z	Social
K	Circulatory	T	Endocrine, nutritional & metabolic		

Figure 2.2: The structure of the International Classification of Primary Care – Version 2 (ICPC-2)

Presentation of data classified in ICPC-2

Statistical reporting is usually at the level of the ICPC-2 classification (for example, acute otitis media/myringitis is ICPC-2 code H71). However, there are some exceptions where data are grouped either above the ICPC-2 level or across the ICPC-2 level. These grouped morbidity, pathology and imaging codes are defined in Appendix 4 available at: <hdl.handle.net/2123/15514>.

Reporting morbidity with groups of ICPC-2 codes

When recording problems managed, GPs may not always be very specific. For example, in recording the management of hypertension, they may simply record the problem as 'hypertension'. In ICPC-2, 'unspecified hypertension' is classified as 'uncomplicated hypertension' (code K86). There is another code for 'complicated hypertension' (K87). In some cases, the GP may simply have failed to specify that the patient had hypertension with complications. The research team therefore feels that for national data reporting, it is more reliable to group the codes K86 and K87 and label this 'Hypertension*' – the asterisk indicating that multiple ICPC-2 codes (as in this example), or ICPC-2 PLUS codes (see below), are included. Appendix 4, Table A4.1 lists the codes included in these groups.

Reporting morbidity with groups of ICPC-2 PLUS codes

In other cases, a concept can be classified within (but be only part of) multiple ICPC-2 codes. For example, osteoarthritis is classified in ICPC-2 in multiple broader codes according to site, such as L92 – shoulder syndrome (includes bursitis, frozen shoulder, osteoarthritis of shoulder, rotator cuff syndrome). When reporting osteoarthritis in this publication, all the more specific osteoarthritis ICPC-2 PLUS terms classified within all the appropriate ICPC-2 codes are grouped. This group is labelled 'Osteoarthritis*' – the asterisk again indicating multiple codes, but in this case they are PLUS codes rather than ICPC-2 codes. Appendix 4, Table A4.1 lists the codes included in these groups.

Reporting chronic morbidity

Chronic conditions are medical conditions characterised by a combination of the following characteristics: duration that has lasted or is expected to last 6 months or more, a pattern of recurrence or deterioration, a poor prognosis, and consequences or sequelae that affect an individual's quality of life.

To identify chronic conditions, a chronic condition list[47] classified according to ICPC-2 was applied to the BEACH data set. Chronic and non-chronic conditions (for example, diabetes and gestational diabetes) are often grouped together when reporting (for example, diabetes – all*). When reporting chronic morbidity, only problems regarded as chronic have been included in the analysis. Where the group used for the chronic analysis differs from that used in other analyses in this report, they are marked with a double asterisk. Codes included in the chronic groups are provided in Appendix 4, Table A4.2.

Reporting pathology and imaging test orders

All the pathology and imaging tests are coded very specifically in ICPC-2 PLUS, but ICPC-2 classifies pathology and imaging tests very broadly (for example, a test of cardiac enzymes is classified in K34 – Blood test associated with the circulatory system; a CT scan of the lumbar spine is classified as L41 – Diagnostic radiology/imaging of the musculoskeletal system). In Australia, the MBS classifies pathology and imaging tests in groups that are relatively well recognised. The team therefore regrouped all pathology and imaging ICPC-2 PLUS codes into MBS standard groups. This allows comparison of data between data sources. The groups are marked with an asterisk, and inclusions are provided in Appendix 4, Tables A4.7 and A4.8.

Classification of pharmaceuticals

Pharmaceuticals that are prescribed, provided by the GP, or advised for over-the-counter purchase, 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, such as medication class, medication group, generic name/composition, and brand name.

The generic name of a medication is its non-proprietary name, which describes the pharmaceutical substance(s) or active pharmaceutical ingredient(s).

When strength and regimen are combined with the CAPS code, we can derive the prescribed daily dose for any prescribed medication or group of medications.

CAPS is mapped to the Anatomical Therapeutic Chemical (ATC)[48] classification, which is the Australian standard for classifying medications at the generic level.[42] The ATC has a hierarchical structure with five levels. For example:

- Level 1: C – Cardiovascular system
- Level 2: C10 – Serum lipid reducing agents
- Level 3: C10A – Cholesterol and triglyceride reducers
- Level 4: C10AA – HMG CoA reductase inhibitors
- Level 5: C10AA01 – Simvastatin (the generic drug).

CAPS is now in the care of the National Centre for Classification in Health. Further information about CAPS is available from <sydney.edu.au/health-sciences/ncch/caps.shtml>.

Use of the pharmaceutical classifications in reporting

For pharmaceutical data, there is the choice of reporting in terms of the CAPS coding scheme or the ATC. They each have advantages in different circumstances.

In the CAPS system, a new drug enters at the product and generic level, and is immediately allocated a generic code. Therefore, the CAPS classification uses a bottom-up approach.

In the ATC, a new generic may initially enter the classification at any level (1 to 5), not always at the generic level. Reclassification to lower ATC levels may occur later. Therefore, the ATC uses a top-down approach.

When analysing medications across time, a generic medication that is initially classified to a higher ATC level will not be identifiable in that data period and may result in under-enumeration of that drug during earlier data collection periods.

There are some differences in the labels applied to generic medications in the two classifications. For example, the medication combination of paracetamol and codeine is labelled as ‘Paracetamol/codeine’ in CAPS and as ‘Codeine combinations excluding psycholeptics’ in the ATC.

- When reporting annual results for pharmaceutical data, the CAPS database is used in tables of the ‘most frequent medications’ (Tables 9.2 to 9.4).
- When reporting the annual results for pharmaceuticals in terms of the ATC hierarchy (Table 9.1), ATC levels 1, 3, and 5 are used. The reader should be aware that the results reported at the generic level (Level 5) may differ slightly from those reported in the ‘most frequent medication’ tables for the reasons described above.

2.9 Quality assurance

All morbidity and therapeutic data elements were secondarily coded by staff entering key words or word fragments, and selecting the required term or label from a pick list. This was then automatically coded and classified by the computer. To ensure reliability of data entry, we used 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. Further logical data checks were conducted through SAS regularly.

2.10 Validity and reliability

A discussion of the reliability and validity of the BEACH program has been published elsewhere.[49] This section touches on some aspects of reliability and validity of active data collection from general practice that should be considered by the reader.

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 analysis and reporting of recorded data are described in Section 2.7. 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,[50] the degree to which GP-reported patient RFEs and problems managed accurately reflect those recalled by the patient,[51] and reliability of secondary coding of RFEs[52] and problems managed.[45] The validity of ICPC as a tool with which to classify the data has also been investigated in earlier work.[53]

2.11 Extrapolated national estimates

A section at the end of each chapter highlights changes that have occurred over the decade 2006–07 to 2015–16. These sections summarise results published in the companion publication, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] Where the results demonstrate a significant change over time, the estimated national change across total GP Medicare services from 2006–07 to 2015–16 can be calculated using the method detailed below.

Note that extrapolations are always based on rate per 100 encounters rather than rate per 100 problems because there is no independent measure of the total number of problems managed in Australian general practice. In contrast, the number of national encounters can be drawn from Medicare claims data.

In this report, we also occasionally extrapolate data for a single year (usually 2015–16) to give the reader some feeling of the real size of the issue across Australian general practice.

When extrapolating from a single time point we:

- divide the 'rate per 100 encounters' of the selected event by 100, and then multiply by the total number of GP service items claimed through Medicare in that year, (for example, 143.0 million in 2015–16, rounded to the nearest 100,000, see Table 2.1), to give the estimated number of the selected event across Australia in that year.

When extrapolating measured change over the decade to national estimates, we:

- divide the 'rate per 100 encounters' of the selected event for 2006–07 by 100, and then multiply by the total number of GP service items claimed through Medicare in that year, (103.4 million, rounded to the nearest 100,000, see Table 2.1), to give the estimated national number of events in 2006–07
- repeat the process using data for 2015–16.

The difference between the two estimates gives the estimated national change in the frequency of that event over the decade. Estimates are rounded to the nearest 100,000 if more than 1 million, and to the nearest 10,000 if below 1 million.

Change is expressed as the estimated increase or decrease over the study period (from 2006–07 to 2015–16), in the number of general practice contacts for that event (for example, an increase or decrease in the number of GP management contacts with a certain problem), or an increase or decrease in the number of times a particular medication type was prescribed in Australia.

Table 2.1 provides the rounded number of GP service items claimed from Medicare in each financial year from 2006–07 to 2015–16.

Table 2.1: Rounded number of general practice professional services claimed from Medicare Australia each financial year, 2006–07 to 2015–16 (million)

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16[(a)]
Rounded number of Medicare GP items of service claimed	103.4	109.5	113.0	116.6	119.2	123.9	128.7	134.2	139.4	143.0

(a) Medicare data for the 2015–16 year included data from the April 2015 to March 2016 quarters because the 2015–16 financial year data were not available at the time of preparation of this report.

Source: Medicare Statistics.[3,4]

Examples of extrapolation

Example 1: Number of GP encounters at which depression was managed nationally in 2015–16

Depression was managed at a rate of 4.2 per 100 GP encounters (95% CI: 4.0–4.4) in 2015–16 (shown in Table 7.4). How many times does this suggest that depression was managed in GP encounters across Australia in 2015–16?

Our best estimate is:

> 6.0 million times [(4.2/100) x 143.0 million], but we are 95% confident that the true number lies between 5.7 million [(4.0/100) x 143.0 million] and 6.3 million [(4.4/100) x 143.0 million].

Using the management rate per 100 encounters as the basis for extrapolation, works very well when estimating total national GP encounters at which a single concept (symptom/complaint, or diagnosis/disease) is managed. However, if you wish to estimate how many GP–patient encounters involve management of any psychological problem, you need to use a different approach (see example 2 below).

Example 2: Number of GP encounters which involve management of psychological problems

The concept 'psychological problems' includes many different individual concepts (for example, depression, dementia, anorexia nervosa, etc). In BEACH, GPs record at least one and up to four problems managed, per encounter. It is therefore possible that at a single encounter, a GP can manage more than one of the many problems classified as 'psychological problems' in the International Classification of Primary Care.

If you use the management rate per 100 encounters to estimate the national number of encounters at which at least one psychological problem was managed in 2015–16, you will overestimate the true number of encounters, because more than one of these problems can be managed at a single encounter.

To overcome this problem, we have a column on the right hand side of Table 6.4 (Patient reasons for encounter by ICPC-2 chapter and most frequent individual reasons for encounter within chapter) and Table 7.3 (Problems managed by ICPC-2 chapter and frequent individual problems within chapter), which gives you the proportion of all BEACH encounters at which at least one problem of each chapter type was managed.

In the example provided, we use this column to answer the question: *At how many encounters across Australia did GPs manage at least one psychological problem in 2015–16?*

Using the far right column of Table 7.3, our best estimate is:

> 17.7 million times (12.4% of 143.0 million), but we are 95% confident that the true number lies between 17.0 million (11.9% of 143.0 million) and 18.4 million (12.9% of 143.0 million).

Example 3: National increase in the number of problems managed from 2006–07 to 2015–16

There was a statistically significant increase in the number of problems managed at GP–patient encounters, from 148.5 per 100 encounters in 2006–07 to 154.3 in 2015–16 (see Table 7.2 in *A decade of Australian general practice activity 2006–07 to 2015–16*).[1] The calculation used to extrapolate the effect of this change across Australia is:

> (148.5/100) x 103.4 million = 153.5 million problems managed nationally in 2006–07, and
> (154.3/100) x 143.0 million = 220.6 million problems managed nationally in 2015–16.

This suggests there were 67.1 million (220.6 million minus 153.5 million) more problems managed at GP–patient encounters in Australia in 2015–16 than in 2006–07. This is the result of the compound effect of the increase in the number of problems managed by GPs at encounters **plus** the far higher number of visits across Australia in 2015–16 than in 2006–07.

Considerations and limitations in extrapolations

The extrapolations to the total events occurring nationally in any one year are only estimates. They may provide:

- an underestimate of the true 'GP workload' of a condition/treatment because the extrapolations are made to GP Medicare items claimed, not to the total number of GP encounters per year – an additional 5% or so of BEACH encounters annually include encounters paid by sources other than Medicare, such as DVA, state governments, workers compensation insurance, and employers, or not charged to anyone.

- an underestimate of activities of relatively low frequency with a skewed distribution across individual GPs. Where activity is so skewed across the practising population, a national random sample will provide an underestimate of activity because the sample reflects the population rather than the minority.

Further, the base numbers used in the extrapolations are rounded to the nearest 100,000, and extrapolation estimates are rounded to the nearest 100,000 if more than a million, and to the nearest 10,000 if below a million, so can only be regarded as approximations. However, the rounding has been applied to all years, so the effect on measures of change will be very small. Therefore, the extrapolation still provides an indication of the size of the effect of measured change nationally.

3 The sample

This chapter describes the GP sample and sampling methods used in the BEACH program. The sampling and recruitment methods are only summarised in this chapter. A more detailed explanation of the BEACH methods is provided in Chapter 2. A summary of the BEACH data sets is reported for each year from 2006–07 to 2015–16 in the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

3.1 Response rate

A random sample of GPs who claimed at least 375 general practice Medicare items of service in the previous 3 months was regularly drawn from Medicare claims data by the Australian Government Department of Health (see Chapter 2).

In 2015–16, contact was attempted with 4,530 GPs, but 23.4% could not be contacted. A third of these had moved (and were untraceable), or had retired or died (Table 3.1), but more than half (53.8%) were those with whom contact could not be established after five calls. Younger GPs were harder to contact. In previous years, these have largely been registrars moving through practices during training, who were no longer at the nominated practice and could not be traced. We were not able to measure the proportion of 'no contact' GPs who were registrars as, owing to changes in 2013 to the privacy requirements for data provided by DoH, information relating to any GPs who do not participate in BEACH must be destroyed quarterly.

The final participating sample for 2015–16, consisted of 921 practitioners, representing 25.6% of those who were contacted and available (Table 3.1). The announcement of the suspension of the BEACH program in early April will have influenced the response rate for the year as some GPs who commenced recording in the last weeks of March elected not to complete data recording where they might otherwise have done so.

Further, there were 44 GPs who commenced recording in the first few weeks of April and decided to complete the task – these would have been participants for the 2016–17 BEACH year. As they were approached from the same DoH sample batch as the final participants from the 2015–16 year, we felt it appropriate to include them in the 2015–16 analysis.

It was not possible to determine the response rate for these 44 participants as they were recruited with many others who had no opportunity to respond to the recruitment invitation. Therefore, for clarity, we have calculated the response rate for the year on the total sample for 2015–16, and included the extra 44 participants into the subsequent analyses in recognition of the valuable contribution made by these GPs.

Table 3.1: Recruitment and participation rates 2015–16

Type of contact	Number	Per cent of approached (*n* = 4,530)	Per cent of contacts established (*n* = 3,470)
Letter sent and phone contact attempted	4,530	100.0	—
No contact	1,060	23.4	—
No phone number could be established	13	0.3	—
Moved & untraceable/retired/deceased	400	8.8	—
Unavailable (overseas, maternity leave, etc.)	77	1.7	—
No contact after five calls	570	12.6	—
Telephone contact established	3,470	76.6	100.0
Declined to participate	2,221	49.0	64.0
Agreed but withdrew	328	7.2	9.4
Agreed and completed	921	20.3	26.5
April 2016 participants – completed [(a)]	*44*	—	—
Total participant sample	**965**	—	—

(a) Includes 44 GPs from the intended 2016–17 participant sample

3.2 Representativeness of the GP sample

Whenever possible, the study group of GPs should be compared with the population from which the GPs were drawn (the sample frame) to identify and, if necessary, adjust for any sample bias that may affect the findings of the study. Comparisons between characteristics of the final GP sample and those of the GPs in the sample frame are provided below. The method by which weightings are generated as a result of these comparisons and applied to the data, are described in Section 3.3.

Statistical comparisons, using the chi-square statistic (χ^2) (significant at the 5% level), were made between BEACH participants and all recognised GPs in the sample frame during the study period (Table 3.2). The GP characteristics data for BEACH participants were drawn from their GP profile questionnaire. DoH provided the grouped data for all GPs in the sample frame, from Medicare data.

Table 3.2 demonstrates there were no significant differences in characteristics of GPs in the final sample of BEACH participants and those of all GPs in the sample frame, in terms of sex, proportion of GPs who had graduated from their primary medical degree in Australia (place of graduation), State/Territory and practice location as classified by the Australian Standard Geographical Classification (ASGC). In the final BEACH GP sample, there was a slight over-representation of GPs in the 55+ years age group, compared with GPs in the sample frame.

Table 3.2: Comparison of BEACH participants and all active recognised GPs in Australia who satisfied the selection criteria (the sample frame)

	BEACH[a][b][c]		Australia[a][d]	
Variable	Number	Per cent of GPs (*n* = 965)	Number	Per cent of GPs (*n* = 25,761)
Sex (χ^2 = 1.8, *p* = 0.176)				
Males	532	55.1	14,768	57.3
Females	433	44.9	10,993	42.7
Age (χ^2 = 8.0, *p* = 0.046)				
< 35 years	80	8.3	2,560	9.9
35–44 years	210	21.9	5,941	23.1
45–54 years	236	24.6	6,709	26.0
55+ years	435	45.3	10,551	41.0
Missing	4	—	—	—
Place of graduation (χ^2 = 0.19, *p* = 0.662)				
Australia	584	60.8	15,474	60.1
Overseas	377	39.2	10,287	39.9
Missing	4	—	—	—
State (χ^2 = 13.9, *p* = 0.052)				
New South Wales	305	31.6	8,250	32.0
Victoria	236	24.5	6,332	24.6
Queensland	180	18.7	5,364	20.8
South Australia	79	8.2	2,016	7.8
Western Australia	111	11.5	2,527	9.8
Tasmania	36	3.7	648	2.5
Australian Capital Territory	14	1.5	398	1.6
Northern Territory	3	0.3	226	0.9
Missing	1	—	—	—
ASGC (χ^2 = 7.2, *p* = 0.127)				
Major Cities of Australia	661	68.6	17,918	69.6
Inner Regional Australia	215	22.3	5,025	19.5
Outer Regional Australia	72	7.5	2,275	8.8
Remote Australia	12	1.2	347	1.4
Very Remote Australia	4	0.4	189	0.7
Missing	1	—	7	—

(a) Missing data removed.

(b) Data drawn from the BEACH GP profile completed by each participating GP.

(c) Includes 44 GPs from the intended 2016–17 participant sample.

(d) All GPs who satisfied the sample selection criteria of at least 375 MBS-claimed GP consultation service items during the most recent 3-month Medicare Australia data period prior to their being sampled. Data provided by the Australian Government Department of Health.

Note: ASGC – Australian Standard Geographical Classification.[54]

GP activity in the previous year

Data on the number of MBS general practice service items claimed in the previous year were also provided by DoH for each GP in the drawn samples, and for all GPs (as a group) in the sample frame. These data were used to determine the 'activity level' of each participating GP, and to compare the activity level of the final participants with that of GPs in the sample frame.

When comparing GP activity level in the previous 12 months, the proportion of GPs in the final participant sample who had claimed fewer than 1,500 services in the previous year was about half that of GPs in the sample frame. This may suggest that those GPs who we could not contact were more likely to be low service providers. A slightly larger proportion of participants had claimed 1,501–3,000 services and 3001–4,500 services, but there was a less than one percentage point difference in the proportion claiming 4,501–6,000 and claiming 6,001–10,000 services. GPs who claimed the highest number of service items represented small proportions of both the participant and sample frame groups.

A clearer comparison using the mean number of claims shows that the mean for the participating GPs was slightly lower than that for the GP sample frame. Participants in the 2015–16 BEACH year conducted on average 92.1 fewer services per year, or 1.8 consultations per week (on a 52-week year, or 2 per week on a 48-week year, assuming 4 weeks leave) (Table 3.3). As the mean number of claims for the sample frame sat within the 95% CIs around the mean for BEACH participants, there was no statistically significant difference in activity levels between the two groups.

Table 3.3: Activity level in the previous 12 months of participating GPs and GPs in the sample frame (measured by the number of GP service items claimed)

	Participants[a] (*n* = 965)		Australia[b] (*n* = 25,761)	
Variable	**Number of GPs**	**Per cent**	**Number of GPs**	**Per cent**
Activity (χ^2 = 37.3, p < 0.0001)				
1–1,500 services in previous year	44	4.6	2,200	8.9
1,501–3,000 services in previous year	222	23.0	4,873	19.8
3,001–4,500 services in previous year	255	26.4	5,729	23.2
4,501–6,000 services in previous year	167	17.3	4,321	17.5
6,001–10,000 services in previous year	227	23.5	5,611	22.8
> 10,000 services in previous year	50	5.2	1,909	7.7
	Number of claims	**95% CI**	**Number of claims**	
Mean activity level	4,890.73	4,712.1–5,069.4	4,982.83	—
Standard deviation	2,827.7	—	—	—
Median activity level	4,248.0	—	—	—

(a) Includes 44 GPs from the intended 2016–17 participant sample.

(b) Number of GPs in the sample frame for whom these data were provided.

3.3 Weighting the data

Age–sex weights

As described in Section 3.2, comparisons are made annually to test how representative BEACH participants are of the GPs in the original Australian sample frame. Where participants in a particular age or sex group are over-represented or under-represented, GP age–sex weights need to be applied to the data sets in post-stratification weighting to achieve comparable estimates and precision. Because there are always slight (even if not statistically significant) differences, even in years where the BEACH participants are representative in all age and sex categories, post-stratification weighting for GP age and sex is applied for consistency over recording years.

Activity weights

In BEACH, each GP provided details of 100 encounters. There was considerable variation among GPs in the number of services each provides in a given year. Encounters were therefore assigned an additional weight directly proportional to the activity level of the recording GP. GP activity level was measured as the number of MBS general practice service items claimed for services by the GP in the previous 12 months (data supplied by DoH). Because the measure is based on annual activity, estimates could only be provided for GPs who had claimed service items during the whole year. Those entering or leaving the sample frame part way through the year will have met the eligibility criteria for inclusion in the BEACH sample (that is, claiming a minimum of 375 MBS GP consultation services during the most recent 3-month Medicare Australia data period at sampling date) but would not have an annual activity level.

Total weights

The final weighted estimates were calculated by multiplying raw rates by the GP age–sex weight and the GP sampling fraction of services (‘activity’) in the previous 12 months. Table 3.4 shows the precision ratio calculated before and after weighting the encounter data.

3.4 Representativeness of the encounter sample

In the BEACH program, we aimed to gain a representative sample of GP–patient encounters each year. To assess the representativeness of the final weighted sample of encounters, the age–sex distribution of patients at weighted BEACH encounters with GP consultation service items claimed (excluding those with Department of Veterans’ Affairs [DVA] patients) was compared with that of patients at all encounters claimed as GP consultation service items through Medicare in the 2015–16 study period (data provided by DoH).

As shown in Table 3.4, there is an excellent fit of the age–sex distribution of patients at the weighted MBS-claimed BEACH encounters with that of the MBS claims distribution, with all precision ratios within the range 0.87–1.08. This indicates that the BEACH sample is a good representation of Australian GP–patient encounters, as no age–sex category varied by more than 13% from the population distribution, and only one by 13%.

The age–sex distribution of patients at BEACH encounters and for MBS GP consultation service item claims, is shown graphically for all patients in Figure 3.1, for males in Figure 3.2, and for females in Figure 3.3.

Table 3.4: Age–sex distribution of patients at BEACH and MBS GP consultation service items

Sex/age	BEACH–raw[a]		BEACH–weighted[b]		Australia[c]	Precision ratios (Australia = 1.00)	
	Number	Per cent (*n* = 80,624)	Number	Per cent (*n* = 80,907)	Per cent (*n* = 118,502,966)	Raw[a]	Weighted[c]
All							
< 1 year	1,583	2.0	1,471	1.8	1.8	1.11	1.00
1–4 years	3,558	4.4	3,750	4.6	4.9	0.90	0.94
5–14 years	4,417	5.5	4,575	5.7	6.3	0.87	0.90
15–24 years	6,401	7.9	6,395	7.9	8.3	0.95	0.95
25–44 years	17,916	22.2	18,265	22.6	22.5	0.99	1.00
45–64 years	21,884	27.1	21,942	27.1	26.0	1.04	1.04
65–74 years	11,952	14.8	11,937	14.8	13.7	1.08	1.08
75+ years	12,913	16.0	12,573	15.5	16.4	0.98	0.95
Male							
< 1 year	808	1.0	748	0.9	1.0	1.00	0.90
1–4 years	1,870	2.3	1,932	2.4	2.6	0.88	0.92
5–14 years	2,219	2.8	2,360	2.9	3.2	0.88	0.91
15–24 years	2,267	2.8	2,424	3.0	3.1	0.90	0.97
25–44 years	6,080	7.5	6,877	8.5	8.5	0.88	1.00
45–64 years	8,824	10.9	9,489	11.7	11.2	0.97	1.04
65–74 years	5,177	6.4	5,501	6.8	6.3	1.02	1.08
75+ years	5,317	6.6	5,438	6.7	7.0	0.94	0.96
Female							
< 1 year	775	1.0	723	0.9	0.9	1.11	1.00
1–4 years	1,688	2.1	1,818	2.2	2.3	0.91	0.96
5–14 years	2,198	2.7	2,215	2.7	3.1	0.87	0.87
15–24 years	4,134	5.1	3,971	4.9	5.2	0.98	0.94
25–44 years	11,836	14.7	11,388	14.1	14.1	1.04	1.00
45–64 years	13,060	16.2	12,452	15.4	14.8	1.09	1.04
65–74 years	6,775	8.4	6,436	8.0	7.4	1.14	1.08
75+ years	7,596	9.4	7,135	8.8	9.4	1.00	0.94

(a) Unweighted Medicare-claimed GP consultation service items only, excluding encounters with patients who hold a DVA Repatriation Health Card.

(b) Calculated from BEACH weighted data, excluding encounters with patients who hold a DVA Repatriation Health Card.

(c) Age–sex distribution of patients at MBS-claimed GP consultation services; data provided by the Australian Government Department of Health.

Note: GP consultation services – see 'Glossary'. Only encounters with valid patient age and sex recorded are included in the comparison.

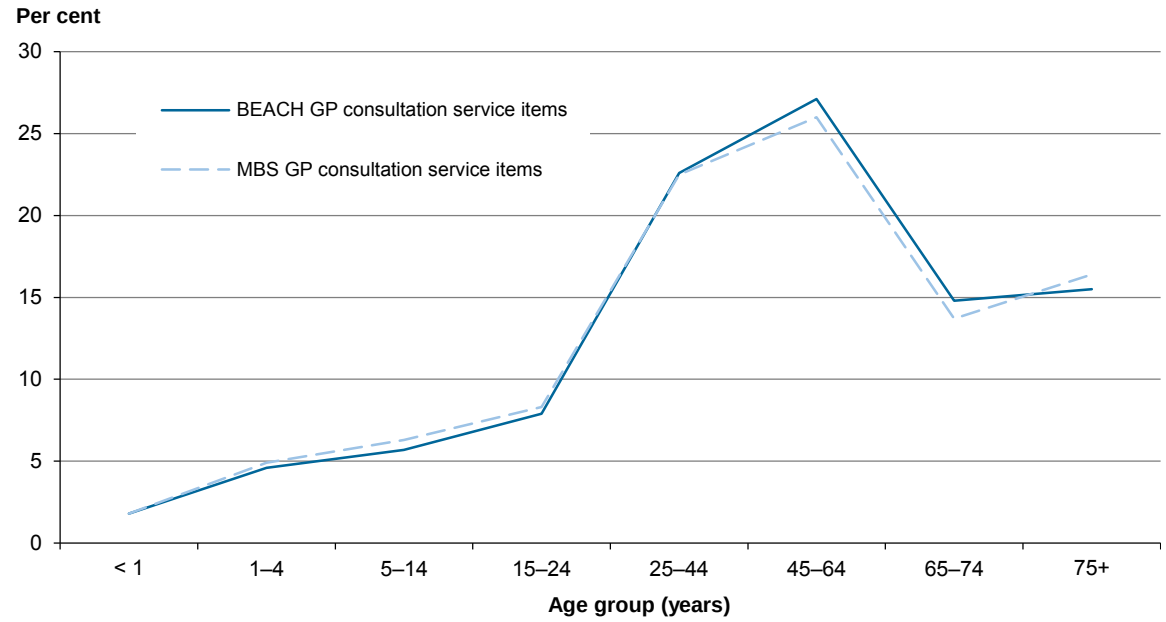


Figure 3.1: Age distribution of all patients at BEACH and MBS GP consultation services, 2015–16

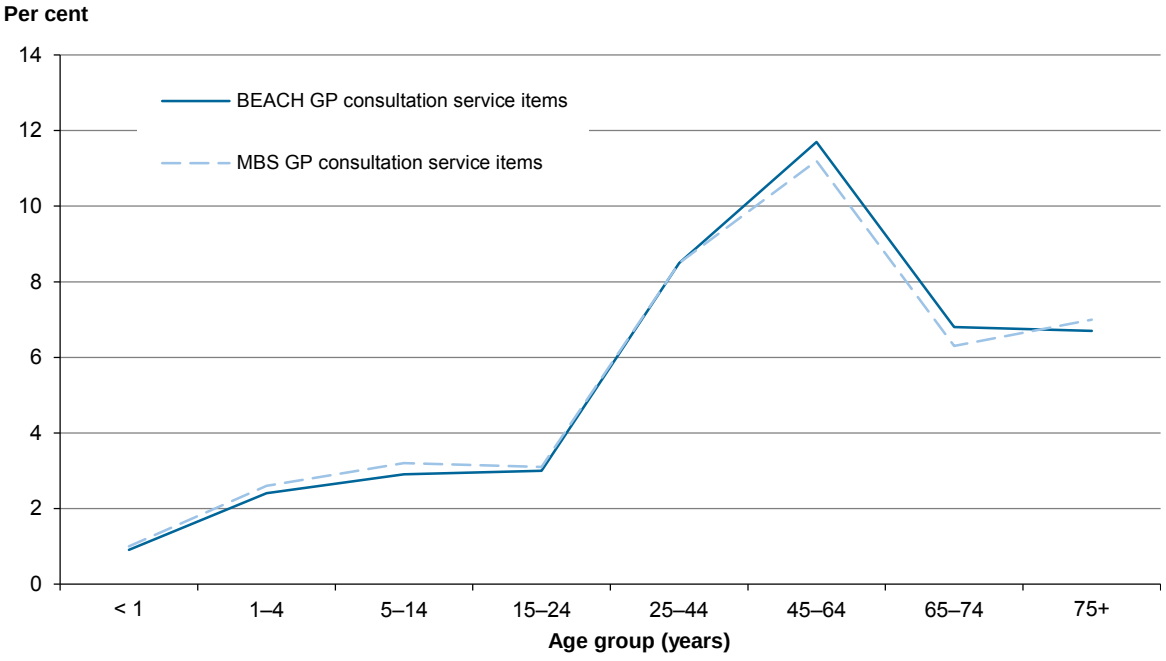


Figure 3.2: Age distribution of male patients at BEACH and MBS GP consultation services, 2015–16

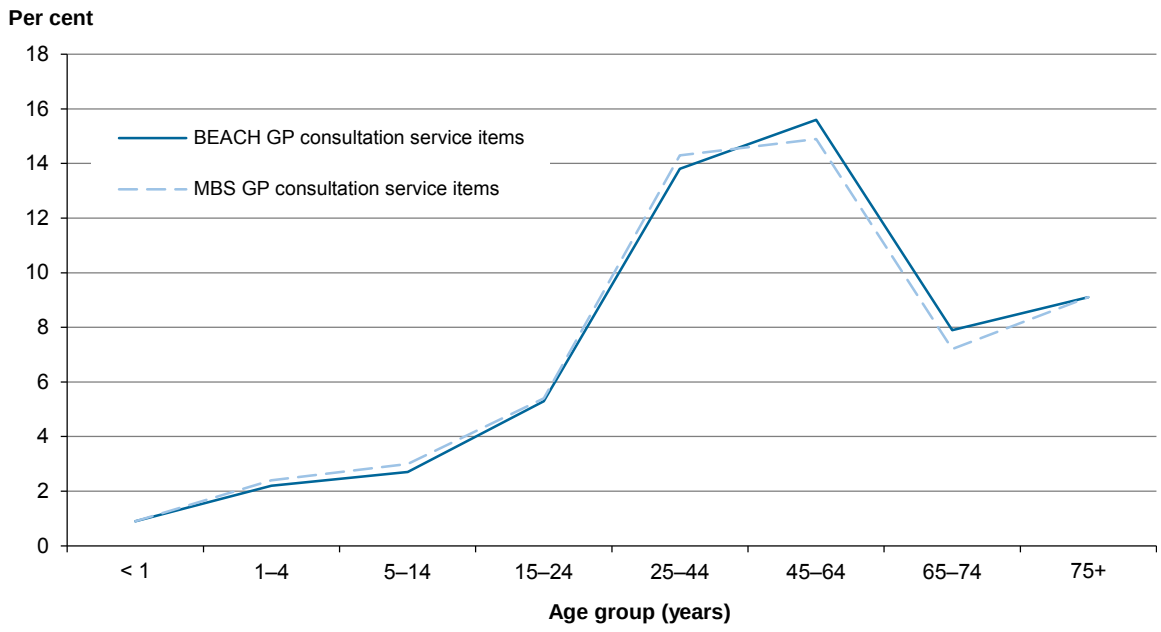


Figure 3.3: Age distribution of female patients at BEACH and MBS GP consultation services, 2015–16

3.5 The weighted data set

The final unweighted data set from the 18th year of collection contained encounters, reasons for encounters, problems managed and management/treatments. Most variables decreased after weighting. Raw and weighted totals for each data element are shown in Table 3.5. The weighted data set is used for all analyses in the remainder of this report.

Table 3.5: The BEACH data set, 2015–16

Variable	Raw	Weighted
General practitioners	965	965
Encounters	96,500	97,398
Reasons for encounter	148,681	149,084
Problems managed	153,643	150,279
Medications	98,965	99,398
Other treatments[(a)]	56,241	54,744
Referrals	16,322	15,671
Pathology	49,501	46,315
Imaging	10,878	10,733
Other investigations	899	829

(a) Other treatments excludes injections for immunisations/vaccinations (raw *n* = 3,986, weighted *n* = 3,850) (see Chapter 10).

4 The participating GPs

This chapter reports data collected between April 2015 and March 2016 (the 18th year of the BEACH program) about the participating GPs and their practices. Details of GP and practice characteristics are reported for each year from 2006–07 to 2015–16 in the 10-year summary report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

4.1 Characteristics of the GP participants

All participants returned a GP profile questionnaire, although some were incomplete. The results are provided in Tables 4.1 and 4.2 (median results not tabled). Of the 965 participants:

- 55.1% were male, and 45.3% were aged 55 years and over (mean age 52.0 years; median age 53 years)
- 57.1% had been in general practice for more than 20 years
- 60.8% had graduated in Australia and 15.2% in Asia
- 61.8% spent 21–40 hours on average per week on direct patient care services (mean hours worked was 36.7; median was 37.5 hours)
- 62.6% were Fellows of the RACGP, and 6.7% were Fellows of the ACRRM
- 48.8% had provided care in a residential aged care facility in the previous month
- 90.1% worked in an accredited practice
- 68.6% practised in Major cities (using ASGC[54])
- 76.7% worked at only one practice location in a regular week, and 18.8% worked in two.

At their major practice address:

- 32.6% were in practices of fewer than five individual GPs, and 28.8% were in practices of 10 or more individual GPs. On average, there were 7.5 individual GPs per practice, with a median of 6 per practice
- 50.2% were in practices of fewer than five full-time-equivalent (FTE) GPs. On average, there were 5.5 FTE GPs per practice, with a median of 4.6 FTE GPs per practice
- 84.7% of the GPs worked in a practice that employed practice nursing staff. Of these GPs, more than one-third (35.7%) worked at practices employing fewer than two FTE practice nurses (where one FTE is 35–45 hours per week). On average, there were 0.3 FTE practice nurses per FTE GP
- four in five GPs (80.9%) had a co-located pathology laboratory or collection centre in, or within 50 metres of, the practice, and more than half (60.3%) had a co-located psychologist
- 37.8% worked in a practice that provided their own or cooperative after-hours care, and 56.8% in a practice that used a deputising service for after-hours patient care (multiple responses allowed).

Those interested in the clinical activity of overseas trained doctors will find more information in Bayram et al. (2007) *Clinical activity of overseas trained doctors practising in general practice in Australia*.[55] Readers interested in the effects of GP age on clinical practice will find more information in Charles et al. (2006) *The independent effect of age of general practitioner on clinical practice*.[56] For more information about the effect of the sex of the GP on clinical practice see Harrison et al. (2011) *Sex of the GP – 20 years on*.[57]

Table 4.1: Characteristics of participating GPs and their practices

GP characteristic	Number[a][b]	Per cent of GPs[a][b] (*n* = 965)
Sex (missing *n* = 0)		
Male	532	55.1
Female	433	44.9
Age (missing *n* = 4)		
< 35 years	80	8.3
35–44 years	210	21.9
45–54 years	236	24.6
55+ years	435	45.3
Years in general practice (missing *n* = 8)		
< 2 years	8	0.8
2–5 years	118	12.3
6–10 years	140	14.6
11–19 years	145	15.2
20+ years	546	57.1
Place of graduation (missing *n* = 4)		
Australia	584	60.8
Overseas	377	39.2
Asia	146	15.2
United Kingdom/Ireland	94	9.8
Africa and Middle East	66	6.9
Europe	44	4.6
New Zealand	14	1.5
Other	13	1.4
Direct patient care hours (worked) per week (missing *n* = 22)		
≤ 10 hours	3	0.3
11–20 hours	95	10.1
21–40 hours	583	61.8
41–60 hours	243	25.8
61+ hours	19	2.0
GP Registrar (in training) (missing *n* = 12)	46	4.8
Fellow of RACGP (missing *n* = 8)	599	62.6
Fellow of ACRRM (missing *n* = 29)	63	6.7
Patient care provided in previous month[c]		
In a residential aged care facility (missing *n* = 8)	467	48.8
As a salaried/sessional hospital medical officer (missing *n* = 9)	109	11.4

(continued)

Table 4.1 (continued): Characteristics of participating GPs and their practices

GP characteristic	Number[(a)(b)]	Per cent of GPs[(a)(b)] (*n* = 965)
Accredited practice (missing *n* = 11)	867	90.1
Practice location by ASGC remoteness structure (missing *n* = 1)		
Major cities	661	68.6
Inner regional	215	22.3
Outer regional	72	7.5
Remote	12	1.2
Very remote	4	0.4
Number of practice locations worked at in a regular week (missing *n* = 16)		
1	728	76.7
2	178	18.8
3	37	3.9
4+	6	0.6
Size of practice – number of individual GPs (missing *n* = 33)		
Solo	77	8.3
2–4	226	24.3
5–9	360	38.6
10–14	167	17.9
15+	102	10.9
Size of practice – full-time equivalent GPs (missing *n* = 143)		
< 1	4	0.5
1.0– <2	81	9.9
2.0– <3	91	11.1
3.0– <4	117	14.2
4.0– <5	120	14.6
5.0– <10	294	35.8
10.0– <15	87	10.6
15+	28	3.4
Practice nurse at major practice address (missing *n* = 12)	807	84.7
Number of individual practice nurses (missing *n* = 31)		
0	146	15.6
1	153	16.4
2	183	19.6
3	152	16.3
4–5	198	21.2
6+	102	10.9

(continued)

Table 4.1 (continued): Characteristics of participating GPs and their practices

GP characteristic	Number[a][b]	Per cent of GPs[a][b] (*n* = 965)
Number of full-time equivalent practice nurses (missing *n* = 141)		
0	146	17.7
< 1	57	6.9
1.0– <2	237	28.8
2.0– <3	206	25.0
3.0– <4	106	12.9
4.0+	72	8.7
Co-located services[d] (missing *n* = 19)		
Pathology laboratory/collection centre	765	80.9
Psychologist	570	60.3
Physiotherapist	495	52.3
Medical specialist	292	30.9
Imaging/radiology services	284	30.0
Dietitian	475	50.2
Podiatrist	459	48.5
Other service	164	17.3
None	58	6.1
After-hours arrangements[c] (missing *n* = 8)		
Practice does own and/or cooperative with other practices	362	37.8
Practice does its own	281	29.4
Cooperative with other practices	94	9.8
Deputising service	544	56.8
Other arrangement	95	9.9
None	52	5.4

(a) Missing data removed.

(b) Includes 44 GPs from the intended 2016–17 participant sample.

(c) Multiple responses allowed.

(d) Services located/available in the practice, in the same building or within 50 metres, available on a daily or regular basis.

Note: ASGC – Australian Standard Geographical Classification; RACGP – Royal Australian College of General Practitioners; ACRRM – Australian College of Rural and Remote Medicine.

Table 4.2: Means of selected characteristics of participating GPs and their practices

Characteristic	Mean (*n* = 965) [a][b]	95% LCL	95% UCL
Mean age of participating GPs (missing *n* = 4)	52.0	51.2	52.7
Mean hours worked per week on direct patient care (missing *n* = 22)	36.7	35.9	37.4
Mean number of individual GPs at major practice address (missing *n* = 33)	7.5	7.2	7.8
Mean number of FTE GPs at major practice address (missing *n* = 143)	5.5	5.3	5.8
FTE practice nurse: FTE GP ratio (missing *n* = 141)	0.3	0.3	0.4

(a) Missing data removed.

(b) Includes 44 GPs from the intended 2016–17 participant sample

Note: LCL – lower confidence limit; UCL – upper confidence limit; FTE – full-time equivalent.

4.2 Changes in characteristics of the GPs over the decade 2006–07 to 2015–16

Changes over the decade 2006–07 to 2015–16, are described in detail in Chapter 4 of the accompanying report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] Briefly, the major changes in the characteristics of the participating GPs were:

- the proportion of participants who were female increased over time
- the proportion who were younger than 45 years did not change significantly, whereas the proportions aged 45–54 years, and 55 years or more, increased over the decade
- the proportion of GPs working 21–40 hours per week on direct patient care significantly increased, though the proportion working 41–60 hours, and the proportion working more than 60 hours, significantly decreased
- the mean number of hours spent on direct patient care significantly decreased
- the proportion of participants holding Fellowship of the RACGP increased over the decade
- the proportion of GPs in smaller practices of 2–4 GPs decreased over time, and the proportion in practices with 10 or more individual GPs almost doubled
- fewer practices are providing after-hours care on their own, or in cooperation with other practices, but more practices are using deputising services for after-hours care than a decade ago.

5 The encounters

This chapter describes the content and types of encounters recorded in the 2015–16 BEACH year. Data about the encounters are reported for each year from 2006–07 to 2015–16 in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

5.1 Content of the encounters

In 2015–16, details of 97,398 encounters (weighted data) were available from 965 GPs. A summary of these encounters is provided in Table 5.1. Reasons for encounter (RFEs) and problems managed are expressed as rates per 100 encounters. Each management action is presented in terms of both a rate per 100 encounters and a rate per 100 problems managed, with 95% confidence limits.

- On average, patients gave 153 RFEs, and GPs managed about 154 problems per 100 encounters.
- Chronic problems accounted for 34.6% of all problems managed, and an average of 53.3 chronic problems were managed per 100 encounters.
- New problems accounted for 38.9% of all problems, and on average 60.1 new problems were managed per 100 encounters.
- Medications were the most common treatment choice (102.1 per 100 encounters). Most medications were prescribed (82.0 per 100 encounters) rather than supplied by the GP (9.1 per 100) or advised for over-the-counter purchase (10.9 per 100).
- For an 'average' 100 GP–patient encounters, GPs provided 102 medications and 39 clinical treatments (such as advice and counselling), undertook 18 procedures, made 10 referrals to medical specialists and 6 to allied health services, and placed 48 pathology test orders and 11 imaging test orders (Table 5.1).

Table 5.1: Summary of morbidity and management at GP–patient encounters

Variable	Number	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
General practitioners	965	—	—	—	—	—	—
Encounters	97,398	—	—	—	—	—	—
Reasons for encounter	149,084	153.1	151.2	155.0	—	—	—
Problems managed	150,279	154.3	152.0	156.6	—	—	—
New problems	58,501	60.1	58.5	61.6	38.9	37.9	39.9
Chronic problems	51,929	53.3	51.4	55.3	34.6	33.6	35.5
Medications	99,398	102.1	99.6	104.5	66.1	64.8	67.5
Prescribed	79,871	82.0	79.8	84.2	53.1	51.9	54.4
GP-supplied	8,869	9.1	8.3	9.9	5.9	5.4	6.4
Advised OTC	10,658	10.9	10.1	11.8	7.1	6.6	7.6
Other treatments[(a)]	54,744	56.2	53.4	59.0	36.4	34.8	38.1
Clinical	37,563	38.6	36.1	41.0	25.0	23.5	26.5
Procedural	17,181	17.6	16.6	18.7	11.4	10.8	12.1
Referrals	15,671	16.1	15.4	16.7	10.4	10.0	10.8
Medical specialist*	9,242	9.5	9.1	9.9	6.2	5.9	6.4
Allied health services*	5,452	5.6	5.2	6.0	3.6	3.4	3.9
Hospital*	305	0.3	0.3	0.4	0.2	0.2	0.2
Emergency department*	261	0.3	0.2	0.3	0.2	0.1	0.2
Other referrals*	410	0.4	0.3	0.5	0.3	0.2	0.3
Pathology	46,315	47.6	45.5	49.6	30.8	29.7	32.0
Imaging	10,733	11.0	10.6	11.5	7.1	6.9	7.4
Other investigations[(b)]	829	0.9	0.8	0.9	0.6	0.5	0.6

(a) Other treatments includes treatment given by practice nurses or Aboriginal health workers in the context of the GP–patient encounter and treatment given by GPs.

(b) Other investigations reported here include only those ordered by the GP. Other investigations in Chapter 12 include those ordered by the GP and those done by the GP or practice staff.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; OTC – over-the-counter.

5.2 Encounter type

Of the 87,727 encounters where a payment source was recorded, 96.1% related to MBS/DVA GP items of service. Items with other health professionals, for example, practice nurse item numbers not accompanied by a GP item of service were recorded infrequently.

Table 5.2 reports the breakdown of encounter type by payment source, counting a single Medicare item number per encounter (where applicable).

- Indirect encounters (where the patient was not seen by the GP) accounted for 1.4%, and direct encounters (where the patient was seen by the GP) accounted for 98.6% of encounters at which a payment source was recorded.
- The vast majority of all direct encounters (97.4%) were claimable through Medicare or the DVA.
- Sixteen indirect encounters were claimed as chronic disease management or case conference items.

- Direct encounters where the GP indicated that no charge was made were rare, accounting for 0.4% of encounters.
- Encounters claimable through workers compensation accounted for 1.4% of all encounters.
- Encounters claimable through other sources (for example, hospital-paid encounters) accounted for 0.8% of all encounters.

Table 5.2: Type of encounter and a source of payment recorded for the encounter

Type of encounter	Number	Per cent of encounters[a] (*n* = 87,727)	95% LCL	95% UCL	Per cent of direct encounters (*n* = 86,523)
Indirect encounters (patient not seen by GP)[b]	1,204	1.4	1.2	1.6	
Direct encounters (patient seen by GP)	86,523	98.6	98.4	98.8	100.0
MBS/DVA items of service (direct encounters only)[c]	84,300	96.1	95.8	96.4	97.4
Workers compensation	1,243	1.4	1.3	1.5	1.4
Other paid (hospital, state, etc)	667	0.8	0.6	0.9	0.8
No charge	313	0.4	0.3	0.4	0.4
Total	**87,727**	**100.0**	—	—	—

(a) Missing data (no payment source specified) removed from analysis (*n* = 9,671).

(b) Sixteen encounters involving chronic disease management or case conference items were recorded as indirect encounters.

(c) Includes direct encounters at which either a GP item or an item with an other health professional (or both) was recorded.

Note: LCL – lower confidence limit; UCL – upper confidence limit; MBS – Medicare Benefits Schedule; DVA – Australian Government Department of Veterans' Affairs.

Table 5.3 provides an overview of the MBS/DVA item numbers recorded in BEACH in 2015–16. At least one MBS/DVA item number was recorded at 84,318 encounters. A single item number was recorded at 96.1% of BEACH encounters said to be claimable from the MBS/DVA.

Table 5.3: Number of MBS/DVA items recorded

Variable	Number	Per cent of MBS/DVA encounters (*n* = 84,318)[a]
Encounters at which one MBS/DVA item was recorded	81,055	96.1
Encounters at which two MBS/DVA items were recorded	2,969	3.5
Encounters at which three MBS/DVA items were recorded	294	0.3
Total encounters at which at least one item was recorded	**84,318**	**100.0**

(a) Total includes 84,300 direct encounters and 18 indirect, including 16 for chronic disease items and 2 practice nurse only items.

Note: MBS – Medicare Benefits Schedule; DVA – Department of Veterans' Affairs.

GPs could record up to three MBS/DVA item numbers per encounter. For comparability with earlier years, in Table 5.4 only one item number per MBS/DVA-claimable encounter has been counted. Selection of one item number was undertaken on a priority basis: consultation item numbers overrode incentive item numbers, which overrode procedural item numbers, which overrode other Medicare item numbers.

- Standard surgery consultations accounted for 77.3% of MBS/DVA-claimable GP consultations, and for 74.2% of all encounters for which a payment source was recorded.
- 11.8% of MBS/DVA-claimable encounters were claimable as long or prolonged surgery consultations.
- Home or institution visits, and visits at residential aged care facilities were all relatively rare, together accounting for 2.6% of MBS/DVA-claimable encounters.

- About 1.6% of encounters were claimable as GP mental health care items, 2.4% as chronic disease management items, and 0.4% as health assessments.
- There was a decrease in home visits in the decade to 2010[58] and this has important implications for ageing patients wishing to be managed at home rather than in institutional care. The changes to the Medicare schedule in May 2010 mean that it is no longer possible to separate home visits from institutional visits using Medicare item numbers. The BEACH collection form was altered from the 2012–13 BEACH data year onwards, to include a tick box to identify home visits. In 2015–16, there were 454 encounters identified as home visits at a rate of 0.5 per 100 encounters (95% CI: 0.3–0.7) (results not tabled). An MBS/DVA GP item was recorded at 453 home visit encounters, or 0.5% (95% CI: 0.3–0.7) of encounters at which an MBS/DVA item was recorded (results not tabled).

Table 5.4: Summary of GP only MBS/DVA items recorded (counting one item per encounter)

MBS/DVA item	Number	Rate per 100 encounters[(a)] (*n* = 87,727)	95% LCL	95% UCL	Per cent of MBS/DVA GP items (*n* = 84,313)
Short surgery consultations	1,711	2.0	1.7	2.2	2.0
Standard surgery consultations	65,132	74.2	73.0	75.4	77.3
Long surgery consultations	9,367	10.7	10.0	11.3	11.1
Prolonged surgery consultations	594	0.7	0.5	0.8	0.7
Residential aged care facility (RACF) visits	1,412	1.6	1.2	2.1	1.7
Home or institution visits (excluding RACF)	778	0.9	0.6	1.1	0.9
GP mental health care	1,441	1.6	1.5	1.8	1.7
Chronic disease management items	2,098	2.4	2.1	2.7	2.5
Health assessments	380	0.4	0.4	0.5	0.5
Case conferences	14	0.0Ŧ	0.0Ŧ	0.0Ŧ	0.0Ŧ
Attendances associated with Practice Incentives Program payments	201	0.2	0.2	0.3	0.2
Other items	1,187	1.4	1.1	1.7	1.4
Therapeutic procedures	367	0.4	0.3	0.5	0.4
Surgical operations	371	0.4	0.3	0.5	0.4
Acupuncture	108	0.1	0.0Ŧ	0.2	0.1
Other items	341	0.4	0.1	0.6	0.4
Total MBS/DVA items of service (GPs only)	**84,313**	**96.1**	**95.8**	**96.4**	**100.0**

(a) Encounters with missing payment source were removed from analysis (*n* = 9,671). Denominator used for analysis *n* = 87,727.

Ŧ Rates are reported to one decimal place. This indicates that the rate is less than 0.05 per 100 encounters.

Note: LCL – lower confidence limit; UCL – upper confidence limit; MBS – Medicare Benefits Schedule; DVA – Australian Government Department of Veterans' Affairs; GP – general practitioner; RACF – residential aged care facility.

Table 5.5 provides the distribution of all MBS/DVA item numbers recorded across Medicare item number groups and the number of encounters at which at least one of each type of item number was recorded. Overall, there were 87,875 item numbers recorded at 84,318 MBS/DVA-claimable encounters in 2015–16, an average of 1.0 item per encounter claimable through MBS/DVA.

Surgery consultations (including short, standard, long and prolonged) were the most commonly recorded type of item number, accounting for 87.4% of all MBS items, and at least one of these items was recorded at 91.1% of MBS/DVA claimable encounters.

Items for hospital, residential aged care and home visits together accounted for 2.5% of all MBS items. Items for other practice nurse, Aboriginal health worker and allied health services accounted for 0.6% of all MBS items, and were recorded at 0.7% of claimable encounters at which at least one MBS item was recorded.

Table 5.5: Distribution of MBS/DVA service item numbers recorded, across item number groups and encounters

	All MBS/ DVA items[(a)] (*n* = 87,875)		Encounters with at least one item recorded[(b)] (*n* = 84,318)			
Items/encounters	**Number**	**Per cent**	**Number**	**Per cent**	**95% LCL**	**95% UCL**
Surgery consultations	76,804	87.4	76,804	91.1	90.3	91.9
Home, institution and residential aged care visits	2,190	2.5	2,190	2.6	2.0	3.2
Chronic disease management items (including case conferences)	3,000	3.4	2,179	2.6	2.3	2.9
Other practice nurse/Aboriginal health worker/allied health worker services	551	0.6	551	0.7	0.4	0.9
GP mental health care items	1,758	2.0	1,758	2.1	1.9	2.3
Surgical operations	1,240	1.4	1,183	1.4	1.2	1.6
Diagnostic procedures and investigations	507	0.6	478	0.6	0.5	0.7
Health assessments	461	0.5	460	0.5	0.5	0.6
Therapeutic procedures	472	0.5	458	0.5	0.4	0.7
Acupuncture	110	0.1	110	0.1	0.0Ŧ	0.2
Pathology services	152	0.2	146	0.2	0.1	0.2
Diagnostic imaging services	4	0.0Ŧ	4	0.0Ŧ	0.0Ŧ	0.0Ŧ
Attendances associated with Practice Incentives Program payments	249	0.3	249	0.3	0.2	0.4
Other items	378	0.4	378	0.4	0.2	0.7
Total items	**87,875**	**100.0**	—	—	—	—

(a) Up to three MBS/DVA items could be recorded at each encounter.

(b) Identifies encounters where at least one item from the MBS group was recorded.

Ŧ Rates are reported to one decimal place. This indicates that the rate is less than 0.05 per 100 encounters.

Note: MBS – Medicare Benefits Schedule; DVA – Australian Government Department of Veterans' Affairs; LCL – lower confidence limit; UCL – upper confidence limit.

5.3 Consultation length

In a subsample of 32,191 BEACH MBS/DVA-claimable encounters at which start and finish times were recorded by the GP, the mean length of consultation in 2015–16 was 14.9 minutes (95% CI: 14.6–15.2). The median length was 13.0 minutes (results not tabled).

For A1 MBS/DVA-claimable encounters (*n* = 29,041), the mean length of consultation in 2015–16 was 14.5 minutes (95% CI: 14.2–14.8), and the median length was 13.0 minutes (results not tabled).

The methods of the substudy from which data on consultation length are collected, are described in Section 2.6.

The determinants of consultation length were investigated by Britt et al. (2004) in *Determinants of GP billing in Australia: content and time*[59] and Britt et al. (2005) in *Determinants of consultation length in Australian general practice*.[60] Length of GP consultations is also discussed in a 'Byte from BEACH' published on the FMRC website (2014): Britt H, Valenti L, Miller G*. Debunking the myth of general practice as '6 minute medicine'.*[61]

5.4 Changes in the encounters over the decade 2006–07 to 2015–16

Chapter 5 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*,[1] provides an overview of changes in general practice encounters over the past decade.

The major changes between 2006–07 and 2015–16 are summarised below.

- There was a 4% increase in the average number of problems managed at encounter, from 149 per 100 encounters in 2006–07 to 154 in 2015–16.
- The number of clinical treatments provided in general practice increased by 30%, from 30 per 100 encounters in 2006–07 to 39 per 100 encounters in 2015–16.
- The number of procedures undertaken per 100 encounters increased by 20%, from 15 to 18 per 100 encounters.
- There was an increased rate of referrals, which was reflected in referrals to allied health services and to medical specialists.
- Pathology test/test battery order rates increased by 12%. Orders for imaging tests also increased.

Of the encounters claimable from MBS/DVA:

- short surgery consultations as a proportion of all MBS/DVA-claimed consultations increased over the study period and standard surgery consultations decreased significantly
- the proportion claimable as chronic disease management items, health assessments and GP mental health care all increased significantly
- the mean length of A1 MBS/DVA-claimable GP–patient encounters in 2015–16 was marginally longer than in 2006–07, increasing from 14.0 to 14.5 minutes. The mean length of all MBS/DVA-claimable encounters increased significantly over the decade from 14.1 minutes to 14.9 minutes. The median length of both groups of MBS/DVA-claimable encounters increased from 12 to 13 minutes.

The changes in management actions are expressed in terms of rates per 100 encounters. As there was a significant increase in the number of problems managed at encounters, it may be more informative to consider changes in management actions in terms of rates per 100 problems managed. Rates per 100 problems are reported in the individual chapters dealing with these items in the 10-year companion report.

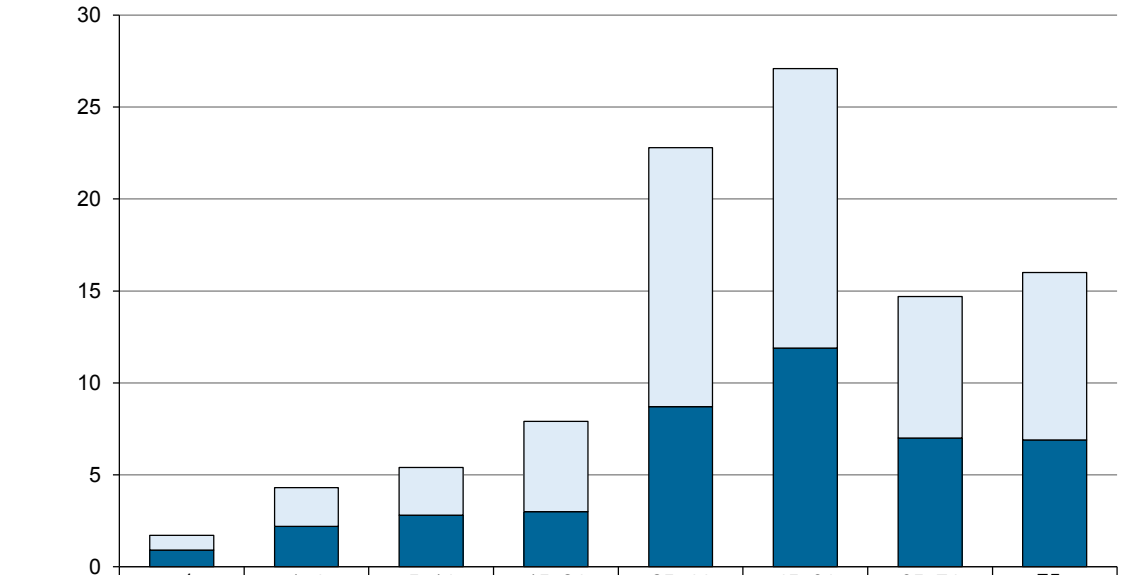
6 The patients

This chapter reports data collected from April 2015 to March 2016 (the 18th year of the BEACH program) about the characteristics of patients at GP encounters and their reasons for encounter. Data on patient characteristics and reasons for encounter are reported for each year from 2006–07 to 2015–16 in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

6.1 Age–sex distribution of patients at encounter

The age–sex distribution of patients at encounters is shown in Figure 6.1. Females accounted for the greater proportion (56.6%) of encounters (Table 6.1). This was reflected across all age groups except among children aged less than 15 years (Figure 6.1).

Patients aged less than 25 years accounted for 19.3% of encounters, those aged 25–44 years for 22.8%, those aged 45–64 years for 27.2%, and those aged 65 years and over for 30.7% of encounters (Table 6.1). Readers interested in changes in the care of middle-aged people in general practice should see Chapter 14.



	<1	1–4	5–14	15–24	25–44	45–64	65–74	75+
Female	0.8	2.1	2.6	4.9	14.1	15.2	7.7	9.1
Male	0.9	2.2	2.8	3.0	8.7	11.9	7.0	6.9

Age group (years)

Note: Missing data removed. The distributions will not agree perfectly with those in Table 6.1 because of missing data in either age or sex fields.

Figure 6.1: Age–sex distribution of patients at encounters, 2015–16

6.2 Other patient characteristics

Table 6.1 presents other characteristics of the patients at GP encounters. In summary:

- the patient was new to the practice at 7.3% of encounters
- nearly half of the encounters were with patients who held a Commonwealth concession card (46.2%) and/or a Repatriation Health Card (1.8%)
- at 1 in 10 encounters (10.5%) the patient was from a non-English-speaking background (see glossary)
- at 1.5% of encounters the patient identified themselves as an Aboriginal and/or Torres Strait Islander person.

Table 6.1: Characteristics of the patients at encounters

Patient characteristics	Number	Per cent of encounters (*n* = 97,398)	95% LCL	95% UCL
Sex (missing)[a]	828			
Males	41,894	43.4	42.5	44.2
Females	54,676	56.6	55.8	57.5
Age group (missing)[a]	847			
< 1 year	1,683	1.7	1.6	1.9
1–4 years	4,188	4.3	4.0	4.6
5–14 years	5,162	5.3	5.0	5.6
15–24 years	7,619	7.9	7.5	8.3
25–44 years	22,033	22.8	21.9	23.7
45–64 years	26,228	27.2	26.6	27.8
65–74 years	14,203	14.7	14.1	15.3
75+ years	15,435	16.0	15.0	16.9
New patient to practice (missing)[a]	1,719			
New patient to practice	6,949	7.3	6.5	8.0
Patient seen previously	88,730	92.7	92.0	93.5
Commonwealth concession card status (missing)[a]	9,096			
Has a Commonwealth concession card	40,788	46.2	44.4	47.9
No Commonwealth concession card	47,514	53.8	52.1	55.6
Repatriation Health Card status (missing)[a]	10,465			
Has a Repatriation Health Card	1,595	1.8	1.7	2.0
No Repatriation Health Card	85,339	98.2	98.0	98.3
Language status (missing)[a]	10,443			
Non-English-speaking background[b]	9,154	10.5	8.5	12.5
English-speaking background	77,801	89.5	87.5	91.5
Indigenous status (missing)[a]	10,254			
Aboriginal and/or Torres Strait Islander[c]	1,308	1.5	1.2	1.8
Non-Indigenous	85,835	98.5	98.2	98.8

(a) Missing data removed.

(b) Speaks a language other than English as their primary language at home.

(c) Self-identified.

Note: LCL – lower confidence limit; UCL – upper confidence limit.

6.3 Patient reasons for encounter

Patient reasons for encounter (RFEs) reflect the patient's demand for care and can provide an indication of service use patterns. Patient demand for care can be influenced by interventions aimed at the general population (for example, health awareness campaigns in popular media and print).

RFEs are those concerns and expectations that patients bring to the GP. Participating GPs were asked to record at least one, and up to three, patient RFEs in words as close as possible to those used by the patient, before the diagnostic or management process had begun. These reflect the patient's view of their reasons for consulting the GP. RFEs can be expressed in terms of one or more symptoms (for example, 'itchy eyes', 'chest pain'), in diagnostic terms (for example, 'about my diabetes', 'for my hypertension'), a request for a service ('I need more scripts', 'I want a referral'), an expressed fear of disease or a need for a check-up.

The patient may describe a single RFE that relates to a single problem managed at the encounter, a single RFE that relates to multiple problems, multiple RFEs that relate to a single problem managed, or multiple RFEs that relate to multiple problems managed at the encounter. GPs may also manage a problem that is unrelated to the patient's RFE (for example, a patient presents about her diabetes but while she is there the GP also provides a vaccination and performs a Pap smear).

Number of reasons for encounter

There were 149,084 RFEs recorded at 97,398 encounters in 2015–16 (Table 6.3). At 58.7% of encounters only one RFE was recorded, at 29.6% two RFEs were recorded and at 11.7% of encounters three RFEs were recorded (Table 6.2). On average, patients presented with 153.1 RFEs per 100 encounters, or about one-and-a-half RFEs per encounter (Table 6.3).

Table 6.2: Number of patient reasons for encounter

Number of RFEs at encounter	Number of encounters (*n* = 97,398)	Per cent of encounters	95% LCL	95% UCL
One RFE	57,136	58.7	57.4	60.0
Two RFEs	28,838	29.6	28.8	30.5
Three RFEs	11,424	11.7	11.1	12.4
Total	**97,398**	**100.0**	—	—

Note: RFEs – reasons for encounter; LCL – lower confidence limit; UCL – upper confidence limit.

Reasons for encounter by ICPC-2 component

The distribution of patient RFEs by ICPC-2 component is presented in Table 6.3, expressed as a percentage of all RFEs and as a rate per 100 encounters with 95% confidence limits. In the 'diagnosis, diseases' group we provide data about infections, injuries, neoplasms, congenital anomalies and 'other' diagnoses and diseases.

Approximately 4 out of 10 (41.7%) patient RFEs were expressed in terms of a symptom or complaint (for example, 'tired', 'fever'). RFEs described in diagnostic terms (for example, 'about my diabetes', 'for my depression') accounted for 18.0% of RFEs. The remaining 40.3% of RFEs were described in terms of processes of care, such as requests for a health check, prescriptions, referrals, test results or medical certificates.

At an 'average' 100 encounters, patients described 63.8 'symptom or complaint' RFEs, 27.6 diagnosis/disease RFEs, 24.0 procedural RFEs and made 16.1 requests for medications, treatments and/or therapeutics.

Table 6.3: Patient reasons for encounter by ICPC-2 component

ICPC-2 component	Number	Per cent of total RFEs (*n* = 149,084)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL
Symptoms and complaints	62,112	41.7	63.8	61.8	65.8
Diagnosis, diseases	26,904	18.0	27.6	26.2	29.1
Infections	6,430	4.3	6.6	6.2	7.0
Injuries	4,191	2.8	4.3	4.1	4.5
Neoplasms	962	0.6	1.0	0.9	1.1
Congenital anomalies	213	0.1	0.2	0.2	0.3
Other diagnoses, diseases	15,108	10.1	15.5	14.4	16.6
Diagnostic and preventive procedures	23,329	15.6	24.0	23.0	24.9
Medications, treatments and therapeutics	15,678	10.5	16.1	15.4	16.8
Test results	9,952	6.7	10.2	9.7	10.7
Referrals and other RFEs	7,404	5.0	7.6	7.2	8.0
Administrative	3,705	2.5	3.8	3.5	4.1
Total RFEs	**149,084**	**100.0**	**153.1**	**151.2**	**155.0**

Note: RFEs – reasons for encounter; LCL – lower confidence limit; UCL – upper confidence limit.

Reasons for encounter by ICPC-2 chapter

The distribution of patient RFEs by ICPC-2 chapter and the most common RFEs within each chapter are presented in Table 6.4. Each chapter and individual RFE is expressed as a percentage of all RFEs and as a rate per 100 encounters with 95% confidence limits.

RFEs of a general and unspecified nature were presented at a rate of 46.3 per 100 encounters, with requests for prescriptions, test results and general check-ups the most frequently recorded of these. RFEs related to the respiratory system occurred at a rate of 20.2 per 100 encounters, those related to the musculoskeletal system at a rate of 15.3 per 100, and those relating to skin at a rate of 15.3 per 100 encounters (Table 6.4).

The far right column of Table 6.4 shows the proportion of patient encounters where there was at least one RFE within an ICPC-2 chapter (representing body systems). Patients may describe multiple RFEs that are classified within the same ICPC-2 chapter (for example, depression and anxiety; or rheumatoid arthritis and osteoporosis), however this column reports only one instance per chapter.

RFEs classified as ‘General and unspecified’ were described at least once at 40.4% of encounters in 2015–16. At least one respiratory RFE was recorded at 17.1% of encounters, while one or more RFEs related to the musculoskeletal system were recorded at 14.1% of encounters.

It is possible to extrapolate the ‘rate per 100 encounters’ and the ‘per cent of encounters’ results to the 143.0 million MBS-claimed GP encounters in 2015–16 (see section 2.9). This allows calculation of the estimated number of times an RFE was presented at GP encounters as well as the number of encounters where an RFE was presented. Using respiratory-related RFEs as an example, we estimate that nationally in 2015–16, patients described 28.9 million RFEs related to the respiratory system at 24.5 million GP–patient encounters.

Table 6.4: Patient reasons for encounter by ICPC-2 chapter and most frequent individual reasons for encounter within chapter

Reasons for encounter	Number	Per cent of total RFEs[a] (*n* = 149,084)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
General and unspecified	**45,089**	**30.2**	**46.3**	**45.0**	**47.6**	**40.4 (39.4–41.5)**
Prescription NOS	9,764	6.5	10.0	9.4	10.6	—
Results tests/procedures NOS	8,420	5.6	8.6	8.2	9.1	—
General check-up*	4,451	3.0	4.6	4.1	5.0	—
Administrative procedure NOS	3,278	2.2	3.4	3.1	3.6	—
Immunisation/vaccination NOS	2,293	1.5	2.4	2.1	2.6	—
Fever	2,102	1.4	2.2	1.9	2.4	—
Other referrals NEC	1,403	0.9	1.4	1.3	1.6	—
Weakness/tiredness	1,397	0.9	1.4	1.3	1.6	—
Blood test NOS	1,068	0.7	1.1	0.9	1.2	—
Clarify or discuss patient's RFE	893	0.6	0.9	0.8	1.0	—
Observation/health education/advice/ diet NOS	855	0.6	0.9	0.8	1.0	—
Follow-up encounter unspecified NOS	832	0.6	0.9	0.7	1.0	—
Other reason for encounter NEC	730	0.5	0.7	0.6	0.9	—
Chest pain NOS	710	0.5	0.7	0.7	0.8	—
Trauma/injury NOS	683	0.5	0.7	0.6	0.8	—
Respiratory	**19,710**	**13.2**	**20.2**	**19.3**	**21.2**	**17.1 (16.4–17.8)**
Cough	6,074	4.1	6.2	5.8	6.6	—
Throat symptom/complaint	2,659	1.8	2.7	2.5	3.0	—
Immunisation/vaccination – respiratory	2,423	1.6	2.5	2.0	3.0	
Upper respiratory tract infection	1,638	1.1	1.7	1.5	1.9	—
Sneezing/nasal congestion	1,474	1.0	1.5	1.3	1.7	—
Musculoskeletal	**14,923**	**10.0**	**15.3**	**14.8**	**15.9**	**14.1 (13.7–14.6)**
Back complaint*	3,023	2.0	3.1	2.9	3.3	—
Knee symptom/complaint	1,379	0.9	1.4	1.3	1.5	—
Shoulder symptom/complaint	1,143	0.8	1.2	1.1	1.3	—
Foot/toe symptom/complaint	1,109	0.7	1.1	1.0	1.2	—
Leg/thigh symptom/complaint	784	0.5	0.8	0.7	0.9	—
Neck symptom/complaint	762	0.5	0.8	0.7	0.9	—
Musculoskeletal injury NOS	726	0.5	0.7	0.7	0.8	—

(continued)

Table 6.4 (continued): Patient reasons for encounter by ICPC-2 chapter and most frequent individual reasons for encounter within chapter

Reasons for encounter	Number	Per cent of total RFEs[a] (*n* = 149,084)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
Skin	**14,893**	**10.0**	**15.3**	**14.7**	**15.9**	**14.5 (14.0–15.0)**
Rash*	2,659	1.8	2.7	2.5	2.9	—
Skin symptom/complaint, other	1,589	1.1	1.6	1.5	1.8	—
Skin check-up*	1,233	0.8	1.3	1.1	1.5	—
Swelling (skin)*	1,054	0.7	1.1	1.0	1.2	—
Laceration/cut	858	0.6	0.9	0.8	1.0	—
Digestive	**9,031**	**6.1**	**9.3**	**8.9**	**9.6**	**8.2 (7.9–8.5)**
Abdominal pain*	1,848	1.2	1.9	1.7	2.0	—
Diarrhoea	1,086	0.7	1.1	1.0	1.2	—
Vomiting	735	0.5	0.8	0.7	0.9	—
Psychological	**8,814**	**5.9**	**9.0**	**8.6**	**9.5**	**8.1 (7.7–8.5)**
Depression*	1,933	1.3	2.0	1.8	2.1	—
Anxiety*	1,429	1.0	1.5	1.3	1.6	—
Sleep disturbance	1,066	0.7	1.1	1.0	1.2	—
Acute stress reaction	691	0.5	0.7	0.6	0.8	—
Circulatory	**7,967**	**5.3**	**8.2**	**7.7**	**8.6**	**7.9 (7.4–8.3)**
Cardiovascular check-up*	3,222	2.2	3.3	3.0	3.6	—
Hypertension/high blood pressure*	1,456	1.0	1.5	1.3	1.7	—
Endocrine and metabolic	**5,757**	**3.9**	**5.9**	**5.5**	**6.3**	**5.7 (5.3–6.0)**
Diabetes (non-gestational)*	1,140	0.8	1.2	1.0	1.3	—
Prescription – endocrine/metabolic	954	0.6	1.0	0.9	1.1	—
Female genital system	**4,435**	**3.0**	**4.6**	**4.2**	**4.9**	**4.2 (3.9–4.5)**
Female genital check-up/Pap smear*	1,566	1.1	1.6	1.4	1.8	—
Menstrual problems*	675	0.5	0.7	0.6	0.8	—
Neurological	**4,321**	**2.9**	**4.4**	**4.2**	**4.7**	**4.3 (4.1–4.5)**
Headache*	1,614	1.1	1.7	1.5	1.8	—
Vertigo/dizziness	997	0.7	1.0	0.9	1.1	—
Ear	**3,220**	**2.2**	**3.3**	**3.1**	**3.5**	**3.2 (3.0–3.3)**
Ear pain/earache	1,211	0.8	1.2	1.1	1.3	—
Pregnancy and family planning	**2,884**	**1.9**	**3.0**	**2.7**	**3.2**	**2.9 (2.6–3.1)**

(continued)

Table 6.4 (continued): Patient reasons for encounter by ICPC-2 chapter and most frequent individual reasons for encounter within chapter

Reasons for encounter	Number	Per cent of total RFEs[a] (*n* = 149,084)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
Urology	**2,595**	**1.7**	**2.7**	**2.5**	**2.8**	**2.4 (2.3–2.5)**
Eye	**2,053**	**1.4**	**2.1**	**2.0**	**2.2**	**1.9 (1.8–2.1)**
Blood and blood-forming organs	**1,325**	**0.9**	**1.4**	**1.2**	**1.5**	**1.4 (1.2–1.5)**
Blood test – blood and blood forming organs	805	0.5	0.8	0.7	1.0	—
Male genital system	**1,110**	**0.7**	**1.1**	**1.0**	**1.2**	**1.1 (1.0–1.2)**
Social	**958**	**0.6**	**1.0**	**0.9**	**1.1**	**1.0 (0.9–1.1)**
Total RFEs	**149,084**	**100.0**	**153.1**	**151.2**	**155.0**	—

(a) Only individual RFEs accounting for ≥ 0.5% of total RFEs are included.

(b) The proportion of all encounters at which the patient described at least one reason for encounter that was classified in the chapter.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: RFEs – reasons for encounter; LCL – lower confidence limit; UCL – upper confidence limit; CI – confidence interval; NEC – not elsewhere classified; NOS – not otherwise specified.

Most frequent patient reasons for encounter

The 30 most commonly recorded RFEs (Table 6.5), accounted for more than half (59.5%) of all RFEs. In this analysis, the specific ICPC-2 chapter to which an across-chapter concept belongs was disregarded, so that, for example, ‘check-up – all’ includes all check-ups from all ICPC-2 chapters, irrespective of whether or not the body system was specified.

Of the top 30 RFEs (Table 6.5), most were either symptom or disease descriptions such as cough, back complaint, throat complaint or rash. However, the top three RFEs reflected requests for a process of care (that is, requests for prescription, check-up and test results), and together accounted for nearly one-quarter of all RFEs (23.5%).

Table 6.5: Thirty most frequent patient reasons for encounter

Patient reason for encounter	Number	Per cent of total RFEs[(a)] (*n* = 149,084)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL
Prescription – all*	13,113	8.8	13.5	12.8	14.1
Check-up – all*	12,014	8.1	12.3	11.7	13.0
Test results*	9,952	6.7	10.2	9.7	10.7
Cough	6,074	4.1	6.2	5.8	6.6
Immunisation/vaccination – all*	4,884	3.3	5.0	4.4	5.6
Administrative procedure – all*	3,705	2.5	3.8	3.5	4.1
Back complaint*	3,023	2.0	3.1	2.9	3.3
Rash*	2,659	1.8	2.7	2.5	2.9
Throat symptom/complaint	2,659	1.8	2.7	2.5	3.0
Blood test – all*	2,184	1.5	2.2	2.0	2.5
Fever	2,102	1.4	2.2	1.9	2.4
Depression*	1,933	1.3	2.0	1.8	2.1
Abdominal pain*	1,848	1.2	1.9	1.7	2.0
Upper respiratory tract infection	1,638	1.1	1.7	1.5	1.9
Headache*	1,614	1.1	1.7	1.5	1.8
Skin symptom/complaint, other	1,589	1.1	1.6	1.5	1.8
Sneezing/nasal congestion	1,474	1.0	1.5	1.3	1.7
Hypertension/high blood pressure*	1,456	1.0	1.5	1.3	1.7
Anxiety*	1,429	1.0	1.5	1.3	1.6
Other referrals NEC	1,403	0.9	1.4	1.3	1.6
Weakness/tiredness	1,397	0.9	1.4	1.3	1.6
Knee symptom/complaint	1,379	0.9	1.4	1.3	1.5
Observation/health education/advice/diet – all*	1,370	0.9	1.4	1.3	1.5
Ear pain/earache	1,211	0.8	1.2	1.1	1.3
Diabetes – all*	1,148	0.8	1.2	1.0	1.3
Shoulder symptom/complaint	1,143	0.8	1.2	1.1	1.3
Foot/toe symptom/complaint	1,109	0.7	1.1	1.0	1.2
Diarrhoea	1,086	0.7	1.1	1.0	1.2
Sleep disturbance	1,066	0.7	1.1	1.0	1.2
Swelling*	1,054	0.7	1.1	1.0	1.2
Subtotal	*88,719*	*59.5*	—	—	—
Total RFEs	**149,084**	**100.0**	**153.1**	**151.2**	**155.0**

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: RFEs – reasons for encounter; LCL – lower confidence limit; UCL – upper confidence limit; NEC – not elsewhere classified.

6.4 Changes in patients and their reasons for encounter over the decade 2006–07 to 2015–16

An overview of changes in the characteristics of patients at encounters and their reasons for encounter over the decade 2006–07 to 2015–16, can be found in Chapter 6 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] Major changes are summarised below.

From 2006–07 to 2015–16, the proportion of BEACH encounters with patients aged 65–74 years increased from 12.7% to 14.7%. When extrapolated, this change (in combination with the increased number of encounters nationally) means that in 2015–16 there were 7.9 million more encounters with patients aged 65–74 years nationally than a decade earlier.

The proportion of patients holding a Repatriation Health Card nearly halved, from 3.4% in 2006–07 to 1.8% in 2015–16. This is probably due to a decline in the number of World War 2 veterans and their partners.

Over the decade, there was no significant change in the number of reasons for encounter recorded per 100 encounters, from 150.8 in 2006–07 to 153.1 in 2015–16. However, there was a significant increase in the proportion providing two RFEs. There was a significant increase in the rate of RFEs describing processes of care, particularly requests for 'medications, treatments and therapeutics' and for test results.

There was a large increase in requests for administrative procedures such as sickness certificates, wellness certificates and care plans. This increase is due to the introduction of many care and management plans for specific chronic conditions over the decade. Another factor that may have influenced this increase is the expectation by employers and schools that workers provide sickness certificates to claim sick days and for children to stay at home from school.

The rate of RFEs describing an infection decreased across the decade. This continues a trend that has been seen particularly among children at GP encounters.[62]

7 Problems managed

A ‘problem managed’ is a formal statement of the provider’s understanding of a health problem presented by the patient, family or community, and can be described in terms of a disease, symptom or complaint, social problem or ill-defined condition managed at the encounter. GPs were instructed to record each problem at the most specific level possible from the information available. As a result, the problem managed may, at times, be limited to the level of a presenting symptom.

At each patient encounter, up to four problems could be recorded by the GP. A minimum of one problem was compulsory. The status of each problem to the patient – new (first presentation to a medical practitioner) or old (follow-up of previous problem) – was also indicated. The concept of a principal diagnosis, which is often used in hospital statistics, is not adopted in studies of general practice where multiple problem management is the norm rather than the exception. Further, the range of problems managed at the encounter often crosses multiple body systems and may include undiagnosed symptoms, psychosocial problems or chronic disease, which makes the designation of a principal diagnosis difficult. Thus, the order in which the problems were recorded by the GP is not significant.

There are two ways to describe the frequency of problems managed: as a percentage of all problems managed in the study or as a rate at which problems are managed per 100 encounters. Where groups of problems are reported (for example, circulatory problems) it must be remembered that more than one of that type of problem (such as hypertension and heart failure) may have been managed at a single encounter. We therefore report these data in a variety of ways to aid interpretation and reporting.

For a single ungrouped problem that can only be managed once per encounter, the rate per 100 encounters can also be regarded as equivalent to the percentage of encounters at which that problem was managed. For example, ‘asthma was managed at a rate of 2.0 per 100 encounters’, can also be regarded as ‘asthma was managed at 2.0% of encounters’. The reader must be mindful that such a statement cannot be made for grouped concepts (ICPC-2 chapters and those marked with asterisks in the tables), as more than one problem within that group could have been managed at a single encounter.

The last column in Table 7.3 describes the proportion of encounters during which at least one problem within each ICPC-2 chapter was managed. This allows users to make the following types of statements: ‘at least one psychological problem was managed at 12.4% of encounters’; or (using the extrapolation methods described in Chapter 2) ‘at least one digestive problem was managed at 17.7 million general practice encounters in 2015–16.’

Changes in the problems managed in Australian general practice from the BEACH study are reported for each year from 2006–07 to 2015–16 in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

7.1 Number of problems managed at encounter

In 2015–16, there were 150,279 problems managed, at a rate of 154.3 per 100 encounters (Table 7.2). Table 7.1 shows that one problem was managed at 61.4% of encounters and two problems were managed at 26.1% of encounters. Approximately 10% of encounters involved the management of three problems (9.4%), and four problems were managed at 3.2% of encounters.

Table 7.1: Number of problems managed at an encounter

Number of problems managed at encounter	Number of encounters	Per cent	95% LCL	95% UCL
One problem	59,804	61.4	60.1	62.7
Two problems	25,385	26.1	25.3	26.8
Three problems	9,132	9.4	8.9	9.9
Four problems	3,077	3.2	2.8	3.5
Total	**97,398**	**100.0**	—	—

Note: LCL – lower confidence limit; UCL – upper confidence limit.

Figure 7.1 shows the age–sex-specific rates of problems managed. The number of problems managed at encounter increased steadily with the age of the patient from young adulthood up to those aged 65–74 years, and this rate remained steady for those aged 75 years or more.

Significantly more problems were managed overall at encounters with female patients (156.9 per 100 encounters, 95% CI: 154.5–159.2) than at those with male patients (151.2 per 100 encounters, 95% CI: 148.7–153.7) (results not tabled). Figure 7.1 demonstrates that this difference was evident in the 15–24 and 25–44 year age groups. There was no difference in the average number of problems managed between males and females for those aged 45–64, 65–74 and 75 years and over.

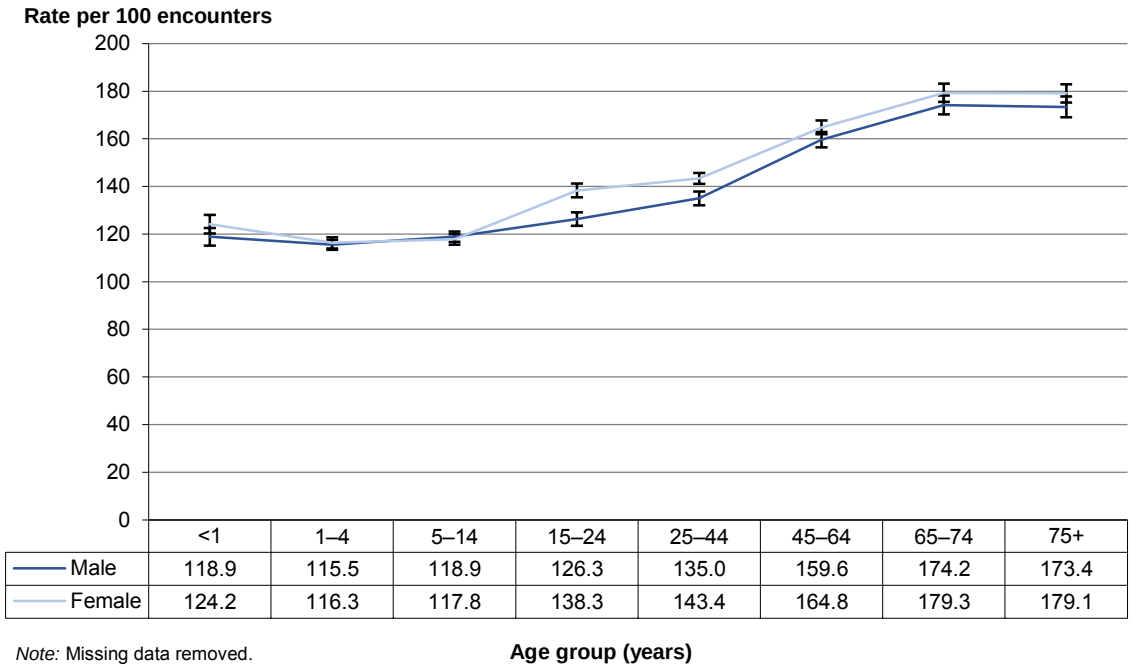


Figure 7.1: Age–sex-specific rates of problems managed per 100 encounters, 2015–16 (95% confidence intervals)

7.2 Problems managed by ICPC-2 component

A broad view of the types of problems managed in general practice can be seen by examining problems managed from the perspective of the component structure of the ICPC-2 classification (as described in Section 2.8). Table 7.2 lists the distribution of problems managed by ICPC-2 component.

Nearly two-thirds (65.1%) of problems were described as diagnoses or diseases. Of these, the majority were 'other diagnoses' (accounting for 42.3% of all problems managed), followed by infections (14.9%), injuries (4.5%) and neoplasms (2.9%).

Nearly 1 in 5 problems (19.3%) were expressed as a symptom or complaint. In some situations, rather than providing clinical descriptions of the problem under management, processes of care were recorded. The processes recorded most often were diagnostic and preventive procedures (for example, check-ups), accounting for 9.5% of problems managed.

At an 'average' 100 encounters GPs managed 100 diagnoses/diseases: 23 infections, 7 injuries, and 4 neoplasms. They also managed an average 30 symptoms and complaints, and 15 problems described as a diagnostic or preventive procedure.

Table 7.2: Problems managed by ICPC-2 component

ICPC-2 component	Number	Per cent of total problems (*n* = 150,279)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL
Diagnosis, diseases	97,801	65.1	100.4	98.4	102.4
Infections	22,412	14.9	23.0	22.3	23.8
Injuries	6,808	4.5	7.0	6.7	7.3
Neoplasms	4,327	2.9	4.4	4.1	4.7
Congenital anomalies	627	0.4	0.6	0.6	0.7
Other diagnoses	63,627	42.3	65.3	63.4	67.3
Symptoms and complaints	29,048	19.3	29.8	29.0	30.7
Diagnostic and preventive procedures	14,301	9.5	14.7	13.9	15.4
Medications, treatments and therapeutics	4,168	2.8	4.3	3.9	4.7
Test results	2,243	1.5	2.3	2.0	2.6
Administrative	1,549	1.0	1.6	1.4	1.8
Referrals and other RFEs	1,170	0.8	1.2	1.1	1.3
Total problems	**150,279**	**100.0**	**154.3**	**152.0**	**156.6**

Note: LCL – lower confidence limit; UCL – upper confidence limit; RFE – reason for encounter.

7.3 Problems managed by ICPC-2 chapter

The frequency and the distribution of problems managed are presented in Table 7.3 by ICPC-2 chapter (equivalent to body systems, as described in Chapter 2). Rates per 100 encounters and the proportion of total problems are provided at the ICPC-2 chapter level, and for frequent individual problems within each chapter. Individual problems accounting for at least 0.5% of all problems managed are listed in the table, in decreasing order of frequency within the chapter.

The most common problems managed were:

- problems of a general and unspecified nature (20.0 per 100 encounters and 13.0% of all problems), particularly general check-ups, prescriptions and general immunisations (usually multisystem childhood immunisations)
- respiratory problems (19.5 per 100 encounters), in particular upper respiratory tract infections, respiratory immunisation/vaccinations, asthma, and acute bronchitis/bronchiolitis
- those classified as musculoskeletal (18.1 per 100 encounters), such as arthritis and back complaints
- skin problems (17.4 per 100 encounters), with contact dermatitis and 'other' skin disease the most common
- circulatory problems (15.1 per 100), led by hypertension and atrial fibrillation/flutter
- endocrine and metabolic problems (13.5 per 100), such as diabetes and lipid disorder.

The last column in Table 7.3 describes the proportion of encounters at which at least one problem within an ICPC-2 chapter was managed. GPs may manage more than one problem within an ICPC-2 chapter (for example, depression and anxiety, rheumatoid arthritis and osteoporosis), but this column reports only one instance per chapter.

At least one general and unspecified problem was managed at 18.5% of encounters in 2015–16, equating to approximately 26.4 million encounters at which at least one general and unspecified problem was managed in 2015–16. At least one respiratory problem was managed at 18.9% of encounters, which extrapolates to 27.0 million encounters at which at least one respiratory problem was managed nationally in 2015–16 (Table 7.3).

Table 7.3: Problems managed by ICPC-2 chapter and most frequent individual problems within chapter

Problem managed	Number	Per cent total problems[a] (*n* = 150,279)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
General and unspecified	**19,467**	**13.0**	**20.0**	**19.2**	**20.8**	**18.5 (17.8–19.1)**
General check-up*	2,852	1.9	2.9	2.7	3.1	—
Immunisation/vaccination NOS	1,949	1.3	2.0	1.8	2.2	—
Prescription NOS	1,736	1.2	1.8	1.5	2.0	—
Results tests/procedures NOS	1,688	1.1	1.7	1.5	2.0	—
Administrative procedure NOS	1,396	0.9	1.4	1.3	1.6	—
Abnormal result/investigation NOS	1,127	0.8	1.2	1.0	1.3	—
Viral disease, other/NOS	1,113	0.7	1.1	1.0	1.3	—
Weakness/tiredness, general	739	0.5	0.8	0.7	0.8	—
Respiratory	**19,018**	**12.7**	**19.5**	**18.8**	**20.3**	**18.9 (18.2–19.6)**
Upper respiratory tract infection	5,313	3.5	5.5	5.1	5.8	—

(continued)

Table 7.3 (continued): Problems managed by ICPC-2 chapter and frequent individual problems within chapter

Problem managed	Number	Per cent total problems[a] (*n* = 150,279)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
Immunisation/vaccination – respiratory	2,946	2.0	3.0	2.5	3.6	—
Asthma	1,942	1.3	2.0	1.8	2.1	—
Acute bronchitis/bronchiolitis	1,935	1.3	2.0	1.8	2.2	—
Sinusitis acute/chronic	1,229	0.8	1.3	1.1	1.4	—
Chronic obstructive pulmonary disease	863	0.6	0.9	0.8	1.0	—
Tonsillitis*	750	0.5	0.8	0.7	0.9	—
Musculoskeletal	**17,597**	**11.7**	**18.1**	**17.5**	**18.6**	**17.1 (16.6–17.6)**
Arthritis – all*	3,438	2.3	3.5	3.3	3.7	—
Osteoarthritis*	2,548	1.7	2.6	2.4	2.8	—
Back complaint*	3,045	2.0	3.1	2.9	3.3	—
Bursitis/tendonitis/synovitis NOS	1,277	0.8	1.3	1.2	1.4	—
Sprain/strain*	1,205	0.8	1.2	1.1	1.4	—
Osteoporosis	977	0.7	1.0	0.9	1.1	—
Fracture*	843	0.6	0.9	0.8	0.9	—
Injury musculoskeletal NOS	805	0.5	0.8	0.7	0.9	—
Skin	**16,961**	**11.3**	**17.4**	**16.8**	**18.1**	**16.4 (15.8–16.9)**
Contact dermatitis	1,721	1.1	1.8	1.6	1.9	—
Skin disease, other	1,144	0.8	1.2	1.0	1.3	—
Laceration/cut	1,084	0.7	1.1	1.0	1.2	—
Solar keratosis/sunburn	1,067	0.7	1.1	1.0	1.2	—
Malignant neoplasm, skin	1,042	0.7	1.1	0.9	1.2	—
Skin symptom/complaint, other	806	0.5	0.8	0.7	0.9	—
Circulatory	**14,678**	**9.8**	**15.1**	**14.4**	**15.8**	**14.1 (13.5–14.7)**
Hypertension*	7,289	4.9	7.5	7.0	7.9	—
Atrial fibrillation/flutter	1,234	0.8	1.3	1.1	1.4	—
Ischaemic heart disease*	868	0.6	0.9	0.8	1.0	—
Cardiovascular check-up*	833	0.6	0.9	0.7	1.0	—
Endocrine and metabolic	**13,151**	**8.8**	**13.5**	**12.9**	**14.1**	**12.3 (11.7–12.8)**
Diabetes (non-gestational)*	3,896	2.6	4.0	3.7	4.3	—
Lipid disorder	2,956	2.0	3.0	2.8	3.3	—
Vitamin/nutritional deficiency	1,419	0.9	1.5	1.3	1.6	—
Hypothyroidism/myxoedema	909	0.6	0.9	0.8	1.0	—
Obesity (BMI > 30)	736	0.5	0.8	0.6	0.9	

(continued)

Table 7.3 (continued): Problems managed by ICPC-2 chapter and frequent individual problems within chapter

Problem managed	Number	Per cent total problems[a] (*n* = 150,279)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of encounters[b] (95% CI) (*n* = 97,398)
Psychological	**12,778**	**8.5**	**13.1**	**12.6**	**13.7**	**12.4 (11.9–12.9)**
Depression*	4,103	2.7	4.2	4.0	4.4	—
Anxiety*	2,126	1.4	2.2	2.0	2.3	—
Sleep disturbance	1,549	1.0	1.6	1.5	1.7	—
Acute stress reaction	740	0.5	0.8	0.7	0.8	—
Digestive	**10,797**	**7.2**	**11.1**	**10.7**	**11.4**	**10.7 (10.3–11.0)**
Gastro-oesophageal reflux disease*	2,487	1.7	2.6	2.4	2.7	—
Gastroenteritis*	1,321	0.9	1.4	1.2	1.5	—
Abdominal pain*	756	0.5	0.8	0.7	0.9	—
Female genital system	**5,303**	**3.5**	**5.4**	**5.1**	**5.8**	**5.0 (4.7–5.3)**
Female genital check-up/Pap smear*	1,515	1.0	1.6	1.4	1.7	—
Menopausal symptom/complaint	683	0.5	0.7	0.6	0.8	—
Neurological	**3,867**	**2.6**	**4.0**	**3.8**	**4.1**	**3.9 (3.7–4.1)**
Headache*	1,126	0.7	1.2	1.1	1.3	—
Ear	**3,523**	**2.3**	**3.6**	**3.4**	**3.8**	**3.6 (3.4–3.7)**
Acute otitis media/myringitis	864	0.6	0.9	0.8	1.0	—
Excessive ear wax	797	0.5	0.8	0.7	0.9	—
Pregnancy and family planning	**3,500**	**2.3**	**3.6**	**3.3**	**3.9**	**3.5 (3.2–3.7)**
Pregnancy*	1,118	0.7	1.1	1.0	1.3	—
Oral contraception*	1,006	0.7	1.0	0.9	1.1	—
Urology	**3,403**	**2.3**	**3.5**	**3.3**	**3.7**	**3.4 (3.3–3.6)**
Urinary tract infection*	1,754	1.2	1.8	1.7	1.9	—
Eye	**2,182**	**1.5**	**2.2**	**2.1**	**2.4**	**2.2 (2.1–2.3)**
Male genital system	**1,748**	**1.2**	**1.8**	**1.7**	**1.9**	**1.8 (1.7–1.9)**
Blood and blood-forming organs	**1,562**	**1.0**	**1.6**	**1.5**	**1.7**	**1.6 (1.5–1.7)**
Social	**744**	**0.5**	**0.8**	**0.7**	**0.8**	**0.8 (0.7–0.8)**
Total problems	**150,279**	**100.0**	**154.3**	**152.0**	**156.6**	—

(a) Only those individual problems accounting for ≥ 0.5% of total problems are included in the table.

(b) The proportion of all encounters at which at least one problem classified in this chapter was managed.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; CI – confidence interval; NOS – not otherwise specified; BMI – body mass index.

7.4 Most frequently managed problems

Table 7.4 shows the most frequently managed individual problems in general practice, in decreasing order of frequency. These 35 problems accounted for 53.4% of all problems managed, and the top 10 problems accounted for 29.4%.

In this analysis, the specific chapter to which 'across chapter concepts' (for example, check-ups, immunisation/vaccination and prescriptions) apply is ignored, and the concept is grouped with all similar concepts regardless of body system. For example, immunisation/vaccination includes vaccinations for influenza, childhood diseases, hepatitis and many others.

Hypertension was the most common problem managed (7.5 per 100 encounters), followed by check-ups (6.3 per 100), upper respiratory tract infection (URTI) (5.5 per 100), immunisation/ vaccination (5.3 per 100), and depression (4.2 per 100) (Table 7.4).

The percentage of each problem that was 'new' is listed in the far right column in Table 7.4. If a problem was a new chronic problem to the patient, or a new episode of a recurrent problem and the patient had not been treated for that problem or episode by any medical practitioner before the encounter, it was considered a new problem (see Glossary). This can provide a measure of general practice incidence. For example, only 5.3% of all contacts with hypertension were new diagnoses. In contrast, 77.3% of URTI problems were new to the patient, suggesting that the majority of people with URTIs who attend the GP, do so only once per episode.

Table 7.4: Most frequently managed problems

Problem managed	Number	Per cent of total problems (*n* = 150,279)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	New as per cent of all problems[(a)]
Hypertension*	7,289	4.9	7.5	7.0	7.9	5.3
Check-up – all*	6,121	4.1	6.3	5.9	6.6	47.2
Upper respiratory tract infection	5,313	3.5	5.5	5.1	5.8	77.3
Immunisation/vaccination – all*	5,194	3.5	5.3	4.8	5.9	66.1
Depression*	4,103	2.7	4.2	4.0	4.4	13.0
Diabetes – all*	3,939	2.6	4.0	3.8	4.3	5.5
Arthritis – all*	3,438	2.3	3.5	3.3	3.7	18.0
Back complaint*	3,045	2.0	3.1	2.9	3.3	23.9
Lipid disorder	2,956	2.0	3.0	2.8	3.3	10.8
Prescription – all*	2,849	1.9	2.9	2.6	3.3	7.1
Gastro-oesophageal reflux disease*	2,487	1.7	2.6	2.4	2.7	13.2
Test results*	2,243	1.5	2.3	2.0	2.6	34.9
Anxiety*	2,126	1.4	2.2	2.0	2.3	16.9
Asthma	1,942	1.3	2.0	1.8	2.1	22.7
Acute bronchitis/bronchiolitis	1,935	1.3	2.0	1.8	2.2	72.8
Urinary tract infection*	1,754	1.2	1.8	1.7	1.9	65.2
Contact dermatitis	1,721	1.1	1.8	1.6	1.9	45.4
Sleep disturbance	1,549	1.0	1.6	1.5	1.7	23.1
Administrative procedure – all*	1,549	1.0	1.6	1.4	1.8	38.0
Vitamin/nutritional deficiency	1,419	0.9	1.5	1.3	1.6	33.2
Abnormal test results*	1,348	0.9	1.4	1.3	1.5	45.4
Gastroenteritis*	1,321	0.9	1.4	1.2	1.5	79.6
Bursitis/tendonitis/synovitis NOS	1,277	0.8	1.3	1.2	1.4	58.4
Atrial fibrillation/flutter	1,234	0.8	1.3	1.1	1.4	7.4
Sinusitis acute/chronic	1,229	0.8	1.3	1.1	1.4	66.1
Sprain/strain*	1,205	0.8	1.2	1.1	1.4	66.0
Skin disease, other	1,144	0.8	1.2	1.0	1.3	58.9
Headache*	1,126	0.7	1.2	1.1	1.3	35.2
Pregnancy*	1,118	0.7	1.1	1.0	1.3	39.9
Viral disease, other/NOS	1,113	0.7	1.1	1.0	1.3	74.0
Laceration/cut	1,084	0.7	1.1	1.0	1.2	43.9
Solar keratosis/sunburn	1,067	0.7	1.1	1.0	1.2	49.6
Malignant neoplasm, skin	1,042	0.7	1.1	0.9	1.2	51.2
Oral contraception*	1,006	0.7	1.0	0.9	1.1	18.7
Osteoporosis	977	0.7	1.0	0.9	1.1	16.9
Subtotal	*80,263*	*53.4*	—	—	—	—
Total problems	**150,279**	**100.0**	**154.3**	**152.0**	**156.6**	**38.9**

(a) The proportion of total contacts with this problem that were accounted for by new problems.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NOS – not otherwise specified.

7.5 Most common new problems

For each problem managed, participating GPs were asked to indicate whether the problem under management was a new problem for the patient (see Glossary). Table 7.5 lists the most common new problems managed in general practice, in decreasing order of frequency. Overall, 58,501 problems (38.9% of all problems) were specified as new, and were managed at a rate of 60.1 per 100 encounters.

New problems were often acute in nature, such as URTI (4.2 per 100 encounters), acute bronchitis/bronchiolitis (1.4 per 100) and urinary tract infection (1.2 per 100). Preventive activities were also frequently recorded, including immunisation/vaccination (3.5 per 100) and check-ups (3.0 per 100 encounters) (Table 7.5).

The far right column of this table shows the new cases of this problem as a proportion of total contacts with this problem. This provides an indication of the incidence of each problem. For example, the 729 new cases of arthritis represented only 18% of all GP contacts with diagnosed arthritis, suggesting that by far the majority of contacts for arthritis were for ongoing management. In contrast, 73% of acute bronchitis/bronchiolitis contacts were first consultations with a medical practitioner for this episode, indicating that the balance (27%) were follow-up consultations for this episode. This suggests that most patients only require one visit to a GP for the management of an episode of acute bronchitis/bronchiolitis.

Table 7.5: Most frequently managed new problems

New problem managed	Number	Per cent of total new problems (*n* = 58,501)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	New as per cent of all problems[(a)]
Upper respiratory tract infection	4,105	7.0	4.2	3.9	4.6	77.3
Immunisation/vaccination – all*	3,435	5.9	3.5	3.1	3.9	66.1
Check-up – all*	2,887	4.9	3.0	2.7	3.2	47.2
Acute bronchitis/bronchiolitis	1,410	2.4	1.4	1.3	1.6	72.8
Urinary tract infection*	1,144	2.0	1.2	1.1	1.3	65.2
Gastroenteritis*	1,052	1.8	1.1	1.0	1.2	79.6
Viral disease, other/NOS	824	1.4	0.8	0.7	1.0	74.0
Sinusitis acute/chronic	812	1.4	0.8	0.7	0.9	66.1
Sprain/strain*	795	1.4	0.8	0.7	0.9	66.0
Test results*	783	1.3	0.8	0.7	0.9	34.9
Contact dermatitis	782	1.3	0.8	0.7	0.9	45.4
Bursitis/tendonitis/synovitis NOS	746	1.3	0.8	0.7	0.8	58.4
Back complaint*	729	1.2	0.7	0.7	0.8	23.9
Skin disease, other	674	1.2	0.7	0.6	0.8	58.9
Acute otitis media/myringitis	639	1.1	0.7	0.6	0.7	73.9
Arthritis – all*	617	1.1	0.6	0.6	0.7	18.0
Abnormal test results*	612	1.0	0.6	0.6	0.7	45.4
Administrative procedure – all*	588	1.0	0.6	0.5	0.7	38.0
Tonsillitis*	562	1.0	0.6	0.5	0.7	74.9
Malignant neoplasm, skin	534	0.9	0.5	0.5	0.6	51.2
Depression*	532	0.9	0.5	0.5	0.6	13.0

(continued)

Table 7.5 (continued): Most frequently managed new problems

New problem managed	Number	Per cent of total new problems (*n* = 58,501)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	New as per cent of all problems[(a)]
Solar keratosis/sunburn	529	0.9	0.5	0.5	0.6	49.6
Excessive ear wax	497	0.8	0.5	0.5	0.6	62.3
Laceration/cut	476	0.8	0.5	0.4	0.5	43.9
Skin symptom/complaint	475	0.8	0.5	0.4	0.6	58.9
Vitamin/nutritional deficiency	471	0.8	0.5	0.4	0.6	33.2
Pregnancy*	447	0.8	0.5	0.4	0.5	39.9
Asthma	440	0.8	0.5	0.4	0.5	22.7
Respiratory infection, other	433	0.7	0.4	0.3	0.6	76.8
Abdominal pain*	432	0.7	0.4	0.4	0.5	57.2
Subtotal	*28,462*	*48.7*	—	—	—	—
Total new problems	**58,501**	**100.0**	**60.1**	**58.5**	**61.6**	—

(a) The proportion of total contacts with this problem that were accounted for by new problems.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NOS – not otherwise specified.

7.6 Most frequently managed chronic problems

To identify chronic conditions, a list classified according to ICPC-2, based on work undertaken by O'Halloran et al. in 2004[47] and regularly updated (see 'Chronic conditions' grouper G84 in the 'Analysis and reporting' section of the ICPC-2 PLUS Demonstrator[63]), was applied to the BEACH data set. More than one-third (34.6%) of the problems managed in general practice were chronic. At least one chronic problem was managed at 40.3% of encounters (95% CI: 39.2–41.5) (results not tabled), and chronic problems were managed at an average rate of 53.3 per 100 encounters (Table 7.6).

In other parts of this chapter, both chronic and non-chronic conditions (for example, diabetes and gestational diabetes) may have been grouped together when reporting (for example, diabetes – all*, Table 7.4). In this section, only problems regarded as chronic have been included in the analysis. For this reason, the condition labels and figures in this analysis may differ from those in Table 7.4. Where the group used for the chronic analysis differs from that used in other analyses in this report, the labels are marked with a double asterisk (for example, Diabetes [non-gestational]**). Codes included in asterisked concepts are presented in Appendix 4, Table A4.2.

Table 7.6 shows the most frequently managed chronic problems. Together, these 30 chronic problems accounted for 78.7% of all chronic problems managed, and for 27.2% of all problems managed. Half of all chronic problems managed (50.2%) were accounted for by the top seven chronic problems: non-gestational hypertension (14.0% of chronic conditions), depressive disorder (7.8%), non-gestational diabetes (7.5%), chronic arthritis (6.6%), lipid disorder (5.7%), oesophageal disease (4.9%) and asthma (3.7%) (Table 7.6).

The far right column of Table 7.6 shows the proportion of each chronic problem that was new to the patient (as defined in Section 7.4). Overall, 16.1% of chronic problems managed were new diagnoses, though just 5.3% of non-gestational diabetes problems were new, and 51.2% of malignant skin neoplasms managed were new problems.

Table 7.6: Most frequently managed chronic problems

Chronic problem managed	Number	Per cent of total chronic problems (*n* = 51,929)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	New as per cent of all chronic problems
Hypertension (non-gestational)**	7,279	14.0	7.5	7.0	7.9	5.3
Depressive disorder**	4,064	7.8	4.2	3.9	4.4	12.7
Diabetes (non-gestational)**	3,896	7.5	4.0	3.7	4.3	5.3
Chronic arthritis**	3,429	6.6	3.5	3.3	3.7	17.9
Lipid disorder	2,956	5.7	3.0	2.8	3.3	10.8
Oesophageal disease	2,521	4.9	2.6	2.4	2.8	13.5
Asthma	1,942	3.7	2.0	1.8	2.1	22.7
Atrial fibrillation/flutter	1,234	2.4	1.3	1.1	1.4	7.4
Malignant neoplasm, skin	1,042	2.0	1.1	0.9	1.2	51.2
Osteoporosis	977	1.9	1.0	0.9	1.1	16.9
Hypothyroidism/myxoedema	909	1.7	0.9	0.8	1.0	10.5
Back syndrome with radiating pain**	880	1.7	0.9	0.8	1.0	22.5
Ischaemic heart disease**	868	1.7	0.9	0.8	1.0	9.6
Chronic obstructive pulmonary disease	863	1.7	0.9	0.8	1.0	15.1
Obesity (BMI > 30)	736	1.4	0.8	0.6	0.9	12.4
Shoulder syndrome (excluding arthritis)**	659	1.3	0.7	0.6	0.7	45.1
Gout	612	1.2	0.6	0.6	0.7	20.5
Chronic skin ulcer (including varicose ulcer)	591	1.1	0.6	0.5	0.7	21.9
Migraine	589	1.1	0.6	0.5	0.7	20.0
Heart failure	535	1.0	0.5	0.5	0.6	13.8
Chronic back pain**	530	1.0	0.5	0.5	0.6	2.5
Schizophrenia	527	1.0	0.5	0.5	0.6	3.3
Dementia (including senile, Alzheimer's)	515	1.0	0.5	0.4	0.6	10.8
Chronic pain NOS	482	0.9	0.5	0.4	0.6	1.1
Anxiety disorder**	457	0.9	0.5	0.4	0.5	13.8
Chronic acne**	420	0.8	0.4	0.4	0.5	26.7
Chronic kidney disease**	370	0.7	0.4	0.3	0.4	8.3
Vertiginous syndrome	361	0.7	0.4	0.3	0.4	52.6
Back syndrome without radiating pain (excluding arthritis, sprains and strains)**	309	0.6	0.3	0.3	0.4	14.8
Neck syndrome (excluding arthritis and sprains/strains)**	309	0.6	0.3	0.3	0.4	32.3
Subtotal	*40,862*	*78.7*	—	—	—	—
Total chronic problems	**51,929**	**100.0**	**53.3**	**51.4**	**55.3**	**16.1**

** Includes multiple ICPC-2 or ICPC-2 PLUS codes and indicates that this group differs from that used for analysis in other sections of this chapter, as only chronic conditions have been included in this analysis (see Appendix 4, Table A4.2 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; BMI – body mass index; NOS – not otherwise specified.

7.7 Changes in problems managed over the decade 2006–07 to 2015–16

Data about the problems managed in general practice from each of the past 10 years of the BEACH study, 2006–07 to 2015–16 are reported in Chapter 7 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] Major changes that occurred over the decade are summarised below.

Overall, the number of problems managed at general practice encounters increased from 148.5 per 100 encounters in 2006–07 to 154.3 in 2015–16. When this result is extrapolated to estimate national figures, this represents 67.1 million more problems managed at general practice encounters in 2015–16 than in 2006–07. A rise in GP attendances over the decade also contributed to this increase. The increased numbers of problems managed was reflected in a significant increase over the decade in the management of new problems (56.5 to 60.1 per 100 encounters).

Changes in some of the most common individual problems managed in general practice are summarised below.

- The management rate of hypertension decreased from 9.6 per 100 encounters in 2006–07 to 7.5 per 100 in 2015–16. Due to the overall increase in the number of general practice encounters nationally, there were still an additional 800,000 encounters at which hypertension was managed in 2015–16 than in 2006–07.
- General check-ups were managed more often in 2015–16 than in 2006–07, increasing from 2.4 to 2.9 per 100 encounters. This represents 1.7 million more occasions where general check-ups were managed in 2015–16 than in 2006–07.
- The management rate of depression increased from 3.7 per 100 encounters to 4.2 per 100 between 2006–07 and 2015–16, suggesting about 2.2 million more occasions where depression was managed in 2015–16 than in 2006–07.
- The management rate of immunisation/vaccination did not change significantly over the decade. However, there were numerous fluctuations in the management rate, with a significant spike in 2009–10 (7.3 per 100 encounters) that coincided with the H1N1 influenza pandemic, and a significant decrease in 2014–15 (3.6 per 100) which may be explained by a delay in supply of the influenza vaccine in 2015. The 2015–16 rate of immunisation/vaccination (5.3 per 100) was similar to that of 2013–14.

The management rate of chronic conditions did not differ in 2015–16 (53.3 per 100 encounters) from that of 2006–07 (53.3 per 100 encounters). However, due to the increase in the number of GP visits nationally, we estimate that GPs managed 21.1 million more chronic problems in 2015–16 than they did a decade earlier.

8 Overview of management

The BEACH survey form allows GPs to record several aspects of patient management for each problem managed at an encounter. Pharmaceutical management is recorded in detail. All modes of treatment, including clinical treatments (for example, counselling) and procedures, recorded briefly in the GP's own words, are related to a single problem. The form allows referrals, hospital admissions, pathology and imaging test orders to be related to a single or multiple problems (see Appendix 1).

A summary of management at GP encounters from 2006–07 to 2015–16 is reported for each year in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

At the 97,398 encounters, GPs undertook 227,690 management activities in total. The most common management type was medication, either prescribed, GP-supplied, or advised for over-the-counter purchase. 'Other treatments' were the second most common management activity, with clinical treatments more frequent than procedural treatments (Table 8.1).

For an 'average' 100 patient problems managed, GPs provided 53 prescriptions and 25 clinical treatments, undertook 11 procedures, made 6 referrals to medical specialists and 4 to allied health services, and placed 31 pathology test/battery orders and 7 imaging test orders.

At an 'average' 100 encounters, they prescribed 82 medications, supplied 9, and advised the purchase of 11. They undertook 39 clinical treatments, 18 procedures, referred 10 patients to specialists and 6 to allied health services, and placed orders for 48 pathology and 11 imaging tests.

Table 8.1: Summary of management

Management type	Number	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Medications	99,398	102.1	99.6	104.5	66.1	64.8	67.5
Prescribed	79,871	82.0	79.8	84.2	53.1	51.9	54.4
GP-supplied	8,869	9.1	8.3	9.9	5.9	5.4	6.4
Advised OTC	10,658	10.9	10.1	11.8	7.1	6.6	7.6
Other treatments	54,744	56.2	53.4	59.0	36.4	34.8	38.1
Clinical	37,563	38.6	36.1	41.0	25.0	23.5	26.5
Procedural	17,181	17.6	16.6	18.7	11.4	10.8	12.1
Referrals and admissions	15,671	16.1	15.4	16.7	10.4	10.0	10.8
Medical specialist*	9,242	9.5	9.1	9.9	6.2	5.9	6.4
Allied health services*	5,452	5.6	5.2	6.0	3.6	3.4	3.9
Hospital*	305	0.3	0.3	0.4	0.2	0.2	0.2
Emergency department*	261	0.3	0.2	0.3	0.2	0.1	0.2
Other referrals*	410	0.4	0.3	0.5	0.3	0.2	0.3
Pathology	46,315	47.6	45.5	49.6	30.8	29.7	32.0
Imaging	10,733	11.0	10.6	11.5	7.1	6.9	7.4
Other investigations[(a)]	829	0.9	0.8	0.9	0.6	0.5	0.6
Total management activities	**227,690**	**233.9**	—	—	**151.4**	—	—

(a) Other investigations reported here include only those ordered by the GP. Other investigations in Chapter 12 include those ordered by the GP and those done by the GP or practice staff.

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; OTC – over-the-counter.

The number of encounters or problems for which at least one form of management was recorded by the GPs gives us another perspective (Table 8.2). At least one management action was recorded at 91.6% of encounters, for 86.0% of problems managed.

- At least one medication or other treatment was given for 71.8% of the problems managed.
- At least one medication (most commonly prescribed) was prescribed, supplied or advised for more than half (51.9%) of the problems managed.
- At least one other treatment (most commonly clinical) was provided for nearly one-third (32.2%) of problems managed.
- At least one referral (most commonly to a medical specialist) was made for 10.3% of problems managed.
- At least one investigation (most commonly pathology) was requested for 19.2% of problems managed (Table 8.2).

When extrapolated nationally based on the total number of MBS claims for GP consultation items of service (see Section 2.11), which in 2015–16 was 143.0 million:

- at least one medication was prescribed, advised for over-the-counter purchase, or supplied by the GP at approximately 89.7 million (95% CI: 88.4–90.9 million) GP–patient encounters across the country in 2015–16
- at least one procedure was undertaken at 22.6 million (95% CI: 21.5–23.6 million) encounters nationally
- at least one referral to a specialist, allied health professional, hospital or emergency department was provided by GPs at 21.0 million (95% CI: 20.2–21.9 million) encounters nationally
- at least one pathology, imaging or other investigation was ordered at 36.6 million (95% CI: 35.6–37.6 million) encounters across Australia in 2015–16.

Table 8.2: Encounters and problems for which management was recorded

Management type	Number of encounters	Per cent of all encounters (*n* = 97,398)	95% LCL	95% UCL	Number of problems	Per cent of all problems (*n* = 150,279)	95% LCL	95% UCL
At least one management type	89,182	91.6	90.9	92.2	129,276	86.0	85.4	86.7
At least one medication or other treatment	78,875	81.0	80.1	81.9	107,857	71.8	70.9	72.7
At least one medication	61,031	62.7	61.8	63.6	77,998	51.9	51.0	52.8
At least one prescription	50,541	51.9	51.0	52.8	63,783	42.4	41.5	43.3
At least one GP-supplied	7,187	7.4	6.7	8.0	7,373	4.9	4.5	5.4
At least one OTC advised	9,055	9.3	8.7	9.9	9,371	6.2	5.8	6.7
At least one other treatment	41,154	42.3	40.6	43.9	48,326	32.2	30.8	33.5
At least one clinical treatment	29,152	29.9	28.3	31.5	33,773	22.5	21.2	23.7
At least one procedural treatment	15,361	15.8	15.0	16.5	16,089	10.7	10.2	11.2
At least one referral or admission	14,319	14.7	14.1	15.3	15,531	10.3	10.0	10.7
At least one referral to a medical specialist	8,828	9.1	8.7	9.4	9,351	6.2	6.0	6.5
At least one referral to allied health services	5,024	5.2	4.8	5.5	5,400	3.6	3.4	3.8
At least one referral to hospital	305	0.3	0.3	0.4	320	0.2	0.2	0.3
At least one referral to emergency department	261	0.3	0.2	0.3	271	0.2	0.1	0.2
At least one other referral	410	0.4	0.3	0.5	432	0.3	0.2	0.3
At least one investigation	24,972	25.6	24.9	26.3	28,786	19.2	18.6	19.7
At least one pathology order	17,938	18.4	17.8	19.0	20,550	13.7	13.2	14.1
At least one imaging order	9,166	9.4	9.1	9.8	9,549	6.4	6.1	6.6
At least one other investigation[(a)]	799	0.8	0.7	0.9	818	0.5	0.5	0.6

(a) Other investigations reported here only include those ordered by the GP. Other investigations in Chapter 12 include those ordered by the GP and those done by the GP or practice staff.

Note: LCL – lower confidence limit; UCL – upper confidence limit; OTC – over-the-counter.

The combinations of management types related to each problem were investigated. The majority of treatments occurred as a single component, or in combination with one other component.

Management was provided:

- as a single component for almost two-thirds (59.3%) of the problems managed (Table 8.3)
- as a double component for 20.2% of problems managed
- less often (6.5%) with more than two components (results not tabled).

Table 8.3 lists the most common management combinations, where management action(s) were recorded. Medication alone was the most common management, followed by a clinical treatment alone, and the combination of a medication and a clinical treatment. When a problem was referred it was most likely that no other treatments were given for that problem at the encounter.

Table 8.3: Most common management combinations

1+ medication	1+ clinical treatment	1+ procedural treatment	1+ referral	1+ imaging order	1+ pathology order	Per cent of total problems (*n* = 97,398)	Per cent of total encounters (*n* = 150,279)
No recorded management						14.0	8.4
1+ management recorded							
✓						32.2	27.1
	✓					10.0	7.2
✓	✓					6.9	10.6
			✓			5.2	3.9
					✓	5.0	2.9
		✓				4.3	3.6
✓					✓	2.9	4.5
✓		✓				2.8	4.4
				✓		2.6	1.9
✓			✓			1.5	3.1
	✓				✓	1.3	1.4
✓				✓		1.2	2.1
		✓			✓	1.2	1.3
	✓		✓			1.2	1.5
✓	✓				✓	0.6	1.9
				✓	✓	0.5	0.7
✓	✓		✓			0.4	1.3
	✓	✓				0.4	0.7
✓	✓	✓				0.4	1.3
			✓		✓	0.3	0.5

Note: 1+ – at least one specified management type.

8.1 Changes in management over the decade 2006–07 to 2015–16

Changes in management over the decade 2006–07 to 2015–16 are described in detail in Chapter 8 of the accompanying report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] In that publication, changes over time are largely reported in terms of changes in management actions as a rate per 100 problems. This reflects change in how GPs are managing problems and accounts for the significant increase in the number of problems managed per encounter over the decade.

The major changes in management actions over the 10 years to 2015–16 are summarised below.

- There was a significant decrease in the rate of prescribed medications, from 56.1 per 100 problems managed in 2006–07 to 53.1 per 100 problems in 2015–16.
- The rate of other treatments increased significantly, from 30.1 to 36.4 per 100 problems. Both clinical and procedural treatments increased significantly. Clinical treatments increased from 19.9 to 25.0 per 100 problems, and the rate of GP-provided procedures increased from 10.2 to 11.4 per 100 problems over the decade.
- The rate of referrals to other health providers significantly increased, from 8.2 to 10.4 per 100 problems managed between 2006–07 and 2015–16, influenced by a 15% increase in referrals to medical specialists (from 5.4 to 6.2 per 100 problems managed) and a 71% increase in referrals to allied health services over the period (from 2.1 to 3.6 per 100 problems managed). It was further influenced by a marginal increase in referrals to emergency departments (from 0.1 to 0.2 per 100 problems managed).
- The rate at which pathology tests/test batteries were ordered significantly increased by 8%, from 28.6 tests/batteries per 100 problems managed in 2006–07 to 30.8 per 100 in 2015–16.
- The rate at which imaging was ordered increased significantly from 6.0 imaging orders per 100 problems managed in 2006–07 to 7.1 per 100 in 2015–16, an increase of 18%.

9 Medications

GPs could record up to four medications for each of four problems managed – a maximum of 16 medications per encounter. Each medication could be recorded as prescribed (the default), supplied by the GP, or recommended for over-the-counter (OTC) purchase. The generic name of a medication is its non-proprietary name, which describes the pharmaceutical substance(s) or active pharmaceutical ingredient(s).

- GPs were asked to:
  - record the generic or brand name, the strength, regimen and number of repeats ordered for each medication
  - designate this as a new or continued medication for this patient for this problem.
- Generic or brand names were entered into the database in the manner recorded by the GP.
- Medications were coded using the Coding Atlas of Pharmaceutical Substances (CAPS) system developed by the FMRC, a hierarchical classification system which captures details of medications from generic to brand and product level. Every medication in the CAPS coding system is mapped to the international Anatomical Therapeutic Chemical (ATC) classification index.[64]
- The reporting of results at drug group, subgroup and generic level uses ATC levels 1, 3 and 5. The most frequently prescribed, supplied or advised individual medications are reported at the CAPS generic level (equivalent to ATC level 5) because ATC does not include many of the over-the-counter medications that arise in BEACH. Further, some ATC level 5 labels are not sufficiently specific for clarity.

Data on medications are reported for each year from 2006–07 to 2015–16 in the companion 10-year summary report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

Readers interested in adverse drug events will find more detailed information from the BEACH program in *Drugs causing adverse events in patients aged 45 or older: a randomised survey of general practice patients*.[65]

9.1 Source of medications

As reported in Chapter 8, a total of 99,398 medications were recorded, at rates of 102.1 per 100 encounters and 66.1 per 100 problems managed. We can derive from Table 8.1 that:

- approximately 4 out of 5 medications (80.4%) were prescribed
- 8.9% of medications were supplied to the patient by the GP
- 10.7% of medications were recommended by the GP for OTC purchase.

When medication rates per 100 encounters are extrapolated to the 143 million general practice Medicare-claimed encounters in Australia from April 2015 to March 2016, we estimate that GPs in Australia:

- prescribed, supplied or advised at least one medication at 89.7 million encounters (62.7% of encounters, Table 8.2)
- wrote a prescription (with/without repeats) for more than 117.3 million medications
- supplied 13 million medications directly to the patient
- recommended 15.6 million medications for OTC purchase (Table 8.1).

9.2 Prescribed medications

Prescribed medications accounted for 80.4% of all medications. There were 79,871 prescriptions recorded, at rates of 82.0 per 100 encounters and 53.1 per 100 problems managed (Table 8.1).

GPs recorded 76.1% of prescribed medications by brand (proprietary) name and 23.9% by their generic (non-proprietary) name. Medications most likely to be recorded by generic name were paracetamol, amoxycillin, and prednisolone (results not tabled).

As shown in Table 8.2, at least one prescription was given at 51.9% of encounters. Extrapolated to the 143 million general practice Medicare-claimed encounters, we estimate that GPs prescribed at least one medication at 74.2 million encounters.

At least one prescription was given for 42.4% of problems managed.

- No prescription was given for 57.6% of problems managed.
- One prescription was given for 34.4% of problems managed.
- Two prescriptions were given for 6.0% of problems managed.
- Three or four prescriptions were given for 2.0% of problems managed (Figure 9.1).

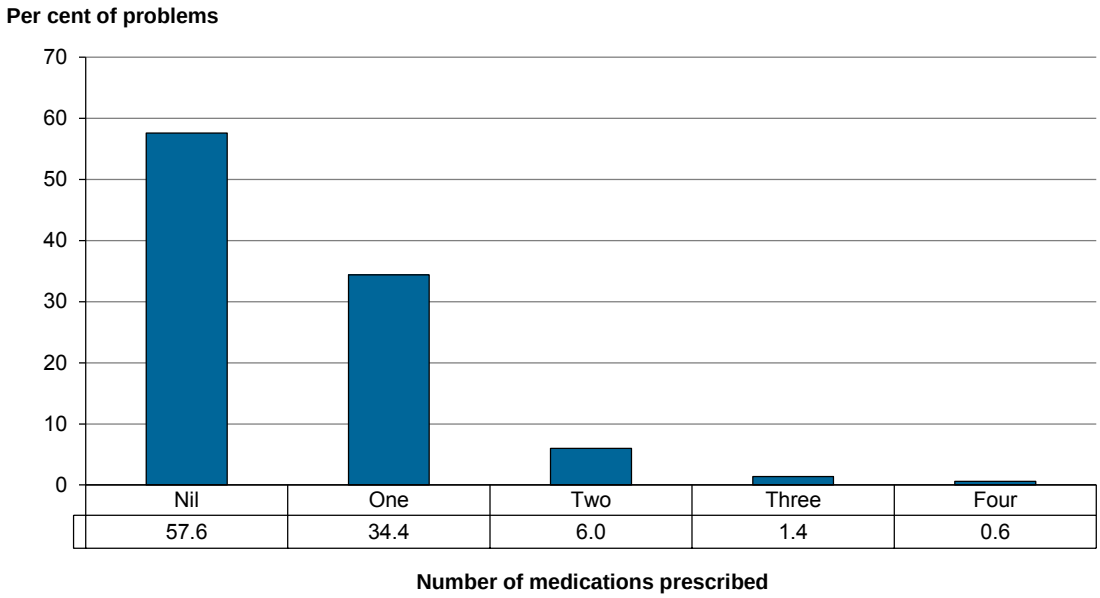
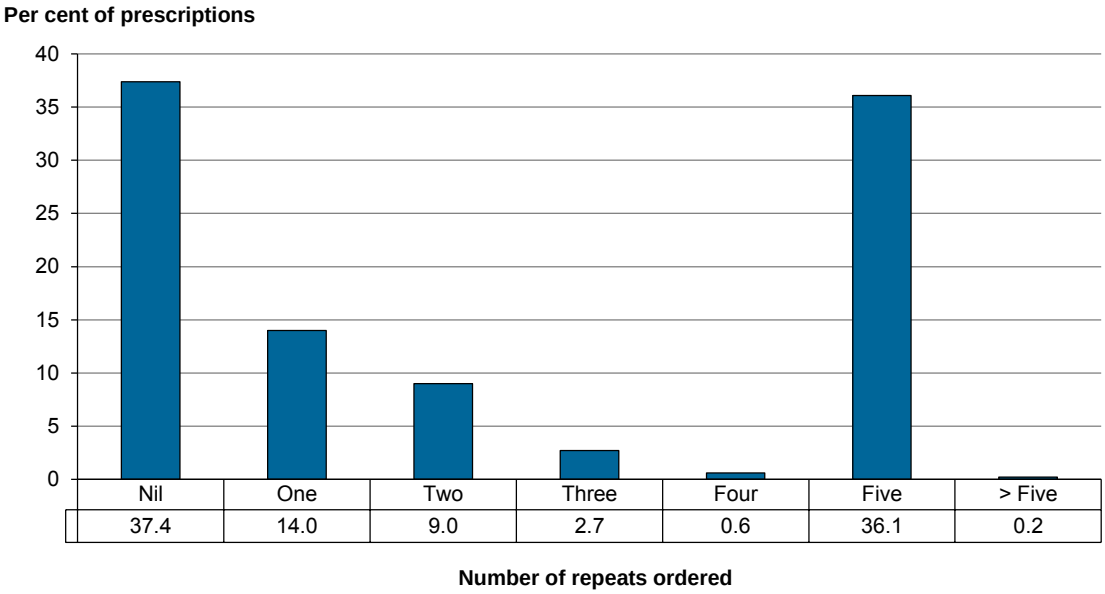


Figure 9.1: Number of medications prescribed per problem, 2015–16

Number of repeats

For 62,958 prescriptions (78.8% of all prescriptions), the GPs recorded 'number of repeats'. The distribution of the specified number of repeats (from nil to more than five) is provided in Figure 9.2. For 37.4% of these prescriptions, the GP specified that no repeats had been prescribed, and for 36.1% five repeats were ordered. The latter proportion reflects the Pharmaceutical Benefits Scheme (PBS) provision of one month's supply and five repeats for many medications used for chronic conditions such as hypertension. The ordering of one repeat was also quite common (14.0%).



Note: Percentages are based on the 62,958 prescriptions for which number of repeats was known.

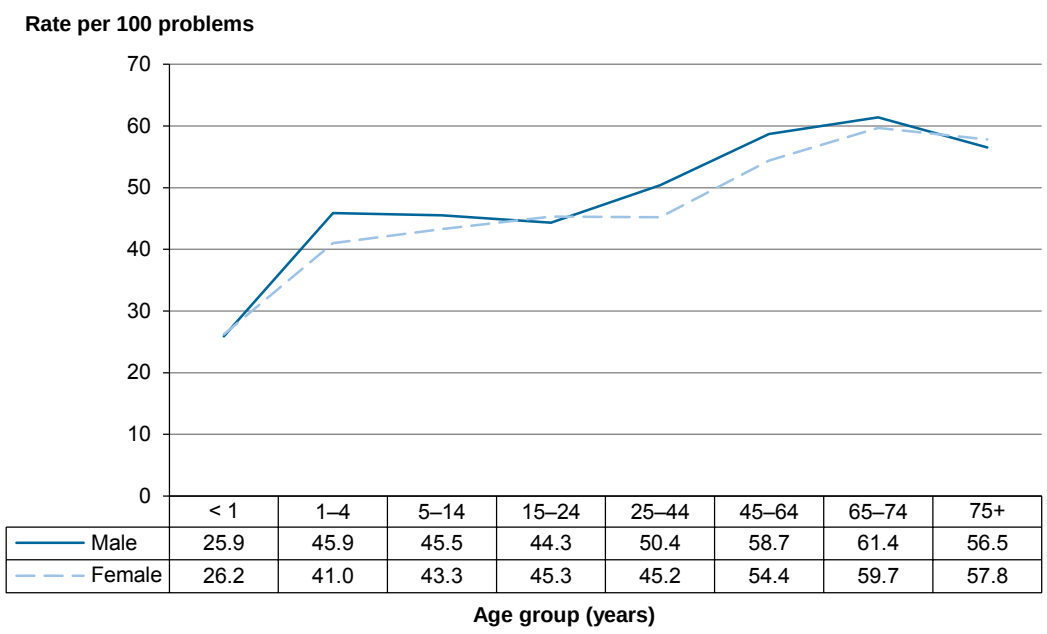
Figure 9.2: Number of repeats ordered per prescription, 2015–16

Age–sex-specific rates of prescribed medications

Age–sex-specific analysis showed similar prescription rates for male (83 per 100 encounters) and female patients (82 per 100), and the well-described tendency for the number of prescriptions written at each encounter to rise with the advancing age of the patient.

The rate of prescribing almost doubled from 53 per 100 encounters for patients aged less than 25 years, to 104 per 100 encounters for patients aged 65 years and over (results not tabled).

However, Figure 9.3 demonstrates that this age-based increase lessens if the prescription rate is considered in terms of the number of problems managed in each age group. This suggests that a substantial part of the higher prescription rate for older patients is due to the increased number of health problems they have managed at an encounter. The remaining increase in prescription rate associated with patient age is probably a reflection of the problems under management, as the rate of chronic problem management increases with patient age.[66]



	< 1	1–4	5–14	15–24	25–44	45–64	65–74	75+
Male	25.9	45.9	45.5	44.3	50.4	58.7	61.4	56.5
Female	26.2	41.0	43.3	45.3	45.2	54.4	59.7	57.8

Figure 9.3: Age–sex-specific prescription rates per 100 problems managed, 2015–16

Types of medications prescribed

Table 9.1 shows the distribution of prescribed medications using the WHO ATC classification.[48] This allows comparison with other data sources such as those produced from PBS data. The table lists medications in frequency order within ATC levels 1, 3 and 5, which are: drug group (mainly anatomical), subgroup, and non-proprietary drug name. Prescriptions are presented as a percentage of total prescriptions, as a rate per 100 encounters, and as a rate per 100 problems managed, each with 95% confidence intervals.

Drugs acting on the nervous system accounted for almost one-quarter (23.6%) of all prescribed medications. Most common were opioids (7.6% of prescribed medications), which include analgesics containing high-dose (at least 30 mg) codeine. The inclusion of analgesic combinations with 30 mg of codeine aligns with the Poisons Regulations of the Therapeutic Goods Administration,[67] which stipulates that high-dose codeine combinations are Schedule 4 (prescription only) medications. Oxycodone was prescribed at a similar rate to the codeine combinations. Antidepressants were also common nervous system medications, as were other analgesics, in particular, plain paracetamol.

Anti-infectives for systemic use, a group including antibiotics and antivirals, accounted for 17.8% of prescribed medications. Cardiovascular system medications made up 17.7%, and lipid-modifying agents were the most common of these.

Table 9.1: Prescribed medications by ATC levels 1, 3 and 5

ATC Classification level 1 3 5	Number	Per cent of prescribed medications (*n* = 79,871)[a]	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Nervous system	**18,861**	**23.6**	**19.4 (18.5–20.2)**	**12.6 (12.0–13.1)**
Opioids	6,072	7.6	6.2 (5.9–6.6)	4.0 (3.8–4.3)
Codeine, combinations excl. psycholeptics	1,513	1.9	1.6 (1.4–1.7)	1.0 (0.9–1.1)
Oxycodone	1,423	1.8	1.5 (1.3–1.6)	0.9 (0.9–1.0)
Tramadol	928	1.2	1.0 (0.8–1.1)	0.6 (0.5–0.7)
Oxycodone, combinations	760	1.0	0.8 (0.7–0.9)	0.5 (0.4–0.6)
Buprenorphine	582	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.4)
Antidepressants	4,171	5.2	4.3 (4.0–4.5)	2.8 (2.6–2.9)
Escitalopram	593	0.7	0.6 (0.5–0.7)	0.4 (0.4–0.4)
Sertraline	571	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.4)
Amitriptyline	544	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)
Venlafaxine	412	0.5	0.4 (0.4–0.5)	0.3 (0.2–0.3)
Mirtazepine	397	0.5	0.4 (0.4–0.5)	0.3 (0.2–0.3)
Other analgesics and antipyretics	1,823	2.3	1.9 (1.7–2.1)	1.2 (1.1–1.3)
Paracetamol, plain	1,680	2.1	1.7 (1.5–1.9)	1.1 (1.0–1.2)
Anxiolytics	1,694	2.1	1.7 (1.6–1.9)	1.1 (1.0–1.2)
Diazepam	1,128	1.4	1.2 (1.0–1.3)	0.8 (0.7–0.8)
Oxazepam	389	0.5	0.4 (0.3–0.5)	0.3 (0.2–0.3)
Hypnotics and sedatives	1,393	1.7	1.4 (1.3–1.5)	0.9 (0.9–1.0)
Temazepam	862	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.6)
Antipsychotics	1,263	1.6	1.3 (1.2–1.4)	0.8 (0.8–0.9)
Prochlorperazine	473	0.6	0.5 (0.4–0.5)	0.3 (0.3–0.4)
Antiepileptics	1,262	1.6	1.3 (1.2–1.4)	0.8 (0.8–0.9)
Pregabalin	733	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Drugs used in addictive disorders	498	0.6	0.5 (0.4–0.6)	0.3 (0.3–0.4)
Anti-infective for systemic use	**14,224**	**17.8**	**14.6 (14.1–15.2)**	**9.5 (9.1–9.9)**
Beta-lactam antibacterials, penicillins	5,623	7.0	5.8 (5.4–6.1)	3.7 (3.5–4.0)
Amoxycillin	2,686	3.4	2.8 (2.5–3.0)	1.8 (1.6–1.9)
Amoxycillin and enzyme inhibitor	2,011	2.5	2.1 (1.9–2.3)	1.3 (1.2–1.5)
Flucloxacillin	431	0.5	0.4 (0.4–0.5)	0.3 (0.2–0.3)
Other beta-lactam antibacterials	2,650	3.3	2.7 (2.5–2.9)	1.8 (1.6–1.9)
Cephalexin	2,341	2.9	2.4 (2.2–2.6)	1.6 (1.4–1.7)
Macrolides, lincosamides and streptogramins	1,905	2.4	2.0 (1.8–2.1)	1.3 (1.2–1.4)
Roxithromycin	733	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Clarithromycin	508	0.6	0.5 (0.4–0.6)	0.3 (0.3–0.4)
Tetracyclines	812	1.0	0.8 (0.8–0.9)	0.5 (0.5–0.6)
Doxycycline	738	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)

(continued)

Table 9.1 (continued): Prescribed medications by ATC levels 1, 3 and 5

ATC Classification level			Number	Per cent of prescribed medications (*n* = 79,871)[a]	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
1	**3**	**5**				
	Sulfonamides and trimethoprim		693	0.9	0.7 (0.6–0.8)	0.5 (0.4–0.5)
		Trimethoprim	528	0.7	0.5 (0.5–0.6)	0.4 (0.3–0.4)
	Viral vaccines		666	0.8	0.7 (0.6–0.8)	0.4 (0.4–0.5)
	Other antibacterials		500	0.6	0.5 (0.5–0.6)	0.3 (0.3–0.4)
	Bacterial vaccines		446	0.6	0.5 (0.4–0.5)	0.3 (0.2–0.3)
	Direct acting antivirals		361	0.5	0.4 (0.3–0.4)	0.2 (0.2–0.3)
Cardiovascular system			**14,167**	**17.7**	**14.5 (13.8–15.3)**	**9.4 (9.0–9.9)**
	Lipid modifying agents, plain		3,379	4.2	3.5 (3.2–3.7)	2.2 (2.1–2.4)
		Atorvastatin	1,347	1.7	1.4 (1.3–1.5)	0.9 (0.8–1.0)
		Rosuvastatin	1,281	1.6	1.3 (1.2–1.4)	0.9 (0.8–0.9)
		Simvastatin	381	0.5	0.4 (0.3–0.4)	0.3 (0.2–0.3)
	Angiotensin II antagonists, plain		2,019	2.5	2.1 (1.9–2.2)	1.3 (1.2–1.4)
		Irbesartan	655	0.8	0.7 (0.6–0.8)	0.4 (0.4–0.5)
		Telmisartan	559	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)
		Candesartan	557	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.4)
	ACE inhibitors, plain		1,710	2.1	1.8 (1.6–1.9)	1.1 (1.1–1.2)
		Perindopril	1,038	1.3	1.1 (1.0–1.2)	0.7 (0.6–0.7)
		Ramipril	482	0.6	0.5 (0.4–0.6)	0.3 (0.3–0.4)
	Angiotensin II antagonists, combinations		1,436	1.8	1.5 (1.3–1.6)	1.0 (0.9–1.0)
		Irbesartan and diuretics	418	0.5	0.4 (0.4–0.5)	0.3 (0.2–0.3)
	Beta blocking agents		1,429	1.8	1.5 (1.3–1.6)	1.0 (0.9–1.0)
		Metoprolol	476	0.6	0.5 (0.4–0.5)	0.3 (0.3–0.3)
		Atenolol	469	0.6	0.5 (0.4–0.5)	0.3 (0.3–0.4)
	Selective calcium channel blockers with mainly vascular effects		1,027	1.3	1.1 (1.0–1.2)	0.7 (0.6–0.7)
		Amlodipine	537	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)
	ACE inhibitors, combinations		609	0.8	0.6 (0.6–0.7)	0.4 (0.4–0.5)
	High-ceiling diuretics		540	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)
		Frusemide	538	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)
Alimentary tract and metabolism			**8,850**	**11.1**	**9.1 (8.7–9.5)**	**5.9 (5.6–6.1)**
	Drugs for peptic ulcer and gastro-oesophageal reflux		3,519	4.4	3.6 (3.4–3.8)	2.3 (2.2–2.5)
		Esomeprazole	1,735	2.2	1.8 (1.7–1.9)	1.2 (1.1–1.2)
		Pantoprazole	814	1.0	0.8 (0.8–0.9)	0.5 (0.5–0.6)
	Blood glucose lowering drugs, excluding insulins		2,352	2.9	2.4 (2.2–2.6)	1.6 (1.4–1.7)
		Metformin	1,263	1.6	1.3 (1.2–1.4)	0.8 (0.8–0.9)
	Insulins and analogues		582	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.4)
	Propulsives		567	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.4)
		Metoclopramide	458	0.6	0.5 (0.4–0.5)	0.3 (0.3–0.3)

(continued)

Table 9.1 (continued): Prescribed medications by ATC levels 1, 3 and 5

ATC Classification level 1 3 5	Number	Per cent of prescribed medications (*n* = 79,871)[a]	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Drugs for constipation	417	0.5	0.4 (0.4–0.5)	0.3 (0.2–0.3)
Respiratory system	**4,632**	**5.8**	**4.8 (4.5–5.0)**	**3.1 (2.9–3.3)**
Adrenergics, inhalants	2,485	3.1	2.6 (2.4–2.7)	1.7 (1.5–1.8)
Salbutamol	1,171	1.5	1.2 (1.1–1.3)	0.8 (0.7–0.9)
Salmeterol and fluticasone	641	0.8	0.7 (0.6–0.7)	0.4 (0.4–0.5)
Formoterol and budesonide	472	0.6	0.5 (0.4–0.5)	0.3 (0.3–0.4)
Decongestants and other nasal preparations	779	1.0	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Other drugs for obstructive airway diseases, inhalants	736	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Musculoskeletal system	**4,218**	**5.3**	**4.3 (4.1–4.6)**	**2.8 (2.6–3.0)**
Anti-inflammatory and antirheumatic products, non-steroid	2,960	3.7	3.0 (2.8–3.3)	2.0 (1.8–2.1)
Meloxicam	914	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.7)
Celecoxib	591	0.7	0.6 (0.5–0.7)	0.4 (0.3–0.5)
Diclofenac	483	0.6	0.5 (0.4–0.6)	0.3 (0.3–0.4)
Antigout preparations	507	0.6	0.5 (0.5–0.6)	0.3 (0.3–0.4)
Drugs affecting bone structure and mineralization	493	0.6	0.5 (0.4–0.6)	0.3 (0.3–0.4)
Dermatologicals	**3,871**	**4.8**	**4.0 (3.7–4.2)**	**2.6 (2.4–2.7)**
Corticosteroids, plain	2,095	2.6	2.2 (2.0–2.3)	1.4 (1.3–1.5)
Betamethasone	799	1.0	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Mometasone	526	0.7	0.5 (0.5–0.6)	0.3 (0.3–0.4)
Genitourinary system and sex hormones	**3,060**	**3.8**	**3.1 (3.0–3.3)**	**2.0 (1.9–2.2)**
Hormonal contraceptives for systemic use	1,209	1.5	1.2 (1.1–1.4)	0.8 (0.7–0.9)
Estrogens	535	0.7	0.5 (0.5–0.6)	0.4 (0.3–0.4)
Urologicals	523	0.7	0.5 (0.5–0.6)	0.3 (0.3–0.4)
Systemic hormonal preparations, excluding sex hormones	**2,849**	**3.6**	**2.9 (2.7–3.1)**	**1.9 (1.8–2.0)**
Corticosteroids for systemic use, plain	1,657	2.1	1.7 (1.6–1.8)	1.1 (1.0–1.2)
Prednisolone oral [all]	1,183	1.5	1.2 (1.1–1.3)	0.8 (0.7–0.9)
Thyroid preparations	893	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.7)
Levothyroxine sodium	866	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.6)
Blood and blood-forming organs	**2,498**	**3.1**	**2.6 (2.4–2.8)**	**1.7 (1.5–1.8)**
Antithrombotic agents	1,868	2.3	1.9 (1.7–2.1)	1.2 (1.1–1.4)
Warfarin	813	1.0	0.8 (0.7–1.0)	0.5 (0.5–0.6)
Sensory organs	**1,900**	**2.4**	**2.0 (1.8–2.1)**	**1.3 (1.2–1.3)**
Anti-infectives ophthalmological	655	0.8	0.7 (0.6–0.7)	0.4 (0.4–0.5)
Chloramphenicol ophthalmological	595	0.7	0.6 (0.5–0.7)	0.4 (0.4–0.4)
Corticosteroids and anti-infective in combination otological	540	0.7	0.6 (0.5–0.6)	0.4 (0.3–0.4)

(continued)

Table 9.1 (continued): Prescribed medications by ATC levels 1, 3 and 5

ATC Classification level 1 3 5	Number	Per cent of prescribed medications (*n* = 79,871)[(a)]	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Antineoplastic and immunomodulating agents	**408**	**0.5**	**0.4 (0.4–0.5)**	**0.3 (0.2–0.3)**
Antiparasitic products, insecticides and repellent	**155**	**0.2**	**0.2 (0.1–0.2)**	**0.1 (0.1–0.1)**
Various	**177**	**0.2**	**0.2 (0.1–0.2)**	**0.1 (0.1–0.1)**
Total prescribed medications	**79,871**	**100.0**	**82.0 (79.8–84.2)**	**53.1 (51.9–54.4)**

(a) Only those individual medications accounting for ≥ 0.5% of total prescribed medications are included in the table.

Note: ATC – Anatomical Therapeutic Chemical classification; CI – confidence interval; ACE – angiotensin-converting enzyme.

Most frequently prescribed medications

The most frequently prescribed individual medications are reported at the CAPS generic level (ATC level 5 equivalent) in Table 9.2. Together these 30 medications made up 42.1% of all prescribed medications.

Table 9.2: Most frequently prescribed medications

Generic medication	Number	Per cent of prescribed medications (*n* = 79,871)	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Amoxycillin	2,686	3.4	2.8 (2.5–3.0)	1.8 (1.6–1.9)
Cephalexin	2,341	2.9	2.4 (2.2–2.6)	1.6 (1.4–1.7)
Amoxycillin/potassium clavulanate	2,011	2.5	2.1 (1.9–2.3)	1.3 (1.2–1.5)
Esomeprazole	1,735	2.2	1.8 (1.7–1.9)	1.2 (1.1–1.2)
Paracetamol [plain]	1,680	2.1	1.7 (1.5–1.9)	1.1 (1.0–1.2)
Paracetamol/codeine	1,507	1.9	1.5 (1.4–1.7)	1.0 (0.9–1.1)
Oxycodone	1,423	1.8	1.5 (1.3–1.6)	0.9 (0.9–1.0)
Atorvastatin	1,347	1.7	1.4 (1.3–1.5)	0.9 (0.8–1.0)
Rosuvastatin	1,281	1.6	1.3 (1.2–1.4)	0.9 (0.8–0.9)
Metformin	1,263	1.6	1.3 (1.2–1.4)	0.8 (0.8–0.9)
Salbutamol	1,186	1.5	1.2 (1.1–1.3)	0.8 (0.7–0.9)
Diazepam	1,128	1.4	1.2 (1.0–1.3)	0.8 (0.7–0.8)
Perindopril	1,038	1.3	1.1 (1.0–1.2)	0.7 (0.6–0.7)
Tramadol	928	1.2	1.0 (0.8–1.1)	0.6 (0.5–0.7)
Meloxicam	914	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.7)
Thyroxine	866	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.6)
Temazepam	862	1.1	0.9 (0.8–1.0)	0.6 (0.5–0.6)
Pantoprazole	814	1.0	0.8 (0.8–0.9)	0.5 (0.5–0.6)
Warfarin sodium	813	1.0	0.8 (0.7–1.0)	0.5 (0.5–0.6)
Betamethasone topical	799	1.0	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Prednisolone	790	1.0	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Oxycodone/naloxone	760	1.0	0.8 (0.7–0.9)	0.5 (0.4–0.6)

(continued)

Table 9.2 (continued): Most frequently prescribed medications

Generic medication	Number	Per cent of prescribed medications (*n* = 79,871)	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Levonorgestrel/ethinyloestradiol	757	0.9	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Doxycycline	738	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Pregabalin	733	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Roxithromycin	733	0.9	0.8 (0.7–0.8)	0.5 (0.4–0.5)
Irbesartan	655	0.8	0.7 (0.6–0.8)	0.4 (0.4–0.5)
Fluticasone/salmeterol	641	0.8	0.7 (0.6–0.7)	0.4 (0.4–0.5)
Chloramphenicol eye	595	0.7	0.6 (0.5–0.7)	0.4 (0.4–0.4)
Escitalopram oxalate	593	0.7	0.6 (0.5–0.7)	0.4 (0.4–0.4)
Subtotal	*33,617*	*42.1*	—	—
Total prescribed medications	**79,871**	**100.0**	**82.0 (79.8–84.2)**	**53.1 (51.9–54.4)**

Note: CI – confidence interval.

9.3 Medications supplied by GPs

GPs supplied 8,869 medications in 2015–16, at a rate of 9.1 medications per 100 encounters, and 5.9 per 100 problems managed. At least one medication was supplied for 4.9% of all problems managed, and at 7.4% of encounters, an estimated 8.4 million encounters nationally in 2015–16. The most frequently supplied medications are listed in Table 9.3.

Table 9.3: Medications most frequently supplied by GPs

Generic medication	Number	Per cent of supplied medications (*n* = 8,869)	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Influenza virus vaccine	2,607	29.4	2.7 (2.1–3.2)	1.7 (1.4–2.1)
Pneumococcal vaccine	525	5.9	0.5 (0.5–0.6)	0.3 (0.3–0.4)
Vitamin B12 (cobalamin)	513	5.8	0.5 (0.4–0.6)	0.3 (0.3–0.4)
Diphtheria/pertussis/tetanus/hepatitis B/polio/ *Haemophilus influenzae B* vaccine	389	4.4	0.4 (0.3–0.5)	0.3 (0.2–0.3)
Triple antigen (diphtheria/pertussis/tetanus)	388	4.4	0.4 (0.3–0.5)	0.3 (0.2–0.3)
Rotavirus vaccine	321	3.6	0.3 (0.3–0.4)	0.2 (0.2–0.2)
Measles/mumps/rubella vaccine	239	2.7	0.2 (0.2–0.3)	0.2 (0.1–0.2)
Measles/mumps/rubella/varicella zoster vaccine	162	1.8	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Diphtheria/tetanus vaccine	152	1.7	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Denosumab	148	1.7	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Haemophilus B/*Meningococcus C* vaccine	123	1.4	0.1 (0.1–0.2)	0.1 (0.1–0.1)
Hepatitis B vaccine	113	1.3	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Hepatitis A vaccine	100	1.1	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Diphtheria/pertussis/tetanus/polio vaccine	96	1.1	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Typhoid vaccine (*Salmonella typhi*)	93	1.1	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Hepatitis A/typhoid (*Salmonella typhi*) vaccine	86	1.0	0.1 (0.1–0.1)	0.1 (0.0–0.1)

(continued)

Table 9.3 (continued): Medications most frequently supplied by GPs

Generic medication	Number	Per cent of supplied medications (*n* = 8,869)	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Immunisation NEC	85	1.0	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Allergen treatment	80	0.9	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Medroxyprogesterone	78	0.9	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Metoclopramide	66	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Testosterone	51	0.6	0.1 (0.0–0.1)	0.0 (0.0–0.0)
Steroid injection NEC	50	0.6	0.1 (0.0–0.1)	0.0 (0.0–0.0)
Local anaesthetic injection	47	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Papillomavirus (HPV) vaccine	44	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Chickenpox (varicella zoster) vaccine	43	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Hepatitis A and B vaccine	42	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Betamethasone systemic	42	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Lignocaine	42	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Salbutamol	41	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Meloxicam	41	0.5	0.0 (0.0–0.1)	0.0 (0.0–0.0)
Subtotal	*6,809*	*76.8*	—	—
Total supplied medications	**8,869**	**100.0**	**9.1 (8.3–9.9)**	**5.9 (5.4–6.4)**

Note: CI – confidence interval; NEC – not elsewhere classified. Data are reported to one decimal place; a rate tabled as 0.0 means the rate was less than 0.05 per 100 encounters or per 100 problems.

9.4 Medications advised for over-the-counter purchase

The GPs recorded 10,658 medications as recommended for OTC purchase, at rates of 10.9 per 100 encounters and 7.1 per 100 problems managed. At least one OTC medication was advised at 9.3% of encounters, equivalent to an estimated 13.3 million encounters nationally where GPs recommended at least one OTC medication. At least one OTC medication was advised for 6.2% of problems (Table 8.2). Table 9.4 shows the 30 most frequent advised medications at the CAPS generic level (ATC level 5 equivalent). Advised medications covered a wide range, and the most common was paracetamol, which accounted for 27.5% of these medications.

Table 9.4: Most frequently advised over-the-counter medications

Generic medication	Number	Per cent of OTC medications (*n* = 10,658)	Rate per 100 encounters (95% CI) (*n* = 97,398)	Rate per 100 problems (95% CI) (*n* = 150,279)
Paracetamol [plain]	2,935	27.5	3.0 (2.7–3.4)	2.0 (1.7–2.2)
Ibuprofen	785	7.4	0.8 (0.7–0.9)	0.5 (0.5–0.6)
Sodium chloride topical nasal	293	2.7	0.3 (0.2–0.4)	0.2 (0.1–0.3)
Mometasone nasal	217	2.0	0.2 (0.2–0.3)	0.1 (0.1–0.2)
Sodium/potassium/citric acid/glucose	213	2.0	0.2 (0.2–0.3)	0.1 (0.1–0.2)
Diclofenac topical	187	1.8	0.2 (0.1–0.2)	0.1 (0.1–0.2)
Simple analgesics	184	1.7	0.2 (0.1–0.3)	0.1 (0.1–0.2)
Loratadine	171	1.6	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Cetirizine	170	1.6	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Vitamin D3 (cholecalciferol)	160	1.5	0.2 (0.1–0.2)	0.1 (0.1–0.1)
Cream/ointment/lotion NEC	144	1.4	0.1 (0.1–0.2)	0.1 (0.1–0.1)
Hydrocortisone/clotrimazole	126	1.2	0.1 (0.1–0.2)	0.1 (0.1–0.1)
Fexofenadine	124	1.2	0.1 (0.1–0.2)	0.1 (0.1–0.1)
Saline bath/solution/gargle	117	1.1	0.1 (0.1–0.2)	0.1 (0.1–0.1)
Clotrimazole topical	110	1.0	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Ferrous sulfate/sodium ascorbate	104	1.0	0.1 (0.1–0.1)	0.1 (0.1–0.1)
Docusate otic	93	0.9	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Cold and flu medication NEC	85	0.8	0.1 (0.0–0.1)	0.1 (0.0–0.1)
Aspirin cardiovascular	84	0.8	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Clotrimazole vaginal	80	0.8	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Vitamin D NEC	79	0.7	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Paracetamol/codeine	78	0.7	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Chloramphenicol eye	77	0.7	0.1 (0.1–0.1)	0.1 (0.0–0.1)
Hyoscine butylbromide	74	0.7	0.1 (0.1–0.1)	0.0 (0.0–0.1)
Povidone-iodine gargle	73	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Antihistamines	73	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Multivitamins with minerals	72	0.7	0.1 (0.1–0.1)	0.0 (0.0–0.1)
Hydrocortisone topical	72	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Bromhexine	72	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Nasal drops/spray NEC	70	0.7	0.1 (0.0–0.1)	0.0 (0.0–0.1)
Subtotal	*7,120*	*66.8*	—	—
Total advised medications	**10,658**	**100.0**	**10.9 (10.1–11.8)**	**7.1 (6.6–7.6)**

Note: OTC – over-the-counter; CI – confidence interval; NEC – not elsewhere classified. Data are reported to one decimal place; a rate tabled as 0.0 means the rate was less than 0.05 per 100 encounters or per 100 problems.

9.5 Changes in medications over the decade 2006–07 to 2015–16

Data on medications are reported for each year from 2006–07 to 2015–16 in Chapter 9 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] In that report, changes over time are measured as change in the management of problems (that is, as a rate per 100 problems). This reflects change in how GPs manage problems, and takes into account the significant increase in the number of problems managed per encounter over the decade to 2015–16.

The rate at which medications were prescribed decreased significantly from 2006–07 (56.1 per 100 problems, 95% CI: 54.7–57.4) to 2015–16 (53.1 per 100 problems, 95% CI: 51.9–54.4). Among the prescribed drug groups that decreased significantly were antibacterials for systemic use, agents acting on the renin-angiotensin system, drugs for obstructive airway disease, systemic anti-inflammatory medications and sex hormones. At the same time, prescribing rates of several drug groups increased significantly, including psychoanaleptics, digestive drugs for acid-related disorders, systemic corticosteroids and antiepileptic drugs.

At the individual generic level, significant increases were found in the prescribing rates of a number of medications. Among them were esomeprazole, oxycodone, rosuvastatin, pantoprazole, oral prednisolone and pregabalin. On the other hand, amoxycillin, plain paracetamol and paracetamol/codeine combination products, temazepam and roxithromycin were among the medications for which significant decreases in prescribing rates occurred over time.

Other changes that occurred over the 10-year period were significant increases in most vaccines supplied to children directly by the GP. Among medications advised for over-the-counter purchase, there was a significant rise in ibuprofen and vitamin D3. There was a significant increase in the proportion of prescriptions for which five repeats were recorded, and a corresponding decrease in those for which one, three or four repeats were recorded over the decade.

10 Other treatments

The BEACH survey form allows GPs to record up to two other (non-pharmacological) treatments for each problem managed at the encounter. Other treatments include all clinical and procedural treatments provided. These groups are defined in Appendix 4, Tables A4.3 and A4.4.

Routine clinical measurements or observations, such as measurements of blood pressure and physical examinations, were not recorded if they were undertaken by the GP. However, GPs were instructed to record clinical measurements or observations if these were undertaken by a practice nurse (PN) or Aboriginal health worker (AHW) in conjunction with the GP at the encounter.

In this chapter 'other treatments' have been counted irrespective of whether they were done by the GP or by the PN/AHW. That is, the non-pharmacological management provided at general practice patient encounters is described, rather than management provided specifically by the GP. In the analysis of procedural treatments, injections given in the provision of vaccines were removed, as this action has already been counted and reported in Section 9.3.

Data on other treatments are reported for each year from 2006–07 to 2015–16 in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

10.1 Number of other treatments

In 2015–16, 54,744 other treatments were recorded, at least one being provided at 42.3% of encounters and for 35.6% of problems managed, at a rate of 56.2 per 100 encounters and 36.4 per 100 problems managed. Extrapolation of the 'at least one' result to the 143.0 million Medicare claimed GP items of service in 2015–16, suggests that nationally there were about 60.5 million GP–patient encounters at which at least one other treatment was provided.

Table 10.1: Summary of other treatments

Variable	Number	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
At least one other treatment (%)	41,154	42.3	40.6	43.9	32.2	30.8	33.5
Other treatments	54,744	56.2	53.4	59.0	36.4	34.8	38.1
Clinical treatments	37,563	38.6	36.1	41.0	25.0	23.5	26.5
Procedural treatments[(a)]	17,181	17.6	16.6	18.7	11.4	10.8	12.1

(a) Excludes all local injection/infiltrations performed for immunisations/vaccinations (*n* = 3,850).

Note: LCL – lower confidence limit; UCL – upper confidence limit.

Table 10.2 shows the relationship between other treatments and pharmacological treatments given for problems managed.

- For 61.8% of the problems that were managed with an 'other treatment', no medication was prescribed, supplied or advised for that problem at that encounter.
- Around 1 in 5 problems (22.5%) were managed with at least one clinical treatment. For 61.0% of these problems, no concurrent pharmacological treatment was provided.
- About 1 in 10 problems (10.7%) were managed with at least one procedural treatment, with no pharmacological management given for 62.6% of these problems.

Table 10.2: Relationship between other treatments and pharmacological treatments

Co-management of problems with other treatments	Number of problems	Per cent within class	Per cent of problems (*n* = 150,279)	95% LCL	95% UCL
At least one other treatment	48,326	100.0	32.2	30.8	33.5
Without pharmacological treatment	29,859	61.8	19.9	19.1	20.7
At least one clinical treatment	33,773	100.0	22.5	21.2	23.7
Without pharmacological treatment	20,618	61.0	13.7	13.0	14.5
At least one procedural treatment	16,089	100.0	10.7	10.2	11.2
Without pharmacological treatment	10,070	62.6	6.7	6.4	7.0

Note: LCL – lower confidence limit; UCL – upper confidence limit.

10.2 Clinical treatments

Clinical treatments include general and specific advice, counselling or education, and administrative processes. During 2015–16, there were 37,563 clinical treatments recorded, at a rate of 38.6 per 100 encounters, and 25.0 per 100 problems managed. Clinical treatments accounted for more than two-thirds (68.6%) of all other treatments recorded (Table 10.1).

Most frequent clinical treatments

Table 10.3 lists the 20 most common clinical treatments provided. Each clinical treatment type is expressed as a percentage of all clinical treatments, and as a rate per 100 encounters and per 100 problems managed with 95% confidence limits.

At least one clinical treatment was recorded at 29.9% (95% CI: 28.3–31.5) of encounters. Using this to extrapolate to the 143.0 million GP items claimed from Medicare over the same period, we estimate that one or more clinical treatments were provided at 42.8 million Medicare claimed encounters.

The top 10 clinical treatments most frequently provided accounted for 84.0% of all clinical treatments. General advice and education was the most frequently recorded (6.3 per 100 encounters), accounting for 16.3% of all clinical treatments, followed by counselling about the problem under management (4.9 per 100 encounters).

Several groups of clinical treatments related to preventive activities. The most common was counselling/advice about nutrition and weight (3.8 per 100 encounters), followed by counselling/ advice about: lifestyle (1.3 per 100), exercise (1.1), health/body (0.6), smoking (0.6), alcohol (0.4), and prevention (0.4). Together, these preventive activities accounted for 21.2% of clinical treatments, provided at a rate of 8.2 per 100 encounters.

Table 10.3: Most frequent clinical treatments

Clinical treatment	Number	Per cent of clinical treatments (*n* = 37,563)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Advice/education NEC*	6,132	16.3	6.3	5.3	7.3	4.1	3.4	4.7
Counselling – problem*	4,798	12.8	4.9	4.2	5.6	3.2	2.8	3.6
Advice/education – treatment*	4,243	11.3	4.4	3.9	4.8	2.8	2.5	3.1
Counselling/advice – nutrition/weight*	3,685	9.8	3.8	3.3	4.3	2.5	2.1	2.8
Counselling – psychological*	3,000	8.0	3.1	2.8	3.4	2.0	1.8	2.2
Advice/education – medication*	2,976	7.9	3.1	2.8	3.3	2.0	1.8	2.2
Other administrative procedure/ document (excluding sickness certificate)*	2,487	6.6	2.6	2.4	2.8	1.7	1.5	1.8
Sickness certificate*	1,568	4.2	1.6	1.4	1.8	1.0	0.9	1.2
Reassurance, support*	1,421	3.8	1.5	1.3	1.7	0.9	0.8	1.1
Counselling/advice – lifestyle*	1,242	3.3	1.3	1.0	1.5	0.8	0.7	1.0
Counselling/advice – exercise*	1,093	2.9	1.1	0.9	1.3	0.7	0.6	0.9
Counselling/advice – health/body*	594	1.6	0.6	0.5	0.8	0.4	0.3	0.5
Counselling/advice – smoking*	555	1.5	0.6	0.5	0.7	0.4	0.3	0.4
Counselling/advice – prevention*	406	1.1	0.4	0.3	0.5	0.3	0.2	0.3
Counselling/advice – alcohol*	405	1.1	0.4	0.4	0.5	0.3	0.2	0.3
Counselling/advice – other*	326	0.9	0.3	0.3	0.4	0.2	0.2	0.3
Observe/wait*	301	0.8	0.3	0.2	0.4	0.2	0.2	0.2
Family planning*	300	0.8	0.3	0.3	0.4	0.2	0.2	0.2
Consultation with primary care provider*	291	0.8	0.3	0.2	0.4	0.2	0.2	0.2
Counsel/advice – relaxation*	285	0.8	0.3	0.2	0.3	0.2	0.2	0.2
Counselling/advice – pregnancy*	267	0.7	0.3	0.2	0.3	0.2	0.1	0.2
Advice/education – sleep	249	0.7	0.3	0.2	0.3	0.2	0.1	0.2
Subtotal	*36,624*	*97.5*	—	—	—	—	—	—
Total clinical treatments	**37,563**	**68.6**	**38.6**	**36.1**	**41.0**	**25.0**	**23.5**	**26.5**

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.3 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NEC – not elsewhere classified.

Problems managed with a clinical treatment

Table 10.4 lists the top 10 problems managed with a clinical treatment. It also shows the extent to which clinical treatments were used for each problem, and the relationship between the use of a clinical treatment and the provision of medication for that problem at that encounter.

- A total of 33,773 problems (22.5% of all problems) involved one or more clinical treatments in their management (Table 10.2).
- While there was a very broad range of problems managed with clinical treatments, the 10 most common accounted for 29.5% of all problems for which clinical treatments were provided.
- Upper respiratory tract infection (URTI) was the problem accounting for the most clinical treatments (5.6% of all problems managed with clinical treatment/s), followed by depression (4.8%), and diabetes (3.5%).

- URTI was managed with a clinical treatment at a rate of 1.9 per 100 encounters. Extrapolation of this result suggests that across Australia in 2015–16, there were 2.7 million occasions where URTI was managed with a clinical treatment.
- A clinical treatment was provided at 35.3% of contacts with URTI, with no concurrent pharmacological treatment provided for 54.7% of these contacts where a clinical treatment was provided.
- Of the top 10 problems managed with a clinical treatment, gastroenteritis was the problem most likely to be managed this way (at 51.5% of contacts) and no concurrent medication was prescribed, supplied or advised on more than half of these management occasions.

Table 10.4: The 10 most common problems managed with a clinical treatment

Problem managed	Number[a]	Per cent of problems with clinical treatment (*n* = 33,773)	Rate per 100 encounters[b] (*n* = 97,398)	95% LCL	95% UCL	Per cent of this problem[c]	Per cent of treated problems no medications[d]
Upper respiratory tract infection	1,877	5.6	1.9	1.7	2.1	35.3	54.7
Depression*	1,635	4.8	1.7	1.5	1.8	39.9	52.0
Diabetes – all*	1,190	3.5	1.2	1.1	1.4	30.2	60.7
Hypertension*	1,064	3.2	1.1	0.9	1.3	14.6	43.6
Anxiety*	885	2.6	0.9	0.8	1.0	41.6	65.9
Lipid disorder	817	2.4	0.8	0.7	0.9	27.6	69.3
Gastroenteritis*	681	2.0	0.7	0.6	0.8	51.5	54.4
Back complaint*	669	2.0	0.7	0.6	0.8	22.0	44.6
Test results*	603	1.8	0.6	0.5	0.7	26.9	95.3
Administrative procedure NOS	553	1.6	0.6	0.5	0.7	39.6	96.6
Subtotal	*9,974*	*29.5*	—	—	—	—	—
Total problems with clinical treatments	**33,773**	**100.0**	**34.7**	**32.6**	**36.8**	—	—

(a) Number of contacts with this problem that generated at least one clinical treatment.

(b) Rate at which a selected problem was managed with one or more clinical treatments, per 100 encounters.

(c) Percentage of contacts with this problem that generated at least one clinical treatment.

(d) The numerator is the number of contacts with this problem that generated at least one clinical treatment but generated no medications. The denominator is the total number of contacts for this problem that generated at least one clinical treatment (with or without medications).

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NOS – not otherwise specified

10.3 Procedural treatments

Procedural treatments include therapeutic actions and diagnostic procedures undertaken at the encounter. Injections for immunisations/vaccinations (*n* = 3,850) are not counted here as these were already counted as a GP-supplied medication in Section 9.3. There were 17,181 procedures recorded at a rate of 17.6 per 100 encounters, and 11.4 per 100 problems managed (Table 10.2).

At least one procedure was undertaken at 15.8% (95% CI: 15.0–16.5) of recorded encounters. Extrapolation of this result to the 143 million Medicare claimed GP consultations across the country in 2015–16 suggests at least one procedure was undertaken at about 22.6 million of these.

Most frequent procedures

Table 10.5 lists the most common procedural treatments recorded. Each procedural treatment is expressed as a percentage of all procedures, as a rate per 100 encounters and per 100 problems with 95% confidence limits. Some of the procedures (for example, international normalised ratio [INR] tests, electrical tracings, physical function tests) are investigations undertaken at the encounter. Results presented in Table 10.5 do not include investigations that were ordered by the GP to be performed by an external provider. A summary of all investigations (both undertaken and ordered) is provided in Chapter 12 (Table 12.6).

The top 10 most frequently performed procedural treatments accounted for 83.8% of all procedures. The most frequent group of procedures was excision/removal tissue/biopsy/destruction/debridement/cauterisation (3.1 per 100 encounters), accounting for 17.4% of procedural treatments recorded.

Table 10.5: Most frequent procedural treatments

Procedural treatment	Number	Per cent of procedural treatments (*n* = 17,181)	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Excision/removal tissue/biopsy/ destruction/debridement/cauterisation*	2,996	17.4	3.1	2.8	3.3	2.0	1.8	2.2
Local injection/infiltration*(a)	2,483	14.5	2.5	2.3	2.8	1.7	1.5	1.8
Dressing/pressure/compression/ tamponade*	2,474	14.4	2.5	2.4	2.7	1.6	1.5	1.8
Physical medicine/rehabilitation – all*	1,385	8.1	1.4	1.2	1.6	0.9	0.8	1.1
Incision/drainage/flushing/aspiration/ removal body fluid*	991	5.8	1.0	0.9	1.1	0.7	0.6	0.7
Check-up – PN/AHW*	935	5.4	1.0	0.3	1.6	0.6	0.2	1.1
Pap smear*	844	4.9	0.9	0.8	1.0	0.6	0.5	0.6
Repair/fixation-suture/cast/prosthetic device (apply/remove)*	806	4.7	0.8	0.7	0.9	0.5	0.5	0.6
Other preventive procedures/high-risk medication*	774	4.5	0.8	0.7	0.9	0.5	0.4	0.6
Other therapeutic procedures/minor surgery*	717	4.2	0.7	0.6	0.9	0.5	0.4	0.6
INR test	664	3.9	0.7	0.6	0.8	0.4	0.4	0.5
Electrical tracings*	548	3.2	0.6	0.5	0.6	0.4	0.3	0.4
Physical function test*	402	2.3	0.4	0.3	0.5	0.3	0.2	0.3
Other diagnostic procedures*	386	2.2	0.4	0.3	0.5	0.3	0.2	0.3
Urine test*	225	1.3	0.2	0.2	0.3	0.1	0.1	0.2
Pregnancy test*	137	0.8	0.1	0.1	0.2	0.1	0.1	0.1
Glucose test	128	0.7	0.1	0.1	0.2	0.1	0.1	0.1
Hormone implant*	121	0.7	0.1	0.1	0.2	0.1	0.1	0.1
Subtotal	*17,017*	*99.0*	—	—	—	—	—	—
Total procedural treatments	**17,181**	**100.0**	**17.6**	**16.6**	**18.7**	**11.4**	**10.8**	**12.1**

(a) Excludes all local injection/infiltrations performed for immunisations/vaccinations (*n* = 2,573).

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Tables A4.4 and A4.5, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; INR – international normalised ratio; PN – practice nurse; AHW – Aboriginal health worker.

Problems managed with a procedural treatment

Table 10.6 lists the top 10 problems managed with a procedural treatment. It also shows the proportion of contacts with each problem that were managed with a procedure, and the proportion of these contacts where medication was not given concurrently.

- One or more procedural treatments were provided in the management of 16,089 problems (10.7% of all problems) (Table 10.2).
- The top 10 problems accounted for more than one-third (34.6%) of all problems managed with a procedural treatment.
- Laceration/cut accounted for the largest proportion of problems managed with a procedure (5.2%), followed by female genital check-up/Pap smear (4.7%), solar keratosis/sunburn (4.4%) and excessive ear wax (3.5%).
- Two thirds (66.3%) of contacts with solar keratosis/sunburn were managed with a procedure at a rate of 0.7 per 100 encounters. Extrapolation of this result suggests that across Australia in 2015–16, there were more than 1 million occasions where solar keratosis/sunburn was managed with a procedure by GPs.
- Of the top 10 problems, warts was the most likely to be managed with a procedure, undertaken at 4 out of 5 (82.4%) contacts with this problem. Of those contacts where warts were managed with a procedural treatment, no medication was prescribed, supplied or advised for that problem at 95.4% of contacts.

Table 10.6: The 10 most common problems managed with a procedural treatment

Problem managed	Number[a]	Per cent of problems with procedure (*n* = 16,089)	Rate per 100 encounters[b] (*n* = 97,398)	95% LCL	95% UCL	Per cent of this problem[c]	Per cent of treated problems no medications[d]
Laceration/cut	842	5.2	0.9	0.8	1.0	77.7	79.1
Female genital check-up/ Pap smear*	757	4.7	0.8	0.7	0.9	50.0	98.7
Solar keratosis/sunburn	707	4.4	0.7	0.6	0.8	66.3	96.2
Excessive ear wax	563	3.5	0.6	0.5	0.6	70.6	92.0
Warts	556	3.5	0.6	0.5	0.6	82.4	95.4
General check-up*	481	3.0	0.5	0.4	0.6	16.9	71.1
Malignant neoplasm, skin	463	2.9	0.5	0.4	0.6	44.4	93.3
Chronic ulcer skin (including varicose ulcer)	438	2.7	0.4	0.4	0.5	74.1	79.2
Vitamin/nutritional deficiency	387	2.4	0.4	0.3	0.5	27.3	0.8
Atrial fibrillation/flutter	372	2.3	0.4	0.3	0.5	30.1	58.8
Subtotal	*5,566*	*34.6*	—	—	—	—	—
Total problems with procedural treatments	**16,089**	**100.0**	**16.5**	**15.6**	**17.4**	—	—

(a) Number of contacts with this problem that generated at least one procedural treatment.

(b) Rate at which a selected problem was managed with one or more procedural treatments, per 100 encounters.

(c) Percentage of contacts with this problem that generated at least one procedural treatment.

(d) The numerator is the number of contacts with this problem that generated at least one procedural treatment but generated no medications. The denominator is the total number of contacts for this problem that generated at least one procedural treatment (with or without medications).

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit.

10.4 Changes in other treatments over the decade 2006–07 to 2015–16

An overview of changes in other treatments provided in general practice over the decade can be found in Chapter 10 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] A summary of the results is provided below.

Clinical treatments

From 2006–07 to 2015–16, there was a significant increase in the rate at which clinical treatments were provided at GP–patient encounters, from 19.9 per 100 problems managed to 25.0 per 100. However, this increase largely occurred between 2006–07 and 2007–08, and in the final BEACH year of 2015–16. We estimate that based on a 30% growth in clinical treatments per 100 encounters, 24.6 million more clinical treatments were provided at GP–patient encounters nationally in 2015–16 than in 2006–07.

- General advice and education was the most frequently recorded clinical treatment throughout the decade and there was no significant change in its rate of use. The rates at which GPs provided psychological counselling and counselling about the problem also did not change. Provision of advice/education about treatment and about medication both significantly increased.
- Counselling/advice about nutrition/weight remained steady at around 2 per 100 problems managed, but occasions of counselling about lifestyle almost tripled (from 0.3 per 100 problems managed to 0.8 per 100), as did counselling about health/body (0.1 to 0.4 per 100). However, there was no change in the rate of counselling/advice about smoking, over the decade.

Procedural treatments

There was a significant increase in the rate at which procedures were performed, from 10.2 per 100 problems in 2006–07 to 11.4 per 100 in 2015–16. The extrapolated effect of this change suggests there were an estimated 9.6 million more procedures undertaken at GP–patient encounters in 2015–16 than a decade earlier.

For every 100 GP–patient encounters in 2006–07, one or more procedures were used in the management of 14.3 problems. This significantly increased over time, to reach 16.5 problems per 100 encounters in 2015–16. This was reflected in a significant increase in procedures undertaken for the management of general check-up and a marginal increase in the procedures undertaken for atrial fibrillation/flutter.

11 Referrals and admissions

A referral is defined as the process by which the responsibility for part, or all, of the care of a patient is temporarily transferred to another health care provider. GPs were instructed only to record new referrals at the encounter (that is, to not record continuations). For each encounter, GPs could record up to two referrals, and each referral was linked by the GP to the problem(s) for which the patient was referred. Referrals included those to medical specialists, allied health services, hospitals for admission, emergency departments, and those to other services (including outpatient clinics and to other GPs).

Data on referrals and admissions are reported for each of the most recent BEACH years from 2006–07 to 2015–16, in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

11.1 Number of referrals and admissions

Table 11.1 provides a summary of referrals and admissions, and the rates per 100 encounters and per 100 problems managed. The patient was given at least one referral at 14.7% of all encounters, for 10.3% of all problems managed.

There were 15,671 referrals made at a rate of 16.1 per 100 encounters, most often to medical specialists (9.5 per 100 encounters, 6.2 per 100 problems managed), followed by referrals to allied health services (5.6 per 100 encounters, 3.6 per 100 problems). Relatively few patients were referred/admitted to hospital, or referred to the emergency department.

Table 11.1: Summary of referrals and admissions

Variable	Number	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
At least one referral[(a)]	14,319	14.7	14.1	15.3	10.3	10.0	10.7
Referrals	**15,671**	**16.1**	**15.4**	**16.7**	**10.4**	**10.0**	**10.8**
Medical specialist*	9,242	9.5	9.1	9.9	6.2	5.9	6.4
Allied health services*	5,452	5.6	5.2	6.0	3.6	3.4	3.9
Hospital*	305	0.3	0.3	0.4	0.2	0.2	0.2
Emergency department*	261	0.3	0.2	0.3	0.2	0.1	0.2
Other referrals*	410	0.4	0.3	0.5	0.3	0.2	0.3

(a) At least one referral was given in the management of 15,531 problems at 14,319 encounters.

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.6, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit. As elsewhere in this report, 'number' is weighted for GP activity and rounded.

11.2 Most frequent referrals

Table 11.2 shows the medical specialists and allied health service groups to whom GPs most often referred patients. Referrals to medical specialists were most often to orthopaedic surgeons (9.1% of specialist referrals), dermatologists (8.3%) and surgeons (8.1%). The top 10 specialist types accounted for 63.7% of specialist referrals and for 40.0% of the 14,695 referrals to specialists and allied health services combined.

Referrals to allied health services were most often to physiotherapists (28.9% of allied health services referrals), psychologists (22.4%), podiatrists/chiropodists (11.6%), dietitians/nutritionists (8.9%) and dentists (3.2%). The top 10 allied health services accounted for 84.3% of allied health referrals and 31.3% of the 14,695 referrals to specialists and allied health services combined.

Table 11.2: Most frequent referrals to medical specialists and allied health services

Professional/organisation	Number	Per cent of referrals to spec/AHS	Per cent of referral group	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Medical specialist*	**9,242**	**62.9**	**100.0**	**9.5**	**9.1**	**9.9**	**6.2**	**5.9**	**6.4**
Orthopaedic surgeon	837	5.7	9.1	0.9	0.8	0.9	0.6	0.5	0.6
Dermatologist	766	5.2	8.3	0.8	0.7	0.9	0.5	0.5	0.6
Surgeon	753	5.1	8.1	0.8	0.7	0.8	0.5	0.5	0.5
Cardiologist	718	4.9	7.8	0.7	0.7	0.8	0.5	0.4	0.5
Ophthalmologist	600	4.1	6.5	0.6	0.6	0.7	0.4	0.4	0.4
Gastroenterologist	547	3.7	5.9	0.6	0.5	0.6	0.4	0.3	0.4
Ear, nose and throat	518	3.5	5.6	0.5	0.5	0.6	0.3	0.3	0.4
Gynaecologist	473	3.2	5.1	0.5	0.4	0.5	0.3	0.3	0.3
Urologist	337	2.3	3.6	0.3	0.3	0.4	0.2	0.2	0.3
Psychiatrist	337	2.3	3.6	0.3	0.3	0.4	0.2	0.2	0.3
Subtotal: top 10 medical specialist referrals	*5,885*	*40.0*	*63.7*	—	—	—	—	—	—
Allied health services*	**5,452**	**37.1**	**100.0**	**5.6**	**5.2**	**6.0**	**3.6**	**3.4**	**3.9**
Physiotherapist	1,574	10.7	28.9	1.6	1.5	1.8	1.0	1.0	1.1
Psychologist	1,222	8.3	22.4	1.3	1.1	1.4	0.8	0.7	0.9
Podiatrist/chiropodist	634	4.3	11.6	0.7	0.6	0.7	0.4	0.4	0.5
Dietitian/nutritionist	483	3.3	8.9	0.5	0.4	0.6	0.3	0.3	0.4
Dentist	172	1.2	3.2	0.2	0.1	0.2	0.1	0.1	0.1
Exercise physiologist	141	1.0	2.6	0.1	0.1	0.2	0.1	0.1	0.1
Audiologist	113	0.8	2.1	0.1	0.1	0.1	0.1	0.1	0.1
Optometrist	100	0.7	1.8	0.1	0.1	0.1	0.1	0.1	0.1
Diabetes educator	81	0.6	1.5	0.1	0.1	0.1	0.1	0.0Ŧ	0.1
Patient support group	75	0.5	1.4	0.1	0.1	0.1	0.0Ŧ	0.0Ŧ	0.1
Subtotal: top 10 allied health referrals	*4,595*	*31.3*	*84.3*	—	—	—	—	—	—
Total allied health and medical specialist referrals	**14,695**	**100.0**	—	**15.1**	**14.5**	**15.7**	**9.8**	**9.4**	**10.2**

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.6, <hdl.handle.net/2123/15514>).

Ŧ Rates are reported to one decimal place. This indicates that the rate is less than 0.05 per 100 encounters.

Note: LCL – lower confidence limit; UCL – upper confidence limit; spec/AHS – specialists and allied health services combined. 'Number' is weighted for GP activity and rounded. Totals may differ slightly from summed components due to rounding.

11.3 Problems most frequently referred to a specialist

The GP could link a single referral to one or more problems that were managed at the encounter. Therefore, there are more problem–referral links than referrals. Table 11.3 shows the most common problems referred to a medical specialist, in decreasing frequency of problem–referral links.

The 9,242 referrals to a medical specialist were provided in the management of 9,459 problems. The 10 problems most often referred to a specialist accounted for just 17.7% of all problem–referral links, reflecting the breadth of problems referred to specialists. Malignant skin neoplasm accounted for 2.4% of problem–referral links, followed by osteoarthritis (2.2%), sleep disturbance (2.2%) and diabetes (2.0%) (Table 11.3). The ranking of problems most often referred reflects not only the need for referral but how frequently that problem is managed at GP encounters. For example, osteoarthritis, commonly managed at GP encounters, is ranked highly, even though referrals were made (far right column) at only 8.1% of GP contacts with this problem. Malignant skin neoplasm resulted in a specialist referral at 1 in 5 (21.9%) GP contacts with this problem. This was followed by ischaemic heart disease (14.0%) and pregnancy (13.9%). The likelihood of referral depends not only on the need for referral, but on other factors such as the acuity/chronicity of the condition. For example, at only 3.9% of GP contacts at which depression is managed is this problem referred, suggesting GPs undertake ongoing management of depression with or without the involvement of other health professionals.

Table 11.3: The 10 problems most frequently referred to a medical specialist

Problem managed	Problem–referral links		Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of contacts with this problem[(a)]
	Number	Per cent				
Malignant neoplasm, skin	228	2.4	0.2	0.2	0.3	21.9
Osteoarthritis*	207	2.2	0.2	0.2	0.2	8.1
Sleep disturbance	207	2.2	0.2	0.2	0.3	13.4
Diabetes – all*	189	2.0	0.2	0.2	0.2	4.8
Depression*	160	1.7	0.2	0.1	0.2	3.9
Pregnancy*	156	1.6	0.2	0.1	0.2	13.9
Back complaint*	146	1.5	0.2	0.1	0.2	4.8
Abnormal test results*	143	1.5	0.1	0.1	0.2	10.6
Ischaemic heart disease*	121	1.3	0.1	0.1	0.2	14.0
Other referral NEC	115	1.2	0.1	0.1	0.2	57.5
Subtotal: top 10 problems referred to a medical specialist	*1,671*	*17.7*	—	—	—	—
Total problems referred to medical specialist	**9,459**	**100**	**9.7**	**9.3**	**10.1**	—

(a) The proportion of GP contacts with this problem that was referred to a medical specialist.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NEC – not elsewhere classified.

Table 11.4 shows the five problems accounting for the greatest proportion of referrals to each of the 10 most common medical specialty types. The top five problems may represent a small or large proportion of all problems referred to a particular specialty. For example, the top five problems accounted for 24.0% of all referrals to general/unspecified surgeons (indicative of the broad range of conditions referred to them), but for 51.4% of all referrals to orthopaedic surgeons, consistent with a more defined range of clinical work.

Orthopaedic surgeon: The two problems accounting for the most referrals were osteoarthritis (19.6% of referrals) and acute internal knee damage (12.2%). Of the five problems most frequently referred, those most likely to be referred were acute internal knee damage (referred at 28.8% of GP contacts) and musculoskeletal injury (not otherwise specified) (8.2%).

Dermatologist: The two problems accounting for the most referrals were malignant skin neoplasm (13.8% of referrals) and other skin symptom/complaint (9.0%). Of the five problems most frequently referred to a dermatologist, those most likely to be referred were acne (referred at 13.8% of GP contacts) and other skin check-up (13.5%).

Surgeon: The two problems accounting for the most referrals were other (not inguinal or diaphragmatic) abdominal hernia (6.2% of general/unspecified surgeon referrals) and inguinal hernia (5.6%). Of the five problems most frequently referred to a general/unspecified surgeon, those most likely to be referred at each GP contact with that problem were inguinal hernia (referred at 40.0% of contacts) and other (not inguinal or diaphragmatic) abdominal hernia (38.4%).

Cardiologist: The two problems accounting for the most referrals were ischaemic heart disease (15.3% of referrals) and atrial fibrillation/flutter (12.9%). Of the five problems most frequently referred, those most likely to be referred were other (not ischaemic, arrhythmic or valvular) heart disease (referred at 23.4% of GP contacts) and chest pain (not otherwise specified) (17.0%).

Ophthalmologist: The two problems accounting for the most referrals were cataract (14.8%) and diabetes (11.4%). Of the five problems most frequently referred to an ophthalmologist, those most likely to be referred were cataract (referred at 59.8% of GP contacts) and other (not blindness, cataract or refractive error) visual disturbance (49.1%).

Gastroenterologist: The two problems accounting for the most referrals were gastro-oesophageal reflux disease (9.8% of referrals) and abdominal pain (8.7%). Of the five problems most frequently referred to a gastroenterologist, those most likely to be referred were rectal bleeding (referred at 24.0% of GP contacts) and benign/uncertain digestive neoplasm (17.8%).

Ear, nose and throat (ENT): The two problems accounting for the most referrals were tonsillitis (7.5% of referrals to an ENT specialist) and acute/chronic sinusitis (6.4%). Of the five problems most frequently referred to an ENT specialist, those most likely to be referred were hearing complaint (referred at 20.5% of GP contacts) and throat symptom/complaint (12.2%).

Gynaecologist: The two problems accounting for the most referrals were menstrual problems (14.8% of referrals) and other (including cysts and dysplasia) female genital disease (14.5%). Of the five problems most frequently referred to a gynaecologist, those most likely to be referred were uterovaginal prolapse (referred at 48.3% of GP contacts) and other female genital disease (29.1%).

Urologist: The two problems accounting for the most referrals were benign prostatic hypertrophy (13.0% of referrals) and abnormal test results (12.7%). Of the five problems most frequently referred, those most likely to be referred were urinary calculus (referred at 22.6% of GP contacts) and benign prostatic hypertrophy (18.1%).

Psychiatrist: The two problems accounting for the most referrals were depression (40.2% of referrals) and anxiety (11.3%). Of the five problems most frequently referred to a psychiatrist, those most likely to be referred at each GP contact with that problem were hyperkinetic disorder (referred at 18.8% of GP contacts) and affective psychosis (9.3%) (Table 11.4).

Table 11.4: The top problems most frequently referred, by type of medical specialist

Specialist	Problem managed	Number	Per cent of problems referred to each specialist	Per cent of contacts with this problem[(a)]
Orthopaedic surgeon	**Total**	**847**	**100.0**	—
	Osteoarthritis*	166	19.6	6.5
	Acute internal knee damage	104	12.2	28.8
	Injury musculoskeletal NOS	66	7.8	8.2
	Fracture*	53	6.3	6.3
	Bursitis/tendonitis/synovitis NOS	46	5.4	3.6
	Subtotal: top five problems	*436*	*51.4*	—
Dermatologist	**Total**	**779**	**100.0**	—
	Malignant neoplasm, skin	108	13.8	10.4
	Skin symptom/complaint, other	70	9.0	8.7
	Contact dermatitis	66	8.5	3.8
	Skin check-up*	64	8.3	13.5
	Acne	60	7.7	13.8
	Subtotal: top five problems	*368*	*47.3*	—
Surgeon	**Total**	**760**	**100.0**	—
	Abdominal hernia, other	47	6.2	38.4
	Inguinal hernia	42	5.6	40.0
	Cholecystitis/cholelithiasis	33	4.3	22.3
	Malignant neoplasm, skin	32	4.2	3.1
	Haemorrhoids	28	3.6	9.9
	Subtotal: top five problems	*182*	*24.0*	—
Cardiologist	**Total**	**749**	**100.0**	—
	Ischaemic heart disease*	115	15.3	13.2
	Atrial fibrillation/flutter	97	12.9	7.8
	Hypertension*	65	8.7	0.9
	Chest pain NOS	50	6.7	17.0
	Heart disease, other	37	5.0	23.4
	Subtotal: top five problems	*364*	*48.6*	—
Ophthalmologist	**Total**	**604**	**100.0**	—
	Cataract	90	14.8	59.8
	Diabetes – all*	69	11.4	1.8
	Glaucoma	49	8.1	30.4
	Eye/adnexa disease, other	41	6.7	22.6
	Visual disturbance, other	38	6.2	49.1
	Subtotal: top five problems	*286*	*47.4*	—

(continued)

Table 11.4 (continued): The top problems most frequently referred, by type of medical specialist

Specialist	Problem managed	Number	Per cent of problems referred to each specialist	Per cent of contacts with this problem[(a)]
Gastroenterologist	**Total**	**558**	**100.0**	—
	Gastro-oesophageal reflux disease*	55	9.8	2.2
	Abdominal pain*	49	8.7	6.4
	Rectal bleeding	46	8.2	24.0
	Benign/uncertain neoplasm, digestive	31	5.6	17.8
	Chronic enteritis/ulcerative colitis	28	5.0	15.6
	Subtotal: top five problems	*208*	*37.3*	—
Ear, nose and throat	**Total**	**527**	**100.0**	—
	Tonsillitis*	40	7.5	5.3
	Sinusitis acute/chronic	34	6.4	2.8
	Acute otitis media/myringitis	25	4.7	2.9
	Hearing complaint	22	4.3	20.5
	Throat symptom/complaint	21	3.9	12.2
	Subtotal: top five problems	*142*	*26.9*	—
Gynaecologist	**Total**	**493**	**100.0**	—
	Menstrual problems*	73	14.8	11.1
	Genital disease, other (female)	71	14.5	29.1
	Uterovaginal prolapse	39	7.9	48.3
	Abnormal test results*	28	5.8	2.1
	Contraception, intrauterine	21	4.2	13.4
	Subtotal: top five problems	*233*	*47.2*	—
Urologist	**Total**	**342**	**100.0**	—
	Benign prostatic hypertrophy	44	13.0	18.1
	Abnormal test results*	43	12.7	3.2
	Malignant neoplasm, prostate	27	7.9	9.0
	Urinary tract infection *	25	7.5	1.5
	Urinary calculus	21	6.2	22.6
	Subtotal: top five problems	*162*	*47.3*	—
Psychiatrist	**Total**	**357**	**100.0**	—
	Depression*	143	40.2	3.5
	Anxiety*	40	11.3	1.9
	Affective psychosis	27	7.6	9.3
	Hyperkinetic disorder	26	7.4	18.8
	Schizophrenia	15	4.3	2.9
	Subtotal: top five problems	*252*	*70.7*	—

(a) The proportion of GP contacts with this problem that was referred to each type of medical specialist.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: NOS – not otherwise specified. The unweighted totals in this table differ from the weighted totals in Tables 11.1 and 11.2.

11.4 Problems most frequently referred to allied health services and hospitals

The 5,452 referrals to an allied health service were provided in the management of 5,742 problems. The 10 most commonly referred problems accounted for 48.8% of all problem–referral links. Depression was the problem accounting for the largest proportion of allied health referrals (10.8%), followed by diabetes (6.8%), back complaints (6.5%) and anxiety (5.6%). However, of the 10 most commonly referred problems, the most likely to be referred to an allied health service was obesity, referred at 25.0% of all GP contacts with this problem (Table 11.5).

Table 11.5: The 10 problems most frequently referred to allied health services

Problem managed	Problem–referral links		Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of contacts with this problem[(a)]
	Number	Per cent				
Depression*	623	10.8	0.6	0.6	0.7	15.2
Diabetes – all*	392	6.8	0.4	0.3	0.5	10.0
Back complaint*	370	6.5	0.4	0.3	0.4	12.2
Anxiety*	323	5.6	0.3	0.3	0.4	15.2
Osteoarthritis*	271	4.7	0.3	0.2	0.3	10.6
Administrative procedure NOS	224	3.9	0.2	0.2	0.3	16.0
Obesity (BMI > 30)	184	3.2	0.2	0.1	0.3	25.0
Sprain/strain*	167	2.9	0.2	0.1	0.2	13.9
Bursitis/tendonitis/synovitis NOS	129	2.3	0.1	0.1	0.2	10.1
Acute stress reaction	117	2.0	0.1	0.1	0.1	15.7
Subtotal: top 10 problems referred to AHS	*2,800*	*48.8*	—	—	—	—
Total problems referred to AHS	**5,742**	**100.0**	**5.9**	**5.5**	**6.3**	—

(a) The proportion of GP contacts with this problem that was referred to allied health services.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NOS – not otherwise specified; BMI – body mass index; AHS – allied health service.

The 305 referrals to a hospital were provided in the management of 320 problems. The 10 problems most frequently referred to a hospital are shown in Table 11.6. Fracture accounted for the highest proportion (4.0%) of these referrals, but appendicitis was the problem most likely to be referred (35.5% of GP contacts).

The 261 referrals to an emergency department were associated with the management of 271 problems. The 10 problems most frequently referred to an emergency department are shown in Table 11.7. Pneumonia accounted for the highest proportion (4.5%) of these referrals, but appendicitis was the problem most likely to be referred (25.9% of GP contacts).

Table 11.6: The 10 problems most frequently referred to hospital

Problem managed	Problem–referral links Number	Per cent	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of contacts with this problem[(a)]
Fracture*	13	4.0	0.01	0.00	0.02	1.5
Appendicitis	12	3.7	0.01	0.00	0.02	35.5
Atrial fibrillation/flutter	10	3.2	0.01	0.00	0.02	0.8
Heart failure	10	3.0	0.01	0.00	0.02	1.8
Pregnancy*	9	2.8	0.01	0.00	0.02	0.8
Abdominal pain*	8	2.5	0.01	0.00	0.01	1.1
Acute myocardial infarction	8	2.4	0.01	0.00	0.02	11.2
Viral hepatitis	6	1.9	0.01	0.00	0.01	3.9
Pneumonia	6	1.8	0.01	0.00	0.01	2.1
Skin infection, other	6	1.8	0.01	0.00	0.01	1.2
Subtotal: top 10 problems referred for admission	*86*	*26.9*	—	—	—	—
Total problems referred to hospital	**320**	**100.0**	**0.33**	**0.27**	**0.39**	—

(a) The proportion of GP contacts with this problem that was referred to hospital.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit. Rates in this table are reported to two decimal places; rates tabled as 0.00 indicate the rate is less than 0.005 per 100 encounters.

Table 11.7: The 10 problems most frequently referred to an emergency department

Problem managed	Problem–referral links Number	Per cent	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Per cent of contacts with this problem[(a)]
Pneumonia	12	4.5	0.01	0.00	0.02	4.4
Abdominal pain*	11	4.2	0.01	0.00	0.02	1.5
Cerebrovascular disease (all)*	11	4.2	0.01	0.00	0.02	3.4
Fracture*	10	3.9	0.01	0.00	0.02	1.2
Skin infection, other	10	3.8	0.01	0.00	0.02	2.1
Acute bronchitis/bronchiolitis	9	3.3	0.01	0.00	0.02	0.5
Appendicitis	9	3.2	0.01	0.00	0.02	25.9
Headache*	7	2.6	0.01	0.00	0.01	0.6
Chest pain NOS	7	2.5	0.01	0.00	0.01	2.3
Digestive system disease, other	7	2.5	0.01	0.00	0.01	2.2
Subtotal: top 10 problems referred to emergency department	*93*	*34.5*	—	—	—	—
Total problems referred to emergency department	**271**	**100.0**	**0.28**	**0.23**	**0.33**	—

(a) The proportion of GP contacts with this problem that was referred to an emergency department.

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; NOS – not otherwise specified. Rates in this table are reported to two decimal places; rates tabled as 0.00 indicate the rate is less than 0.005 per 100 encounters.

11.5 Changes in referrals over the decade 2006–07 to 2015–16

An overview of changes in referrals over the decade can be found in Chapter 11 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] In that report, changes over time are discussed in terms of change in the management of problems (that is, as a rate per 100 problems managed). This reflects change in how GPs manage problems, and accounts for the significant increase in the number of problems managed per encounter over the decade.

In summary, over the 10 years there was a significant increase in the proportion of problems that were referred: in 2006–07 at least one referral was made in the management of 8.3% of problems and this increased to 10.3% of problems managed by 2015–16.

The overall rate of referral per 100 problems managed increased from 8.2 in 2006–07 to 10.4 in 2015–16, and per 100 encounters from 12.2 to 16.1. This suggests that there were 10.4 million more referrals made by GPs nationally in 2015–16 than a decade earlier.

Referrals to medical specialists increased from 5.4 per 100 problems managed in 2006–07 to 6.2 in 2015–16. There was a significant decrease in the rate of referrals to ophthalmologists, and marginally significant increases in referrals to dermatologists, cardiologists and psychiatrists.

Referrals to allied health services increased from 2.1 per 100 problems managed in 2006–07 to 3.6 in 2015–16. This was reflected in significant increases in referral rates per 100 problems to physiotherapists, psychologists, podiatrists/chiropodists and dietitians/nutritionists.

12 Investigations

The GP participants were asked to record (in free text) any pathology, imaging or other tests ordered or undertaken at the encounter, and to nominate the patient problem(s) associated with each test order placed. This allows the linkage of a test order to a single problem or multiple problems. Up to five orders for pathology, and two for imaging and other tests could be recorded at each encounter. A single test may have been ordered for the management of multiple problems, and multiple tests may have been ordered in the management of a single problem.

A pathology test order may be for a single test (for example, Pap smear, HbA1c) or for a battery of tests (for example, lipids, full blood count). Where a battery of tests was ordered, the battery name was recorded rather than each individual test within the battery. GPs also recorded the body site for any imaging ordered (for example, x-ray chest, CT head).

Data on investigations are reported for each year from 2006–07 to 2015–16 in the 10-year report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

12.1 Number of investigations

Table 12.1 shows the number of encounters and problems at which a pathology or imaging test was ordered. There were no pathology or imaging tests recorded at three-quarters (74.8%) of encounters.

At least one pathology test order was recorded at 18.4% of encounters (and for 13.7% of problems managed), and at least one imaging test was ordered at 9.4% of encounters (and for 6.4% of problems managed).

Table 12.1: Number of encounters and problems for which pathology or imaging was ordered

Pathology/imaging test ordered	Number of encounters	Per cent of encounters (*n* = 97,398)	95% LCL	95% UCL	Number of problems	Per cent of problems (*n* = 150,279)	95% LCL	95% UCL
Pathology and imaging ordered	2,532	2.6	2.4	2.8	1,811	1.2	1.1	1.3
Pathology only ordered	15,406	15.8	15.3	16.3	18,740	12.5	12.1	12.9
Imaging only ordered	6,634	6.8	6.5	7.1	7,738	5.1	4.9	5.4
No pathology or imaging tests ordered	72,827	74.8	74.1	75.5	121,991	81.2	80.7	81.7
At least one pathology ordered	17,938	18.4	17.8	19.0	20,550	13.7	13.2	14.1
At least one imaging ordered	9,166	9.4	9.1	9.8	9,549	6.4	6.1	6.6
At least one other investigation ordered	799	0.8	0.7	0.9	818	0.5	0.5	0.6
At least one other investigation performed in the practice	1,262	1.3	1.1	1.5	1,277	0.8	0.7	1.0
At least one other investigation ordered or performed	2,014	2.1	1.9	2.2	2,051	1.4	1.2	1.5

Note: LCL – lower confidence limit; UCL – upper confidence limit.

12.2 Pathology ordering

A report on changes in pathology ordering by GPs from 1998 to 2001 was produced in 2003.[68] A review of GP pathology orders in the National Health Priority Areas and other selected problems between 2000 and 2008 was reported in *General practice in Australia, health priorities and policies 1998 to 2008*.[14] A report, *Evidence-practice gap in pathology test ordering: a comparison of BEACH pathology data and recommended testing*, was produced by the FMRC for the Australian Government Quality Use of Pathology Program in June 2009.[17] A PhD thesis, *Evaluation of pathology ordering by general practitioners in Australia*, was completed in 2013.[15] Readers may wish to consider those publications in conjunction with the information presented below.

Nature of pathology orders at encounter

The GPs recorded 46,315 orders for pathology tests (or batteries of tests), at a rate of 47.6 per 100 encounters or 30.8 per 100 problems managed (Table 12.2). The pathology tests recorded were grouped according to the categories set out in Appendix 4, Table A4.7. The main pathology groups reflect those used in the Medicare Benefits Schedule (MBS).[69]

The distribution of pathology tests by MBS group, and the most common tests within each group are presented in Table 12.2. Each group and individual test is expressed as a proportion of all pathology tests, as a proportion of the group, and as a rate per 100 encounters and per 100 problems managed with 95% confidence limits.

Tests classed as chemistry accounted for more than half (58.7%) of the pathology test orders, the most common being: lipid tests, for which there were 3.7 orders per 100 encounters and 2.4 per 100 problems managed, electrolytes, urea and creatinine (3.2 per 100 encounters and 2.1 per 100 problems), thyroid function tests (3.1 and 2.0), and multi-biochemical analysis (3.1 and 2.0). Haematology tests accounted for 17.2% of all pathology, including the most frequently ordered individual pathology test, full blood count (FBC). FBC tests accounted for 14.0% of all pathology, there being 6.7 FBC orders per 100 encounters and 4.3 per 100 problems managed. Microbiology accounted for 13.7% of pathology orders, with urine microscopy, culture and sensitivity being the most frequent test type in the group at 2.0 orders per 100 encounters and 1.3 per 100 problems managed.

Table 12.2: Most frequent pathology tests ordered within each MBS pathology group

Pathology test ordered	Number	Per cent of all pathology	Per cent of group	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Chemistry*	**27,197**	**58.7**	**100.0**	**27.9**	**26.4**	**29.4**	**18.1**	**17.2**	**19.0**
Lipids*	3,602	7.8	13.2	3.7	3.4	4.0	2.4	2.2	2.6
Electrolytes, urea and creatinine*	3,091	6.7	11.4	3.2	2.9	3.5	2.1	1.9	2.2
Thyroid function*	3,043	6.6	11.2	3.1	2.9	3.4	2.0	1.9	2.2
Multi-biochemical analysis*	3,018	6.5	11.1	3.1	2.8	3.4	2.0	1.8	2.2
Liver function*	2,464	5.3	9.1	2.5	2.3	2.8	1.6	1.5	1.8
Glucose/glucose tolerance*	2,394	5.2	8.8	2.5	2.2	2.7	1.6	1.5	1.7
Ferritin*	1,821	3.9	6.7	1.9	1.7	2.0	1.2	1.1	1.3
HbA1c*	1,429	3.1	5.3	1.5	1.3	1.6	1.0	0.9	1.0
Chemistry, other*	1,075	2.3	4.0	1.1	0.9	1.3	0.7	0.6	0.8
C reactive protein	1,068	2.3	3.9	1.1	1.0	1.2	0.7	0.6	0.8
Hormone assay*	792	1.7	2.9	0.8	0.7	0.9	0.5	0.5	0.6

(continued)

Table 12.2 (continued): Most frequent pathology tests ordered within each MBS pathology group

Pathology test ordered	Number	Per cent of all pathology	Per cent of group	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Prostate specific antigen*	692	1.5	2.5	0.7	0.6	0.8	0.5	0.4	0.5
Vitamin B12	606	1.3	2.2	0.6	0.5	0.7	0.4	0.3	0.5
Albumin/creatinine, urine*	550	1.2	2.0	0.6	0.5	0.6	0.4	0.3	0.4
Vitamin D	422	0.9	1.6	0.4	0.4	0.5	0.3	0.2	0.3
Calcium/phosphate/magnesium*	327	0.7	1.2	0.3	0.3	0.4	0.2	0.2	0.3
Urate/uric acid	211	0.5	0.8	0.2	0.2	0.3	0.1	0.1	0.2
Haematology*	**7,945**	**17.2**	**100.0**	**8.2**	**7.7**	**8.6**	**5.3**	**5.0**	**5.6**
Full blood count	6,478	14.0	81.5	6.7	6.3	7.0	4.3	4.1	4.5
ESR	788	1.7	9.9	0.8	0.7	0.9	0.5	0.5	0.6
Coagulation*	530	1.1	6.7	0.5	0.5	0.6	0.4	0.3	0.4
Microbiology*	**6,354**	**13.7**	**100.0**	**6.5**	**6.1**	**6.9**	**4.2**	**4.0**	**4.5**
Urine M,C&S*	1,912	4.1	30.1	2.0	1.8	2.1	1.3	1.2	1.4
Microbiology, other*	778	1.7	12.2	0.8	0.7	0.9	0.5	0.5	0.6
Faeces M,C&S*	630	1.4	9.9	0.6	0.5	0.8	0.4	0.3	0.5
Venereal disease*	526	1.1	8.3	0.5	0.5	0.6	0.3	0.3	0.4
Hepatitis serology*	420	0.9	6.6	0.4	0.4	0.5	0.3	0.2	0.3
Vaginal swab M,C&S*	320	0.7	5.0	0.3	0.3	0.4	0.2	0.2	0.2
Chlamydia*	314	0.7	4.9	0.3	0.3	0.4	0.2	0.2	0.2
Skin swab M,C&S*	224	0.5	3.5	0.2	0.2	0.3	0.1	0.1	0.2
H pylori*	217	0.5	3.4	0.2	0.2	0.3	0.1	0.1	0.2
Cytopathology*	**1,465**	**3.2**	**100.0**	**1.5**	**1.3**	**1.7**	**1.0**	**0.9**	**1.1**
Pap smear*	1,425	3.1	97.3	1.5	1.3	1.6	0.9	0.8	1.0
Other NEC*	**1,020**	**2.2**	**100.0**	**1.0**	**0.8**	**1.3**	**0.7**	**0.5**	**0.8**
Blood test	581	1.3	56.9	0.6	0.4	0.8	0.4	0.3	0.5
Other test NEC*	220	0.5	21.6	0.2	0.2	0.3	0.1	0.1	0.2
Tissue pathology*	**931**	**2.0**	**100.0**	**1.0**	**0.8**	**1.1**	**0.6**	**0.5**	**0.7**
Histology, skin	884	1.9	94.9	0.9	0.8	1.0	0.6	0.5	0.7
Immunology*	**920**	**2.0**	**100.0**	**0.9**	**0.8**	**1.1**	**0.6**	**0.5**	**0.7**
Immunology, other*	521	1.1	56.6	0.5	0.5	0.6	0.3	0.3	0.4
Simple tests*	**247**	**0.5**	**100.0**	**0.3**	**0.2**	**0.3**	**0.2**	**0.1**	**0.2**
Infertility/pregnancy*	**236**	**0.5**	**100.0**	**0.2**	**0.2**	**0.3**	**0.2**	**0.1**	**0.2**
Total pathology tests	**46,315**	**100.0**	—	**47.6**	**45.5**	**49.6**	**30.8**	**29.7**	**32.0**

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.7, <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; ESR – erythrocyte sedimentation rate; M,C&S – microscopy, culture and sensitivity; H Pylori – test for *Helicobacter pylori* infection; NEC – not elsewhere classified.

Problems for which pathology tests were ordered

Table 12.3 describes the problems for which pathology was commonly ordered, in decreasing frequency order of problem–pathology combinations. Diabetes (accounting for 7.1% of all problem–pathology combinations), hypertension, general check-up, and weakness/tiredness were the most common problems for which pathology tests were ordered.

The two columns on the far right show the proportion of each problem that resulted in a pathology order, and the rate of pathology tests/batteries of tests per 100 specified problems when at least one test was ordered. For example, 69.7% of contacts with weakness/tiredness resulted in pathology orders, and when pathology was ordered for weakness/tiredness, the GPs ordered an average of 395 tests/batteries of tests per 100 'tested' weakness/tiredness contacts. In contrast, only 12.7% of contacts with hypertension problems resulted in a pathology test, but the resulting test orders accounted for more tests (5.7%) than those ordered for weakness/tiredness (4.2%). This is because in general practice, hypertension is managed far more frequently (7.5 per 100 encounters) than weakness/tiredness (0.8 per 100 encounters) (see Section 7.3).

Table 12.3: The 10 problems for which pathology was most frequently ordered

Problem managed	Number of problems	Number of problem–pathology combinations[(a)]	Per cent of problem–pathology combinations[(a)]	Per cent of problems with test[(b)]	Rate of pathology orders per 100 problems with pathology[(c)]
Diabetes – all*	3,939	3,452	7.1	30.4	288.0
Hypertension*	7,289	2,768	5.7	12.7	298.6
General check-up*	2,852	2,494	5.2	25.1	347.6
Weakness/tiredness	739	2,033	4.2	69.7	394.7
Lipid disorder	2,956	1,681	3.5	24.6	230.7
Female genital check-up/ Pap smear*	1,515	1,445	3.0	78.8	121.0
Abnormal test results*	1,348	1,304	2.7	51.1	189.5
Blood test NOS	415	1,199	2.5	83.6	345.6
Urinary tract infection*	1,754	1,160	2.4	55.2	119.8
Pregnancy*	1,118	892	1.8	38.3	208.4
Subtotal	*23,926*	*18,428*	*38.1*	—	—
Total problems	**150,279**	**48,319**	**100.0**	**13.7**	**235.1**

(a) A test was counted more than once if it was ordered for the management of more than one problem at an encounter. There were 49,501 pathology test orders and 48,319 problem–pathology combinations.

(b) The percentage of total contacts with the problem that generated at least one order for pathology.

(c) The rate of pathology orders placed per 100 problem contacts with at least one order for pathology.

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.1, <hdl.handle.net/2123/15514>).

Note: NOS – not otherwise specified.

12.3 Imaging ordering

Readers wanting a more detailed study of imaging orders should consult the comprehensive report on imaging orders by GPs in Australia in 1999–00, by the FMRC using BEACH data, and published by the Australian Institute of Health and Welfare and the University of Sydney in 2001.[70] A 2014 report, *Evaluation of imaging ordering by general practitioners in Australia 2002–03 to 2011–12,* described changes in GPs' imaging ordering over time and evaluated the alignment between guidelines and GP test ordering for selected problems.[18] This recent report was funded by a grant from the Diagnostic Imaging Quality Program, through the Australian Government Department of Health. Readers may wish to consider those reports in conjunction with the information presented below.

Nature of imaging orders at encounter

There were 10,733 imaging test orders recorded, at a rate of 11.0 per 100 encounters and 7.1 per 100 problems managed. The distribution of imaging tests by MBS group and the most common tests within each group are presented in Table 12.4. Each group and individual test is expressed as a percentage of all imaging tests, as a percentage of the group, and as a rate per 100 encounters and per 100 problems with 95% confidence limits. Ultrasound accounted for 44.4% of all imaging test orders, the most common being pelvis (ordered at a rate of 0.7 per 100 encounters) and shoulder ultrasounds (0.6). Diagnostic radiology accounted for 39.1% of all tests, and included the most commonly ordered individual imaging test, chest x-ray (0.9 per 100 encounters).

Table 12.4: Most frequent imaging tests ordered within each MBS imaging group

Imaging test ordered	Number	Per cent of all imaging	Per cent of group	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Ultrasound*	**4,770**	**44.4**	**100.0**	**4.9**	**4.7**	**5.1**	**3.2**	**3.0**	**3.3**
Ultrasound; pelvis	656	6.1	13.8	0.7	0.6	0.7	0.4	0.4	0.5
Ultrasound; shoulder	569	5.3	11.9	0.6	0.5	0.6	0.4	0.3	0.4
Ultrasound; abdomen	390	3.6	8.2	0.4	0.4	0.4	0.3	0.2	0.3
Ultrasound; breast; female	378	3.5	7.9	0.4	0.3	0.4	0.3	0.2	0.3
Ultrasound; obstetric	269	2.5	5.6	0.3	0.2	0.3	0.2	0.1	0.2
Ultrasound; hip	191	1.8	4.0	0.2	0.2	0.2	0.1	0.1	0.1
Test; Doppler	166	1.5	3.5	0.2	0.1	0.2	0.1	0.1	0.1
Echocardiography	163	1.5	3.4	0.2	0.1	0.2	0.1	0.1	0.1
Ultrasound; foot/toe(s)	150	1.4	3.1	0.2	0.1	0.2	0.1	0.1	0.1
Ultrasound; knee	134	1.2	2.8	0.1	0.1	0.2	0.1	0.1	0.1
Ultrasound; kidney	132	1.2	2.8	0.1	0.1	0.2	0.1	0.1	0.1
Ultrasound; leg	131	1.2	2.7	0.1	0.1	0.2	0.1	0.1	0.1
Ultrasound; thyroid	128	1.2	2.7	0.1	0.1	0.2	0.1	0.1	0.1
Ultrasound; kidney/ureter/bladder	123	1.2	2.6	0.1	0.1	0.2	0.1	0.1	0.1
Ultrasound; elbow	106	1.0	2.2	0.1	0.1	0.1	0.1	0.1	0.1
Ultrasound; hand/finger(s)	96	0.9	2.0	0.1	0.1	0.1	0.1	0.0	0.1
Ultrasound; wrist	94	0.9	2.0	0.1	0.1	0.1	0.1	0.0	0.1
Ultrasound; ankle	89	0.8	1.9	0.1	0.1	0.1	0.1	0.0	0.1
Ultrasound; scrotum	86	0.8	1.8	0.1	0.1	0.1	0.1	0.0	0.1

(continued)

Table 12.4 (continued): Most frequent imaging tests ordered within each MBS imaging group

Imaging test ordered	Number	Per cent of all imaging	Per cent of group	Rate per 100 encounters (*n* = 97,398)	95% LCL	95% UCL	Rate per 100 problems (*n* = 150,279)	95% LCL	95% UCL
Ultrasound; neck	75	0.7	1.6	0.1	0.1	0.1	0.0	0.0	0.1
Echocardiography; stress	66	0.6	1.4	0.1	0.0	0.1	0.0	0.0	0.1
Ultrasound; abdomen upper	62	0.6	1.3	0.1	0.0	0.1	0.0	0.0	0.1
Test; doppler carotid	59	0.6	1.2	0.1	0.0	0.1	0.0	0.0	0.1
Ultrasound; nuchal translucency	57	0.5	1.2	0.1	0.0	0.1	0.0	0.0	0.1
Ultrasound; liver	50	0.5	1.0	0.1	0.0	0.1	0.0	0.0	0.0
Diagnostic radiology*	**4,201**	**39.1**	**100.0**	**4.3**	**4.1**	**4.5**	**2.8**	**2.7**	**2.9**
X-ray; chest	856	8.0	20.4	0.9	0.8	1.0	0.6	0.5	0.6
X-ray; knee	466	4.3	11.1	0.5	0.4	0.5	0.3	0.3	0.3
Test; densitometry	334	3.1	8.0	0.3	0.3	0.4	0.2	0.2	0.3
Mammography; female	324	3.0	7.7	0.3	0.3	0.4	0.2	0.2	0.2
X-ray; foot/feet	259	2.4	6.2	0.3	0.2	0.3	0.2	0.1	0.2
X-ray; shoulder	258	2.4	6.1	0.3	0.2	0.3	0.2	0.1	0.2
X-ray; hip	237	2.2	5.6	0.2	0.2	0.3	0.2	0.1	0.2
X-ray; ankle	198	1.8	4.7	0.2	0.2	0.2	0.1	0.1	0.2
X-ray; hand	157	1.5	3.7	0.2	0.1	0.2	0.1	0.1	0.1
X-ray; wrist	132	1.2	3.1	0.1	0.1	0.2	0.1	0.1	0.1
X-ray; finger(s)/thumb	101	0.9	2.4	0.1	0.1	0.1	0.1	0.1	0.1
X-ray; abdomen	90	0.8	2.1	0.1	0.1	0.1	0.1	0.0	0.1
X-ray; spine; cervical	77	0.7	1.8	0.1	0.1	0.1	0.1	0.0	0.1
X-ray; spine; lumbar	77	0.7	1.8	0.1	0.1	0.1	0.1	0.0	0.1
X-ray; spine; lumbosacral	65	0.6	1.5	0.1	0.0	0.1	0.0	0.0	0.1
X-ray; elbow	52	0.5	1.2	0.1	0.0	0.1	0.0	0.0	0.0
Computerised tomography*	**1,242**	**11.6**	**100.0**	**1.3**	**1.2**	**1.4**	**0.8**	**0.8**	**0.9**
CT scan; spine; lumbar	179	1.7	14.4	0.2	0.1	0.2	0.1	0.1	0.1
CT scan; abdomen	158	1.5	12.7	0.2	0.1	0.2	0.1	0.1	0.1
CT scan; brain	147	1.4	11.8	0.2	0.1	0.2	0.1	0.1	0.1
CT scan; chest	136	1.3	11.0	0.1	0.1	0.2	0.1	0.1	0.1
CT scan; sinus	82	0.8	6.6	0.1	0.1	0.1	0.1	0.0	0.1
CT scan; spine; lumbosacral	74	0.7	6.0	0.1	0.1	0.1	0.0	0.0	0.1
CT scan; head	71	0.7	5.7	0.1	0.1	0.1	0.0	0.0	0.1
CT scan; spine; cervical	52	0.5	4.2	0.1	0.0	0.1	0.0	0.0	0.0
Magnetic resonance imaging*	**464**	**4.3**	**100.0**	**0.5**	**0.4**	**0.5**	**0.3**	**0.3**	**0.4**
MRI; knee	173	1.6	37.3	0.2	0.1	0.2	0.1	0.1	0.1
MRI; brain	80	0.7	17.2	0.1	0.1	0.1	0.1	0.0	0.1
Nuclear medicine*	**56**	**0.5**	**100.0**	**0.1**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**
Total imaging tests	**10,733**	**100.0**	**—**	**11.0**	**10.6**	**11.5**	**7.1**	**6.9**	**7.4**

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.8 <hdl.handle.net/2123/15514>).

Note: LCL – lower confidence limit; UCL – upper confidence limit; CT – computerised tomography; MRI – magnetic resonance imaging. Rates are reported to one decimal place, a rate tabled as 0.0 indicates the rate is less than 0.05 per 100 encounters or per 100 problems.

Problems for which imaging tests were ordered

Table 12.5 lists the problems for which imaging was commonly ordered, in decreasing frequency order of problem–imaging combinations. Bursitis/tendonitis/synovitis accounted for 5.1% of all orders, followed by back complaint (4.3%), osteoarthritis (4.2%) and shoulder syndrome (3.4%).

The two columns on the far right show the proportion of each problem that resulted in an imaging test, and the rate of imaging tests per 100 specified problems when at least one test was ordered. For example, 13.2% of contacts with back complaints resulted in an imaging test, and 114.8 tests were ordered per 100 back complaint contacts that involved a test order. Note that breast lump/mass (female) and shoulder syndrome were the problems most likely to be tested (78.4% and 45.5% respectively).

Table 12.5: The 10 problems for which an imaging test was most frequently ordered

Problem managed	Number of problems	Number of problem–imaging combinations[a]	Per cent of problem–imaging combinations[a]	Per cent of problems with test[b]	Rate of imaging orders per 100 problems with imaging[c]
Bursitis/tendonitis/synovitis NOS	1,277	552	5.1	35.1	123.3
Back complaint*	3,045	461	4.3	13.2	114.8
Osteoarthritis*	2,548	460	4.2	15.8	114.3
Shoulder syndrome	659	371	3.4	45.5	123.6
Sprain/strain*	1,205	361	3.3	25.4	118.1
Injury musculoskeletal NOS	805	357	3.3	37.6	118.1
Pregnancy*	1,118	340	3.1	30.1	100.8
Abdominal pain*	756	312	2.9	36.4	113.3
Fracture*	843	300	2.8	32.4	110.0
Breast lump/mass (female)	170	190	1.8	78.4	142.3
Subtotal	*12,426*	*3,705*	*34.2*	—	—
Total problems	**150,279**	**10,824**	**100.0**	**6.4**	**113.3**

(a) A test was counted more than once if it was ordered for the management of more than one problem at an encounter. There were 10,733 imaging test orders and 10,824 problem–imaging combinations.

(b) The percentage of total contacts with the problem that generated at least one order for imaging.

(c) The rate of imaging orders placed per 100 tested problem contacts with at least one order for imaging.

* Includes multiple ICPC-2 and ICPC-2 PLUS codes (see Appendix 4, Table A4.1 <hdl.handle.net/2123/15514>).

Note: NOS – not otherwise specified.

12.4 Other investigations

Other investigations include diagnostic procedures ordered by the GP, or undertaken by the GP or practice staff at the encounter. GPs ordered 829 other investigations during the study year, and GPs or practice staff undertook a further 1,313. There were, in total, 2,142 other investigations either ordered or undertaken (Table 12.6).

The first section of Table 12.6 lists the other investigations ordered by GPs. The second lists the other investigations undertaken in the practice by GPs or practice staff. The third section lists the total other investigations (either ordered or undertaken in the practice). Each investigation is expressed as a percentage of total other investigations ordered or undertaken and as a rate per 100 encounters and per 100 problems with 95% confidence limits. Electrical tracings were the most common group of other investigations ordered or undertaken, making up 45.0% of other investigations, followed by physical function test (27.6%).

The results also demonstrate that the majority of electrical tracings were undertaken in the practice (56.9%). In contrast, the majority (96.9%) of diagnostic endoscopies were ordered to be done by external providers (Table 12.6).

Table 12.6: Other investigations ordered by GPs or performed in the practice

	Investigations ordered by the GP			
Investigation	**Number**	**Per cent**	**Rate per 100 encounters (95% CI) (*n* = 97,398)**	**Rate per 100 problems (95% CI) (*n* = 150,279)**
Investigations ordered by the GP	**829**	**100.0**	**0.9 (0.8–0.9)**	**0.6 (0.5–0.6)**
Electrical tracings*	415	50.0	0.4 (0.4–0.5)	0.3 (0.2–0.3)
Diagnostic endoscopy*	217	26.2	0.2 (0.2–0.3)	0.1 (0.1–0.2)
Physical function test*	189	22.8	0.2 (0.2–0.2)	0.1 (0.1–0.1)
Other diagnostic procedures*	9	1.0	0.0 (0.0–0.0)	0.0 (0.0–0.0)
Investigations undertaken in the practice	**1,313**	**100.0**	**1.3 (1.2–1.5)**	**0.9 (0.8–1.0)**
Electrical tracings*	548	41.8	0.6 (0.5–0.6)	0.4 (0.3–0.4)
Diagnostic endoscopy*	8	0.6	0.0 (0.0–0.0)	0.0 (0.0–0.0)
Physical function test*	402	30.6	0.4 (0.3–0.5)	0.3 (0.2–0.3)
Other diagnostic procedures*	355	27.1	0.4 (0.2–0.5)	0.2 (0.2–0.3)
All investigations (ordered or undertaken)	**2,142**	**100.0**	**2.2 (2.0–2.4)**	**1.4 (1.3–1.5)**
Electrical tracings*	963	45.0	1.0 (0.9–1.1)	0.6 (0.6–0.7)
Diagnostic endoscopy*	224	10.5	0.2 (0.2–0.3)	0.1 (0.1–0.2)
Physical function test*	591	27.6	0.6 (0.5–0.7)	0.4 (0.3–0.4)
Other diagnostic procedures*	364	17.0	0.4 (0.3–0.5)	0.2 (0.2–0.3)

* Includes multiple ICPC-2 or ICPC-2 PLUS codes (see Appendix 4, Table A4.5 <hdl.handle.net/2123/15514>).

Note: CI – confidence interval.

12.5 Changes in investigations over the decade 2006–07 to 2015–16

Data on investigations are reported for each year from 2006–07 to 2015–16 in Chapter 12 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1] In that report, changes over time are measured as change in the management of problems (that is, as a rate per 100 problems). This reflects change in how GPs manage problems, and adjusts for the significant increase in the number of problems managed per encounter over the decade. The major changes are highlighted below.

- There was no change in the proportion of problems where at least one pathology test was ordered (13.4% of problems managed in 2006–07 and 13.7% in 2015–16). However, the number of pathology tests ordered increased over the decade from 28.6 tests (or batteries of tests) per 100 problems managed in 2006–07 to 30.8 in 2015–16. This increased rate of ordering (per 100 problems) was due to GPs ordering more tests per problem once the decision to order pathology had been made, not to any change in the likelihood of pathology being ordered in the management of problems. Rates of chemistry, immunology and 'simple' tests increased marginally over the decade. Order rates for all other pathology groups did not change.
- There was no change in the proportion of encounters involving at least one pathology test (17.4% of encounters in 2006–07 to 18.4% in 2015–16. However, the rate of tests ordered per 100 encounters increased from 42.4 to 47.6 over the decade, equating to approximately 24.2 million more pathology tests ordered nationally in 2015–16 than 10 years earlier. This national increase was driven by a rise in the number of problems managed at encounter (increasing from 148.5 to 154.3 per 100 encounters over the decade, see Chapter 5) and the increased GP attendance rate in Australia.[3,4]
- At least one imaging test was ordered for 5.5% of all problems managed in 2006–07, rising to 6.4% of all problems in 2015–16. The proportion of encounters generating imaging orders increased from 7.9% in 2006–07 to 9.4% in 2015–16. This resulted in an estimated 5.3 million more encounters nationally at which imaging was ordered by GPs in 2015–16 than in 2006–07.
- The number of imaging tests ordered increased from 6.0 tests per 100 problems managed in 2006–07 to 7.1 per 100 problems in 2015–16. Total imaging orders per 100 encounters increased significantly from 9.0 per 100 encounters in 2006–07 to 11.0 in 2015–16, suggesting that nationally there were 6.4 million more imaging tests ordered by GPs in 2015–16 than in 2006–07.
- There were changes in the types of imaging tests ordered, with a move away from diagnostic radiology toward ultrasound imaging. Ultrasounds were the most commonly ordered imaging test, and GPs' ordering increased from 3.2 to 4.9 per 100 encounters, a national increase of about 3.7 million ultrasound orders over the decade period. The rate of computerised tomography orders increased marginally and magnetic resonance imaging increased significantly over the decade, but these tests accounted for a smaller proportion of total imaging orders.

13 Patient risk factors

General practice is a useful intervention point for health promotion because the majority of the population visit a GP at least once per year. In 2015–16, 86.8% of Australians visited a GP at least once (personal communication, DoH, May 2016). GPs have substantial knowledge of population health, screening programs and other interventions. They are therefore in an ideal position to advise patients about the benefits of health screening, and to counsel individuals about their lifestyle choices.

Since the BEACH program began in 1998, a section at the bottom of each encounter form has been used to investigate aspects of patient health or healthcare delivery not covered by general practice consultation-based information. These additional substudies are referred to as SAND (Supplementary Analysis of Nominated Data). The SAND methods are described in Section 2.6.

The patient risk factors collected in BEACH include body mass index (BMI) (calculated using self-reported height and weight), self-reported alcohol consumption and self-reported smoking status. These patient risk factors are recorded for a subsample of 40 of the 100 patient encounters recorded by each GP. An example of the encounter form with the patient risk factor SAND questions is included as Appendix 1. The methods used in the risk factor substudies reported in this chapter are described in each section below.

Unweighted (sample) data on patient risk factors measured in SAND are reported for each of the 10 most recent years, and risk factor prevalence after adjustment for general practice attendance patterns by age–sex for each of the 9 most recent years are reported in the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

Abstracts of results and the research tools used in other SAND substudies from April 1998 to March 2016 have been published. Those conducted:

- from April 1998 to March 1999 were published in *Measures of health and health care delivery in general practice in Australia*[26]
- from April 1999 to July 2006 were published in *Patient-based substudies from BEACH: abstracts and research tools 1999–2006*[27]
- since August 2006 have been published in each of the general practice annual reports[28-36]
- in the 2015–16 BEACH year are provided in Chapter 15 of this publication.

13.1 Body mass index

From the most recent publicly available Australian data, high body mass index (BMI) was the third highest contributor to the total burden of disease in Australia in 2003, accounting for 7.5% of the total burden,[71] an increase from 4.3% of the total burden and sixth rank in 1996.[72]

More recently, Australasian (comprising Australia and New Zealand) disease burdens have been estimated by the Global Burden of Disease 2010 study. It describes and compares the burden of disease and injury attributable to 67 risk factors in 21 regions. In Australasia, 'dietary risks' accounted for 11% of the total disease burden, followed by 'high body mass index' (9% of burden) and smoking (8%).[73,74]

In 2016, the Organisation for Economic Co-operation and Development (OECD) reported that Australia's adult obesity rates (based on measured data) in 1989, 1995, 2007, 2011 and 2014 were among the highest in the world (10.8%, 19.8%, 24.6%, 28.3% and 27.9% of adults respectively), with Australia's adult obesity rate fifth globally, behind the United States, Mexico, Hungary and New Zealand.[75]

In 2007 (or nearest year), Australia was fourth, with obesity rates two percentage points below that of New Zealand, and in 2014 (or nearest year), Australia was fifth with obesity rates still around two percentage points below New Zealand. Over this period, the obesity rates of both nations increased by about three percentage points (from 24.6% to 27.9% and 26.5% to 29.9% respectively). In a similar 7-year period, obesity rates in the United States increased by about four percentage points to 38.2%, and those in Mexico increased by two percentage points to 32.4%.[75]

Australia's obesity rate of 27.9% in 2014 is much higher than the average for the 19 OECD countries most recent measured data (22.8%). The OECD suggest that the rise in adult obesity in Australia should be treated as a public health priority.[76] They indicate that preventable conditions such as type 2 diabetes and other chronic conditions are associated with obesity, resulting in avoidable escalating health care costs in the future. They make five suggestions regarding what can be done to tackle the obesity problem, one of which is to "Encourage primary care physicians to counsel at-risk patients about making healthy lifestyle choices".[76]

The Australian Bureau of Statistics' National Health Survey (2014–15), using trained interviewer measured data, estimated that 35.5% of Australians aged 18 years and over were overweight (BMI 25–< 30) and 27.9% were obese (BMI 30 or more); 63.4% were overweight or obese. Men were more likely to be overweight or obese (70.8%) than women (56.3%).[77]

The National Health Survey also reported that about one in four (27.4%) of children aged 5–17 years were classified as overweight or obese (20.2% overweight, 7.4% obese).[77]

The Australian government has recognised the epidemic of overweight and obesity, and the likely impact on future health costs and negative health outcomes. New guidelines about the clinical management of overweight and obesity were released by the National Health and Medical Research Council (NHMRC) in May 2013.[78]

Method

Patient BMI was investigated for a subsample of 40 of each GP's 100 patient encounters. Each GP was instructed to ask the patient (or their carer in the case of children):

- What is your height in centimetres (without shoes)?
- What is your weight in kilograms (unclothed)?

Metric conversion tables (from feet and inches; from stones and pounds) were provided to the GP.

The BMI for an individual was calculated by dividing weight (kilograms) by height (metres) squared. The WHO recommendations[79] for BMI groups were used. They specify that an adult (18 years and over) with a BMI:

- less than 18.5 is underweight
- greater than or equal to 18.5 and less than 25 is normal weight
- greater than or equal to 25 and less than 30 is overweight
- of 30 or more is obese.

The reported height for adult patients was checked against sex-appropriate upper and lower height limits from the ABS.[80] Adults whose self-reported height was outside the sex-appropriate limits were excluded from the analysis.

The standard BMI cut-offs described above are not appropriate in the case of children. Cole et al. (2000 & 2007) developed a method to calculate the age–sex-specific BMI cut-off levels for underweight, overweight and obesity specific to children aged 2–17 years.[81,82] There are four categories defined for childhood BMI: underweight, normal weight, overweight and obese. This method, based on international data from developed Western cultures, is applicable in the Australian setting.

The reported height of children was checked against age–sex-appropriate upper and lower height limits from the ABS and Centres for Disease Control.[80,83] Children whose self-reported height was outside the age–sex-appropriate limits were excluded from the analysis.

The BEACH data on BMI are presented separately for adults (aged 18 years and over) and children (aged 2–17 years).

Results

Body mass index of adults

The sample size was 31,662 patients aged 18 years and over at encounters with 964 GPs.

- Almost two-thirds (63.2%) of these adults were overweight (34.5%) or obese (28.8%) (Table 13.1).
- Just over one-third (34.6%) of adult patients had a BMI in the normal range, and 2.2% of were underweight. Underweight was more prevalent among females than males.
- Males were more likely to be overweight or obese (70.2%, 95% CI: 69.2–71.3) than females (58.6%, 95% CI: 57.5–59.6) (results not tabled).
- Overweight/obesity was most prevalent among male patients aged 65–74 years (77.2%) and 45–64 years (77.0%) (Figure 13.1).
- In female patients, overweight/obesity was most prevalent in those aged 65–74 years (70.1%) and 45–64 years (64.9%) (Figure 13.1).
- Underweight was most prevalent among patients aged 18–24 years (5.7%, 95% CI: 4.7–6.7) (results not tabled).
- Of young adults (aged 18–24 years), 7.1% of females and 3.2% of males were underweight, and among those aged 75 years and over, 4.0% of females and 1.5% of males were underweight (Figure 13.2).

Our overall and sex-specific prevalence estimates of overweight/obesity among patients at general practice encounters (63% of adults, 70% of males and 59% of females) are consistent with the ABS 2014–15 figures from the National Health Survey (based on measured BMI data), which reported that 63% of adults aged 18 years and over (71% of males and 56% of females) were overweight or obese.[77]

Readers interested in the prevalence of the three WHO-defined levels of obesity will find more information and discussion in Chapter 7 of *General practice in Australia, health priorities and policies 1998 to 2008*.[84]

Estimation of body mass index for the adult general practice patient population

The BEACH study provides data about patient BMI from a sample of the patients attending general practice. As older people attend a GP more often than young adults, and females attend more often than males, they have a greater chance of being selected in the subsample. This leads to a greater proportion of older and female patients in the BEACH sample than in the total population who attend a GP at least once in a year. The 2015–16 BEACH sample was weighted to estimate the BMI of the GP–patient attending population (that is, the 16.2 million adult patients who attended a GP at least once in 2015–16 (personal communication, DoH, May 2016), using the method described by Knox et al. (2008).[21] This statistical adjustment had little effect on the resulting proportions.

The estimates for the adult population who attended general practice at least once (after adjusting for age–sex general practice attendance patterns) suggest that 27.9% of the adult patient population were obese, 34.0% were overweight, 35.8% were normal weight and 2.2% were underweight (Table 13.1).

Table 13.1: Patient body mass index (aged 18 years and over)

BMI class	Male[a]		Female[a]		Total respondents	
	Per cent in BEACH sample (95% CI) (*n* = 12,499)	Per cent in patient population (95% CI)[b]	Per cent in BEACH sample (95% CI) (*n* = 18,932)	Per cent in patient population (95% CI)[b]	Per cent in BEACH sample (95% CI) (*n* = 31,662)	Per cent in patient population (95% CI)[b]
Obese	28.5 (27.5–29.6)	27.7 (26.6–28.8)	28.9 (28.0–29.8)	28.2 (27.2–29.1)	28.8 (28.0–29.6)	27.9 (27.1–28.8)
Overweight	41.7 (40.7–42.7)	40.5 (39.4–41.5)	29.7 (29.0–30.4)	28.5 (27.7–29.2)	34.5 (33.9–35.1)	34.0 (33.4–34.7)
Normal	28.7 (27.6–29.7)	30.7 (29.5–31.9)	38.5 (37.5–39.5)	40.4 (39.3–41.4)	34.6 (33.7–35.4)	35.8 (34.9–36.7)
Underweight	1.1 (0.9–1.3)	1.2 (1.0–1.4	3.0 (2.7–3.2)	3.0 (2.7–3.3)	2.2 (2.0–2.4)	2.2 (2.0–2.4)

(a) Patient sex was not recorded for 231 respondents, missing data removed.

(b) Estimation of BMI among the total adult general practice patient population (that is, patients aged 18 years and over who attended a GP at least once in 2015–16).

Note: BMI – body mass index; CI – confidence interval.

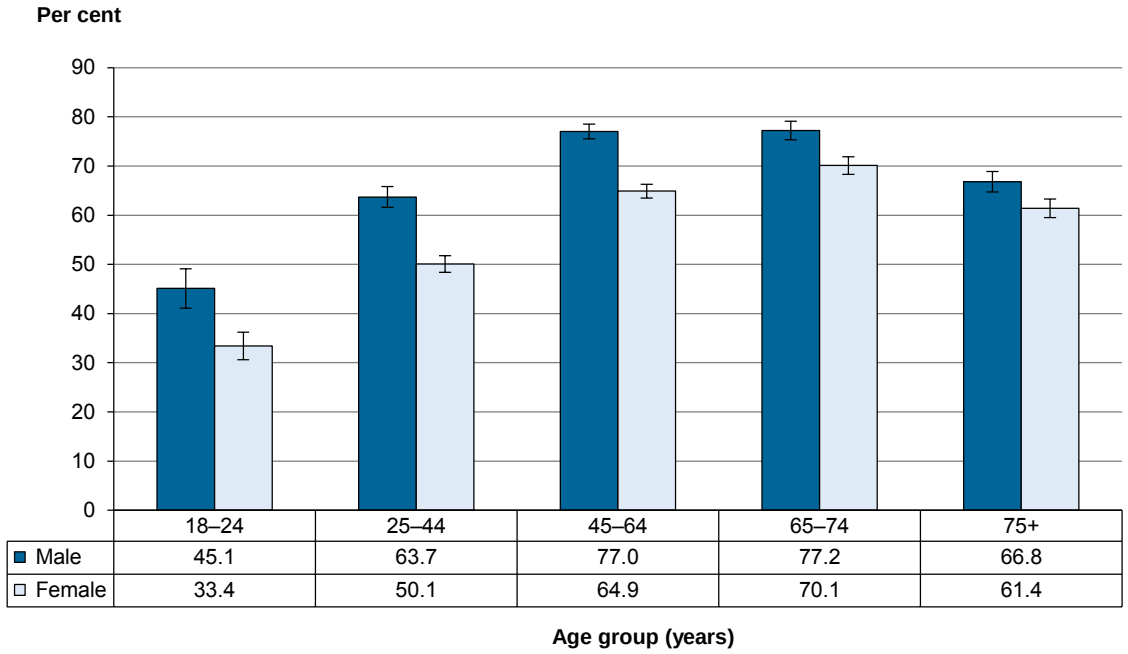


Figure 13.1: Age–sex-specific rates of overweight/obesity among sampled male (*n* = 12,499) and female (*n* = 18,932) adults, 2015–16 (95% confidence intervals)

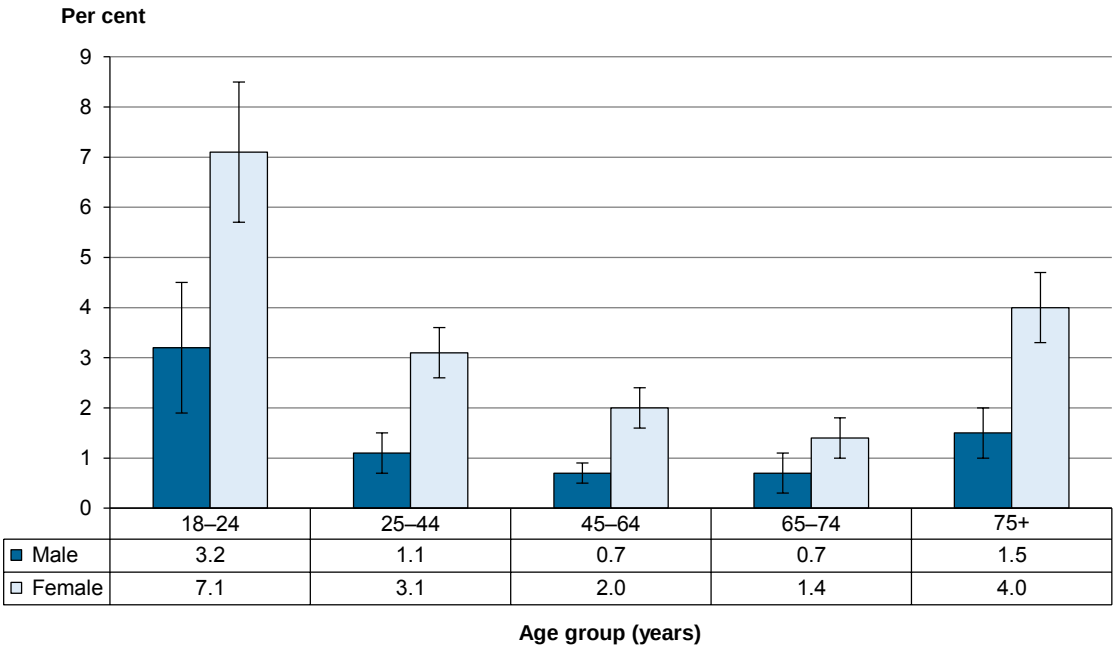


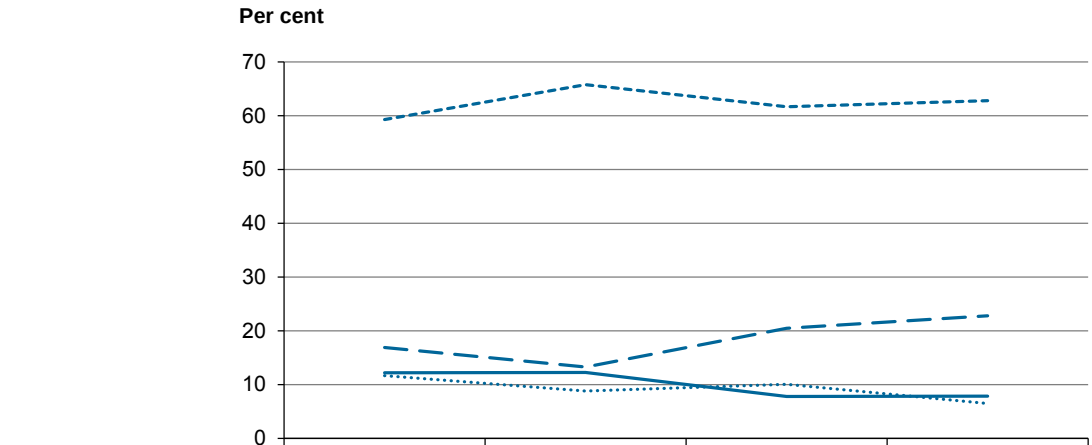
Figure 13.2: Age–sex-specific rates of underweight among sampled male (*n* = 12,499) and female (*n* = 18,932) adults, 2015–16 (95% confidence intervals)

Body mass index of children

BMI was calculated for 3,077 patients aged 2–17 years at encounters with 800 GPs.

- More than one in four children (28.0%, 95% CI: 26.2–29.8) were classed as overweight or obese, including 9.9% (95% CI: 8.7–11.1) obese and 18.1% (95% CI: 16.7–19.5) overweight (results not tabled).
- There was no difference in the prevalence of overweight/obesity among male (28.4%, 95% CI: 26.1–30.8) and female children (27.5%, 95% CI: 25.0–30.0) (results not tabled).
- The age-specific rates of obesity followed similar patterns for both sexes (Figures 13.3 and 13.4).

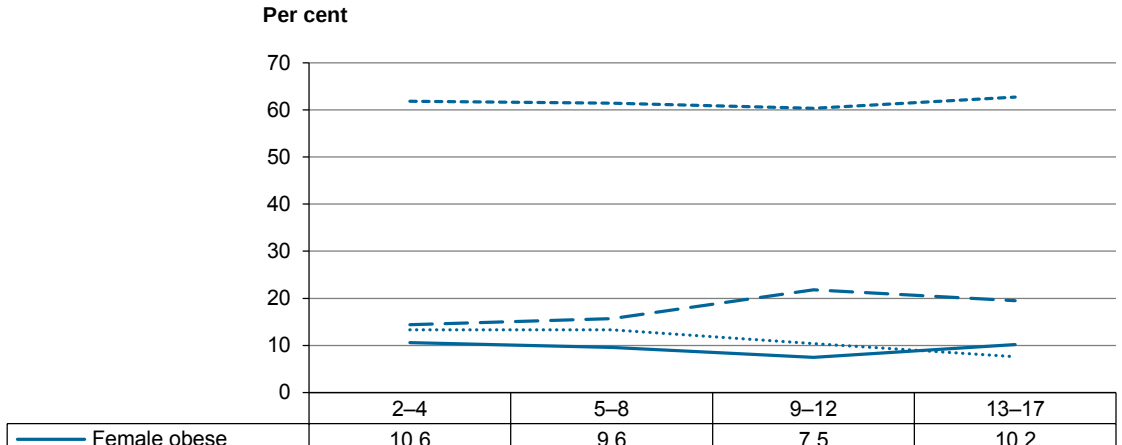
Readers interested in further detail and discussion about overweight and obesity in children attending general practice will find more information in Cretikos et al. (2008) *General practice management of overweight and obesity in children and adolescents in Australia*.[85]



	2–4	5–8	9–12	13–17
Male obese	12.2	12.3	7.8	7.9
Male overweight	16.9	13.3	20.5	22.8
Male normal weight	59.3	65.8	61.7	62.8
Male underweight	11.7	8.8	10.1	6.5

Age group (years)

Figure 13.3: Age-specific rates of obesity, overweight, normal weight and underweight among sampled male children (*n* = 1,541), 2015–16



	2–4	5–8	9–12	13–17
Female obese	10.6	9.6	7.5	10.2
Female overweight	14.4	15.7	21.8	19.5
Female normal weight	61.8	61.4	60.3	62.7
Female underweight	13.3	13.3	10.4	7.6

Age group (years)

Figure 13.4: Age-specific rates of obesity, overweight, normal weight and underweight among sampled female children (*n* = 1,536), 2015–16

13.2 Smoking (patients aged 18 years and over)

Tobacco smoking is the leading cause of ill health, drug-related death and hospital separations in Australia.[86] It is a major risk factor for coronary heart disease, stroke, peripheral vascular disease, several cancers, respiratory disorders and other diseases.[87] The most recent publicly available Australian data identified smoking as the risk factor associated with the greatest disease burden, accounting for 7.8% of the total burden of disease in Australia in 2003,[71] a decrease from 9.7% of the total burden in 1996.[72]

The Global Burden of Disease 2010 study has compared burden of disease and injury attributable to 67 risk factors in 21 regions. In Australasia (which includes Australia), 'tobacco smoking, including second-hand smoke' was ranked as the second most important risk factor for disease burden. These Australasian rankings are on par with the global risk factor rankings, with 'tobacco smoking, including second-hand smoke' also second globally.[73]

In 2016, the OECD reported that Australia has been successful in reducing tobacco consumption by more than half, from 30.6% of adults in 1986 to 13.0% in 2013.[75] Their 2015 Health Policy in Australia overview suggested that through a range of public health and policy initiatives, "Australia has achieved one of the lowest smoking rates in the world." They attribute this remarkable reduction to policies and programs including the world's first plain packaging legislation, smoking bans in public places and continually increasing prices through taxation.[76]

According to the 2010 National Drug Strategy Household Survey (NDSHS), 15.1% of Australians aged 14 years and over smoked daily: 16.4% of males and 13.9% of females.[88] The 2014–15 National Health Survey reported that 14.5% of Australians aged 18 years and over were daily smokers: 16.9% of males and 12.1% of females.[77]

Method

GPs were instructed to ask adult patients (18 years and over):

- What best describes your smoking status?
  - Smoke daily
  - Smoke occasionally
  - Previous smoker
  - Never smoked

Results

The smoking status of 32,664 adult patients was established at encounters with 965 GPs. Table 13.2 shows that:

- 13.3% of sampled adult patients were daily smokers
- significantly more male (16.1%) than female patients (11.5%) were daily smokers (Table 13.2)
- only 2.1% of sampled adult patients were occasional smokers
- more than one-quarter of sampled adults (27.7%) were previous smokers.

Estimation of smoking in the adult general practice patient population

The BEACH study provides data about patient smoking habits from a sample of the patients attending general practice. As older people attend a GP more often than young adults, and females attend more often than males, they have a greater chance of being selected in the subsample. This leads to a greater proportion of older and female patients in the BEACH sample than in the total population who attend a GP at least once in a year. The 2015–16 BEACH sample was weighted to estimate the smoking status of the GP–patient attending population (that is, the 16.2 million adult patients who

attended a GP at least once in 2015–16 [personal communication, DoH, May 2016]), using the method described by Knox et al. (2008).[21]

After adjusting for age–sex general practice attendance patterns, we estimated that 15.8% of the patient population aged 18 or more were daily smokers, 2.8% were occasional smokers, 25.0% were previous smokers and 56.4% had never smoked. Male patients in the total general practice population were significantly more likely to be daily (19.3%), occasional (3.5%) and previous smokers (29.5%), than female patients (12.8%, 2.1% and 21.2%, respectively) (Table 13.2).

Table 13.2: Patient smoking status (aged 18 years and over)

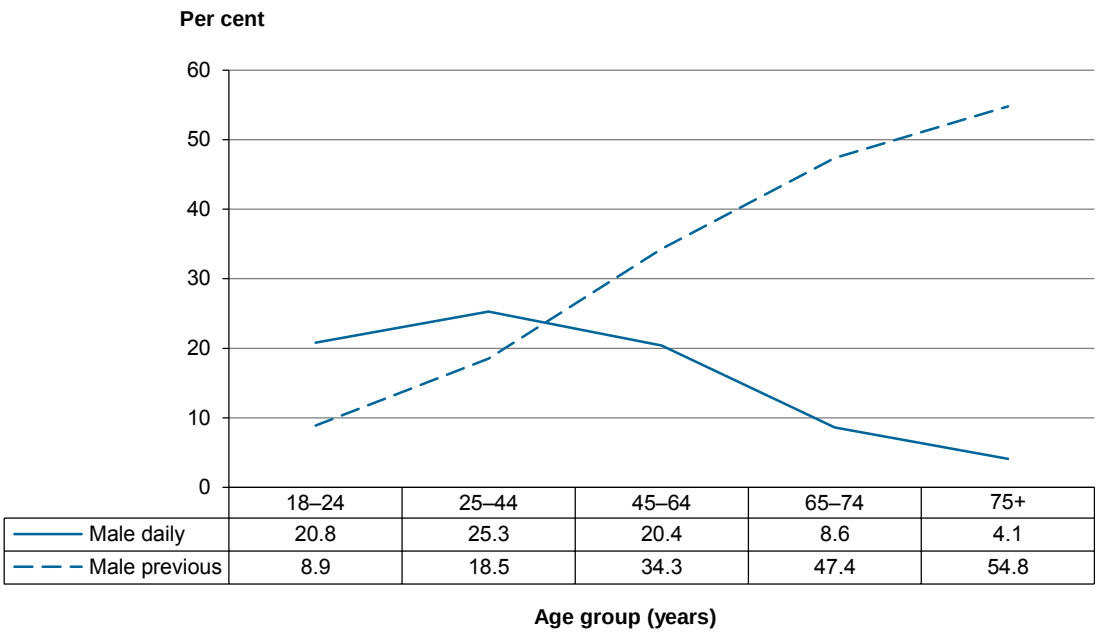
	Male[a]		Female[a]		Total respondents	
Smoking status	Per cent in BEACH sample (95% CI) (*n* = 12,881)	Per cent in patient population (95% CI)[b]	Per cent in BEACH sample (95% CI) (*n* = 19,546)	Per cent in patient population (95% CI)[b]	Per cent in BEACH sample (95% CI) (*n* = 32,664)	Per cent in patient population (95% CI)[b]
Daily	16.1 (15.2–17.0)	19.3 (18.2–20.3)	11.5 (10.9–12.2)	12.8 (12.1–13.5)	13.3 (12.7–14.0)	15.8 (15.1–16.6)
Occasional	2.7 (2.3–3.1)	3.5 (3.0–4.0)	1.8 (1.5–2.0)	2.1 (1.8–2.4)	2.1 (1.9–2.4)	2.8 (2.4–3.1)
Previous	35.8 (34.6–37.0)	29.5 (28.3–30.6)	22.4 (21.5–23.2)	21.2 (20.3–22.0)	27.7 (26.9–28.5)	25.0 (24.3–25.8)
Never	45.4 (44.2–46.6)	47.8 (46.4–49.1)	64.3 (63.3–65.4)	63.9 (62.8–65.0)	56.8 (55.8–57.7)	56.4 (55.4–57.4)

(a) Patient sex was not recorded for 237 respondents, missing data removed.

(b) Estimation of smoking status among the total adult general practice patient population (that is, patients aged 18 years and over who attended a GP at least once in 2015–16).

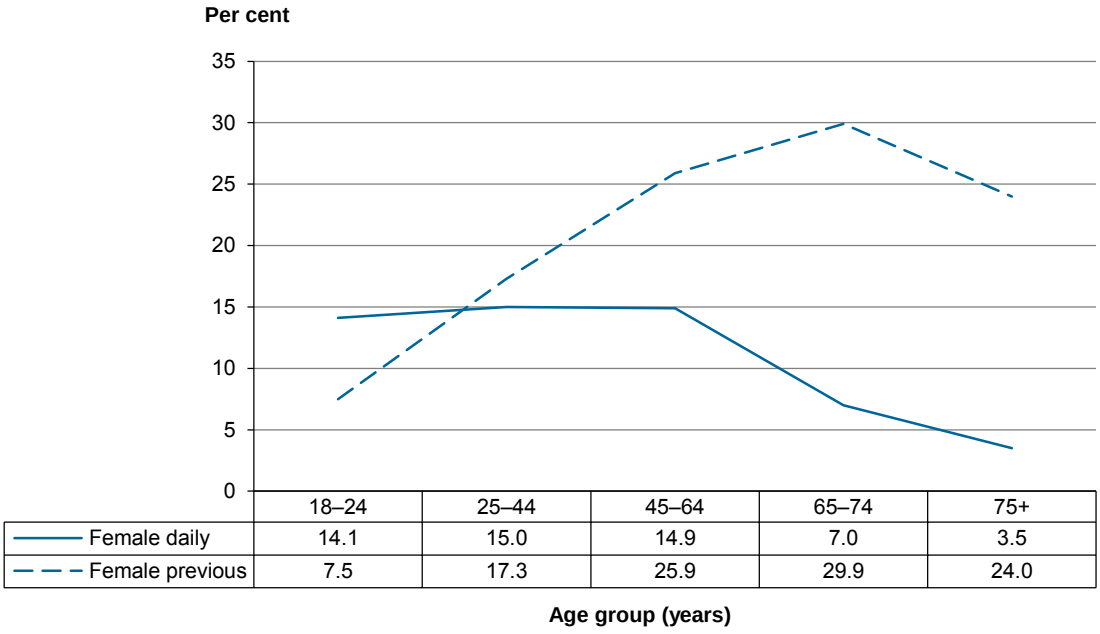
Note: CI – confidence interval.

Daily smoking was least prevalent among older adults aged 65–74 and 75 years or more (7.7% and 3.8% respectively), and most prevalent among adult patients aged 25–44 years (18.5%) (results not tabled). Over half (54.8%) of the male and 24.0% of the female patients aged 75 years and over were previous smokers, but only 4.1% of males and 3.5% of females in this age group were daily smokers (Figures 13.5 and 13.6).



	18–24	25–44	45–64	65–74	75+
Male daily	20.8	25.3	20.4	8.6	4.1
Male previous	8.9	18.5	34.3	47.4	54.8

Figure 13.5: Smoking status – male age-specific rates among sampled patients (*n* = 12,881), 2015–16



	18–24	25–44	45–64	65–74	75+
Female daily	14.1	15.0	14.9	7.0	3.5
Female previous	7.5	17.3	25.9	29.9	24.0

Figure 13.6: Smoking status – female age-specific rates among sampled patients (*n* = 19,546), 2015–16

13.3 Alcohol consumption (patients aged 18 years and over)

Among people aged 65 years and over, low to moderate consumption of alcohol has been found to have a preventive effect against selected causes of morbidity.[89] Following a review of the evidence, the NHMRC stated that at low levels of consumption, alcohol has some cardiovascular health benefits in certain age groups (middle-aged and older males, and women after menopause). Low levels of alcohol consumption raise high-density lipoprotein cholesterol and reduce plaque accumulations in arteries. Alcohol can also have a mild anti-coagulating effect. However, the authors of the review noted that the extent of cardiovascular risk reduction is uncertain, and the potential cardiovascular benefits can be gained from other means, such as exercise or diet modification.[90] From the most recent publicly available Australian data, in 2003, alcohol consumption accounted for 3.3% of the total burden of disease in Australia; however, after taking into account the benefit derived from low to moderate alcohol consumption, this fell to 2.3%.[71]

The Global Burden of Disease 2010 study compared burden of disease and injury attributable to 67 risk factors in 21 regions. In Australasia (which includes Australia) 'alcohol use' was ranked as the ninth risk factor for disease burden, a lower ranking than in the global risk factor rankings, where 'alcohol use' ranked fifth.[73]

The 2014–15 National Health Survey uses the lifetime risk of harm from alcohol-related disease or injury described by the National Health and Medical Research Council 2009 guidelines. They effectively define 'at-risk' drinking as 'drinking more than two standard drinks on any day'.[77] They report 17.4% of Australian adults consumed at 'risky levels', down from 19.5% in 2011–12.[77]

The Australian Health Survey classified alcohol use for those aged 18 years or more based on the estimated average daily consumption of alcohol during the previous week. The results indicated that 11.7% drank at levels considered to be risky (13.4% of males and 10.1% of females), based on the 2001 NHMRC guidelines.[19] Based on the NHMRC 2009 guidelines, 19.5% of adults drank at levels exceeding the guidelines (29.1% of males and 10.1% of females).[19]

The 2010 National Drug Strategy Household Survey (NDSHS) found that 20.1% of people aged 14 years and over (29.0% of males and 11.3% of females) drank at levels considered to put them at risk of harm from alcohol-related disease or injury over their lifetime. The study also found that 28.4% of people aged 14 years or more (38.2% of males and 18.9% of females) drank (at least once in the previous month) in a pattern that placed them at risk of an alcohol-related injury from a single drinking occasion.[88] These alcohol consumption risk levels were based on the NHMRC 2009 guidelines.[90]

For consistency over time, this report uses the definitions of alcohol-related risk developed by WHO (see 'Method' below).[91] This differs from the definition in the NHMRC guidelines.

Method

To measure alcohol consumption, BEACH uses AUDIT-C,[92] which is the first three items from the WHO Alcohol Use Disorders Identification Test (AUDIT),[91] with scoring for an Australian setting.[93] The AUDIT-C tool has demonstrated validity and internal consistency and performs as well as the full AUDIT tool.[94] The three AUDIT-C questions are practical and valid in a primary care setting to assess 'at-risk' alcohol consumption (heavy drinking and/or active alcohol dependence).[92] The scores for each question range from zero to four. A total (sum of all three questions) score of five or more for males, or four or more for females, suggests that the person's drinking level is placing him or her at risk.[93]

GPs were instructed to ask adult patients (18 years and over):

- How often do you have a drink containing alcohol?
  - Never
  - Monthly or less
  - Once a week/fortnight
  - 2–3 times a week
  - 4 times a week or more
- How many standard drinks do you have on a typical day when you are drinking?

  _____
- How often do you have six or more standard drinks on one occasion?
  - Never
  - Less than monthly
  - Monthly
  - Weekly
  - Daily or almost daily

A standard drinks chart was provided to each GP to help the patient identify the number of standard drinks consumed.

Results

Patient self-reported alcohol consumption was recorded for 31,720 adult patients (18 years and over) at encounters with 965 GPs.

- Just under one-quarter of sampled adults reported drinking alcohol at at-risk levels (22.7%) (Table 13.3).
- At-risk drinking was more prevalent among male (26.5%) than female patients (20.3%) (Table 13.3).
- At-risk drinking was most prevalent in those aged 18–24 years, particularly among males. In this age group, over a third of males (39.5%) and over a quarter of females (30.9%) reported at-risk alcohol consumption (Figure 13.7).
- The proportion of patients who were at-risk drinkers decreased with age among both males and females (Figure 13.7).

Estimation of alcohol consumption levels in the adult general practice patient population

The BEACH study provides data about patient alcohol consumption from a sample of the patients attending general practice. As older people attend a GP more often than young adults, and females attend more often than males, they have a greater chance of being selected in the subsample. This leads to a greater proportion of older and female patients in the BEACH sample than in the total population who attend a GP at least once in a year. The 2015–16 BEACH sample was weighted to estimate the prevalence of at-risk alcohol consumption among the GP–patient attending population (that is, the 16.2 million adult patients who attended a GP at least once in 2015–16 (personal communication, DoH, May 2016), using the method described by Knox et al. (2008).[21]

After adjusting for age–sex general practice attendance patterns, we estimated that 25.3% of the patient population were at-risk drinkers, 44.0% were responsible drinkers and 30.7% were non-drinkers. Males in the general practice attending population were significantly more likely to be at-risk drinkers (29.6%) than females (21.7%) (Table 13.3).

Table 13.3: Patient alcohol consumption (aged 18 years and over)

Alcohol consumption	Male		Female		Total respondents	
	Per cent in BEACH sample (95% CI) (*n* = 12,588)	Per cent in patient population (95% CI)[(a)]	Per cent in BEACH sample (95% CI) (*n* = 19,132)	Per cent in patient population (95% CI)[(a)]	Per cent in BEACH sample (95% CI) (*n* = 31,720)	Per cent in patient population (95% CI)[(a)]
At-risk drinker	26.5 (25.3–27.7)	29.6 (28.2–30.9)	20.3 (19.3–21.2)	21.7 (20.7–22.6)	22.7 (21.9–23.6)	25.3 (24.4–26.3)
Responsible drinker	48.4 (47.2–49.7)	46.6 (45.3–47.9)	41.0 (39.9–42.1)	41.8 (40.6–42.9)	43.9 (43.0–44.9)	44.0 (43.0–45.0)
Non-drinker	25.1 (23.9–26.3)	23.8 (22.5–25.1)	38.7 (37.4–40.1)	36.6 (35.2–38.0)	33.3 (32.2–34.5)	30.7 (29.5–31.8)

(a) Estimation of alcohol consumption among the total adult general practice patient population (that is, patients aged 18 years and over who attended a GP at least once in 2015–16).

Note: CI – confidence interval.

These estimates are not directly comparable with the results from the 2014–15 National Health Survey[77], 2011–12 Australian Health Survey[19] or the 2010 NDSHS.[88] They all use different definitions for risky levels of alcohol consumption, and different adult populations (patients aged 18 years or more for BEACH study and National Health Survey, persons aged 15 or 18 years or more for the Australian Health Survey, and persons aged 14 years or more for the NDSHS).

Readers interested in the relationship between morbidities managed and alcohol consumption will find more information in Proude et al. (2006) *The relationship between self-reported alcohol intake and the morbidities managed by GPs in Australia*.[95]

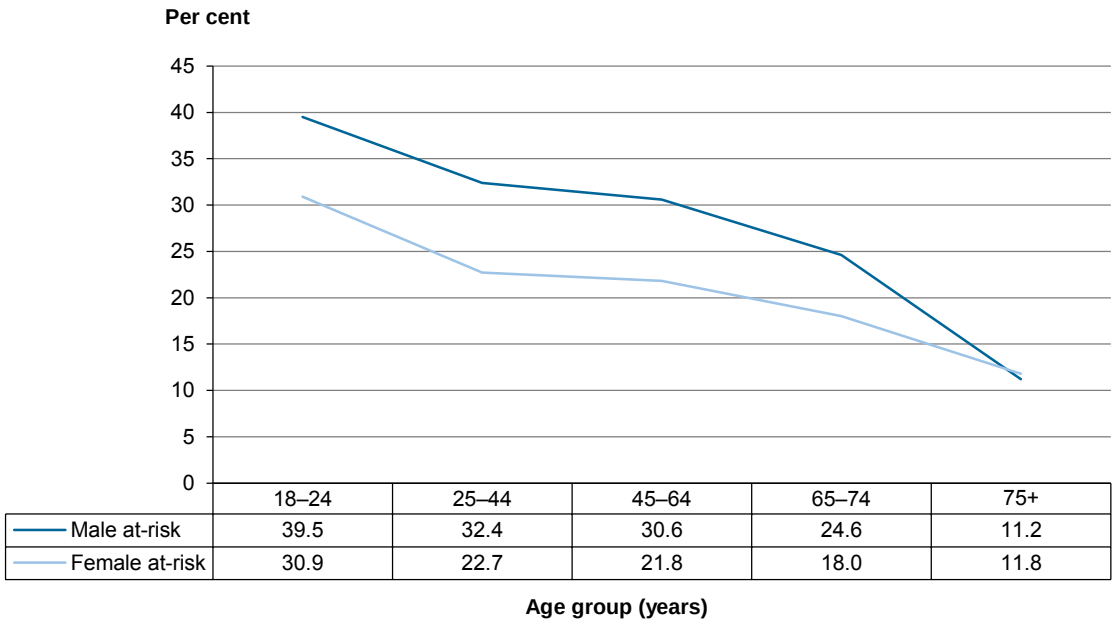


Figure 13.7: Age–sex-specific rates of at-risk alcohol consumption in sampled patients, 2015–16

13.4 Risk factor profile of adult patients

All patient risk factor questions (BMI, smoking and alcohol consumption) were asked of the same subsample of patients. This allows us to build a risk profile of this sample. For the purposes of this analysis, being overweight or obese, a daily smoker or an at-risk drinker was considered a risk factor. A risk factor profile was prepared for the 30,672 adult patients from 964 GPs, for whom data were available in all three elements (Table 13.4).

- About half (53.7%) the sampled adult respondents had one risk factor. The most common was overweight (23.7% of adults) followed by obesity (20.3%).
- Almost 1 in 5 patients (18.5%) had two risk factors. The most common combinations were:
  - overweight and at-risk alcohol consumption – 6.6% of patients
  - obesity and at-risk alcohol consumption – 4.7% of patients
  - overweight and daily smoking – 2.5% of patients
  - obesity and daily smoking – 2.5% of patients.
- A small group of patients (2.9%) had all three risk factors.

Table 13.5 shows the number of risk factors by patient sex.

- Sampled females were significantly more likely to have no risk factors (28.7%) than sampled males (19.0%).
- Sampled females were significantly less likely to have two or three risk factors (15.0% and 2.1% respectively) than sampled males 23.9% and 4.1%).

Estimation of the risk profile of the adult general practice patient population

The 2015–16 BEACH sample was weighted to estimate the risk profile of the GP–patient attending population, that is, the 16.2 million adult patients who attended a GP at least once in 2015–16.

After adjusting for age–sex general practice attendance patterns we estimated that:

- one-quarter of all attending adult patients had no risk factors (24.3%)
- half of the adult patients had one risk factor (51.7%), with the most common being overweight (22.0% of adults) followed by obesity (18.7%)
- 1 in 5 patients had two risk factors (20.4%), with the most common combinations being overweight and at-risk alcohol consumption (7.0%), followed by obesity and at-risk alcohol consumption (4.8%)
- 3.6% of patients who attended general practice had three risk factors (Table 13.4)
- significantly more female than male patients had no risk factors (29.3% and 18.6% respectively). Male patients were also more likely to have two and three risk factors (25.9% and 4.9%) than females (15.6% and 2.4%) (Table 13.5).

Table 13.4: Risk factor profile of patients (aged 18 years and over)

Number of risk factors	Number	Per cent in BEACH sample (*n* = 30,672)	95% LCL	95% UCL	Per cent in patient population[(a)]	95% LCL	95% UCL
No risk factors	**7,628**	**24.9**	**24.1**	**25.6**	**24.3**	**23.5**	**25.1**
One risk factor	**16,481**	**53.7**	**53.0**	**54.5**	**51.7**	**50.9**	**52.5**
Overweight only	7,261	23.7	23.1	24.3	22.0	21.4	22.6
Obese only	6,235	20.3	19.7	21.0	18.7	18.1	19.4
At-risk alcohol level only	2,020	6.6	6.1	7.0	7.4	6.9	7.9
Current daily smoker only	965	3.1	2.9	3.4	3.6	3.3	3.9
Two risk factors	**5,684**	**18.5**	**17.9**	**19.2**	**20.4**	**19.7**	**21.1**
Overweight and at-risk alcohol level	2,026	6.6	6.2	7.0	7.0	6.6	7.4
Obese and at-risk alcohol level	1,433	4.7	4.4	5.0	4.8	4.5	5.2
Overweight and current daily smoker	771	2.5	2.3	2.7	2.9	2.7	3.2
Obese and current daily smoker	774	2.5	2.3	2.7	2.8	2.6	3.1
Daily smoker and at-risk alcohol level	680	2.2	2.0	2.4	2.8	2.5	3.0
Three risk factors	**879**	**2.9**	**2.6**	**3.1**	**3.6**	**3.3**	**3.9**
Overweight and current daily smoker and at-risk alcohol level	513	1.7	1.5	1.8	2.1	1.9	2.3
Obese and current daily smoker and at-risk alcohol level	366	1.2	1.1	1.3	1.5	1.3	1.6

(a) Estimation of risk factor profile among the total adult general practice patient population (that is, patients aged 18 years and over who attended a GP at least once in 2015–16).

Note: LCL – lower confidence limit; UCL – upper confidence limit.

Table 13.5: Number of risk factors by patient sex

	Male		Female	
Number of risk factors	Per cent in BEACH sample (95% CI) (*n* = 12,194)	Per cent in patient population (95% CI)[(a)]	Per cent in BEACH sample (95% CI) (*n* = 18,478)	Per cent in patient population (95% CI)[(a)]
No risk factors	19.0 (18.1–20.0)	18.6 (17.6–19.6)	28.7 (27.8–29.6)	29.3 (28.3–30.3)
One risk factor	53.0 (51.9–54.1)	50.6 (49.4–51.7)	54.2 (53.4–55.1)	52.7 (51.8–53.5)
Two risk factors	23.9 (23.0–24.9)	25.9 (24.8–27.0)	15.0 (14.3–15.6)	15.6 (14.9–16.3)
Three risk factors	4.1 (3.7–4.5)	4.9 (4.5–5.4)	2.1 (1.8–2.3)	2.4 (2.1–2.6)

(a) Estimation of risk factor profile among the total adult general practice patient population (that is, patients aged 18 years and over who attended a GP at least once in 2015–16).

Note: CI – confidence interval.

13.5 Changes in patient risk factors over the decade 2006–07 to 2015–16

To investigate changes over time in prevalence of patient risk factors (overweight and obesity, smoking and at-risk alcohol consumption), results are reported from the BEACH sample data for each year from 2006–07 to 2015–16 in Chapter 13 of the companion report, *A decade of Australian general practice activity 2006–07 to 2015–16*.[1]

The major changes between 2006–07 and 2015–16 are summarised below.

- The prevalence of obesity in sampled adults attending general practice increased significantly, from 23.5% to 28.8%, an increase apparent in both male and female patients. In parallel, the prevalence of normal weight in adults attending general practice decreased significantly, from 39.0% to 34.6%.
- The prevalence of overweight and obesity among sampled children aged 2–17 years effectively remained static for the 10-year period from 2006–07 to 2015–16 (around 18% and 10% respectively). Similar patterns were noted for both male and female children.
- There was a significant decrease in the prevalence of current daily smoking and occasional smoking among sampled adults aged 18 years and over, from 16.1% and 3.2% respectively in 2006–07, to 13.3% and 2.1% in 2015–16. These decreases were apparent among both male and female patients.
- Prevalence of at-risk levels of alcohol consumption among sampled adults declined from about 27% in 2006–07 to 23% in 2015–16. A corresponding increase in non-drinkers from about 28% in 2006–07 to 33% in 2015–16 was apparent. The significant decrease in at-risk levels of alcohol consumption and increase in non-drinkers applied among both male and female patients.
- There was a significant increase in the proportion of sampled adults with one risk factor from 49.8% in 2006–07, to 53.7% in 2015–16, and the increase applied to both male and female patients. There was a significant decrease in the proportion of patients with two (20.4% to 18.5%) or three (3.7% to 2.9%) risk factors — corresponding with the increase in the proportion with one risk factor. This pattern was reflected among both male and female patients.

14 Care of middle-aged people in general practice

14.1 Introduction

In last year's BEACH annual report, we wrote a special feature on the care of older Australians (aged 65 years or more [65+]) in general practice[36] with main results summarised below. This year we examine 'middle-aged' patients (aged 45 to 64 years) as these patients would be prime targets for interventions to improve their future health.

The 65+ study highlighted some of the challenges facing general practice as a result of the ageing of the population. We showed that since 2000–01, patients aged 65+ consistently used a greater share of GP service resources than the proportion they accounted for in the population. Further, over the 15 years studied, this share had increased by more than their relative increase as a proportion of the population.

Patients aged 65+ used more health resources than the average Australian (1.9 times as many GP encounters and 2.4 times as many medications). When they visited a GP in 2014–15, they were about 50% more likely to be referred and about 45% more likely to have tests ordered than in 2000–01.

Nearly all patients aged 65+ at a GP consultation had one or more diagnosed chronic condition(s). In the Australian population, 90% of this older group had at least one chronic condition, the majority (57%) had three or more (multimorbidity) and almost 10% had seven or more diagnosed chronic conditions. For example, both hypertension and osteoarthritis had already been diagnosed in more than 50% of older patients sitting in front of a GP.

Our results demonstrated the level of complexity in the management of these patients. When GPs manage a single chronic condition in an older patient, they usually have to consider the implications of the presence of multiple other diagnosed chronic morbidities and the average 5.6 medications being taken for these conditions.

Considered collectively, our findings suggested that though we have some challenges ahead of us, these are mostly a by-product of the success of our health system. For example, the ageing population is partly a product of our increased longevity. We are better able to keep people alive, with increased years without disability than in the past. This allows people to extend their years as productive members of the workforce or the community. Medical advances have changed many once life-threatening health events (for example, acute coronary syndrome) into ones for which intervention (for example, stents) can solve (but not cure) the problem, though the patient may require ongoing (for example, cardiovascular) management for the rest of their lives.

The overall effect is that there are more people being diagnosed with more conditions, where each condition will be managed for a longer period of time. The resulting exponential increase in chronic condition management generates a similar growth in the number of GP visits and the number of management actions, such as prescriptions and test orders. The increased use of GP services has no doubt contributed to our increased life expectancy, and is provided at a per-person cost in line with, or less than, that of other countries.

The current feature examines the care of 'middle-aged' Australians in general practice—those aged 45–64 years. It is likely that this group of patients would be prime targets of interventions as they should be less likely to have the complex morbidity we found in older Australians. By examining this group of patients, we may identify areas of potential improvement that could enhance patients' long term health.

14.2 Results

The share of general practice use by patients aged 45–64 years

Figure 14.1 provides an overview of change in the population and use of GP services.

- People aged 45–64 years increased from 22.8% of the population in June 2000 to 25.1% in June 2011. By June 2015, the proportion of people aged 45–64 years had decreased to 24.6%. The initial increase was likely due to the wave of younger 'baby boomers' entering this age group. The decrease from 2011 was likely to be the reverse, when a wave of older 'baby boomers' moved into the 65+ range without being replaced in the same volume by younger generations.
- GP encounters with patients aged 45–64 years increased from 25.9% of all BEACH encounters in 2000–01 to a peak of 28.9% in 2008–09. By 2015–16, it had decreased to 26.9%. The proportion of GP encounters used by 45–64 year olds follows a pattern similar to the change in the age distribution of the Australian population.
- GP face-to-face clinical consulting time spent managing patients aged 45–64 years increased from 27.4% of all clinical time in 2000–01 to 30.3% in 2008–09 and then decreased to 28.1% in 2015–16.
- Problems managed at GP encounters with patients aged 45–64 years increased from 28.1% in 2000–01 to 30.6% in 2008–09 and then decreased to 28.6% in 2015–16.
- All medications that were GP-prescribed, supplied or advised for over-the-counter (OTC) purchase for patients aged 45–64 increased from 27.6% in 2000–01 to 29.8% in 2008–09, then decreased to 28.5% in 2015–16.
- Pathology and imaging tests ordered for patients aged 45–64 increased from 33.5% of all tests in 2000–01 to 35.8% in 2008–09, then decreased to 32.2% in 2015–16.
- Referrals made by GPs that were for patients aged 45–64 years increased from 29.4% of all referrals in 2000–01 to 32.3% in 2007–08, then decreased to 29.6% in 2015–16.

In summary, as the proportion of GP encounters used by patients aged 45–64 years followed change in the age distribution of the Australian population, so too did the proportion of problems managed by GPs for this age group, and therefore the proportions of medications, tests and referrals accounted for by these middle-aged patients.

The previous feature[36] found that in 2000–01, patients aged 45–64 years accounted for more GP encounters, GP clinical time, problems managed and referrals than patients aged 65+. By 2014–15, patients aged 65+ accounted for more of all these services than patients aged 45–64 years. The exceptions were: medications, for which patients aged 65+ accounted for more across all the years studied; and tests, for which patients aged 45–64 years accounted for more across all years studied.

Figure 14.1 facilitates relative comparisons between the proportion of management actions accounted for by patients aged 45–64 years and the proportion they account for in the population. For example, in 2015–16, patients aged 45–64 years accounted for 32.2% of all tests ordered by GPs while accounting for just 24.6% of the population. By dividing the 32.2% by 24.6%, we find that people aged 45–64 on average used 31% more tests than the average Australian. Using the same approach, in 2015–16, compared with the average Australian, people aged 45–64 years had:

- 9% more GP encounters
- 14% more clinical face-to-face time with GPs
- 16% more problems managed
- 16% more medications prescribed/advised or supplied
- 31% more tests ordered
- 20% more referrals made.

While patients aged 45–64 years used more health resources than the average Australian, patients aged 65 years or older used more again. In 2015–16, compared with an average person aged 45–64 years, people aged 65+ had an average:

- 88% more GP encounters
- 102% more problems managed
- 108% more medications prescribed/advised or supplied
- 56% more tests ordered
- 76% more referrals made (results not shown).

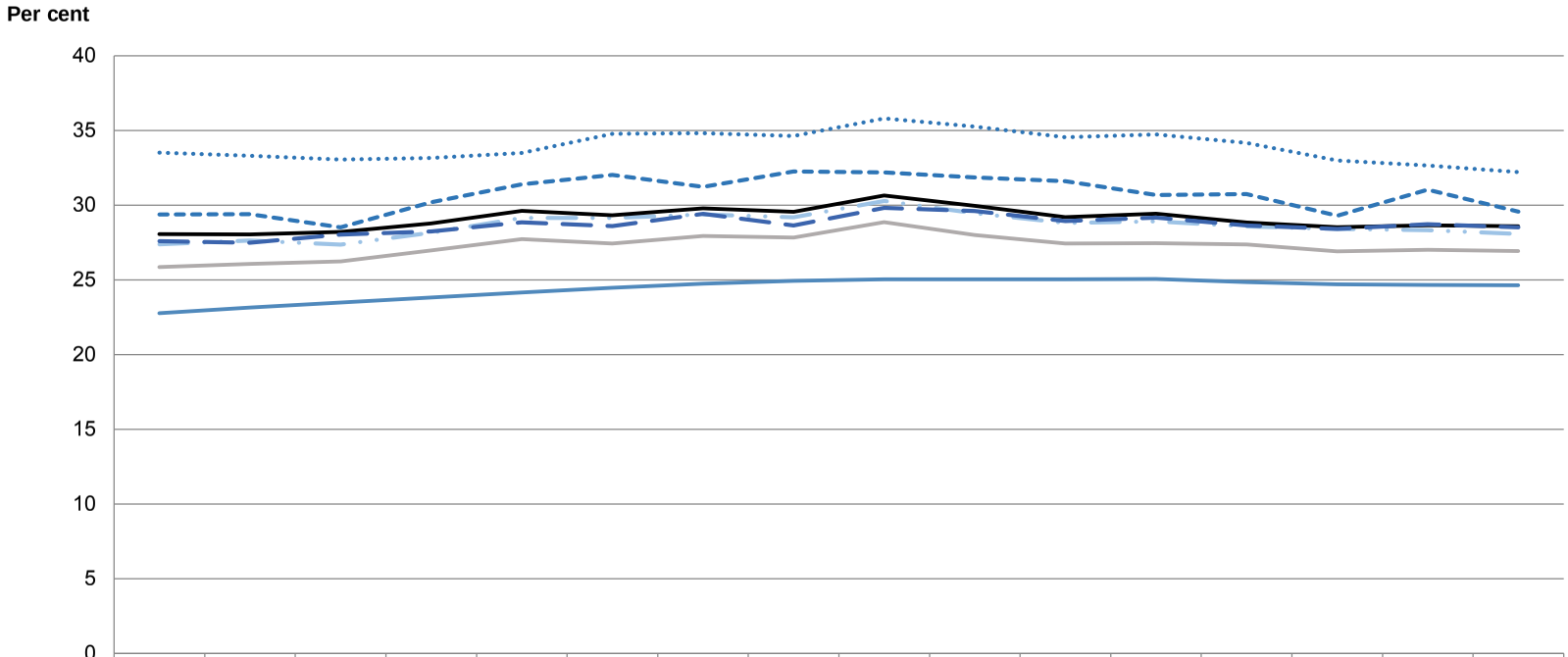
Figure 14.2 gives an idea of the content of GP encounters with patients aged 45–64 years, from 2000–01 to 2015–16. On average, for every 100 encounters with these patients:

- the number of problems managed increased by 5%
- the number of tests ordered increased by 46%
- the number of referrals (to specialists, allied health professionals, emergency departments or hospitals) increased by 53%
- the number of medications prescribed, supplied to the patient or advised for over-the-counter purchase decreased by 5%. This decrease may be due to the increasing number of combination medication products available (which now require a single prescription, when previously GPs had to prescribe the two products separately) and to the increasing numbers of medications that were previously prescription-only, but are now available for over-the-counter purchase, without the need to see a GP.

Figure 14.3 examines the age-specific rate of problems managed and management actions used per 100 encounters in 2015–16.

- The number of problems managed per 100 encounters increased significantly with age, with patients aged 65+ having 9% more problems managed than patients aged 45–64 years.
- Medications per 100 encounters also increased significantly with age; patients aged 65+ had 12% more medications prescribed/advised/supplied than patients aged 45–64 years.
- Patients aged 45–64 years had a significantly higher rate of tests ordered per 100 encounters than both younger (34% higher) and older patients (19% higher).
- Patients aged 45–64 had a significantly higher rate of referrals per 100 encounters than younger patients (18%), however there was no significant difference found between patients aged 45–64 years and older patients.

Figure 14.4 shows that patients aged 45–64 years had significantly longer average measured consultations than patients at all GP encounters across all the years studied. It also shows that the average length of consultations with patients aged 45–64 years significantly increased from 14.7 minutes in 2000–01 to 15.5 minutes in 2015–16.



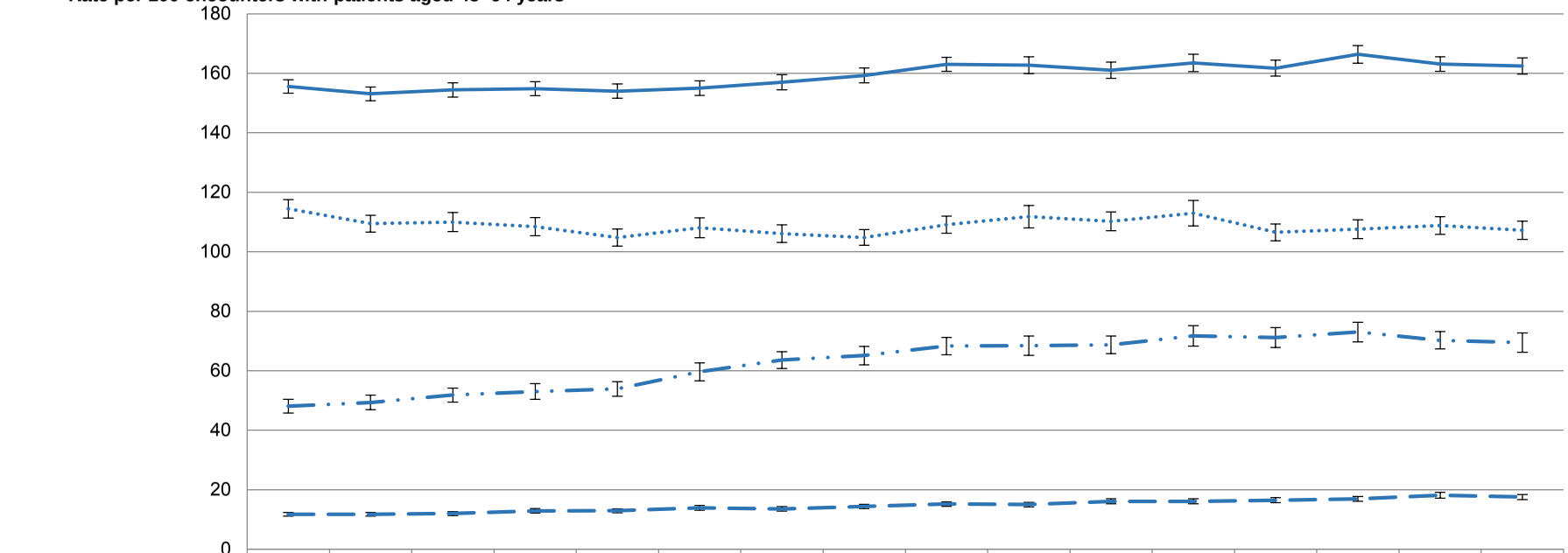
	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Population	22.8	23.1	23.5	23.8	24.2	24.5	24.8	24.9	25.0	25.0	25.0	25.1	24.8	24.7	24.7	24.6
Encounters	25.9	26.1	26.2	27.0	27.7	27.4	27.9	27.8	28.9	28.0	27.4	27.5	27.4	26.9	27.0	26.9
Clinical time	27.4	27.6	27.4	28.2	29.1	29.1	29.4	29.2	30.3	29.5	28.8	28.9	28.6	28.4	28.3	28.1
Problems managed	28.1	28.0	28.2	28.8	29.6	29.3	29.8	29.5	30.6	30.0	29.2	29.4	28.8	28.5	28.6	28.6
Medications	27.6	27.5	28.0	28.2	28.9	28.6	29.4	28.6	29.8	29.6	28.9	29.2	28.6	28.4	28.7	28.5
Tests	33.5	33.3	33.1	33.2	33.5	34.8	34.8	34.6	35.8	35.3	34.5	34.7	34.2	33.0	32.7	32.2
Referrals	29.4	29.4	28.5	30.2	31.4	32.0	31.2	32.3	32.2	31.9	31.6	30.7	30.7	29.3	31.0	29.6

BEACH data years

Source: Population data: ABS 3101.0 Australian Demographic Statistics, Table 59.[2,96] Proportion and content of encounters: BEACH. Length of consultation: BEACH SAND data.

Notes: Medications include GP-prescribed, GP-supplied direct to the patient, and those advised for patient over-the-counter purchase. Tests include pathology, imaging, and other tests ordered or undertaken at the encounter. Referrals include all referrals made at the encounter (e.g. to medical specialists, allied health services, hospitals, clinics).

Figure 14.1 Proportion of population, GP encounters and management actions accounted for by people aged 45–64 years (2000–01 to 2015–16)

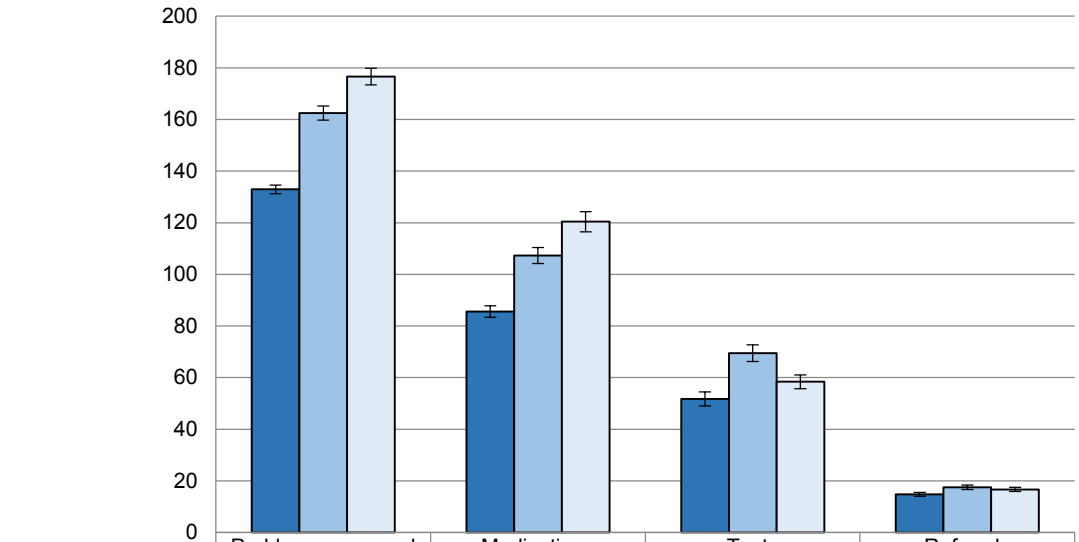


	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Problems managed	155.6	153.1	154.4	154.8	154.0	155.0	157.0	159.3	163.0	162.8	161.0	163.5	161.7	166.4	163.1	162.5
Medications	114.4	109.5	110.0	108.5	104.8	108.1	106.1	104.8	109.1	111.8	110.2	113.0	106.5	107.6	108.9	107.3
Tests	48.1	49.4	51.9	53.0	53.9	59.7	63.6	65.1	68.3	68.4	68.7	71.7	71.1	73.0	70.3	69.5
Referrals	11.8	11.7	12.0	12.9	12.9	13.9	13.6	14.4	15.2	15.0	16.1	16.1	16.5	16.9	18.1	17.5

BEACH data years

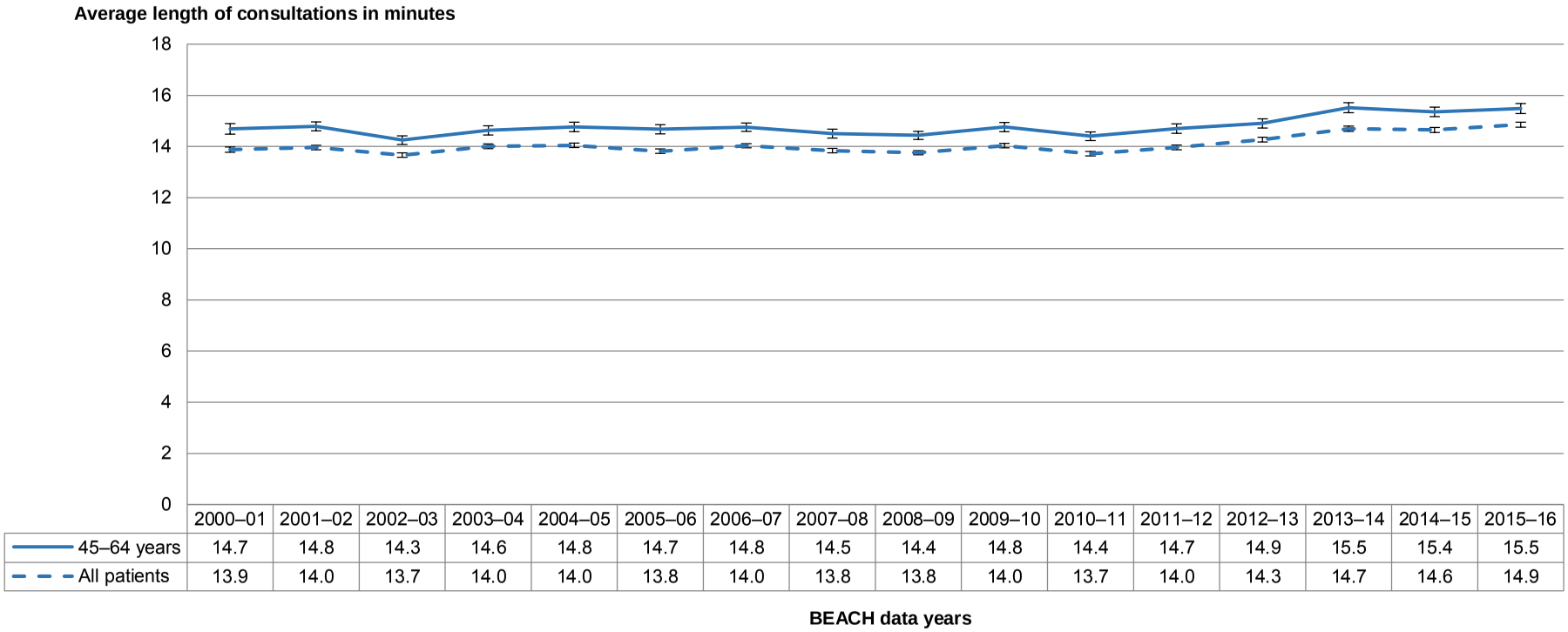
Notes: Medications include GP-prescribed, GP-supplied direct to the patient, and those advised for patient over-the-counter purchase. Tests include pathology, imaging, and other tests ordered or undertaken at the encounter. Referrals include all referrals made at the encounter (e.g. to medical specialists, allied health services, hospitals, clinics).

Figure 14.2: Rate of problems managed and clinical actions used in treatment per 100 encounters with 95% confidence intervals, patients aged 45–64 years (2000–01 to 2015–16)



	Problems managed	Medications	Tests	Referrals
Less than 45 years	132.9	85.6	51.7	14.8
45–64 years	162.5	107.3	69.5	17.5
65 years or more	176.6	120.4	58.4	16.7

Figure 14.3 Age-specific rate of problems managed, medications, tests and referrals per 100 encounters, 2015–16 (95% confidence intervals)



	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
45–64 years	14.7	14.8	14.3	14.6	14.8	14.7	14.8	14.5	14.4	14.8	14.4	14.7	14.9	15.5	15.4	15.5
All patients	13.9	14.0	13.7	14.0	14.0	13.8	14.0	13.8	13.8	14.0	13.7	14.0	14.3	14.7	14.6	14.9

Figure 14.4: Average length of GP consultations with patients aged 45–64 years compared with all patients (2000–01 to 2015–16)

Number of chronic conditions in people aged 45–64 years

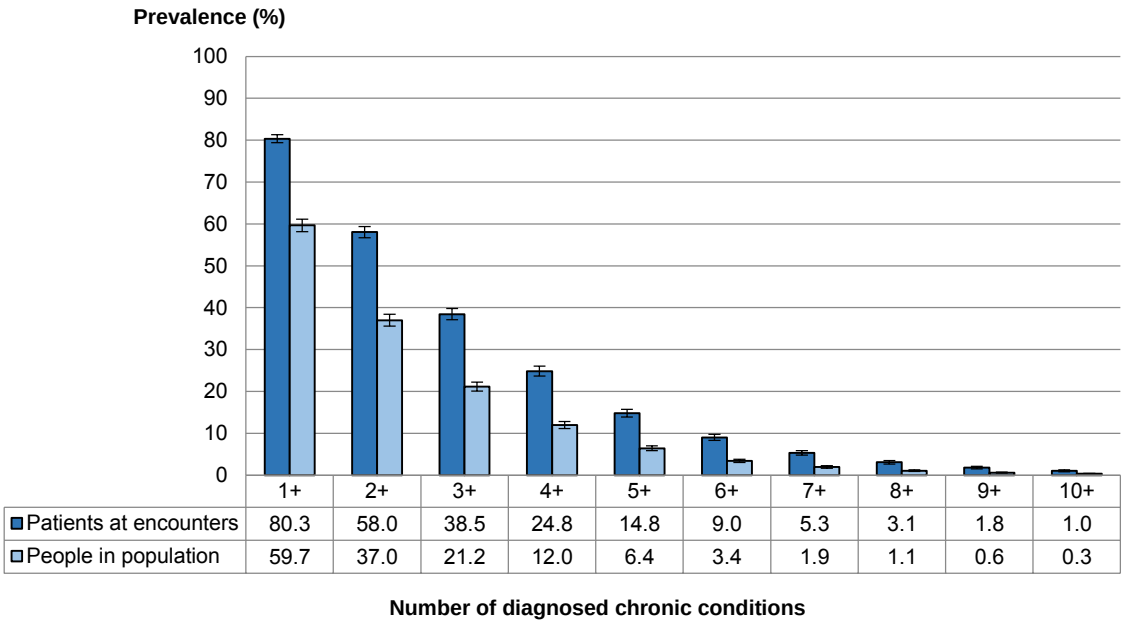
Between December 2012 and March 2016, we conducted a series of SAND substudies (see Section 2.6 for SAND methods) that examined the prevalence of diagnosed chronic conditions and multimorbidity among patients at general practice encounters. In total, information was collected from 43,531 patients, making it one of the largest nationally representative multimorbidity studies in the world. There were 11,747 patients in the sample aged 45–64 years. The study is described in more detail in SAND abstract 246 (Chapter 15).

Figure 14.5 shows that among those aged 45–64 years:

- the majority had one or more chronic conditions (80.3% of patients at GP encounters and 59.7% of people in the population). This means that only 19.7% of patients at encounters and 40.3% of people in the population aged 45–64 years had no diagnosed chronic conditions
- over one-third (38.5%) of patients at encounters and one in five (21.2%) people in the population had three or more diagnosed chronic conditions
- 9.0% of patients at encounters and 3.4% of people in the population had six or more diagnosed chronic conditions
- 1.0% of patients at encounters and 0.3% of people in the population had 10 or more diagnosed chronic conditions. Although this appears to be a very small proportion it does suggest about 19,000 middle-aged people have 10 or more diagnosed chronic conditions.

Extrapolating the proportion in the population with at least one diagnosed chronic condition (59.7%) to the number of people aged 45–64 in the population as of June 2015 (5,858,207) gives an estimated 3.5 million people aged 45–64 years with at least one chronic condition. Extrapolating last year's estimate of 89.7% of people aged 65+ having at least one diagnosed chronic condition to the number of people aged 65+ in the population in 2015 (3,569,020), gives an estimate of about 3.2 million people aged 65+ who have at least one diagnosed chronic condition. This is 300,000 less than the number of people aged 45–64 years with at least one diagnosed chronic condition.

Repeating the extrapolation for people with three or more diagnosed chronic conditions, we estimate there were about 1.2 million people aged 45–64 and 2.0 million people aged 65+ with three or more chronic conditions.



	1+	2+	3+	4+	5+	6+	7+	8+	9+	10+
Patients at encounters	80.3	58.0	38.5	24.8	14.8	9.0	5.3	3.1	1.8	1.0
People in population	59.7	37.0	21.2	12.0	6.4	3.4	1.9	1.1	0.6	0.3

Figure 14.5 Proportion of people aged 45–64 years with a minimum number of chronic conditions, 2012–16

Prevalence and management of chronic conditions

Table 14.1 shows the prevalence and management rates of common chronic conditions among patients aged 45–64 years. The pattern differs markedly for individual chronic conditions.

Example 1: diagnosed hypertension

- was present in 26.4% of patients aged 45–64 years at GP–patient encounters
- was managed at 9.7% of encounters with patients aged 45–64 years, and therefore was managed at 36.6% of encounters with patients with diagnosed hypertension.

Patients aged 45–64 years with diagnosed hypertension visited a GP an average 7.9 times a year. Therefore, we can conclude that among patients with diagnosed hypertension, this condition was managed at 2.9 of their 7.9 visits a year on average.

The prevalence of diagnosed hypertension among people aged 45–64 years in the population was 17.5%. Of those people with hypertension, 70.5% had two or more other chronic conditions (that is, they had three or more diagnosed chronic conditions in total).

Example 2: diagnosed type 2 diabetes

- was present in 10.6% of patients aged 45–64 years at encounters
- was managed at 5.1% of encounters with patients aged 45–64 years
- was managed at 48.0% of GP encounters with a patient with diagnosed type 2 diabetes.

Patients aged 45–64 years with diagnosed type 2 diabetes visited 8.6 times a year on average (a little more often than patients with hypertension). This means that for these patients, their type 2 diabetes was managed 4.1 times a year on average.

The prevalence of type 2 diabetes among people aged 45–64 years in the population was 6.0%, and 78.6% of these people had two or more other diagnosed chronic conditions.

Example 3: diagnosed congestive heart failure (CHF)

- was present in 0.9% of patients aged 45–64 years at encounters
- was managed at only 0.2% of encounters with patients aged 45–64 years
- was therefore managed at 21.8% of GP visits made by a patient with diagnosed CHF.

Patients aged 45–64 years with CHF visited 12.4 times a year on average (over 50% more often than patients with hypertension). We conclude that in these patients, CHF was managed 2.7 times a year on average.

The prevalence of CHF among people aged 45–64 years in the population was 0.4% and nearly all of these people (94.5%) had two or more other chronic conditions.

Patterns of multimorbidity

We examined specific patterns of multimorbidity, and found the most common ‘pair’ of chronic conditions diagnosed among patients aged 45–64 years was hypertension and hyperlipidaemia:

- 10.3% (95% CI: 9.6–11.0) of patients surveyed at GP encounters have both
- 6.4% (95% CI: 5.9–7.0) of people in the population have both.

Of patients with both these conditions who were surveyed at encounter, 51.6% (95% CI: 49.3–53.9) had three or more other chronic conditions (i.e. five or more in total).

Hypertension and osteoarthritis was the second most prevalent pair, and both conditions were diagnosed in:

- 8.2% (95% CI: 7.6–8.8) of patients surveyed at encounter
- 4.1% (95% CI: 3.6–4.5) of people in the population.

Hyperlipidaemia and osteoarthritis was the third most common pair:

- 6.1% (95% CI: 5.5–6.6) of patients at encounters have both
- 3.2% (95% CI: 2.8–3.6) of people in the population have both.

It is therefore not surprising, that the most prevalent ‘trio’ of diagnosed chronic conditions was hypertension, hyperlipidaemia and osteoarthritis; all three conditions were diagnosed in:

- 3.8% (95% CI: 3.4–4.3) of patients at encounters
- 1.8% (95% CI: 1.5–2.0) of people in the population in this age group.

Of those patients at encounters with these three conditions, 77.4% (95% CI: 74.9–79.9) had at least two or more other conditions (5 or more diagnosed chronic conditions in total).

Table 14.1: Prevalence and management of chronic conditions among people aged 45–64 years

Diagnosed condition	Prevalence at encounters (95% CI)	Proportion of encounters where this problem was managed (95% CI)	Management ratio	Number of GP visits in previous year (95% CI)	Number of times this problem managed in general practice per year	Estimated prevalence in the population (95% CI)	Proportion of those with this condition that had 2 or more other chronic conditions (95% CI)
Hypertension	26.4% (25.4–27.3)	9.7% (9.0–10.3)	36.6%	7.9 (7.7–8.1)	2.9	17.5% (16.6–18.4)	70.5% (69.0–72.1)
Depression	22.0% (21.1–22.9)	5.6% (5.2–6.0)	25.4%	7.9 (7.6–8.1)	2.0	12.2% (11.5–13.0)	60.1% (58.2–62.1)
Osteoarthritis	20.5% (19.5–21.5)	3.9% (3.6–4.2)	19.1%	8.7 (8.5–9.0)	1.7	12.1% (11.2–12.9)	75.7% (74.2–77.3)
Hyperlipidaemia	18.8% (17.8–19.8)	4.7% (4.2–5.1)	24.9%	7.6 (7.4–7.8)	1.9	13.4% (12.5–14.2)	75.1% (73.3–76.8)
Anxiety	14.3% (13.5–15.1)	2.3% (2.1–2.6)	16.3%	7.9 (7.6–8.2)	1.3	7.8% (7.2–8.4)	59.9% (57.4–62.3)
Chronic back pain	11.9% (11.2–12.7)	2.2% (1.9–2.4)	18.2%	9.1 (8.7–9.5)	1.6	6.4% (5.7–7.0)	70.2% (67.5–72.8)
Gastro-oesophageal reflux disease	11.6% (10.8–12.3)	3.1% (2.8–3.4)	26.8%	8.6 (8.3–8.9)	2.3	7.0% (6.4–7.6)	74.9% (72.6–77.2)
Type 2 diabetes	10.6% (10.0–11.3)	5.1% (4.7–5.5)	48.0%	8.6 (8.3–8.9)	4.1	6.0% (5.5–6.5)	78.6% (76.5–80.6)
Asthma	8.8% (8.2–9.3)	2.0% (1.8–2.3)	23.1%	6.4 (6.1–6.7)	1.5	5.7% (5.1–6.2)	42.6% (40.1–45.1)
Malignant neoplasm	5.4% (4.9–5.8)	2.3% (2.0–2.3)	42.5%	8.1 (7.8–8.4)	3.4	3.5% (3.1–3.9)	63.4% (60.4–66.3)
Hypothyroidism	5.4% (4.9–5.8)	1.5% (1.3–1.7)	28.3%	7.3 (6.9–7.6)	2.1	3.6% (3.2–3.9)	60.6% (57.1–64.1)
Ischaemic heart disease	4.9% (4.4–5.3)	0.9% (0.7–1.0)	17.7%	9.9 (9.6–10.3)	1.8	2.6% (2.3–2.9)	88.3% (86.3–90.2)
Insomnia	4.4% (3.9–4.9)	1.3% (1.1–1.5)	30.2%	9.5 (8.8–10.1)	2.9	2.3% (1.9–2.7)	83.1% (79.5–86.8)

(continued)

Table 14.1 (continued): Prevalence and management of chronic conditions among people aged 45–64 years

Diagnosed condition	Prevalence at encounters (95% CI)	Proportion of encounters where this problem was managed (95% CI)	Management ratio	Number of GP visits in previous year (95% CI)	Number of times this problem managed in general practice per year	Estimated prevalence in the population (95% CI)	Proportion of those with this condition that had 2 or more other chronic conditions (95% CI)
Chronic obstructive pulmonary disease	3.7% (3.4–4.1)	0.8% (0.7–0.9)	20.9%	10.3 (9.8–10.8)	2.1	1.8% (1.5–2.0)	84.7% (82.2–87.2)
Sleep apnoea	3.1% (2.8–3.5)	0.6% (0.5–0.7)	19.1%	8.8 (8.2–9.4)	1.7	1.7% (1.5–2.0)	80.3% (75.6–85.1)
Other arthritis	2.9% (2.6–3.3)	0.2% (0.1–0.3)	6.7%	7.6 (7.0–8.2)	0.5	1.8% (1.5–2.2)	67.6% (62.4–72.7)
Osteoporosis	2.7% (2.4–3.0)	0.6% (0.5–0.8)	23.2%	9.7 (9.3–10.1)	2.3	1.6% (1.3–1.8)	81.4% (78.7–84.1)
Rheumatoid arthritis	1.7% (1.4–1.9)	0.7% (0.5–0.8)	39.2%	8.9 (8.0–9.8)	3.5	0.9% (0.7–1.1)	60.7% (54.7–66.6)
Atrial fibrillation	1.6% (1.4–1.9)	0.7% (0.5–0.8)	42.8%	11.3 (10.6–11.9)	4.8	0.9% (0.7–1.0)	86.0% (83.3–88.8)
Stroke/cerebrovascular accident	1.5% (1.2–1.7)	0.3% (0.2–0.4)	19.8%	10.1 (9.5–10.7)	2.0	0.7% (0.6–0.9)	89.0% (86.0–91.9)
Chronic renal failure	1.4% (1.1–1.6)	0.3% (0.2–0.4)	23.6%	11.3 (10.5–12.0)	2.7	0.7% (0.5–0.9)	87.6% (83.2–92.0)
Type 1 diabetes	1.0% (0.9–1.2)	0.3% (0.2–0.3)	24.3%	7.2 (6.4–7.9)	1.7	0.6% (0.5–0.8)	55.3% (47.6–63.0)
Congestive heart failure	0.9% (0.7–1.1)	0.2% (0.1–0.3)	21.8%	12.4 (11.7–13.2)	2.7	0.4% (0.3–0.5)	94.5% (92.6–96.4)
Peripheral vascular disease	0.9% (0.7–1.1)	0.1% (0.1–0.2)	16.1%	12.0 (11.3–12.7)	1.9	0.4% (0.3–0.5)	91.0% (87.8–94.2)
Hyperthyroidism	0.7% (0.6–0.9)	0.2% (0.2–0.3)	33.0%	7.0 (6.0–7.9)	2.3	0.6% (0.4–0.8)	59.9% (50.9–68.9)
Glaucoma	0.5% (0.4–0.6)	0.1% (0.1–0.1)	18.5%	8.8 (8.1–9.5)	1.6	0.4% (0.2–0.5)	77.6% (72.0–83.3)
Dementia (including Alzheimer's disease)	0.3 (0.2–0.5)	0.1 (0.1–0.2)	31.1%	10.5 (9.6–11.5)	3.3	0.1 (0.1–0.2)	82.2 (78.0–86.5)

Notes: CI: confidence intervals. Sources and calculation methods for results presented in Table 14.1 are provided in Appendix 5.

Lifestyle risk factors in patients aged 45–64 years

While age is an important contributing factor for many chronic conditions, lifestyle risk factors are also contributors. Patient weight, smoking status and level of alcohol consumption were all studied in SAND subsamples in each BEACH year. The SAND methods are described in Section 2.6, and Chapter 13 examines the prevalence of risk factors among all adult patients at GP encounters.

Body Mass Index

For samples from each year 2000–01 to 2015–16, the number of patients aged 45–64 years for whom BMI could be calculated ranged from 9,858 to 10,995.

Using the WHO definitions of BMI[79], Figure 14.6 shows that between 2000–01 and 2015–16, the proportion of sampled patients aged 45–64 years who were:

- underweight stayed relatively constant at around 1.4%
- classed as 'normal' weight decreased from 33.1% to 27.4%
- considered 'overweight' decreased from 39.3% to 35.4%
- classed as 'obese' increased by 37% from 26.1% to 35.8%
  - classed as 'Class III obesity' or 'morbidly obese' more than doubled from 2.7% to 5.7%.

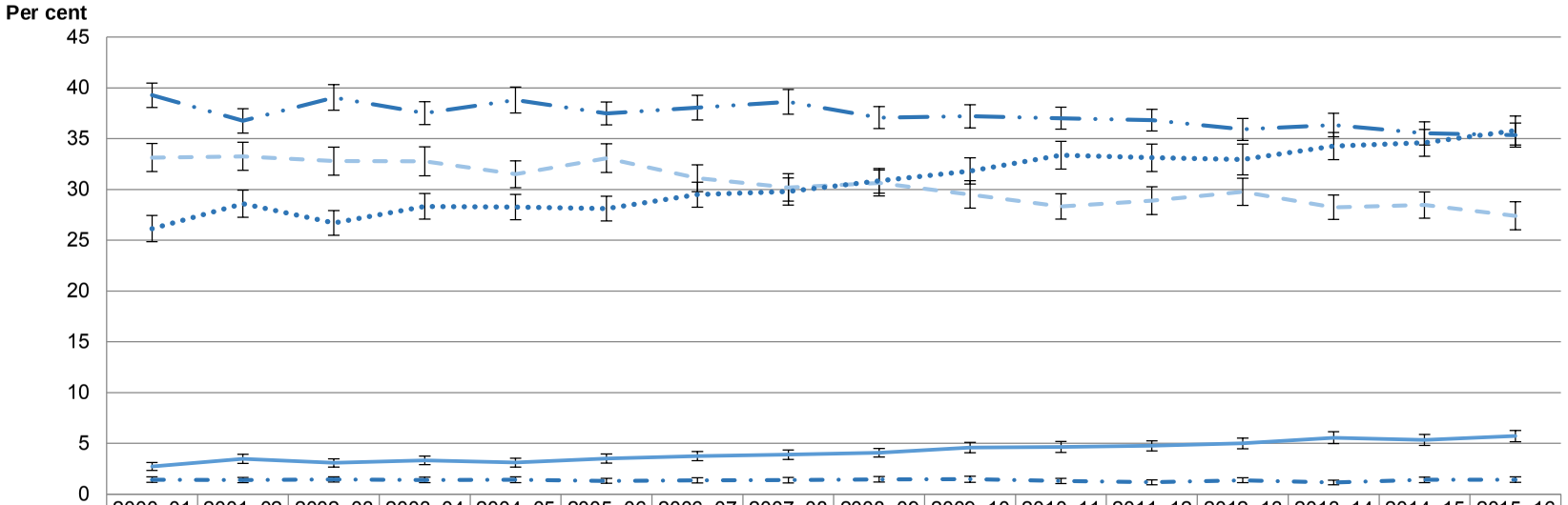
This increase in the proportion of patients considered to be obese is a concern as it is expected to increase the prevalence of related health problems (such as diabetes and cardiovascular disease) and escalate health care costs in future.[97]

Smoking status & alcohol consumption

As discussed in Chapter 13, tobacco smoking is the leading cause of ill health, drug-related death and hospital separations in Australia.[98]

Figure 14.7 shows that between 2000–01 and 2015–16, there was no significant change in the proportion of patients aged 45–64 years who were daily smokers, staying steady at around 18% of patients.

Figure 14.7 also shows there was no significant change in the proportion of patients aged 45–64 years at GP encounters who were 'hazardous drinkers' of alcohol (defined as 'at risk' drinkers in Chapter 13), around one-quarter of 45–64 year olds.

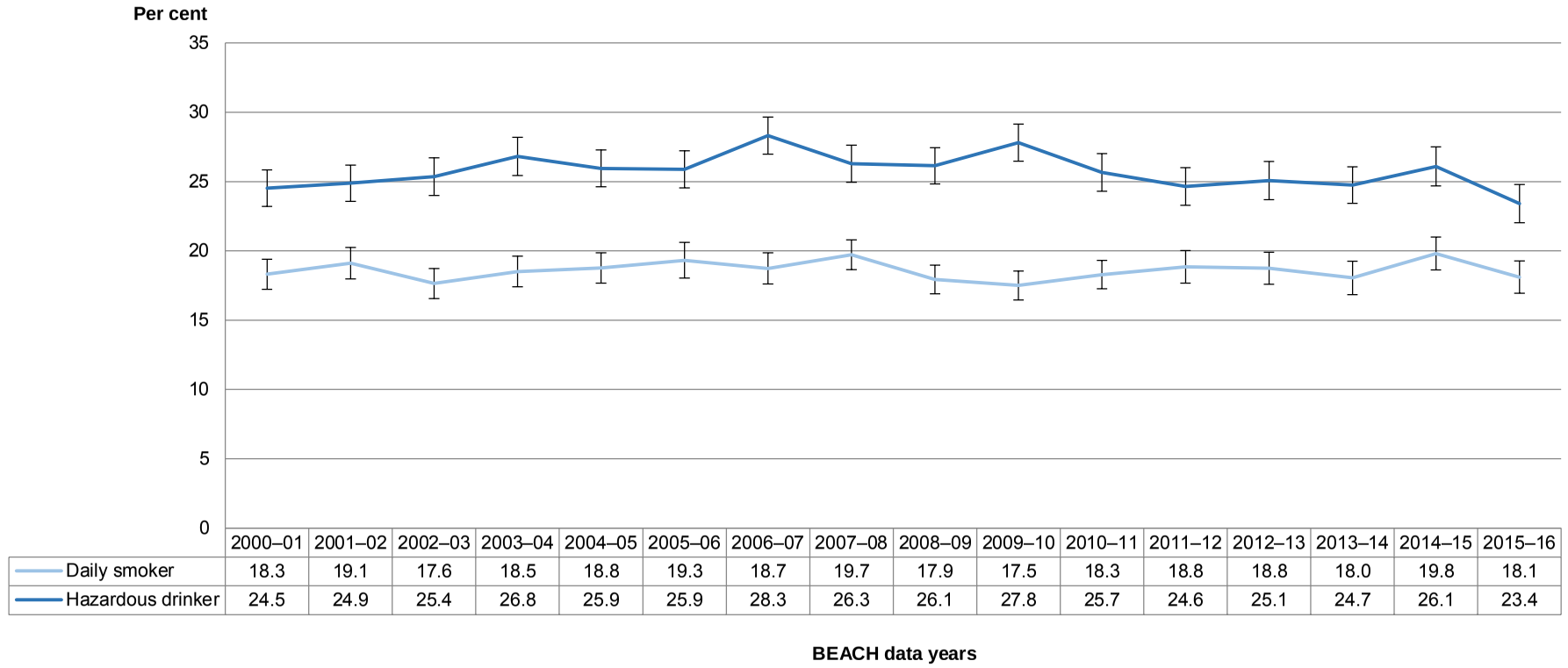


	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Underweight	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.4	1.5	1.5	1.3	1.2	1.4	1.1	1.4	1.4
Normal	33.1	33.3	32.8	32.8	31.5	33.1	31.1	30.2	30.6	29.5	28.3	28.9	29.8	28.2	28.5	27.4
Overweight	39.3	36.8	39.1	37.5	38.8	37.5	38.1	38.6	37.1	37.2	37.0	36.8	35.9	36.3	35.5	35.4
Obese	26.1	28.6	26.7	28.3	28.3	28.1	29.5	29.8	30.8	31.8	33.4	33.1	32.9	34.3	34.6	35.8
Morbidly Obese	2.7	3.5	3.1	3.3	3.1	3.5	3.7	3.9	4.1	4.6	4.6	4.7	5.0	5.6	5.3	5.7

BEACH data years

Note: BMI – body mass index. Underweight – BMI <18.5, normal – BMI 18.5–24.99, overweight – BMI 25.0–29.99, obese – BMI 30, morbidly obese – BMI 40+.
Columns will not total to 100% as the obesity category includes morbid obesity.

Figure 14.6: Proportion of patients at encounters aged 45–64 years in each body mass index group with 95% confidence intervals (2000–01 to 2015–16)



	2000–01	2001–02	2002–03	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Daily smoker	18.3	19.1	17.6	18.5	18.8	19.3	18.7	19.7	17.9	17.5	18.3	18.8	18.8	18.0	19.8	18.1
Hazardous drinker	24.5	24.9	25.4	26.8	25.9	25.9	28.3	26.3	26.1	27.8	25.7	24.6	25.1	24.7	26.1	23.4

Note: Hazardous drinker is defined in Chapter 13

Figure 14.7: Proportion of patients at encounters aged 45–64 years who were daily smokers and hazardous drinkers with 95% confidence intervals (2000–01 to 2015–16)

14.3 Discussion

This study has highlighted areas in which the health of people aged 45–64 years differs significantly from that of people in other age groups. However, like their older counterparts(those aged 65+), middle-aged patients use more health resources than average, have high rates of morbidity and have shown no improvement in their lifestyle risk factor profile over the 16 years of this study.

Patients aged 45–64 years, account for a significant proportion of GP resources. In 2000–01, they accounted for more GP encounters, GP clinical time, problems managed and referrals than older patients aged 65+. However, by 2014–15, patients aged 65+ accounted for more of all these services than those aged 45–64 years. Our results suggest that this change in proportional GP resource use by 45–64 year olds reflected their changed proportion of the population. This trend is likely to continue as more baby boomers progress into the 65+ cohort.

In November 2006, a new item number (item 717) was added to the MBS for a 'well person's health check' (one check per person) for people aged 45–49 years attending general practice[99] who have one or more identifiable risk factors for chronic disease. In theory, the health assessment at this age could help patients make lifestyle changes to prevent or delay the onset of chronic disease. Risk factors for consideration included lifestyle factors (smoking, physical activity, poor nutrition and alcohol consumption), biomedical factors (high cholesterol, high blood pressure, impaired glucose metabolism or excess weight), and family history of chronic disease.[99] In 2008 an additional item number was added to the MBS, covering a check once every 3 years for patients aged 40–49 years, with diabetes health risk factors.[100]

The rate of test ordering at encounters with 45–64 year olds was higher than average among all patients, and higher than that for those 65+, but was relatively consistent over the study period. Some of this may be due to screening of 'well persons' but considering the age of these patients and the number of already diagnosed chronic conditions, much of this testing may well be associated with monitoring, with the aim of secondary prevention. In fact, the growth in test ordering for the 45–64 year olds was less (46%) than it was for patients at all encounters (57%). Further, compared with the 8% growth of the population aged 45–64 years, the proportion of tests they accounted for actually decreased by 4%.

Earlier diagnosis of chronic conditions and their subsequent ongoing management is likely to mean more encounters in general practice, because chronic conditions usually require lifelong management. However, the extra associated costs should improve patients' overall health and potentially reduce the number of avoidable hospitalisations which generally incur far greater costs than the extra care provided in general practice.

Almost 60% of the population in this age group have one or more diagnosed chronic problems. Given the focus of the 45–49 health check was to prevent or delay the onset of chronic disease, and the focus of the diabetes check was prevention and/or early diagnosis, it is highly possible that some of these chronic conditions were diagnosed as a result of these checks.

Our results suggest there are about 300,000 more people aged 45–64 years (3.5 million) than aged 65+ years (3.2 million) with at least one diagnosed chronic condition. While people aged 65+ are far more likely than middle-aged patients to have multiple diagnosed chronic conditions, we estimate that about 1.2 million 45–64 year olds have three or more. Counting those in each age group with three or more chronic conditions results in 4.2 million Australians aged 45 years or older with at least three diagnosed chronic health problems. Since these conditions will generally continue to be treated over the patient's lifetime, and people with multiple diagnosed chronic conditions visit the GP more often than average, this has implications for future visit rates in general practice, and for the costs associated with the care of these patients as they age.

One in five 45–64 year olds, already had three or more diagnosed chronic conditions, the most common combination being hypertension + hyperlipidaemia + osteoarthritis. The most common 'pair'

of diagnosed chronic conditions in this age group was hypertension + hyperlipidaemia: 1 in 10 surveyed patients and 1 in 15 of the population have both.

By 2015–16, over 70% of surveyed 45–64 year old patients were either overweight or obese, with the proportion who were morbidly obese more than doubling over the study period. Our results indicate that over the 16 year study period, there was a steady pattern of people moving 'up the obesity scale'. This does not augur well for their future health as they move into the 65+ cohort. Further, if the sharp decrease observed in the proportion of normal weight patients since 2000–01 continues, in another 16 years we will have very few normal weight 45–64 year old patients at general practice encounters in Australia. Obesity is a problem being faced by most OECD countries and, as yet, none have found a solution to this ever-growing 'epidemic'.[97]

While the proportions of patients who were daily smokers and hazardous drinkers decreased significantly among all adult patients at encounters (Chapter 13), there was no change in these risk behaviours for patients in the 45–64 year age group. Around 1 in 5 were daily smokers and 1 in 4 drank alcohol at hazardous levels. Despite interventions to address lifestyle risk factors, this age group is increasingly more likely to be overweight or obese, and there has been no measurable change in smoking and hazardous alcohol consumption for patients at GP encounters.

The Federal Government's 'Health Care Homes' initiative currently proposes to target people with multiple chronic conditions,[101] to improve the coordination of care of these people. However, our study suggests there will be middle-aged patients who do not have multiple chronic conditions, but who do have potentially modifiable lifestyle risk factors who would benefit from a 'Health Care Home' environment that enables greater access to allied health professionals.

We have reported on the 45–64 age group of patients because this is the group where early diagnosis of chronic conditions and the institution of secondary prevention measures could have a large long-term impact on both longevity and the number of quality-adjusted life years that will be enjoyed by future elder Australians. These early primary care interventions could significantly reduce the need for secondary and tertiary services (and associated costs) as the population continues to age. The study demonstrates that GPs are rising to the challenge of early diagnosis and management in middle-aged people.

This chapter contains unpublished methods that form part of Christopher Harrison's thesis for his candidature for Doctor of Philosophy in Medicine.

15 SAND abstracts and research tools

Since BEACH began in April 1998, a section on the bottom of each encounter form has been used to investigate aspects of patient health or healthcare delivery not covered by general practice consultation-based information. These additional substudies are referred to as SAND (Supplementary Analysis of Nominated Data). The SAND methods are described in Section 2.6. All substudies were approved by the Human Ethics Committee of the University of Sydney.

The Family Medicine Research Centre (FMRC) and most of the organisations supporting the BEACH program select topics for investigation in the SAND studies. In each BEACH year, up to 20 substudies can be conducted in addition to the study of patient risk behaviours (see Chapter 13). Topics can be repeated to increase the sample size and its statistical power.

This chapter includes the abstracts and research tools for SAND substudies, most of which were conducted from April 2015 to March 2016. The subjects covered in the abstracts in this chapter are listed in Table 15.1, with the sample size for each topic.

Table 15.1: SAND abstracts for 2015–16 and sample size for each

Abstract number	Subject	Number of respondents	Number of GPs
236	Prevalence, severity and management of heart failure	2,922	99
237	Influenza risk factors and vaccination in general practice patients	2,885	99
238	Diabetes prevalence and management (including insulin use) in general practice patients	2,403	81
239	Continuity of care and health service utilisation in general practice	4,927	168
240	Management of asthma and COPD in general practice patients – 2015	2,547	86
241	Proton pump inhibitor use among general practice patients	2,642	89
242	Cardiovascular disease risk and use of lipid-lowering medication[(a)]	3,182	184
243	Rhinitis management among Australian general practice patients	2,723	93
244	Continual medication and adverse drug events in general practice patients	10,667	363
245	Health care utilisation by general practice patients	2,688	91
246	Prevalence of chronic conditions and multimorbidity	43,531	1,450
247	COPD prevalence, severity and management in general practice patients – 2016	2,437	87
248	Influenza risk factors and vaccination in general practice patients – 2016	2,826	95

(a) Substudy limited to patients aged 45 years and over.

SAND abstract number 236: Prevalence, severity and management of heart failure

Organisation collaborating for this study: Novartis Pharmaceuticals Australia Pty Ltd.

Issues: Prevalence of heart failure (HF) in general practice. For those with HF: stage of HF; condition testing; current medication use, initiator of medication; complementary medications taken; hospitalisation for acute HF episode; discharge to community-based management program.

Sample: 2,922 patients from 99 GPs; data collection period: 31/03/2015 – 04/05/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Methods for this substudy: The stages of HF were based on the New York Heart Association's (NYHA) functional classification system of symptoms, see <https://heartfoundation.org.au/images/uploads/publications/Chronic_Heart_Failure_Guidelines_2011.pdf>.

Summary of results

The sex distribution of the 2,922 respondents did not differ from patients at all 2014–15 BEACH encounters.

Of 2,922 respondents, 103 (3.5%, 95% CI: 2.6–4.5) reported they had diagnosed HF; prevalence did not differ among males (3.4%) and females (3.6%). Prevalence was higher in the 75+ age group (13.8%, 95% CI: 10.3–7.3) than in the 65–74 age group (3.8%) and the 45–64 age group (1.6%). The prevalence of HF among patients who attended general practice at least once in the year was estimated to be 1.8% (95% CI: 1.3–2.3), and among the Australian population 1.5% (95% CI: 1.1–2.0).

Of the 95 patients for whom stage of HF was recorded, 20 (21.1%) were asymptomatic, 36 (37.9%) had mild HF, and 12 (12.6%) had severe HF. Of the 96 respondents to the question on brain natriuretic peptide testing, 16 had been tested (5.2% at diagnosis and 11.5% since diagnosis), half (51%) had not been tested and 32.3% did not know.

At least one medication for HF was being taken by the majority (98.0%) of 99 respondents: 69.7% were taking 1+ diuretic(s), 49.5% 1+ beta blocker(s), 24.2% 1+ angiotensin-converting enzyme (ACE) inhibitor(s), 20.2% 1+ angina medication(s) and 19.2% 1+ angiotensin II receptor antagonist(s) (ATRA). Two patients (2.0%) were not taking any medication for HF. Among the 99 respondents 222 medications were recorded. Of these medications, 27.9% were high ceiling diuretics and 22.1% were beta blockers. Overwhelmingly, the most common individual medication used was diuretic furosemide (27.9%), followed by the potassium-sparing agent spironolactone (5.9%).

Of the 222 medications recorded, 72.6% were initiated by specialists and 27.4% by GPs. However, ATRA + diuretic had been initiated by GPs for 3 of the 4 patients on this medication.

Of 92 respondents, 25 (27.2%) were taking at least one complementary product; vitamin D was the most common (19.0%) of the 42 products recorded.

Of 94 respondents, 24 (25.5%) had been hospitalised for an acute HF episode in the previous 12 months. Only 1 in 5 HF patients had been discharged under a community-based management program.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **HEART FAILURE (HF).**

You may tear out this page as a guide to completing the following set of forms.

INSTRUCTIONS

The following 30 forms relate to the **next 30 PATIENTS in the order in which the patients are seen.**

Please **DO NOT select patients** to suit the topic being investigated.

Heart failure (HF)

Please use the tick boxes to indicate whether the patient has been **diagnosed with heart failure (HF)**.

If the patient **does not** have HF please tick the box labelled '**no**' and **END the questions** here for this patient.

BNP testing

Please advise whether the patient has been **tested for:**

- **BNP** (brain natriuretic peptide) or
- **NT-proBNP** (N-terminal pro b-type natriuretic peptide)

as part of the diagnosis of HF.

Complementary medications

Please record all **complementary medications regularly taken** by the patient, irrespective of the condition/s for which they are taken.

Complementary medications **include herbal products, homeopathic remedies, traditional medicines, vitamins, and minerals**. They can be purchased at a chemist, health food or grocery store **without a prescription**.

Community-based management program

Please advise whether the patient was **discharged** under a **community-based heart failure management program**.

If neither you, nor the patient, know this information, please tick the box labelled '**Don't know**'.

Stage of HF

Referring to the **New York Heart Association functional classification system** (**see definition on card**) please indicate the patient's **stage of HF**.

Medications for HF

Please write the **name and regimen** of any **medications** currently used by the patient for **HF management**.

For each medication please **circle an option** to indicate whether the medication was **initiated** by a **GP** or a **specialist.**

Hospitalisation for HF

Please advise whether the patient has **been hospitalised** for **treatment of HF in the past 12 months**.

Does this patient have heart failure (HF)?	**Stage of HF is:** *(See definition on card)*	**Has the patient been tested for BNP or NT-proBNP?**	**Current medication/s for HF are:** Name & Form / Strength / Dose / Freq	**Initiated by** *(please circle)*	**What complementary medications are regularly taken by this patient?** *(e.g. herbal, natural therapies, vitamins and/ or minerals)*	**In the past 12 months, has the patient been hospitalised for treatment of HF?**	**If 'yes', was the patient discharged under a community-based heart failure management program?**
☐ Yes ☐ No → **End questions**	☐ Class I (asymptomatic) ☐ Class II (mild) ☐ Class III (moderate) ☐ Class IV (severe) ☐ Don't know	☐ Yes - at diagnosis ☐ Yes - since diagnosis ☐ No ☐ Don't know	_____ _____ _____ _____ ☐ **No** HF medication	GP / Spec GP / Spec GP / Spec GP / Spec	_____ _____ _____ ☐ **None**	☐ Yes ☐ No	☐ Yes ☐ No ☐ Don't know

BL171C

SAND abstract number 237: Influenza risk factors and vaccination in general practice patients

Organisation collaborating for this study: Seqirus (Australia) Pty Ltd.

Issues: Proportion of general practice patients with influenza (flu) infection risk factors. For those at risk: types of risk factors, awareness of eligibility for free flu vaccination. For all respondents: vaccination status for 2015 and for 2014; reasons for not vaccinating. Proportion diagnosed with influenza in prior 12 months.

Sample: 2,885 patients from 99 GPs; data collection period: 31/03/2015 – 04/05/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

The age and sex distributions of patients did not differ from that of all BEACH encounters in 2014–15. Of the 2,885 respondents, 51.9% (95% CI: 47.6–56.3) (*n* = 1,498) had at least one risk factor for influenza (35.7% had one, 11.8% two, and 3.5% three risk factors). There was no significant difference between risk factor status of males (53.5%) and females (50.9%).

The most common risk factors were older age (34.4% were aged 65+ years), chronic respiratory condition (10.4%), diabetes (7.9%), chronic heart disease (7.7%), chronic neurological condition (3.2%) and Indigenous patients aged 15 years or more (1.4%). For patients aged 15–64 years (*n* = 1,610), 29.9% (95% CI: 25.8–34.1) had at least one risk factor, and for patients aged 65+ years (*n* = 992), 42.1% had at least one risk factor in addition to their age. Risk factor status increased significantly with patient age, risk(s) being present in 6.7% of patients aged 0–14 years, increasing to 100.0% of patients aged 65+.

Of 1,453 respondents with one or more risk factor(s), 91.2% were aware of the availability of free flu vaccinations through the National Immunisation Program. Awareness was significantly higher in older patients (97.5% of patients aged 65+ were aware) than among others (79.2% of patients aged <65).

Of 2,712 respondents for whom vaccination status was recorded, 60.9% were either already vaccinated, or planned to be vaccinated, for the 2015 flu season. Of 2,706 respondents, 51.2% had been vaccinated for the 2014 flu season. Reported vaccination/ intention to vaccinate in 2015 is reported as a percentage of each risk subgroup, with the percentage reported vaccinated in 2014 in parentheses: 84.9% (74.9%) of those with at least one risk factor; 87.6% (84.0%) of those aged 65+ years; 76.0% (76.0%) of those who were pregnant; 90.0% (78.0%) of Indigenous patients aged 15+; 90.9% (87.3%) of those with chronic heart disease; 89.8% (78.0%) of those with diabetes; 76.9% (68.8%) of those with a chronic metabolic disorder; 85.0% (73.7%) of patients with a chronic respiratory condition; 85.5% (83.9%) of patients with chronic renal failure; 69.1% (60.0%) of patients with impaired immunity; 81.7% (76.1%) of those with a chronic neurological condition; and 84.6% (70.8%) of those with a haematological disorder.

Of the 1,162 patients who were not vaccinated for the 2014 flu season, 1,102 gave a total of 1,126 reasons for non-vaccination. Of these, 57.4% reported they considered themselves at low risk and 14.4% reported patient objections. For 9.5%, the GP did not consider the patient to be at risk.

Of 2,709 respondents, 83 (3.1%, 95% CI: 1.9–4.3) had been diagnosed with influenza in the prior 12 months. Flu vaccination status in 2014 was known for 2,529 of these respondents; 54.4% were vaccinated. Of those vaccinated, 36 (2.6%) had been diagnosed with influenza in the prior 12 months, and this did not significantly differ from the 47 (4.1%) of those not vaccinated.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about the **INFLUENZA RISK FACTORS AND VACCINATION.**
Please complete these questions in addition to information about the encounter. *You may tear out this page as a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer these questions for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.**
Please **DO NOT select patients** to suit the topic being investigated.
Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Risk factors for influenza infection

Please use the tick boxes to indicate whether the patient has any of the listed **risk factors** or **indications** for **influenza** vaccination.

Please tick as many as apply.

Indications for vaccination include medical conditons that can lead to severe influenza. Examples of conditions included in each of the following categories are drawn from the Immunise Australia Program.

- **Chronic heart disease** includes: congestive heart failure, coronary artery disease, cyanotic congenital heart disease.
- **Chronic respiratory conditions** include: severe asthma (for which frequent hospitalisation is required); cystic fibrosis; bronchiectasis; suppurative lung disease; chronic obstructive pulmonary disease (COPD).
- **Impaired immunity** includes immunocompromising conditions (such as asplenia or splenic dysfunction, HIV infection) and immunosuppressive therapy.
- **Chronic neurological conditions** include: hereditary and degenerative CNS diseases (including multiple sclerosis); seizure disorders; spinal cord injuries; neuromuscular disorders.

If the patient **does not** have any of the listed risk factors/indications please tick the box labelled '**none of the above**'.

Immunise Australia Program

For patients who have **at least one of the listed risk factors** please ask whether (prior to today's visit) they were aware that **free influenza vaccine** is available through the **Immunise Australia Program**.

Influenza vaccination status

For the **2015 flu season**, please indicate whether the patient **has been** or **intends to be vaccinated**.

Please use the tick boxes to indicate whether this patient **received the influenza vaccine** for (or during) the **2014** flu season.

Patients who were NOT vaccinated

For patients who **did not** receive the **influenza vaccination** for the **2014 season,** please indicate the **reasons that the vaccine was not given**.

Influenza diagnosis

Please indicate whether the patient was **diagnosed** (either laboratory confirmed or clinical diagnosis) **with influenza** in the **past 12 months**.

Does the patient have any influenza infection risk factor(s)? *(Tick all that apply)*	**If 'yes', was the patient aware (prior to today's visit) that influenza vaccination is freely available through the Immunise Australia Program?**	**For the 2015 season is the patient vaccinated or intending to do so?**	**Did the patient receive influenza vaccination for / during the 2014 flu season?**	**If not vaccinated in 2014, the reason(s) was:**	**Was the patient diagnosed* with influenza in the past 12 months?** *(*either laboratory confirmed or clinical diagnosis)*
☐ Aged ≥65 years ☐ Pregnant ☐ Indigenous aged ≥15 years ☐ Chronic heart disease ☐ Diabetes ☐ Chronic metabolic disorders ☐ Chronic respiratory conditions ☐ Chronic renal failure ☐ Impaired immunity (e.g. HIV) ☐ Chronic neurological conditions ☐ Haematological disorders ☐ **None of the above** BL171B	☐ Yes ☐ No	☐ Yes ☐ No ☐ Don't know	☐ Yes ☐ No ☐ Don't know	☐ GP assessed patient not at risk ☐ Cost to patient ☐ Patient objection ☐ Patient considers themselves low risk ☐ Other: _____ *(please specify)*	☐ Yes ☐ No ☐ Don't know

SAND abstract number 238: Diabetes prevalence and management (including insulin use) in general practice patients

Organisation collaborating for this study: AstraZeneca Pty Ltd (Australia).

Issues: Prevalence of Type 1 and Type 2 diabetes in general practice patients. For all those with diabetes: HBA1c and estimated glomerular filtration rate (eGFR) levels; BMI; current medication use; initiator of mediation; patient home glucose monitoring; current insulin management.

Sample: 2,403 patients from 81 GPs; data collection period: 05/05/2015 – 08/06/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

The age and sex distributions of the 2,403 respondents were similar to those of all patients at 2015–16 BEACH encounters. Of 2,403 respondents, 9.1% (95% CI: 7.5–10.7) had diagnosed diabetes: 0.7% had Type 1 and 8.4% had Type 2. Prevalence was estimated among the Australian population to be 6.0% (95% CI: 4.8–7.2): 0.6% Type 1 and 5.4% Type 2. Prevalence of Type 2 diabetes increased with age: 1.7% in the 25–44 age group, 10.5% in the 45–64 age group, 20.7% in the 65–74 age group and 16.7% in the 75+ age group. Type 1 diabetes was most prevalent in the 75+ age group (1.4%).

Of 197 patients with HbA1c level reported, 30.5% had a high HbA1c when using a > 58 mmol/mol cut-off and 41.1% had high levels when using a > 53 mmol/mol cut-off. Of 200 patients with eGFR level reported, 74.5% had abnormal eGFR with cut-off of < 90 mL/min/1.73^2 and 27.0% abnormal with cut-off of < 60 mL/min/1.73^2. Body mass index (BMI) was calculated for 196 diabetic adult patients. Half were obese (51.0%), 33.7% overweight and 15.3% normal weight.

Of 211 respondents, 84.8% were currently taking medication for diabetes. Metformin was most common (59.2%), followed by gliclazide (25.6%). At group level the most common medications used were metformin (59.2%), sulphonamides (27.0%) and basal insulin (13.3%). The number of therapy groups used showed 9.5% (*n* = 211) were taking triple therapy, 37.9% dual, 37.4% mono, and 15.2% no therapy.

For more than two-thirds of patients with diabetes (70.1%) (*n* = 184), the GP alone made decisions about hypoglycaemic initiation/titration, for 23.4% the GP was in consultation with a specialist and for 6.5% the specialist alone made the decisions. For diabetic patients taking insulin (*n* = 50), GP + specialist was more common (48.0%, 95% CI: 31.6–64.4) than for all patients with diabetes. Of the 206 respondents to home glucose monitoring frequency, 38.3% monitored daily (median 2.5 tests/day), 38.8% less than daily (median 2.5 tests/week) and 22.8% did not home monitor.

For the 50 patients taking insulin, the GP regarded postprandial glucose levels as important for 94.0%. Of the 50 patients, 56.0% were taking basal, 42.0% rapid acting insulin, 34.0% premix insulin, 30.0% basal and rapid acting insulin, 30.0% premix insulin and 24% basal insulin alone. The mean duration of insulin use was 6.0 years and median 5.0 years.

For 60 insulin medications with a recorded dosage, the mean daily dose for insulin aspart (*n* = 25) was 48.2 mg, and for insulin glargine (*n* = 25) 49.6 mg. For 46 patients on insulin whose HBA1c level was recorded, the mean level was 62.5 mmol/mol. eGFR was known for 46: 73.9% had abnormal eGFR with cut-off of < 90 mL/min/1.73^2 and 39.1% abnormal for cut-off of < 60 mL/min/1.73^2. For the 47 patients on insulin with a recorded BMI, 57.4% were obese, 25.5% were overweight and 17.0% were of normal weight.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **DIABETES MANAGEMENT.**

You may tear out this page as a guide to completing the following set of forms.

INSTRUCTIONS

The following 30 forms relate to the **next 30 PATIENTS in the order in which the patients are seen.**

Please **DO NOT select patients** to suit the topic being investigated.

Diabetes

Please use the tick boxes to advise whether this patient has been diagnosed with **Type 1 or Type 2 diabetes mellitus**.

If the patient **does not have** diabetes please **end the questions here for this patient**.

Medications for diabetes

Please write the **name and regimen** of any **medications** currently used by the patient for **diabetes management**.

If the patient is not taking any medications for the management of diabetes please tick the box labelled 'No medication'.

Home glucose monitoring

Please indicate **how often** the patient currently **tests** their **glucose levels at home.**

If the patient measures their glucose levels:

- **daily** please s**pecify the average number of times glucose is tested per day** (i.e. the number of strips used per day)
- **less often than daily** (e.g. once a week) please s**pecify the average number of times glucose is tested per week** (i.e. the number of strips used per week).

If the patient does not measure their glucose levels tick the box labelled '**never**'.

HbA1c level, estimated glomerular filtration rate (eGFR), patient height and weight

Please advise, at the **most recent testing,** the patient's:

- **HbA1c level**.
- **estimated glomerular filtration rate (eGFR)**

Ask the patient: What is their **height** (without shoes)* and their **weight** (unclothed)?* Conversion tables from stone/pounds to kilograms and feet/inches to centimetres are provided.

** You are NOT REQUIRED to weigh or measure the patient, but if the patient is unsure, you may either do so or take information from the medical records.*

Medication management

Please indicate which type of health professional currently makes decisions about **initiation and/or titration of hypoglycaemic medication(s)** for this patient.

For patients currently taking insulin

Initiation of insulin therapy

Please advise how many years and/or months this patient has been using insulin.

Control of post-prandial glucose

Please advise whether, in your clinical opinon, control of post-prandial glucose levels is important for this patient.

Does this patient have diagnosed diabetes?	**What were the most recent levels of:**	**Current medication/s for diabetes are:**	**Who currently initiates/ titrates hypoglycaemic medications for this patient?** *(e.g. increasing drug dose or initiating insulin)*	**How often does the patient measure their glucose at home?**	**For patients using INSULIN:**	**(b) In your clinical opinion, is control of post-prandial glucose levels important for this patient?**
☐ Yes - Type 1 ☐ Yes - Type 2 ☐ No → **End questions**	HbA1c: _____ mmol/mol eGFR: _____ mL/min/ 1.73m^2 **...and the current:** height: _____ cm weight: _____ kg	**Name & Form / Strength / Dose / Freq** _____ _____ _____ _____ ☐ **No** medication BL172B	☐ GP only ☐ GP in consultation with specialist ☐ Specialist only	☐ Daily - how many times per day: _____ ☐ Less than daily - no. times per week: _____ ☐ Never	**(a) Approximately how long ago was insulin initiated?** _____ years _____ months	☐ Yes ☐ No

SAND abstract number 239: Continuity of care and health service utilisation in general practice

Organisation collaborating for this study: Family Medicine Research Centre.

Issues: Whether patients had a regular practice they usually visited. Health service utilisation in previous 12 months including: number of GP visits, regular GP and practice; allied health professionals, medical/surgical specialists, emergency departments visited and hospital admissions; prevalence of chronic conditions.

Sample: 4,972 patients from 168 GPs; data collection period: 05/05/2015 – 13/07/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Methods for this substudy: Each patient's data were weighted by the number of times they saw a GP in the previous year to account for varying attendance rates. This provided a prevalence estimate for the 'active patient population', i.e. patients who visited a GP at least once in the previous year.

Summary of results

The age and sex distributions of the 4,972 respondents did not differ from patients at all 2015–16 BEACH encounters. Males were significantly more likely to record just 1–3 GP visits (28.3%, 95% CI: 25.3–31.3) than females (22.3%, 95% CI: 19.7–24.9). Visit rate increased with age, with 9.6% of patients aged 0–14 frequent or very frequent attendees, compared with 51.5% of those aged 75+.

Of the 4,972 patients, 95.1% (95% CI: 93.6–96.7) had a regular general practice they usually visited. After adjustment for attendance rates, we estimate 91.3% (95% CI: 88.9–93.7) of people who attended a GP at least once in the year (active patients) have a regular practice.

The average number of GP visits in the previous 12 months was 8.9 for 4,927 respondents, and for active patients it was 4.3. The average number of different GPs seen by respondents was 2.5, and for active patients 2.0. The majority of respondents (75.6%) visited only one practice in the previous 12 months, and 19.3% visited two. Of active patients, 78.7% visited one practice and 17.0% two.

The average number of allied health professionals visited in the previous 12 months was 0.8: 62.4% of respondents visited none, 21.1% one and 16.5% two or more. In the total active patient population, we estimate the mean number visited to be 0.4: 74.8% visited none, and 16.3% one. The average number of medical specialists seen was 0.8: 54.7% none, 24.6% one, and 20.7% two or more. For the active patient population, the adjusted average was 0.5: 20.1% one, and 10.8% two or more.

Of 4,927 respondents, 19.3% had at least one emergency department visit. We estimate that 13.5% of the active patient population had at least one visit to an emergency department in the previous 12 months. At least one hospital admission in the previous 12 months was reported for 18.2% of the sample, two-thirds of whom (12.8% of the respondents) were admitted only once. Of active patients, we estimate 12.0% had been admitted to hospital at least once, with the majority (9.2%) admitted only once in the previous 12 months.

Of the respondents, 32.1% had no diagnosed chronic conditions, 67.9% at least one: 22.0% one, 15.6% two, 10.1% three and the remaining 20.2% four or more. For the total active patient population we estimate: 48.5% had no diagnosed chronic conditions, 22.4% had one, 12.7% two, 7.2% three and 9.2% four or more. Hypertension was the most prevalent chronic condition (23.0% of respondents and 15.3% of the active patient population) followed by osteoarthritis (15.2% and 8.7%), hyperlipidaemia, depression and anxiety.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **HEALTH CARE UTILISATION and PREVALENCE of CHRONIC DISEASE.** Please complete these questions in addition to information about the encounter. *This page is a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer the questions in the shaded section for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.**

Please **DO NOT select patients** to suit the topic being investigated.

Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Abbreviations

IHD = ischaemic heart disease
CHF = congestive heart failure
COPD = chronic obstructive pulmonary disease (including emphysema)
GORD = gastro-oesophageal reflux disease

Regular general practice

Please ask the patient whether they have a **regular general practice that they usually visit**.

If '**yes**' please indicate whether the patient regards the **practice they are visiting today** as their **regular general practice.**

*A **general practice** is defined as a group of primary care practitioners who share medical records.*

Co-ordination of care

This question aims to assess **the complexity of co-ordinating the care** of patients.

From the list provided, please advise **how many individual** health care services were provided to the patient over the **previous 12 months.** These may have included visits to/ consultations with:

- **any GP** at **any** practice, (including you today) for **any** problem
- **individual GPs** (at yours and/or another practice - please ask the patient), for **any** problem
- different (GP) **practices** (including your own)
- any **allied health professional/s** (private or outpatient) who provided healthcare for **any** problem
- any **medical or surgical specialist/s** (either private or outpatient) who provided healthcare for **any** problem *(N.B. if two of the same type (e.g. 2 cardiologists) count both)*
- any **emergency department** visit for **any** problem
- any **hospital admission** for **any** problem (including day-only surgery)

Patient's diagnosed chronic conditions/problems

The aim of these questions is to allow us to investigate their relationship between **prevalence** and **patterns** of **multimorbidity** in GP patients, and service utilisation.

If the patient has **NO diagnosed chronic problems** please tick the box labelled '**NO**', and end the questions here for this patient.

If the patient **DOES** have **diagnosed chronic conditions**, please **use the tick boxes to indicate which ones** (whether or not you managed them today). Tick as many as apply. We have listed the most common chronic problems alphabetically.

If the patient has a **malignant neoplasm(s)** please **specify the primary site** of the neoplasm.

If the patient has any **other diagnosed chronic problems** that are **not listed** please specify these in the **'Other chronic problems not listed'** section.

Ask the patient:
Does the patient have a regular general practice* they usually visit?
☐ Yes - this one
☐ Yes - another one
☐ No *(*a practice is a group of primary care practitioners who share medical records)*

Ask the patient:
In the last 12 months, the number of:

1) times they saw **any** GP..... _____
2) different individual **GPs** seen..... _____
3) different (GP) **Practices** attended ..... _____
4) individual **Allied Health** Profs seen... _____
5) individual Medical **Specialists** seen... _____
6) **Emergency Dept** visits made ..... _____
7) **Hospital** admissions ..... _____

BL172C

Does the patient have any chronic conditions/ problems?
☐ Yes →
☐ No ↘
End questions

If 'yes' please tick all that apply:

☐ Anxiety
☐ Asthma
☐ Atrial fibrillation
☐ CHF
☐ Chronic back pain
☐ COPD
☐ Depression
☐ GORD
☐ Hyperlipidaemia
☐ Hypertension
☐ Hypothyroidism
☐ IHD
☐ Malignant neoplasm → Site: _____
☐ Obesity
☐ Osteoarthritis
☐ Osteoporosis
☐ Type 2 diabetes

Other chronic problems not listed: *(please specify)*
_____
_____
_____

SAND abstract number 240: Management of asthma and COPD in general practice patients – 2015

Organisation collaborating for this study: AstraZeneca Pty Ltd (Australia).

Issues: Prevalence of diagnosed asthma and chronic obstructive pulmonary disease (COPD) in general practice patients. For patients with asthma and/or COPD: their age when diagnosed; current medication; exacerbation management action in previous 12 months.

Sample: 2,547 patients from 86 GPs; data collection period: 09/06/2015 – 13/07/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>. Note: SABA – short-acting beta agonist; ICS – inhaled corticosteroid; LABA – long-acting beta agonist; LAMA – long-acting muscarinic agent.

Summary of results

The age and sex distribution of the 2,547 respondents did not significantly differ from that of patients at all 2014–15 BEACH encounters. Of the 2,547 respondents, 280 (11.0%) had asthma only, 28 (1.1%) both asthma and COPD, and 68 (2.7%) had COPD only. In total, 12.1% had asthma and 3.8% had COPD.

Among 278 of the 280 patients with asthma only, most (58.5%) were diagnosed by the age of 18 years (*n* = 265): 16.6% by age 5, 27.5% 5–11 years, and 14.3% 12–18 years. Patients had been diagnosed for an average of 24.4 years. Of 274 respondents with asthma only, 82.1% were taking at least one asthma medication, most commonly SABA (56.9%), ICS/LABA (46.0%) and ICS (10.6%). Salbutamol was the most commonly used medication (46.9%), followed by salbutamol/fluticasone (24.7%). At least one asthma exacerbation management action was required in the previous 12 months for 40.4% of 265 respondents. Actions included: corticosteroids (21.1%), antibiotics (34.7%), emergency department attendance (5.3%), and hospital admission (3.0%).

Among the 28 patients with asthma and COPD, prevalence increased with age, from 0.2% of patients aged 30–44 to 3.1% of patients aged 75+. Of 23 respondents, the majority were diagnosed with asthma before COPD (*n* = 16), 5 at the same time and 2 with COPD before asthma. The average number of years since diagnosis was 41.3 for asthma and 17.7 years for COPD. For 23 patients for whom severity of COPD was known, 4 were mild, 15 moderate and 4 severe. The most commonly used medication types were ICS/LABA (*n* = 23), SABA (*n* = 18) and LAMA (*n* = 14). Salmeterol/fluticasone was most commonly used (*n* = 19), followed by salbutamol (*n* = 17). Of 27 respondents, 92.6% required at least one exacerbation management action including: corticosteroids (51.9%), antibiotics (88.9%), emergency department attendance (25.9%), and hospital admission (22.2%).

Among 66 of the 68 patients with COPD only, prevalence increased with age, from 0.5% of those aged 30–44 to 7.0% of patients aged 75+. Of 63 respondents, 55.6% were diagnosed between 45 and 64 years of age. The average time since diagnosis was 11.7 years. Of 62 patients for whom severity was known, 48.4% were mild, 40.3% moderate and 11.3% severe. Of 66 respondents, 81.8% took at least one medication. LAMA was the most common type (45.5%), followed by ICS/LABA (43.9%) and SABA (30.3%). Tiotropium bromide was the most common medication (30.1%) followed by salbutamol (21.5%) and salmeterol/fluticasone (18.3%). The majority (57.8%) of patients required at least one exacerbation management action including: corticosteroids (40.6%), antibiotics (56.3%), emergency department attendance (14.1%), and hospital admission (10.9%).

Of 107 respondents aged 12–18 years, 22.4% had asthma and none had COPD. Of 23 with asthma, 13 were taking at least one medication. SABA was the most common medication type and salbutamol was the most common medication taken by this age group.

The following page contains the recording form and instructions with which the data in this substudy were collected.

Severity of Chronic Obstructive Pulmonary Disease (COPD) reference card

Severity	Spirometry	Symptoms
Mild	FEV_1 60–80% predicted	Breathlessness on moderate exertion Recurrent chest infections Little or no effect on daily activities.
Moderate	FEV_1 40–59% predicted	Increasing dyspnoea Breathless walking on level ground Increasing limitation of daily activities Cough and sputum production Exacerbations requiring corticosteroids and/or antibiotics.
Severe	FEV_1 <40% predicted	Dyspnoea on minimal exertion Daily activities severely curtailed Experiencing regular sputum production Chronic cough Exacerbations of increasing frequency and severity.

Note: FEV_1—postbronchodilator forced expiratory volume in one second.

Source: Lung Foundation Australia. Stepwise Management of Stable COPD. Available from, http://lungfoundation.com.au/health-professionals/guidelines/copd/stepwise-management-of-stable-copd/ Brisbane. Lung Foundation Australia. 2015.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **MANAGEMENT OF ASTHMA AND COPD.**

You may tear out this page as a guide to completing the following set of forms.

INSTRUCTIONS

The following 30 forms relate to the **next 30 PATIENTS in the order in which the patients are seen.**

Please **DO NOT select patients** to suit the topic being investigated.

Asthma and Chronic Obstructive Pulmonary Disease (COPD)

Please use the tick boxes to indicate whether this patient has ever been diagnosed with **asthma and/or COPD**.

If the patient has **not been diagnosed with asthma or COPD** please **finish the questions here** for this patient.

Patient age at diagnosis

In the space provided, please **write** the patient's approximate **age at the time they were first diagnosed with asthma and/or COPD**. If you do not know, please ask the patient for their best estimate.

Exacerbation management

Please write **the number of times** (over the past 12 months) management of the patient's asthma/COPD has required any of the listed interventions.

If the patient has **not required** the listed management actions please **write '0' or '–'** in the space provided next to each action.

Current asthma/COPD medications

Please write the **name, form** and regimen (**dose and frequency**) of any medication(s) **currently taken to manage this patient's asthma/COPD**.

Please indicate **how long** the patient has taken the medication by **writing the number** of months in the **space beside** each medication.

If the patient is **not taking any medication** for the treatment of asthma/COPD please tick the box labelled '**no asthma/COPD medication**'.

Previous ICS/LABA use

For patients who are **not** currently taking an **inhaled corticosteroid/ long-acting beta agonist (ICS/LABA)** combination medication, please indicate whether the patient has **ever taken an ICS/LABA combination medication** for the management of asthma/COPD.

If the patient has taken an ICS/LABA, please use the tick boxes to indicate which medication/s have been tried. Please tick all that apply.

Note ICS/LABA combination medications include: Symbicort (Budesonide/Eformoterol); Seretide (Fluticasone propionate/Salmeterol); Flutiform (Fluticasone propionate/ Eformoterol); Breo (Fluticasone furoate/Vilanterol).

For patients with COPD

Medications used at diagnosis

Please advise the medication (or combination of medications) that were **initiated at the time of COPD diagnosis.**

LABA = Long-acting beta agonist
LAMA = Long-acting muscarinic agent
ICS = Inhaled corticosteroid

Severity of COPD

Referring to the **COPD severity scale** on the **laminated card** in your research pack, please indicate the **severity of the patient's COPD**.

Has this patient been diagnosed with:	The patient's age (approx) when first diagnosed with:	In the past 12 mths, how many times has asthma/COPD required: *(If none write '–' or '0')*	Current asthma/COPD medication/s: Name & Form / Strength / Dose / Freq / Duration of use	If an ICS/LABA combination is not currently taken, has this patient ever taken an ICS/LABA?	For patients with COPD: What medications were initiated at diagnosis?	For patients with COPD: Severity of COPD? *(See reference card)*
☐ Asthma ☐ COPD ☐ Both ☐ Neither → **End questions**	Asthma: _____ (yrs) COPD: _____ (yrs)	Course(s) of oral corticosteroid: ____ Course(s) of antibiotics:…… ____ Visit(s) to emergency dept: . ____ Admission(s) to hospital: …. ____	_____ ____ mths _____ ____ mths _____ ____ mths ☐ **No asthma/COPD medication** BL173B	☐ Yes → *If 'yes' which one(s)*: ☐ Symbicort ☐ Seretide ☐ Flutiform ☐ Breo ☐ No ☐ Don't know	☐ ICS/LABA + LAMA ☐ ICS/LABA ☐ LAMA ☐ LABA ☐ LAMA/LABA ☐ Don't know	☐ Mild ☐ Moderate ☐ Severe ☐ Don't know

SAND abstract number 241: Proton pump inhibitor use among general practice patients

Organisation collaborating for this study: Family Medicine Research Centre.

Issues: The proportion of general practice patients taking proton pump inhibitors (PPIs) and the conditions for which they were prescribed; proportion prescribed for initial or maintenance treatment; how long patients have been taking PPIs and the PPI they are taking; proportion of patients who had attempted to stop PPI or reduce dose and their level of success.

Sample: 2,642 patients from 89 GPs; data collection period: 14/07/2015 – 17/08/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

The age and sex distributions of the respondents in this sample did not differ from the age and sex distributions of patients at all 2014–15 BEACH encounters.

Of 2,642 patients who responded to the SAND questions about PPI use, a total of 474 (17.9%) were either currently taking (*n* = 375, 14.2%) or had previously taken (*n* = 99, 3.7%) PPIs in the past 12 months. When these results are extrapolated to all patients who attended general practice at least once in 2014–15, we estimate that 14.4% of the attending population, and 12.4% of the Australian population are currently taking/have taken PPIs in the previous 12 months.

Of 471 respondents currently taking/who had taken PPIs in the past 12 months, 67.9% were taking it for oesophageal reflux, 15.3% for oesophagitis, 9.1% for gastrointestinal risk reduction and 8.1% for peptic ulcer disease (multiple responses allowed). Other indications for PPI use included gastritis (1.9%), hiatus hernia (1.3%) and *Helicobacter pylori* infection (0.8%).

Of 461 respondents, a PPI was prescribed for the initial treatment/healing phase for 18.9% of patients and the maintenance phase for 76.8%.

Of 427 respondents currently taking/who had taken a PPI in the past 12 months, the average duration of PPI use at any dose was 3.8 years. The 396 patients who responded to the question on duration had been taking the specified PPI at the current/most recent dose for an average of 3 years.

Of the most recent PPI prescribed for 463 respondents currently taking/who had taken PPI in the past 12 months, 44.1% were taking/had taken esomeprazole, 24.6% pantoprazole, 17.3% rabeprazole, 11.4% omeprazole and 2.2% lansoprazole.

Of 356 respondents currently taking a PPI, 14.9% had attempted to cease PPI use and 22.5% had attempted to reduce the dose in the previous 12 months. Of 127 patients who had attempted to cease or reduce the dose of PPI, the majority (64.6%) indicated that the attempt had been unsuccessful.

Of 209 patients currently taking PPI, for whom PPI cessation or dose reduction had not been attempted in the previous 12 months, reasons were recorded for 205 patients. For 80.0% of patients, PPI cessation/dose reduction was considered by the GP to be not clinically indicated, for 10.7% no attempt was made due to patient refusal, 2.0% were planning to reduce PPI soon and 7.8% gave other reasons.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about the **USE OF PROTON PUMP INHIBITORS.**
Please complete these questions in addition to information about the encounter. *You may tear out this page as a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer the questions in the shaded section for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.**
Please **DO NOT select patients** to suit the topic being investigated.

We are conducting this research in response to concerns raised recently that general practice patients are taking PPIs at maximal doses long term without attempts to reduce dose or cease. This study aims to provide evidence about PPI use among general practice patients and attempts to cease or reduce dose of PPIs.

Proton pump inhibitor (PPI) use

Please use the tick boxes to indicate whether this patient is **currently taking proton pump inhibitors (PPIs)** or has **taken PPIs in the past 12 months**.

If the patient has **not taken PPIs in the past 12 months** please **finish the questions here** for this patient.

Phase of management associated with most recent PPI prescription

Please use the tick boxes to indicate the most recent **phase of management the PPI is/was prescribed for** i.e. the **initial (acute) treatment or healing phase**, the **maintenance phase, or other phase**. If you tick the box marked 'other' please write your response in the space provided.

PPI medication

Please write the **name, form** and regimen (**dose and frequency**) **of the PPI medication** currently prescribed or the most recent PPI taken.

Duration of use at this dose

Please indicate **how long** the patient has been taking/did take the PPI at the specified dose by **writing the number of months or years** in the space provided.

Indication for PPI

Please record the **condition/s for which the PPI was indicated**.

If the indication is not one of those with tick boxes, please write the indication beside the box marked 'other' in the space provided.

Duration of PPI use

Please indicate **how long** the patient has been taking/ did take PPI by **writing the number of months or years** in the space provided.

Attempt to cease or reduce dose of PPI

For current PPI users, please advise whether in the **past 12 months** there was any **attempt to cease or reduce dose of PPI** medication.

If an **attempt** was made please use the tick boxes to indicate whether it **was successful**.

If **no** attempt was made to cease or reduce dose, please indicate the **reason/s why**. If you tick the box marked 'other' please write your response in the space provided.

Has this patient taken PPIs in the past 12 months:	For which indication/s was PPI prescribed?	Most recent/current management phase PPI was prescribed for:	How long has/had this patient taken PPI?	Current (or most recent) PPI medication:	For current PPI users: Has cessation or dose reduction been attempted in the past 12 months?	If 'yes', was this successful? / If 'no', why not?
☐ Yes - currently ☐ Yes - in past 12 months ☐ No → **End questions**	☐ Oesophageal reflux ☐ Oesophagitis ☐ Peptic ulcer disease ☐ GI risk reduction ☐ Other: _____ *(please specify)*	☐ Initial treatment or healing ☐ Maintenance ☐ Other: _____ *(please specify)*	_____ months OR _____ years	Name & Form / Strength / Dose / Freq _____ How long has/was PPI taken at this dose? _____ months OR _____ years	☐ Yes - to cease ☐ Yes - to reduce dose ☐ No ☐ Don't know	If 'yes', was this successful? ☐ Yes ☐ No If 'no', why not? ☐ Patient refusal ☐ Not clinically indicated ☐ Other: _____

BL174B

SAND abstract number 242: Cardiovascular disease risk and use of lipid-lowering medication

Organisation collaborating for this study: Sanofi-Aventis Australia Pty Ltd.

Issues: Prevalence of cardiovascular disease (CVD) risk factors; blood pressure level; low–density lipoprotein level (LDL); lipid medication management; changes in lipid medication use.

Sample: 3,182 patients aged 45+ from 184 GPs; data collection period: 18/08/2015 – 26/10/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Methods for this substudy: Patient cardiovascular risk status was calculated using a three-step process involving CVD risk guidelines from the National Vascular Disease Prevention Alliance, the Framingham equation, and other factors for consideration in CVD risk (family history of premature heart disease; obesity calculated from reported BMI).
<www.cvdcheck.org.au/index.php?option=com_content&view=article&id=47Itemid=27>.

Summary of results

There were 3,182 respondents aged 45+ years. The age and sex distributions of these respondents did not differ from patients in this age group at all BEACH encounters in 2015–16.

Hypertension (54.1%) was the most common CVD risk factor reported in these patients, followed by dyslipidaemia (35.5%) and BMI of 30 or more (21.7%). Diabetes was reported for 14.9% of patients, 13.3% had a family history of coronary artery disease, and 10.7% were current smokers. For 745 (23.4%) respondents, CVD risk factors placed them in the known very high risk category. Sufficient information was given to estimate overall CVD risk via the Framingham equation for 2,962 respondents. Of these, 34.1% had high risk, 12.2% moderate risk and 53.7% low CVD risk.

Based on National Heart Foundation categories, 15.6% of 2,932 respondents had normal blood pressure, 48.2% high-normal and 36.3% high. Of 2,380 respondents, the average LDL was 2.8 mmol/L. Women had significantly higher average LDL (2.9 mmol/L, 95% CI: 2.85–2.96) than men (2.7 mmol/L, 95% CI: 2.63–2.77). Average LDL decreased significantly with age, from 3.1 mmol/L (95% CI: 3.0–3.1) in patients aged 45–64 years to 2.5 mmol/L (95% CI: 2.4–2.6) in patients 75 years and older. Average LDL for patients with very high CVD risk (2.3 mmol/L, 95% CI: 2.2–2.4) was significantly lower than for all other groups.

Of 2,578 patients for whom triglyceride level was known, the average was 1.5 mmol/L (95% CI: 1.5–1.6). There were no significant differences in average triglyceride levels between males and females, or among different patient age groups. Average triglyceride level was significantly lower for patients at low CVD risk than for patients in moderate, high or very high risk groups, although none of the latter groups differed from each other.

Of 3,088 respondents, 37.3% were currently taking at least one lipid medication, predominantly statin (34.0%), ezetimibe (2.0%), statin + ezetimibe combination (1.7%) or a fibrate (0.8%). There were 1,189 current lipid medications recorded, with the most common being atorvastatin (39.0%) and rosuvastatin (33.2%). The majority (71.9%) of the very high CVD risk group were taking at least one lipid medication, a significantly higher proportion than all other risk groups.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **LIPID MEDICATION USE and CARDIOVASCULAR DISEASE RISK.**
Please complete these questions in addition to information about the encounter.
Tear out this page as a guide to completing the shaded section of the following forms.

INSTRUCTIONS

The questions in the shaded section of the following 30 forms investigate the absolute cardiovascular risk for **patients aged 45 years or more**. For the **next 30 PATIENTS**, ask every adult patient aged 45 years or more the following questions. If the patient is **less than 45 years of age leave the questions blank**. Please **DO NOT select patients** to suit the topic being investigated.

Conditions or risks - patients aged 45 yrs or more

Please use the tick boxes to advise whether the patient **has**, or **has a history of**, any of the listed **conditions or risk factors.**

- **LV hypertrophy** = left ventricular hypertrophy
- **AMI in past 2 yrs** = recent (within 24 mths) acute myocardial infarct. If more than 2 years ago, **please tick 'CHD'**
- **Moderate/severe chronic kidney disease (CKD):** defined as persistent proteinuria or estimated glomerular filtration rate (eGFR) < 45 mL/min/1.73 m^2
- **CHD** = coronary heart disease diagnosed in the patient
- **Fam Hx CHD** = Family history of CHD, symptomatic in one or more 1st degree relatives aged <60 yrs, or in one or more 2nd degree relatives aged <50 yrs
- **PVD/PAD** = peripheral vascular / arterial disease
- **Microalbuminuria:** defined as > 20 mcg/min **or** urinary albumin:creatinine ratio >2.5 mg/mmol for males, >3.5 mg/mmol for females

Clinical measurements

Please write the patient's most recent results of **blood pressure**, **total cholesterol**, **HDL and LDL cholesterol,** and **triglyceride (TG)** tests.

If the patient has **never been tested**, or you **don't know** the results of the previous test, please tick the box labelled '**Don't know / never tested**' for that measure.

Current lipid medication

Please write the name and regimen of any **lipid-lowering medication currently** being taken by the patient.

If the patient **is not** currently taking a lipid lowering medication please tick the box labelled **'no current lipid medication'**.

Previous lipid medication

If the patient's current lipid medication status **has changed** *(i.e. they changed from one medication to the current one, are on the same medication but at a different dose, or stopped a lipid medication)*, please write the name and regimen of the **lipid-lowering medication previously taken**. (If more than one change since statins were initiated, please give details for the **most recent** change).

If the current lipid medication is the **only one** the patient has taken, please tick the '**no previous lipid medication**' box.

Statin intolerance

Please indicate whether the patient is **intolerant** to statins based on the **following definition**: *'the inability to tolerate at least 2 different statins - one statin at the lowest starting dose and the other statin at any dose*'.[1]

[1]Banach M, Rizzo M, Toth P, et al. 2015. *Statin intolerance - an attempt at a unified definition. Position paper from an International Lipid Expert Panel. Arch Med Sci* 11(1):1-23.

Side effects

Please advise what (if any) **side effects** the patient has experienced that necessitated **dose limitation** of their statin medication.

NB: **>2 ULN** = *more than twice the Upper Limit of Normal*

>3 ULN = *more than three times the Upper Limit of Normal)*

If aged 45+ yrs, does the patient have, or have a history of:

- ☐ Current smoker
- ☐ Hypertension
- ☐ LV hypertrophy
- ☐ Dyslipidaemia
- ☐ Previous Stroke
- ☐ AMI in past 2yrs
- ☐ Mod/severe CKD
- ☐ BMI >30
- ☐ CHD
- ☐ Fam Hx - CHD
- ☐ PVD / PAD
- ☐ Diabetes
- ☐ Micro-albuminuria

What were the most recent levels of: (Don't know / never tested)

- BP: ____ / ____ mmHg ☐
- TC: _____ mmol/L ☐
- HDL C: _____ mmol/L ☐
- LDL C: _____ mmol/L ☐
- TG: _____ mmol/L ☐

Current lipid medication(s) are:

Name & Form	Strength	Dose	Freq

☐ **No current lipid medication**

Previous lipid medication(s) were:

Name & Form	Strength	Dose	Freq

☐ **No previous lipid medication**

Is the patient intolerant to statins? (see green sheet for definition*)

- ☐ Yes
- ☐ No
- ☐ Don't know

Has the patient had any dose-limiting side effects?

- ☐ Muscle pain
- ☐ Creatine Kinase > 2ULN
- ☐ Liver Function Test >3ULN
- ☐ Other symptoms: _____
- ☐ No

BL176B

SAND abstract number 243: Rhinitis management among Australian general practice patients

Organisation collaborating for this study: Seqirus (Australia) Pty Ltd.

Issues: Prevalence of allergic and non-allergic rhinitis and asthma in general practice patients. For patients with allergic and non-allergic rhinitis (separately analysed): proportion with asthma; suspected causes; confirmatory diagnostic tests; duration; specialist referral; and number of GP and specialist visits in previous 12 months.

Sample: 2,723 patients from 93 GPs; data collection period: 22/09/2015 – 26/10/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

Of 2,723 patients who responded to the SAND questions about rhinitis, a total of 536 (19.7%) had either allergic (*n* = 446, 16.4%) or non-allergic (*n* = 91, 3.3%) rhinitis.

There were no significant differences in the sex-specific rates of rhinitis, 21.1% of females and 17.6% of males having some type of rhinitis. Rhinitis was significantly more prevalent among surveyed patients aged 45–64 years (23.2%) than among patients aged less than 15 years (12.2%), but there were no significant differences between other patient age groups.

Of 445 patients with allergic rhinitis, 319 responded to the co-existence of diagnosed asthma. Of these, 39.5% (95% CI: 34.0–45.0) also had diagnosed asthma.

Of 445 patients with allergic rhinitis, 434 advised causal agents. Grasses/pollens were the most commonly reported (67.5%), followed by indoor allergens (25.8%), animal dander (16.6%); infections (6.5%), and 6.7% advised 'other' causes, the most frequent of which was perfume (*n* = 8). The cause was reported as 'unknown' for 21.0%.

Of 445 patients with allergic rhinitis, 430 patients responded about diagnostic tests. Of these, 109 reported 148 tests: no tests had been undertaken for 321 respondents (74.7%), a skin prick test was used for 16.3%, allergen-specific immunoglobulin E (IgE) test for 8.8%, and total IgE test for 7.7%. The majority of skin prick tests (63.8%) were ordered by specialists, and 34.5% were ordered by GPs. Of total IgE tests, 53.1% were ordered by a GP and 46.9% by a specialist. Two-thirds (68.6%) of allergen-specific IgE tests had been ordered by GPs and 31.4% by specialists.

Of 431 respondents with allergic rhinitis, the majority (68.4%) had been diagnosed more than 5 years earlier than the recorded encounter. A further 11.8% were diagnosed between 3 and 5 years earlier, 12.8% 1–3 years earlier, and 7.0% less than 12 months ago.

Of 433 respondents with allergic rhinitis, 18.2% had been referred to a specialist for its management. The highest proportions of referrals were to ENT specialists (7.9% of respondents), followed by allergists (6.5%), immunologists (2.5%), respiratory physicians (1.2%), and dermatologists (0.7%).

Of 415 respondents with allergic rhinitis, the majority (58.8%) had not required GP management of their rhinitis in the previous 12 months, 17.6% had had one GP visit for allergic rhinitis, 11.3% two visits, and 12.3% three or more visits.

Only 257 patients with allergic rhinitis responded about the number of specialist visits. Of these, 89.9% had required none in the previous 12 months, 6.6% one visit, and 3.5% two or more visits.

Of 90 patients with non-allergic rhinitis: 8 (13.8%, 95% CI: 5.2–22.3) of 58 respondents also had asthma, the most common known cause was infection (20/87, 23.0%), the majority (74/86, 86.0%) reported no diagnostic tests and 41/84 (48.8%) had been diagnosed more than 5 years earlier.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **RHINITIS MANAGEMENT.**
Please complete these questions in addition to information about the encounter. *You may tear out this page as a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer these questions for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.**
Please **DO NOT select patients** to suit the topic being investigated.
Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Rhinitis

Please use the tick boxes to indicate whether the patient has **allergic rhinitis** (either seasonal or perennial) or **other rhinitis**.

If the patient **does not have rhinitis** please **end questions here** for this patient.

Asthma

For patients with rhinitis, please indicate whether they have also been diagnosed with **asthma**.

Tests

Please indicate which **test(s)** were used to **comfirm** the rhinitis diagnosis.

Please tick all that apply.

For each test ordered, please **circle a response** to indicate the **type of health professional** (GP, specialist or other health professional) **who ordered the test**.

If no tests were performed, please tick the box labelled '**No tests**'.

GP and specialist visits

Please indicate the approximate **number of GP and/or specialist visits** this patient made **for the management of rhinitis** in the **past 12 months**.

If the patient's rhinitis did not require any visits please write '-' or '0' in the space provided

Cause/s of rhinitis

For patients with rhinitis, please advise the **cause/s** of the patient's **rhinitis**.

If the cause is not listed please tick 'other' and write the cause in the space provided.

If the cause is not known for this patient, please tick the box labelled '**Don't know**'.

Duration of rhinitis

Please advise **how long since** the patient was first **diagnosed with rhinitis**.

Specialist referrals

Please advise whether this patient has ever been **referred to a specialist for their rhinitis**.

If '**yes**', please write the **type/s of specialist/s** referred to in the space provided.

Does the patient have:	**What is/are the cause/s of the rhinitis?**	**What test/s were used to confirm diagnosis?**	**Ordered by?** *(please circle)*	**How long ago was rhinitis diagnosed?**	**Has the patient's rhinitis ever required a referral to a specialist?**	**If 'yes', what type/s of specialist/s:**	**In the past 12 months, how many GP and/or specialist visits has the rhinitis required?** *(If none write '–' or '0')*
☐ Allergic rhinits *(seasonal or perennial)*	☐ Grasses/pollen *(Tick all that apply)*	☐ Skin prick test	**GP / Spec / Other**	☐ <12 mths	☐ Yes	_____	No. of GP visits: _____
☐ Other rhinitis	☐ Animal dander	☐ Total IgE test	**GP / Spec / Other**	☐ 1-3 years	☐ No	_____	
☐ No rhinitis → **End questions** ←	☐ Indoor allergen (e.g. dust mites, mould)	☐ Allergen-specific IgE	**GP / Spec / Other**	☐ >3-5 years	☐ Don't know	_____	No. of specialist visits: _____
Does the patient have asthma? ☐ Yes ☐ No	☐ Infection	☐ Other _____ *(please specify)*	**GP / Spec / Other**	☐ >5 years			
	☐ Other: _____ *(please specify)*	☐ **No tests**					
	☐ **Don't know**						

BL176C

SAND abstract number 244: Continual medication and adverse drug events in general practice patients

Organisation collaborating for this study: Family Medicine Research Centre.

Issues: The proportion of general practice patients on continual medications, the number of medications and the number of prescribers; the proportion who had a medication review; the proportion who had an adverse drug event; the severity and rate of hospitalisation for adverse drug events.

Sample: 10,667 patients from 363 GPs; data collection periods: 14/07/2015 – 21/09/2015, and 27/10/2015 – 18/01/2016.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

A significantly greater proportion of this sample was female, but there was no significant difference in age distribution, when compared with patients at all 2014–15 encounters.

Of the 10,667 patients in this sample, two-thirds (68.5%, 95% CI: 66.2–70.8) had been prescribed or advised at least one medication for continual use in the previous 6 months. On average, patients took 3.2 continual medications. Polypharmacy (defined as a patient taking five or more continual medications) was present in 27.2% of the patients.

Of 7,138 respondents who were taking at least one continual medication, 21.4% reported that no doctor had prescribed or advised any new medication in the previous 6 months, 47.9% reported that one doctor had prescribed or advised a new medication, and 30.7% reported that two doctors had done so. For those on continual medications, on average, 1.2 doctors had prescribed or advised new medications.

Medication reviews had been performed for 69.1% of the 6,955 respondents taking continual medication for which medication review status was known. GPs were involved (either alone or in conjunction with a pharmacist or nurse) in 92.5% of medication reviews. Patients with polypharmacy were significantly more likely to have a medication review (77.7%, 95% CI: 74.3–81.0) than those without (63.3%, 95% CI: 59.9–67.0).

Of 7,253 respondents taking at least one continual medication, 11.2% (*n* = 813) had experienced an adverse drug event in the previous 6 months. Significantly more patients with polypharmacy had an adverse drug event in the previous 6 months (16.1%, 95% CI: 14.2–18.0) than those who were taking less than five continual medications (5.4%, 95% CI: 4.8–6.0).

For 870 patients who had experienced an adverse drug event and for whom information was provided about the severity of the most recent event: 60.9% had experienced an adverse drug event regarded as ‘mild’ in the GP’s clinical opinion, 32.3% had experienced a ‘moderate’ adverse drug event, and 6.8% had experienced a ‘severe’ event.

Of 842 patients who had an adverse drug event and for whom information was provided about hospitalisation, 5.0% reported a hospital admission as a result of their most recent adverse drug event and 2.3% reported attendance at an emergency department without admission to hospital.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **THE ASSOCIATION BETWEEN POLYPHARMACY AND ADVERSE DRUG EVENTS (ADE).** Please complete these questions in addition to information about the encounter.

Tear out this page as a guide to completing the shaded section of the following forms.

INSTRUCTIONS

The shaded section of the following 30 forms relate to the **next 30 PATIENTS in the order in which the patients are seen. If you see the same patient twice in this set of 30 forms please only survey them once. Leave the shaded section blank if the patient attends a second time.** Please **DO NOT select patients** to suit the topic being investigated.

Previous research shows that 1 in 10 patients have had an ADE in the previous 12 months (Miller G et al. Drugs causing adverse events in patients aged 45 or older: a randomised survey of Australian general practice patients BMJ Open. 2013 Oct 10;3(10):e003701. doi: 10.1136/bmjopen-2013-003701)

Continuing medication use

This question refers to any **prescribed or advised (over-the-counter) medications INTENDED to be taken continually** (i.e. for 4 months or more) by the patient, including any that have since **stopped**.

This includes e.g. a course of monthly injections, a bronchodilator PRN, a daily prescribed statin, an advised NSAID or low-dose aspirin, etc.

Please **write the number** of each in the spaces provided.

If **no continuing medications** were prescribed or advised, **please tick the box labelled 'No continual meds', then go to Part 2 of the form** and answer the questions about adverse drug events.

Number of prescribers - ASK the PATIENT

If 'yes' please write the **number of different prescribers** (include hospitals, and private specialists) for **any new** medication in the **space provided**.

Please **do not** include doctors writing a repeat prescription for a medication already initiated by another clinician.

Medication review - ASK the PATIENT

Please ask the patient whether, over the past 6 months (i.e. other than today), **any of the listed health professionals have reviewed all the medications** they are taking.

PART 2: Adverse Drug Event (ADE)

ASK THE PATIENT - if they have **experienced an adverse drug event (ADE) from the use of any medication** in the **past six months**.

An adverse event is an unintended event which could have harmed or did harm the patient. 'Harm' includes physical, psychological or emotional suffering.

If **no ADEs** were experienced, please **end the questions here** for this patient.

Severity of the most recent ADE

Please indicate the **severity of the most recent ADE** in terms of harm to the patient (in your clinical opinion)

Mild - a reaction of limited duration not requiring further treatment; minimum impact on daily adtivities

Moderate - a reaction of longer duration or which required further treatment; limited impact on daily activities.

Severe - a reaction of any duration which results in long term limitation of daily activities.

Hospitalisation

As a result of the **most recent ADE**, please indicate whether the patient was treated at a **hospital emergency department** or was **admitted to hospital**?

In the past 6 months, how many different medications were prescribed and/or advised for continual use by the patient?

Prescribed: _____

Advised OTC: _____

☐ **NO continual meds → to Part 2**

Ask the patient -
If 'yes', how many doctors have prescribed/advised any new medication for the patient in the past 6 months?

_____
(please specify)

Ask the patient - In the past 6 months (not including today), have any of the following reviewed all the medications you are taking? *(Tick all that apply)*

☐ GP
☐ Practice nurse
☐ Pharmacist
☐ Don't know
☐ None of the above

Please continue → to Part 2

Part 2:

Ask the patient - have they experienced an adverse drug event (ADE) in the past 6 months?

☐ Yes
☐ No → **End questions**

In your clinical opinion, how severe was the most recent ADE?

☐ Mild
☐ Moderate
☐ Severe

Was the patient hospitalised as a result of the most recent ADE?

Emergency Department
☐ Yes ☐ No

Hospital Admission
☐ Yes ☐ No

BL174C

SAND abstract number 245: Health care utilisation by general practice patients

Organisation collaborating for this study: Family Medicine Research Centre.

Issues: Proportion of patients with a regular practice; health resources used in the previous year, specifically, frequency of visits to GPs, to practices, to specialists, to emergency departments, and hospital admissions; prevalence and number of chronic problems.

Sample: 2,688 patients from 91 GPs; data collection period: 27/10/2015 – 30/11/2015.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>. A general practice was defined as 'a solo GP or a group of GPs who share medical records'.

Summary of results

The age and sex distributions of respondents did not differ from those of patients at all BEACH encounters in 2014–15. Of 2,688 respondents, 90.2% said the practice they were visiting that day was their regular one, 6.4% said another practice was their regular one, and 3.4% did not have a regular practice. In total, 2,596 patients (96.6%, 95% CI: 94.8–98.3) had a regular practice.

The average number of GP visits per patient was 9.6. Of 2,650 respondents, 10.2% had visited a GP more than 20 times in the previous 12 months. GP visits rose with patient age: patients aged 25–44 years had a significantly higher average number of visits than younger patients, and patients aged 75+ had significantly more visits than those aged less than 65 years. The average number of individual GPs visited in the previous 12 months was 2.4 per patient. Of 2,629 respondents: 31.2% had seen only one GP, 32.0% had seen two, one in five patients (19.3%) had visited three GPs, and 17.4% had visited four or more.

The mean number of different general practices attended in the previous 12 months was 1.3 and the median was 1.0 per patient. Of 2,598 respondents, 78.7% had attended only one practice, and 19.1% had attended two. Only 2.2% had attended three or more practices.

The average number of individual specialists seen in the previous 12 months was 1.1 per patient. Of 2,662 respondents, 47.9% had not seen a specialist, 24.0% had seen one, and 13.9% had seen two. Significantly higher numbers of specialists were seen by older age groups.

The average number of emergency department visits per patient in the previous 12 months was 0.34. Of 2,628 respondents, 79.3% had not visited an emergency department, 13.3% had been once, and 4.6% had been twice. Emergency department visit numbers were similar across all age groups except for patients aged 75+ years, for whom a significantly higher average number of visits were recorded.

The average number of hospital admissions per patient in the previous 12 months was 0.36. Of 2,512 respondents, 77.7% had not been admitted to hospital, 15.5% had been admitted once, and 4.3% had been admitted twice. Hospital admissions were significantly higher among patients aged 65–74 years (0.40) compared with younger age groups and significantly higher again for patients aged 75+ years.

Of 2,661 respondents, 28.5% had no chronic conditions, 24.5% had one, 15.1% had two, and 31.8% had three or more. The proportion with three or more chronic conditions rose significantly through each age group to 75.4% of those aged 75+ years.

Factors predicting higher health care utilisation varied: higher number of GP visits and chronic conditions increase the number of specialists seen; having a regular practice, higher number of different GPs and more chronic conditions increase emergency department visits; and having a higher number of different GPs and chronic problems increase the number of hospital admissions.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **HEALTH CARE UTILISATION.** Please complete these questions in addition to information about the encounter. *This page is a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer the questions in the shaded section for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.** Please **DO NOT select patients** to suit the topic being investigated.

This study aims to investigate the use of health care services by general practice patients, and the complexity of co-ordinating their health care. You may need to use patient recall, your notes and knowledge to complete these questions

Regular general practice

Please ask the patient whether they have a **regular general practice that they usually visit**.

If '**yes**' please indicate whether the patient regards the **practice they are visiting today** as their **regular general practice.**

*A **general practice** is defined as a solo GP or a group of GPs who share medical records.*

Number of GPs and practices visited

Please advise, over the past 12 months **how many**:

- **individual GPs** (including you) at your and/or another practice the patient has seen
- individual GP **practices** (including your own) the patient has visited.

Number of specialists visited

Please advise, over the past 12 months **how many individual medical or surgical specialist/s** (either private or outpatient, but not as an inpatient) were seen by the patient for **any** problem.

Note if two of the same type of specialist were seen (e.g. 2 cardiologists) count both.

If the patient has **not seen a specialist in the past 12 months,** please **write '0' or '–'** in the space provided.

Emergency Department visits and Hospital admissions

Please advise, over the past 12 months **how many**:

- **Emergency Department** visits were made by the patient for **any** problem
- **hospital admissions** (including day-only surgery) were made by the patient for **any** problem.

If the patient has **not visited an Emergency Department and/or been admitted to hospital in the past 12 months,** please **write '0' or '–'** in the space provided.

Frequency of GP visits

Using patient recall, and your notes and knowledge, please write the approximate **number of times (including today's visit)** the patient has **seen any GP for any reason** in the **past 12 months**.

Number of diagnosed chronic conditions/ problems

Please indicate the number of **chronic conditions** diagnosed for this patient.

Ask the patient: Do you have a regular general practice* you usually visit?	**Approx. how many times has this patient seen any GP in the past 12 months? (including today)**	**Approx. how many individual GPs (including you) and practices (including this one) has the patient been to in the past 12 months?**	**Approx. how many individual medical or surgical specialists** has the patient seen in the past 12 months?**	**Approx. how many Emergency Department visits and Hospital admissions has the patient had in the past 12 months?**	**How many chronic conditions/problems does this patient have?**
☐ Yes - this one ☐ Yes - another one ☐ No **a general practice is a solo GP or a group of GPs who share medical records*	_____	GPs seen: _____ GP practices visited: _____	_____ ***include private and outpatient specialists (exclude those seen as an inpatient)*	Emergency Department visits: _____ Hospital admissions: _____	☐ None ☐ 1 ☐ 2 ☐ 3 or more

BL177B

SAND abstract number 246: Prevalence of chronic conditions and multimorbidity

Organisation collaborating for this study: Family Medicine Research Centre and the National Health Performance Authority.

Issues: The prevalence of chronic conditions and multimorbidity among: patients at GP encounters; active patients (those who see a GP at least once in a year); people in the general Australian population. The number of times patients had seen a GP in the previous 12 months.

Sample: 43,531 patients from 1,450 GPs; data collection period: 27/11/2012 – 28/03/2016.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

There were 43,531 patients in the total sample. The age of the patient was recorded at 43,200 encounters. There was no significant difference between the age distribution of respondents in this sample and that of patients at all 2014–15 BEACH encounters. Sex was also known for 43,186 patients. There was no significant difference between the sex distribution of respondents in this sample (40.4% male) and that of patients at all 2014–15 BEACH encounters (40.7% male).

On average, patients at GP encounters saw a GP 9.6 times in the previous year. On average, active patients saw a GP 4.6 times in the previous year. This is lower than the average 6.8 GP Medicare items claimed per person who claimed at least one item in 2014–15.

The most prevalent condition was hypertension – an estimated 26.5% of patients at encounters, 15.5% of patients who attended general practice at least once in the previous year and 12.4% of the Australian population have diagnosed hypertension. The second most prevalent condition was osteoarthritis – an estimated 22.7% of patients at encounters, 12.1% of active patients and 9.5% of the Australian population have osteoarthritis. The third was hyperlipidaemia, prevalent in an estimated 16.5% of patients at encounters, 10.1% of active patients and 8.2% of the population.

The body system (ICPC-2 chapter) most likely to be affected by a chronic condition was the circulatory system – 32.4% of patients at encounters, 18.7% of patients who attended general practice in the past year and 15.0% of the general population have a chronic circulatory condition. The second most common was musculoskeletal conditions – 32.0% of patients at encounters, 18.0% of active patients and 14.4% of people in the population have at least one.

Prevalence estimates range widely depending on the type of multimorbidity considered and the group of interest.

For multimorbidity defined as 2+ diagnosed chronic conditions, about half of patients at encounters (51.6%), 31.5% of active patients and 25.7% of people in the population have two or more diagnosed chronic conditions.

For multimorbidity defined as 3+ diagnosed chronic conditions, over one-third (37.4%) of patients at encounters, 19.7% of active patients and 15.8% of people in the population had three or more diagnosed chronic conditions.

For multimorbidity defined as 2+ ICPC-2 chapters affected, nearly half (47.8%) of patients at encounters, 28.3% of active patients and 23.0% of people in the population had diagnosed chronic conditions from two or more ICPC 2 chapters.

For complex multimorbidity, defined as 3+ ICPC-2 chapters affected, 30.4% of patients at encounters, 15.2% of active patients and 12.1% of people in the population had been diagnosed with chronic conditions from three or more ICPC-2 chapters.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about the **PATIENT'S CHRONIC CONDITIONS / PROBLEMS AND SERVICE USE.** Please complete these questions in addition to information about the encounter. *This page is a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer the questions in the shaded section for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.** Please **DO NOT select patients** to suit the topic being investigated.

Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Abbreviations

BMI = body mass index
IHD = ischaemic heart disease
CHF = congestive heart failure
CVA = cerebrovascular accident
COPD = chronic obstructive pulmonary disease (including emphysema)
GORD = gastro-oesophageal reflux disease

Frequency of GP visits

Using patient recall, and your notes and knowledge, please write the approximate **number of times (including today's visit)** the patient has **seen any GP for any reason** in the **past 12 months**.

Co-ordination of care

This question aims to assess **the complexity of co-ordinating the care** of each patient.

Please advise **how many individual** health care providers have provided care to this patient over the **previous 12 months (including today).**

- The number of **GPs** either in your practice or at another practice (ask the patient), for **any** problem
- The number of **GP practices** (including your own) the patient has visited, for **any** problem
- any **medical or surgical specialist/s** (either private or hospital-based) who has provided healthcare to the patient for **any** problem (i.e. the responsible specialist)
- any **allied health professional** (either private or hospital-based) who has/have provided healthcare to the patient for **any** problem

For example, if the patient has seen you and a partner at your practice (and has gone to no other practice), a cardiologist, a diabetes educator, and a physiotherapist, your response would be:

Individual GPs 2
GP practices 1
Medical specialists 1
Allied Health Profs 2

Patient's diagnosed chronic conditions/problems

The aim of these questions is to estimate the **prevalence** and **patterns** of **multimorbidity** in general practice patients. With an ageing population, the prevalence of multimorbidity is expected to increase and much of the care will fall on general practice. This study will highlight the complexity of multimorbidity and assist in planning for future health service needs.

If the patient has **NO diagnosed chronic problems** please tick the box labelled '**NO**', and end the questions here for this patient.

If the patient **DOES** have **diagnosed chronic conditions or problems**, please **use the tick boxes to indicate which ones** (irrespective of whether you have managed them today). Tick as many as apply.

If the patient has a **malignant neoplasm(s)** please **specify the primary site** of the neoplasm.

If the patient has any **other diagnosed chronic problems or conditions** that are **not listed** please specify these in the **'Other chronic problems not listed'** section.

Approx. how many times has this patient seen any GP in the past 12 months? (including today)

_____

BL178B

In the past 12 months (including today), how many of the following has the patient seen?

Individual GPs _____
GP practices _____
Medical specialists _____
Allied Health Profs _____

Does the patient have any chronic conditions/ problems?

☐ Yes →
☐ No →

End questions

If 'yes' please tick all that apply:

Cardiovascular
- ☐ Hypertension
- ☐ IHD
- ☐ CHF
- ☐ Peripheral Vascular Disease
- ☐ CVA/stroke
- ☐ Atrial fibrillation

Musculoskeletal
- ☐ Osteoarthritis
- ☐ Rheumatoid arthritis
- ☐ Other arthritis
- ☐ Osteoporosis
- ☐ Chronic back pain

Psychological
- ☐ Depression
- ☐ Anxiety
- ☐ Insomnia
- ☐ Dementia (including Alzheimer's)

Endocrine / nutritional
- ☐ Hyperlipidaemia
- ☐ Diabetes Type 1
- ☐ Diabetes Type 2
- ☐ Obesity (BMI ≥30)
- ☐ Hypothyroidism
- ☐ Hyperthyroidism

Other:
- ☐ Asthma
- ☐ COPD
- ☐ Sleep apnoea
- ☐ GORD
- ☐ Chronic renal failure
- ☐ Glaucoma
- ☐ Malignant neoplasm → Site: _____

Other chronic problems not listed: *(please specify)*

_____
_____

SAND abstract number 247: COPD prevalence, severity and management in general practice patients – 2016

Organisation collaborating for this study: Novartis Pharmaceuticals Australia Pty Ltd.

Issues: The surveyed prevalence of patients with diagnosed chronic obstructive pulmonary disease (COPD) with/without asthma; severity of COPD; exacerbations; management of COPD.

Sample: 2,437 patients from 87 GPs; data collection period: 19/01/2016 – 22/02/2016.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Methods for this substudy: COPD severity was defined using the COPD-X guideline (see <copdx.org.au/copd-x-plan/confirm-diagnosis/c3-assessing-the-severity-of-copd/>). Post-bronchodilator forced expiratory volume in one second (FEV_1) > 80 was defined as normal, FEV_1 60–80 mild, FEV_1 40–59 moderate, and FEV_1 < 40 severe. Note: LABA – long-acting beta agonist; SABA – short-acting beta agonist; LAMA – long-acting muscarinic agent; SAMA – short-acting muscarinic agent; ICS – inhaled corticosteroid.

Summary of results

The age and sex distributions of the 2,437 respondents did not differ from the age and sex distributions of patients at all 2014–15 BEACH encounters.

Of 2,437 patients who responded to questions about COPD, 122 (5.0%; 95% CI: 3.9–6.1) had diagnosed COPD. Of these, one-third (*n* = 42) had COPD with asthma and two-thirds (*n* = 80) had COPD without asthma. A further 199 (8.2%) had asthma without COPD.

Extrapolating to the population (assuming people who did not attend general practice at least once in a year did not have COPD), it was estimated that 2.6% (95% CI: 1.9–3.2) of the Australian population have diagnosed COPD with or without asthma.

There was no significant difference between the proportions of male and female patients with diagnosed COPD (6.5% males and 3.9% females). Age-specific rates showed that COPD increased with patient age. Only 6 patients aged <45 years had COPD, while 3.0% of those aged 45–64, 9.8% of those aged 65–74 and 12.7% of patients aged 75 years or older had been diagnosed with COPD.

FEV_1 responses were recorded for 115 of the 122 patients with COPD. For nearly half (47.8%) the response was 'Don't know'. Of those with a known FEV_1 (*n* = 60), GPs reported that 5.0% had normal lung function, 60.0% had mild COPD, 25.0% moderate COPD, and 10.0% severe COPD.

More than half (72/121, 59.5%) of patients with COPD had experienced at least one exacerbation in the previous 12 months. Of those with exacerbations, (26/71), 36.6% had experienced three or more exacerbations in the previous 12 months.

COPD medication information was reported for 121 patients, 9 of whom (7.4%) were not taking any COPD medications, and 33 (27.3%) who were taking one type of medication. Two different types of COPD medication were taken by 43.8% of patients and 21.5% were taking three or more. The most common medication combination was LABA/ICS in fixed dose combination with a LAMA taken by 19.8% of patients (24/121), followed by SABA/SAMA (19/121, 15.7%).

For patients taking a LABA+LAMA, 44.4% (4/9) had been treated with both agents since their COPD diagnosis, compared with 20.6% (7/34) of those taking LABA/ICS+LAMA.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **MANAGEMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE.** Please complete these questions in addition to information about the encounter. *You may tear out this page as a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer the questions in the shaded section for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.** Please **DO NOT select patients** to suit the topic being investigated.

Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Chronic Obstructive Pulmonary Disease (COPD) and Asthma

Please use the tick boxes to indicate whether this patient has been diagnosed with **COPD (without asthma)**, **COPD with asthma** or **asthma (without COPD)**.

If the patient has been diagnosed with COPD (with or without asthma) please continue the questions.

If the patient has **not been diagnosed with COPD** please **finish the questions here** for this patient.

COPD exacerbations

Please use the tick boxes to indicate whether the patient has experienced any **COPD exacerbations in the past 12 months**.

If the patient has experienced exacerbations in the past 12 months, please indicate **how many have occurred**.

Regimen of COPD medication from time of diagnosis

If the patient is taking a **combination** of

1. **LABA + LAMA**, or of
2. **LABA / ICS + LAMA**,

please advise whether the combinations were **initiated at the time of COPD diagnosis** or were initiated **separately, one subsequent to the other**.

FEV_1 result

Please indicate the patient's **FEV_1 result** (post-bronchodilator forced expiratory volume in one second) from the most recent spirometry.

Current COPD (with/without asthma) medications

Please write the **name, form** and regimen (**dose and frequency**) of any COPD (+/- asthma) medication(s) **currently taken to manage this patient's COPD (+/- asthma)**.

If the patient is **not taking any medication** for the treatment of COPD (+/- asthma) please tick the box labelled '**no medication**'.

Has this patient been diagnosed with:

- ☐ COPD with Asthma
- ☐ COPD without Asthma
- ☐ Asthma without COPD
- ☐ None of the above

End questions

BL179C

What is the patient's most recent FEV_1 result?

- ☐ >80%
- ☐ 40-49%
- ☐ 60-80%
- ☐ <40%
- ☐ 50-59%
- ☐ Don't know

FEV_1 = post-bronchodilator forced expiratory volume in one second

Has the patient experienced any COPD exacerbations in the past 12 months?

- ☐ Yes
- ☐ No

If 'yes', how many exacerbations has the patient experienced?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ ≥3

Current COPD (+/- asthma) medication/s:

Name & Form	Strength	Dose	Freq

☐ **No medication**

For patients taking:
1. LABA + LAMA *or*
2. LABA / ICS + LAMA
has the patient been ...

- ☐ treated with both agents since diagnosis of COPD?
- ☐ treated with one agent initially with the other added later?

SAND abstract number 248: Influenza risk factors and vaccination in general practice patients – 2016

Organisation collaborating for this study: AstraZeneca Pty Ltd (Australia).

Issues: Proportion of general practice patients with influenza (flu) infection risk factors; and for those at-risk, types of risk factors, awareness of eligibility for free flu vaccination. For all respondents: vaccination status for 2016 and for 2015; reasons for not vaccinating in 2015. Proportion diagnosed with influenza in prior 12 months.

Sample: 2,826 patients from 95 GPs; data collection period: 23/02/2016 – 28/03/2016.

Method: Detailed in the paper entitled *SAND Method 2015–16* on this website: <sydney.edu.au/medicine/fmrc/publications/sand-abstracts>.

Summary of results

The age and sex distributions of patients did not differ from that of all BEACH encounters 2015–16. Of the 2,826 respondents: 51.0% (95% CI: 46.4–55.6) (*n* = 1,441) had at least one risk factor for influenza (31.0% had one, 13.0% two, and 7.0% had three or more risk factors). The most common risk factors were: older age (35.5% were aged 65+ years), chronic respiratory condition (10.4%), diabetes (10.3%), chronic heart disease (8.9%), chronic neurological condition (2.9%), and Indigenous patients aged between 6 months and 5 years, or aged 15 years or more (1.9%).

For patients aged 15–64 years (*n* = 1,558), 27.7% (95% CI: 23.7–31.6) had at least one risk factor: 9.2% had a chronic respiratory condition, 7.3% diabetes, 2.8% chronic heart disease, and 2.8% had impaired immunity. For patients aged 65+ years (*n* = 976), 50.4% had at least one risk factor (in addition to risk associated with age): 21.0% had chronic heart disease, 17.9% had diabetes, and 13.3% had a chronic respiratory condition.

Risk factor status increased significantly with patient age, risk(s) being present in 9.0% of patients aged 0–14 years, increasing to 100.0% of patients aged 65+. There was no significant difference between risk factor status of males (52.6%) and females (49.8%).

Of 1,408 respondents with one or more risk factor(s), 92.0% were aware of the availability of free flu vaccinations through the National Immunisation Program. Awareness was significantly higher in older patients (95.8% of patients aged 65+ being aware) than among those less than 65 years (83.9%).

Of 2,703 respondents, 56.5% were either already vaccinated, or planned to be vaccinated, for the 2016 flu season. The proportion of respondents with influenza vaccination or planned vaccination rose significantly through each age group from the 25–44 age group upwards. Of 2,693, 50.4% had been vaccinated for the 2015 flu season. Of patients with at least one risk factor, 77.4% were vaccinated, and for those with no risk factors 20.2% were vaccinated.

Of 1,240 patients who were not vaccinated for the 2015 flu season, 1,149 gave 1,201 reasons for non-vaccination. Of these, 59.8% of patients reported they considered themselves at low risk and 14.1% stated ‘patient objections’ as the reason for not vaccinating. For 12.4%, the GP considered the patient ‘not at risk’. There were 286 patients who had at least one influenza risk factor but were not vaccinated. Of these patients, 268 provided reasons for not vaccinating, the most common were that they considered themselves low risk (49.6%) or they objected to an influenza vaccination (26.9%).

Of 2,679 respondents, 61 (2.3%, 95% CI: 1.4–3.1) had been diagnosed with influenza in the prior 12 months. The 2015 flu vaccination status was known for 2,568 respondents: ‘yes’ for 1,341; and ‘no’ for 1,227. Of those vaccinated, 35 (2.6%) had been diagnosed with influenza in the prior 12 months, and this did not significantly differ from the 26 (2.1%) of those not vaccinated.

The following page contains the recording form and instructions with which the data in this substudy were collected.

PLEASE READ CAREFULLY

The shaded section of the following forms asks questions about **INFLUENZA RISK FACTORS AND VACCINATION.**
Please complete these questions in addition to information about the encounter. *You may tear out this page as a guide to completing the shaded section of the following forms.*

INSTRUCTIONS

Answer these questions for **EACH** of the **next 30 PATIENTS in the order in which the patients are seen.**
Please **DO NOT select patients** to suit the topic being investigated.
Use your own knowledge, patient knowledge and your records as you see fit, in order to answer these questions.

Risk factors for influenza infection

Please use the tick boxes to indicate whether the patient has any of the listed **risk factors** or **indications** for **influenza** vaccination.

Please tick as many as apply.

Indications for vaccination include medical conditons that can lead to severe influenza. Examples of conditions included in each of the following categories are drawn from the Immunise Australia Program.

- **Chronic heart disease** includes: congestive heart failure, coronary artery disease, cyanotic congenital heart disease.
- **Chronic respiratory conditions** include: severe asthma (for which frequent hospitalisation is required); cystic fibrosis; bronchiectasis; suppurative lung disease; chronic obstructive pulmonary disease (COPD).
- **Impaired immunity** includes immunocompromising conditions (such as asplenia or splenic dysfunction, HIV infection) and immunosuppressive therapy.
- **Chronic neurological conditions** include: hereditary and degenerative CNS diseases (including multiple sclerosis); seizure disorders; spinal cord injuries; neuromuscular disorders.

If the patient **does not** have any of the listed risk factors/indications please tick the box labelled '**none of the above**'.

Immunise Australia Program

For patients who have **at least one of the listed risk factors** please ask whether (prior to today's visit) they were aware that **free influenza vaccine** is available through the **Immunise Australia Program**.

Influenza vaccination status

For the **2016 flu season**, please indicate whether the patient **has been** or **intends to be vaccinated**.

Please use the tick boxes to indicate whether this patient **received the influenza vaccine** for (or during) the **2015** flu season.

Patients who were NOT vaccinated

For patients who **did not** receive the **influenza vaccination** for the **2015 season,** please indicate the **reasons that the vaccine was not given**.

Influenza diagnosis

Please indicate whether the patient was **diagnosed** (either laboratory confirmed or clinical diagnosis) **with influenza** in the **past 12 months**.

Does the patient have any influenza infection risk factor(s)? *(Tick all that apply)*

- ☐ Aged ≥65 years
- ☐ Pregnant
- ☐ Indigenous aged 6 mths to <5 years or ≥15 years
- ☐ Chronic heart disease
- ☐ Diabetes
- ☐ Chronic metabolic disorders
- ☐ Chronic respiratory conditions
- ☐ Chronic renal failure
- ☐ Impaired immunity (e.g. HIV)
- ☐ Chronic neurological conditions
- ☐ Haematological disorders
- ☐ **None of the above**

BL180C

If 'yes', was the patient aware (prior to today's visit) that influenza vaccination is freely available through the Immunise Australia Program?

- ☐ Yes
- ☐ No

For the 2016 season is the patient vaccinated or intending to do so?

- ☐ Yes
- ☐ No
- ☐ Don't know

Did the patient receive influenza vaccination for / during the 2015 flu season?

- ☐ Yes
- ☐ No
- ☐ Don't know

If <u>not</u> vaccinated in 2015, the reason(s) was:

- ☐ GP assessed patient not at risk
- ☐ Cost to patient
- ☐ Patient objection
- ☐ Patient considers themselves low risk
- ☐ Other: _____ *(please specify)*

Was the patient diagnosed* with influenza in the past 12 months? *(*either laboratory confirmed or clinical diagnosis)*

- ☐ Yes
- ☐ No
- ☐ Don't know

References

1. Britt H, Miller GC, Bayram C, Henderson J, Valenti L, Harrison C et al. A decade of Australian general practice activity 2006–07 to 2015–16. General practice series no. 41. Sydney: Sydney University Press; 2016. Available at: http://purl.library.usyd.edu.au/sup/9781743325155
2. Australian Bureau of Statistics. Australian Demographic Statistics: Dec 2015. Cat. no. 3101.0. Canberra: ABS, 2016. Viewed 27 July 2016, http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0
3. Australian Government Department of Health. Annual Medicare Statistics – Financial Year 2007–08 to 2014–15 (Table 2 National Figures). Canberra: DoH, 2015. Viewed 24 June 2016, http://www.health.gov.au/internet/main/publishing.nsf/Content/Annual-Medicare-Statistics
4. Australian Government Department of Health. Quarterly Medicare Statistics – September Quarter 1984 to March Quarter 2016. Canberra: DoH, 2016. Viewed 22 June 2016, http://health.gov.au/internet/main/publishing.nsf/Content/Quarterly-Medicare-Statistics
5. Australian Institute of Health and Welfare. Health expenditure Australia 2013–14. Health and welfare expenditure series no. 54. AIHW Cat. no. HWE 63. Canberra: AIHW; 2015. Available at: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129552833
6. Australian Institute of Health and Welfare. Medical workforce 2014. Canberra: AIHW, 2015. Viewed 28 July 2016, http://www.aihw.gov.au/workforce/medical/additional/
7. Australian Government Department of Health. GP Workforce Statistics – 1984–85 to 2013–14. Canberra: DoH, 2014. Viewed 12 August 2016, http://www.health.gov.au/internet/main/publishing.nsf/Content/General+Practice+Statistics-1
8. Meza RA, Angelis M, Britt H, Miles DA, Seneta E, Bridges-Webb C. Development of sample size models for national general practice surveys. Aust J Public Health 1995;19(1):34–40.
9. Classification Committee of the World Organization of Family Doctors. ICPC-2: International Classification of Primary Care. 2nd ed. Oxford: Oxford University Press; 1998.
10. Robertson J, Fryer JL, O'Connell DL, Smith AJ, Henry DA. Limitations of Health Insurance Commission (HIC) data for deriving prescribing indicators. Med J Aust 2002;176(9):149–424.
11. Henderson J, Harrison C, Britt H. Indications for antidepressant medication use in Australian general practice patients. Aust N Z J Psychiatry 2010;44(9):865.
12. Britt H, Harrison C, Miller G. A misleading measure of GP prescribing of antibiotics for URTI. Number 2012-001. Sydney: FMRC, University of Sydney, 2012. Viewed 12 August 2016, http://sydney.edu.au/medicine/fmrc/beach/bytes/BEACH-Byte-2012-001.pdf
13. Australian Association of Pathology Practices Inc. & Britt H. An analysis of pathology test use in Australia. Canberra: AAPP, 2008. Viewed 21 August 2013, http://pathologyaustralia.com.au/wp-content/uploads/2013/03/DOD-paper-+-append.pdf
14. Bayram C & Valenti L. GP pathology ordering. In: Britt H & Miller GC (eds). General practice in Australia, health priorities and policies 1998 to 2008. General practice series no. 24. Cat. no. GEP 24. Canberra: Australian Institute of Health and Welfare, 2009;57–86. Available at: http://www.aihw.gov.au/publications/index.cfm/title/10721
15. Bayram CF. Evaluation of pathology ordering by general practitioners in Australia. PhD thesis. The University of Sydney, 2013. Available at: http://opac.library.usyd.edu.au:80/record=b4660233~S4
16. Studdert DM, Britt HC, Pan Y, Fahridin S, Bayram CF, Gurrin LC. Are rates of pathology test ordering higher in general practices co-located with pathology collection centres? Med J Aust 2010;193(2):114–19. Available at: https://www.mja.com.au/journal/2010/193/2/are-rates-pathology-test-ordering-higher-general-practices-co-located-pathology

17. Bayram C, Britt H, Miller G, Valenti L. Evidence-practice gap in GP pathology test ordering: a comparison of BEACH pathology data and recommended testing. Sydney: The University of Sydney, 2009. Viewed 27 June 2016, http://goo.gl/4tVhss
18. Britt H, Miller GC, Valenti L, Henderson J, Gordon J, Pollack AJ et al. Evaluation of imaging ordering by general practitioners in Australia 2002–03 to 2011–12. General practice series no. 35. Sydney: Sydney University Press; 2014. Available at: http://purl.library.usyd.edu.au/sup/9781743324134
19. Australian Bureau of Statistics. Australian Health Survey: First Results, 2011–12. Cat. no. 4364.0.55.001. Canberra: ABS, 2012. Viewed 1 December 2015. http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/1680ECA402368CCFCA257AC90015AA4E/$File/4364.0.55.001.pdf
20. Kerry SM & Bland JM. Sample size in cluster randomisation. BMJ 1998;316(7130):549.
21. Knox SA, Harrison CM, Britt HC, Henderson JV. Estimating prevalence of common chronic morbidities in Australia. Med J Aust 2008;189(2):66–70. Available at: http://www.mja.com.au/public/issues/189_02_210708/kno10474_fm.html
22. Britt HC, Harrison CM, Miller GC, Knox SA. Prevalence and patterns of multimorbidity in Australia. Med J Aust 2008;189(2):72–77. Available at: http://www.mja.com.au/public/issues/189_02_210708/bri10473_fm.html
23. Harrison C, Britt H, Miller G, Henderson J. Prevalence of chronic conditions in Australia. PLoS ONE 2013;8(7):e67494. Epub 2013 Jul 23. Available at: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0067494
24. Harrison C, Britt H, Miller G, Henderson J. Examining different measures of multimorbidity, using a large prospective cross-sectional study in Australian general practice. BMJ Open 2014;4(7):e004694.
25. Harrison C, Henderson J, Miller G, Britt H. The prevalence of complex multimorbidity in Australia. Aust N Z J Public Health 2016;40(3):239–44. Epub 2016 Mar 31. Available at: http://onlinelibrary.wiley.com/doi/10.1111/1753-6405.12509/epdf
26. Sayer GP, Britt H, Horn F, Bhasale A, McGeechan K, Charles J et al. Measures of health and health care delivery in general practice in Australia. General practice series no. 3. AIHW Cat. no. GEP3. Canberra: Australian Institute of Health and Welfare; 2000. Available at: http://www.aihw.gov.au/publications/index.cfm/title/5500
27. Britt H, Miller GC, Henderson J, Bayram C. Patient-based substudies from BEACH: abstracts and research tools 1999–2006. General practice series no. 20. AIHW Cat. no. GEP 20. Canberra: Australian Institute of Health and Welfare; 2007. Available at: http://www.aihw.gov.au/publication-detail/?id=6442468006
28. Britt H, Miller GC, Charles J, Bayram C, Pan Y, Henderson J et al. General practice activity in Australia 2006–07. General practice series no. 21. AIHW Cat. no. GEP 21. Canberra: Australian Institute of Health and Welfare; 2008. Available at: http://www.aihw.gov.au/publications/index.cfm/title/10574
29. Britt H, Miller GC, Charles J, Henderson J, Bayram C, Harrison C et al. General practice activity in Australia 2007–08. General practice series no. 22. AIHW Cat. no. GEP 22. Canberra: Australian Institute of Health and Welfare; 2008. Available at: http://www.aihw.gov.au/publications/index.cfm/title/10651
30. Britt H, Miller G, Charles J, Henderson J, Bayram C, Pan Y et al. General practice activity in Australia 2008–09. General practice series no. 25. AIHW Cat. no. GEP 25. Canberra: Australian Institute of Health and Welfare; 2009. Available at: http://www.aihw.gov.au/publication-detail/?id=6442468308
31. Britt H, Miller G, Charles J, Henderson J, Bayram C, Pan Y et al. General practice activity in Australia 2009–10. General practice series no. 27. AIHW Cat. no. GEP 27. Canberra: Australian Institute of Health and Welfare; 2010. Available at: http://www.aihw.gov.au/publication-detail/?id=6442472433

32. Britt H, Miller G, Charles J, Henderson J, Bayram C, Valenti L et al. General practice activity in Australia 2010–11. General practice series no. 29. Sydney: Sydney University Press; 2011. Available at: http://purl.library.usyd.edu.au/sup/9781920899868
33. Britt H, Miller GC, Henderson J, Charles J, Valenti L, Harrison C et al. General practice activity in Australia 2011–12. General practice series no. 31. Sydney: Sydney University Press; 2012. Available at: http://purl.library.usyd.edu.au/sup/9781743320181
34. Britt H, Miller GC, Henderson J, Bayram C, Valenti L, Harrison C et al. General practice activity in Australia 2012–13. General practice series no. 33. Sydney: Sydney University Press; 2013. Available at: http://purl.library.usyd.edu.au/sup/9781743323779
35. Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L et al. General practice activity in Australia 2013–14. General practice series no. 36. Sydney: Sydney University Press; 2014. Available at: http://purl.library.usyd.edu.au/sup/9781743324219
36. Britt H, Miller GC, Henderson J, Bayram C, Harrison C, Valenti L et al. General practice activity in Australia 2014–15. General practice series no. 38. Sydney: Sydney University Press; 2015. Available at: http://purl.library.usyd.edu.au/sup/9781743324523
37. SAS proprietary software release 9.3. Cary: SAS Institute Inc, 2011.
38. Wolfe R & Hanley J. If we're so different, why do we keep overlapping? When 1 plus 1 doesn't make 2. CMAJ 2002;166(1):65–66.
39. Cumming G & Finch S. Inference by eye: confidence intervals and how to read pictures of data. Am Psychol 2005;60(2):170–80.
40. Austin PC & Hux JE. A brief note on overlapping confidence intervals. J Vasc Surg 2002;36(1):194–95.
41. World Health Organization. Family of international classifications. Geneva: WHO, 2015. Viewed 2 August 2016, http://www.who.int/classifications/en/
42. Australian Institute of Health and Welfare. Australian family of health and related classifications matrix. Canberra: AIHW, 2005. Viewed 2 August 2016, www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442475388&libID=6442475369
43. Wonca International Classification Committee. ICPC-2 English 2-pager. Singapore: World Organization of Family Doctors, 1998. Viewed 2 August 2016, http://www.kith.no/upload/2705/ICPC-2-English.pdf
44. Britt H. A new coding tool for computerised clinical systems in primary care–ICPC plus. Aust Fam Physician 1997;26(Suppl 2):S79–S82.
45. Bridges-Webb C, Britt H, Miles DA, Neary S, Charles J, Traynor V. Morbidity and treatment in general practice in Australia 1990–1991. Med J Aust 1992;157(19 Oct Spec Sup):S1–S56.
46. Britt H, Miles DA, Bridges-Webb C, Neary S, Charles J, Traynor V. A comparison of country and metropolitan general practice. Aust Fam Physician 1994;23(6):1116–25.
47. O'Halloran J, Miller GC, Britt H. Defining chronic conditions for primary care with ICPC-2. Fam Pract 2004;21(4):381–86.
48. World Health Organization Collaborating Centre for Drug Statistics Methodology. Anatomical Therapeutic Chemical (ATC) classification index with Defined Daily Doses (DDDs). January 2016 ed. Oslo: WHO; 2016. Available at: http://www.whocc.no/
49. Britt H, Miller G, Bayram C. The quality of data on general practice – a discussion of BEACH reliability and validity. Aust Fam Physician 2007;36(1–2):36–40.
50. Driver B, Britt H, O'Toole B, Harris M, Bridges-Webb C, Neary S. How representative are patients in general practice morbidity surveys? Fam Pract 1991;8(3):261–68.
51. Britt H, Harris M, Driver B, Bridges-Webb C, O'Toole B, Neary S. Reasons for encounter and diagnosed health problems: convergence between doctors and patients. Fam Pract 1992;9(2):191–94.
52. Britt H. Reliability of central coding of patient reasons for encounter in general practice, using the International Classification of Primary Care. Journ Informatics in Prim Care 1998;May:3–7.

53. Britt H. A measure of the validity of the ICPC in the classification of reasons for encounter. Journ Informatics in Prim Care 1997;Nov:8–12.

54. Australian Bureau of Statistics. Australian Standard Geographical Classification. AIHW Cat. no. 1216.0. Canberra: ABS; 2008. Available at: www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1216.0Jul%202008?OpenDocument

55. Bayram C, Knox S, Miller G, Ng A, Britt H. Clinical activity of overseas-trained doctors practising in general practice in Australia. Aust Health Rev 2007;31(3):440–48.

56. Charles J, Britt H, Valenti L. The independent effect of age of general practitioner on clinical practice. Med J Aust 2006;185(2):105–9.

57. Harrison CM, Britt HC, Charles J. Sex of the GP – 20 years on. Med J Aust 2011;195(4): 192–96.

58. Britt H, Miller GC, Charles J, Henderson J, Bayram C, Valenti L et al. General practice activity in Australia 2000–01 to 2009–10: 10 year data tables. General practice series no. 28. AIHW Cat. no. GEP 28. Canberra: Australian Institute of Health and Welfare; 2010. Available at: http://www.aihw.gov.au/publication-detail/?id=6442472440

59. Britt H, Valenti L, Miller GC, Farmer J. Determinants of GP billing in Australia: content and time. Med J Aust 2004;181(2):100–4.

60. Britt HC, Valenti L, Miller GC. Determinants of consultation length in Australian general practice. Med J Aust 2005;183(2):68–71.

61. Britt H, Valenti L, Miller G. Debunking the myth of general practice as '6 minute medicine'. Number 2014-002. Sydney: FMRC, University of Sydney, 2014. Viewed 12 August 2016, http://sydney.edu.au/medicine/fmrc/beach/bytes/BEACH-Byte-2014-002.pdf

62. Charles J, Pan Y, Britt H. Trends in childhood illness and treatment in Australian general practice, 1971–2001. Med J Aust 2004;180(5):216–19. Available at: https://www.mja.com.au/system/files/issues/180_05_010304/cha10579_fm.pdf

63. Family Medicine Research Centre. ICPC-2 PLUS – Demonstrator. Sydney: FMRC, 2014. Viewed 12 August 2016, http://sydney.edu.au/medicine/fmrc/icpc-2-plus/demonstrator/index.php

64. World Health Organization Collaborating Centre for Drug Statistics Methodology. Anatomical Therapeutic Chemical (ATC) classification index with Defined Daily Doses (DDDs). Oslo: WHO, 2016. Viewed 11 May 2016, http://www.whocc.no/

65. Miller GC, Valenti L, Britt H, Bayram C. Drugs causing adverse events in patients aged 45 or older: a randomised survey of Australian general practice patients. BMJ Open 2013;3(10):e003701.

66. O'Halloran J, Harrison C, Britt H. The management of chronic problems. Aust Fam Physician 2008;37(9):697. Available at: http://www.racgp.org.au/afpbackissues/2008/200809/200809beach.pdf

67. Therapeutic Goods Administration. Scheduling of medicines and poisons. Canberra: TGA, 2016. Viewed 12 August 2016, http://www.tga.gov.au/industry/scheduling.htm

68. Britt H, Knox S, Miller GC. Changes in pathology ordering by general practitioners in Australia 1998–2001. General practice series no. 13. AIHW Cat. no. GEP 13. Canberra: Australian Institute of Health and Welfare; 2003. Available at: http://www.aihw.gov.au/publication-detail/?id=6442467531

69. Australian Government Department of Health. Medicare Benefits Schedule book. Canberra: DoH, 2016. Viewed 27 June 2016, http://www.health.gov.au/internet/mbsonline/publishing.nsf/Content/Downloads-201607

70. Britt H, Miller GC, Knox S. Imaging orders by general practitioners in Australia 1999–00. General practice series no 7. AIHW Cat. no. GEP 7. Canberra: Australian Institute of Health and Welfare; 2001. Available at: http://www.aihw.gov.au/publications/index.cfm/title/6949

71. Begg S, Vos T, Barker B, Stevenson C, Stanley L, Lopez AD. The burden of disease and injury in Australia 2003. AIHW Cat. no. PHE 82. Canberra: Australian Institute of Health and Welfare; 2007. Available at: http://www.aihw.gov.au/publication-detail/?id=6442467990

72. Mathers C, Vos T, Stevenson C. The burden of disease and injury in Australia. AIHW Cat. no. PHE 17. Canberra: AIHW; 1999. Available at: http://www.aihw.gov.au/publication-detail/?id=6442467088

73. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, ir-Rohani H et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380(9859):2224–60.

74. Australian Institute of Health and Welfare. Australia's Health 2014. Australia's health no. 14. AIHW Cat. no. AUS 178. Canberra: AIHW; 2014. Available at: http://www.aihw.gov.au/publication-detail/?id=60129547205

75. Organisation for Economic Co-operation and Development. OECD Health Data 2016. Risk Factors tables. Paris: OECD, 2016. Viewed 12 July 2016, http://www.oecd.org/els/health-systems/health-statistics.htm

76. Organisation for Economic Co-operation and Development. OECD Health Policy Overview 2015. Health Policy in Australia – Dec 2015. Paris: OECD, 2015. Viewed 12 July 2016, http://www.oecd.org/australia/Health-Policy-in-Australia-December-2015.pdf

77. Australian Bureau of Statistics. National Health Survey: First Results, 2014–15. Cat. no. 4364.0.55.001. Canberra: ABS, 2015. Viewed 28 June 2016, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4364.0.55.0012014-15?OpenDocument

78. National Health and Medical Research Council. Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia. Melbourne: NHMRC; 2013 May. Available at: https://www.nhmrc.gov.au/guidelines-publications/n57

79. World Health Organization. Body mass index (BMI). Geneva: WHO, 2015. Viewed 12 August 2016, http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

80. Australian Bureau of Statistics. National Nutrition Survey: nutrient intakes and physical measurements, Australia 1995. AIHW Cat. no. 4805.0. Canberra: ABS; 1998. Available at: http://www.abs.gov.au/ausstats/abs@.nsf/PrimaryMainFeatures/4805.0?OpenDocument

81. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ 2000;320(7244):1240–43.

82. Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body mass index cut offs to define thinness in children and adolescents: international survey. BMJ 2007;335(7612):194.

83. Ogden CL, Kuczmarski RJ, Flegal KM, Mei Z, Guo S, Wei R et al. Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version 54. Pediatrics 2002;109(1):45–60.

84. Valenti L. Overweight and obesity. In: Britt H & Miller GC (eds). General practice in Australia, health priorities and policies 1998 to 2008. General practice series no. 24. Cat. no. GEP 24. Canberra: Australian Institute of Health and Welfare, 2009;105–120. Available at: http://www.aihw.gov.au/publications/index.cfm/title/10721

85. Cretikos MA, Valenti L, Britt HC, Baur LA. General practice management of overweight and obesity in children and adolescents in Australia. Med Care 2008;46(11):1163–69.

86. Australian Institute of Health and Welfare. Australia's Health 2008. Biennial health report no. 11. AIHW Cat. no. AUS 99. Canberra: AIHW; 2008. Available at: http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442453674

87. Australian Institute of Health and Welfare. Australia's Health 2012. Australia's health no. 13. AIHW Cat. no. AUS 156. Canberra: AIHW; 2012. Available at: http://www.aihw.gov.au/publication-detail/?id=10737422172

88. Australian Institute of Health and Welfare. 2010 National Drug Strategy Household Survey report. Drug Statistics Series no. 25. AIHW Cat. no. PHE 145. Canberra: AIHW; 2011. Available at: http://www.aihw.gov.au/publication-detail/?id=32212254712

89. Ridolfo B & Stevenson C. The quantification of drug-caused mortality and morbidity in Australia, 1998. Drug Statistics Series. AIHW Cat. no. PHE 29. Canberra: AIHW; 2001. Available at: http://www.aihw.gov.au/publication-detail/?id=6442467226

90. National Health and Medical Research Council. Australian guidelines to reduce health risks from drinking alcohol. Canberra: Commonwealth of Australia; 2009. Available at: http://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/ds10-alcohol.pdf

91. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption-II. Addiction 1993;88(6):791–804.

92. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. Arch Intern Med 1998;158(16):1789–95.

93. Centre for Drug and Alcohol Studies. The alcohol use disorders identification test. 1993. Sydney, The University of Sydney.

94. Meneses-Gaya C, Zuardi AW, Loureiro SR, Hallak JE, Trzesniak C, de Azevedo Marques JM et al. Is the full version of the AUDIT really necessary? Study of the validity and internal construct of its abbreviated versions. Alcohol Clin Exp Res 2010;34(8):1417–24.

95. Proude EM, Britt H, Valenti L, Conigrave KM. The relationship between self-reported alcohol intake and the morbidities managed by GPs in Australia. BMC Fam Pract 2006;7:17.

96. Australian Bureau of Statistics. Australian demographic statistics: June 2014. Cat. no. 3101.0. Canberra: ABS, 2015. Viewed 6 October 2015, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202014?OpenDocument

97. Organisation for Economic Co-operation and Development. OECD Health Statistics 2014. How does Australia compare? Paris: OECD, 2014. Viewed 12 August 2016, http://www.oecd.org/els/health-systems/Briefing-Note-AUSTRALIA-2014.pdf

98. Australian Institute of Health and Welfare. Australia's Health 2010: the twelfth biennial health report of the Australian Institute of Health and Welfare. AIHW Cat. no. AUS 122. Canberra: AIHW; 2010. Available at: www.aihw.gov.au/publication-detail/?id=6442468376

99. Australian Government Department of Health. Health assessment for people aged 45 to 49 years who are at risk of developing chronic disease. Australian Government Department of Health, 2014. Viewed 8 August 2016, http://www.health.gov.au/internet/main/publishing.nsf/Content/mbsprimarycare_mbsitem701_703_705_707

100. Australian Government Department of Health. Health assessment for people aged 40 to 49 years with a high risk of developing type 2 diabetes. Australian Government Department of Health, 2012. Viewed 1 August 2016, http://www.health.gov.au/internet/main/publishing.nsf/Content/mbsprimarycare_mbsitem_type2diabetes

101. Australian Government Department of Health. A Healthier Medicare for chronically-ill patients. Canberra: DoH, 2016. Viewed 27 July 2016, http://www.health.gov.au/internet/ministers/publishing.nsf/Content/health-mediarel-yr2016-ley021.htm

Abbreviations

ABS	Australian Bureau of Statistics
ACE	angiotensin-converting enzyme
ACRRM	Australian College of Rural and Remote Medicine
ADE	adverse drug event
AHS	allied health service
AHW	Aboriginal health worker
AIHW	Australian Institute of Health and Welfare
ASGC	Australian Standard Geographical Classification
ATC	Anatomical Therapeutic Chemical (classification)
ATRA	angiotensin II receptor antagonist
BEACH	Bettering the Evaluation and Care of Health
BMI	body mass index
BP	blood pressure
CAPS	Coding Atlas for Pharmaceutical Substances
CHF	congestive heart failure
CI	confidence interval (in this report 95% CI is used)
CT	computerised tomography
DoH	Australian Government Department of Health
DVA	Australian Government Department of Veterans' Affairs
eGFR	estimated glomerular filtration rate
ENT	ear, nose and throat
HCV	hepatitis C virus
FACRRM	Fellow of the Australian College of Rural and Remote Medicine
FMRC	Family Medicine Research Centre
FRACGP	Fellow of the Royal Australian College of General Practitioners
FMRC	Family Medicine Research Centre
FTE	full-time equivalent
GDP	gross domestic product
GP	general practitioner
HbA1c	haemoglobin, type A1c

ICPC-2	International Classification of Primary Care – Version 2
ICPC-2 PLUS	a terminology classified according to ICPC-2
ICS	inhaled corticosteroid
INR	international normalised ratio
LABA	long-acting beta agonist
LCL	lower confidence limit
MBS	Medicare Benefits Schedule
M,C&S	microscopy, culture and sensitivity
NDSHS	National Drug Strategy Household Survey
NEC	not elsewhere classified
NESB	non-English-speaking background
NHMRC	National Health and Medical Research Council
NOS	not otherwise specified
OECD	Organisation for Economic Co-operation and Development
OTC	over-the-counter (medications advised for over-the-counter purchase)
Pap	Papanicolaou test
PBS	Pharmaceutical Benefits Scheme
PIP	practice incentive payments
PN	practice nurse
PPP	purchasing power parity
RACF	residential aged care facility
RACGP	Royal Australian College of General Practitioners
RFE	reason for encounter
SABA	short-acting beta agonist
SAND	Supplementary Analysis of Nominated Data
SAS	Statistical Analysis System
SIP	service incentive payments
UCL	upper confidence limit
URTI	upper respiratory tract infection
USD	United States Dollars
WHO	World Health Organization
Wonca	World Organization of Family Doctors

Symbols

χ^2	chi-square
—	not applicable
<	less than
>	more than
n	number
∓	rate is less than 0.05 per 100 encounters

Glossary

A1 Medicare items: See *MBS/DVA items: A1 Medicare items*.

Aboriginal: The patient identifies himself or herself as an Aboriginal person.

Activity level: The number of general practice A1 Medicare items claimed during the previous 3 months by a participating GP.

Allied health services: Clinical and other specialised health services provided in the management of patients by allied and other health professionals including physiotherapists, occupational therapists, dietitians, dentists and pharmacists.

Chapters (ICPC-2): The main divisions within ICPC-2. There are 17 chapters primarily representing the body systems.

Chronic problem: See *Diagnosis/problem: Chronic problem*.

Commonwealth concession card: An entitlement card provided by the Australian Government, which entitles the holder to reduced-cost medicines under the Pharmaceutical Benefits Scheme and some other concessions from state and local government authorities.

Complaint: A symptom or disorder expressed by the patient when seeking care.

Component (ICPC-2): In ICPC-2 there are seven components that act as a second axis across all chapters.

Co-located health service: a health service (for example, physiotherapist, psychologist etc.) located in the practice building or within 50 metres of the practice building, available on a daily or regular basis.

Co-operative after-hours arrangements: the normal after-hours arrangements for patient care provision is undertaken in co-operation with another practice(s).

Consultation: See *Encounter*.

Diagnosis/problem: A statement of the provider's understanding of a health problem presented by a patient, family or community. GPs are instructed to record at the most specific level possible from the information available at the time. It may be limited to the level of symptoms.

- *New problem:* The first presentation of a problem, including the first presentation of a recurrence of a previously resolved problem, but excluding the presentation of a problem first assessed by another provider.
- *Old problem:* A previously assessed problem that requires ongoing care, including follow-up for a problem or an initial presentation of a problem previously assessed by another provider.
- *Chronic problem:* A medical condition characterised by a combination of the following characteristics: duration that has lasted, or is expected to last, 6 months or more, a pattern of recurrence or deterioration, a poor prognosis, and consequences or sequelae that impact on an individual's quality of life. (*Source:* O'Halloran J, Miller GC, Britt H 2004. *Defining chronic conditions for primary care with ICPC-2*. Fam Pract 21(4):381–6).
- *Work-related problem:* Irrespective of the source of payment for the encounter, it is likely in the GP's view that the problem has resulted from work-related activity or workplace exposure, or that a pre-existing condition has been significantly exacerbated by work activity or workplace exposure.

Encounter (enc): Any professional interchange between a patient and a GP.

Indirect: Encounter where there is no face-to-face meeting between the patient and the GP but a service is provided (for example, prescription, referral).

Direct: Encounter where there is a face-to-face meeting of the patient and the GP. Direct encounters can be further divided into:

- *MBS/DVA-claimable:* Encounters for which GPs have recorded at least one MBS item number as claimable, where the conditions of use of the item require that the patient be present at the encounter.
- *Workers compensation:* Encounters paid by workers compensation insurance.
- *Other paid:* Encounters paid from another source (for example, state).

Full-time equivalent (FTE): A GP working 35–45 hours per week.

General practitioner (GP): A medical practitioner who provides primary comprehensive and continuing care to patients and their families within the community (*Source*: Royal Australian College of General Practitioners).

Generic medication: See *Medication: Generic*

GP consultation service items: See *MBS/DVA items: GP consultation service items*.

MBS/DVA items: MBS item numbers recorded as claimable for activities undertaken by GPs and staff under the supervision of GPs. In BEACH, an MBS item number may be funded by Medicare or by the Department of Veterans' Affairs (DVA).

- *A1 Medicare items:* Medicare 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.
- *GP consultation service items:* Includes GP services provided under the MBS professional services category including MBS items classed as A1, A2, A5, A6, A7, A14, A17, A18, A19, A20, A22, A23, A27, A30 and selected items provided by GPs classified in A11 and A15.
- *MBS/DVA item categories:* (Note: item numbers recorded in BEACH in earlier years which are no longer valid are mapped to the current MBS groups).
  - *Surgery consultations:* Identified by any of the following item numbers: short 3, 52, 5000, 5200; standard 23, 53, 5020, 5203; long 36, 54, 2143, 5040; prolonged 44, 57, 2195, 5060, 5208.
  - *Residential aged care facility:* Identified by any of the following item numbers: 20, 35, 43, 51, 92, 93, 95, 96, 5010, 5028, 5049, 5067, 5260, 5263, 5265, 5267.
  - *Home or institution visits (excluding residential aged care facilities):* Identified by any of the following item numbers: 4, 19, 24, 33, 37, 40, 47, 50, 58, 59, 60, 65, 87, 89, 90, 91, 503, 507, 5003, 5023, 5043, 5063, 5220, 5223, 5227, 5228.
  - *GP mental health care:* Identified by any of the following item numbers: 2700, 2701, 2702, 2704, 2705, 2710, 2712, 2713, 2715, 2717, 2721, 2723, 2725.
  - *Chronic disease management items:* Identified by any of the following item numbers: 720, 721, 722, 723, 724, 725, 726, 727, 729, 730, 731, 732.
  - *Health assessments:* Identified by any of the following item numbers: 700, 702, 703, 704, 705, 706, 707, 708, 709, 710, 712, 713, 714, 715, 717, 718, 719.
  - *Case conferences:* Identified by any of the following item numbers: 139, 734, 735, 736, 738, 739, 740, 742, 743, 744, 747, 750, 762, 765, 771, 773, 775, 778.
  - *Attendances associated with Practice Incentives Program payments:* Identified by any of the following item numbers: 2497, 2501, 2503, 2504, 2506, 2507, 2509, 2517, 2518, 2521, 2522, 2525, 2526, 2546, 2547, 2552, 2553, 2558, 2559, 2574, 2575, 2577, 2598, 2600, 2603, 2606, 2610, 2613, 2616, 2620, 2622, 2624, 2631, 2633, 2635, 2664, 2666, 2668, 2673, 2675, 2677, 2704, 2705.
  - *Practice nurse/Aboriginal health worker/allied health worker services:* Identified by any of the following item numbers: 711, 10950, 10951, 10960, 10966, 10970, 10986, 10987, 10988, 10989, 10993, 10994, 10995, 10996, 10997, 10998, 10999, 16400, 82210.
  - *Acupuncture:* Identified by any of the following item numbers: 173, 193, 195, 197, 199.

- *Diagnostic procedures and investigations:* Identified by item numbers: 11000–12533.
- *Therapeutic procedures:* Identified by item numbers: 13206–23042 (excluding 16400).
- *Surgical operations:* Identified by item numbers: 30001–52036.
- *Diagnostic imaging services:* Identified by item numbers: 55037–63000.
- *Pathology services:* Identified by item numbers: 65120–74991.

Medication:

- *Generic*: The generic name of a medication is its non-proprietary name, which describes the pharmaceutical substance(s) or active pharmaceutical ingredient(s).
- *GP-supplied:* The medication is provided directly to the patient by the GP at the encounter.
- *Over-the-counter (OTC):* Medication that the GP advises the patient to purchase OTC (a prescription is not required for the patient to obtain an OTC medication).
- *Prescribed:* Medications that are prescribed by the GP (that is, does not include medications that were GP-supplied or advised for over-the-counter purchase).

Medication status:

- *New:* The medication prescribed/provided at the encounter/advised is being used for the management of the problem for the first time.
- *Continued:* The medication prescribed/provided at the encounter/advised is a continuation or repeat of previous therapy for this problem.
- *Old*: See *Continued*.

Morbidity: Any departure, subjective or objective, from a state of physiological wellbeing. In this sense, sickness, illness and morbid conditions are synonymous.

Non-English speaking background: The patient reported that the primary language spoken at home is not English.

Patient status: The status of the patient to the practice.

- *New patient*: The patient has not been seen before in the practice.
- *Patient seen previously:* The patient has attended the practice before.

Problem managed: See *Diagnosis/problem*.

Provider: A person to whom a patient has access when contacting the healthcare system.

Reasons for encounter (RFEs): The subjective reasons given by the patient for seeing or contacting the general practitioner. These can be expressed in terms of symptoms, diagnoses or the need for a service.

Recognised GP: A medical practitioner who is:

- vocationally recognised under Section 3F of the *Health Insurance Act*, *or*
- a holder of the Fellowship of the Royal Australian College of General Practitioners who participates in, and meets the requirements for, quality assurance and continuing medical education as defined in the Royal Australian College of General Practitioners (RACGP) Quality Assurance and Continuing Medical Education Program, *or*
- undertaking an approved placement in general practice as part of a training program for general practice leading to the award of the Fellowship of the Royal Australian College of General Practitioners, or undertaking an approved placement in general practice as part of some other training program recognised by the RACGP as being of equivalent standard. (*Source:* Commonwealth Department of Health and Aged Care (DHAC) 2001. *Medicare Benefits Schedule book*. Canberra: DHAC).

Referral: The process by which the responsibility for part, or all, of the care of a patient is temporarily transferred to another health care provider. Only new referrals to specialists and allied health services, and for hospital and residential aged care facility admissions arising at a recorded encounter are included. Continuation referrals are not included. Multiple referrals can be recorded at any one encounter.

Repatriation Health Card: An entitlement card provided by the Department of Veterans' Affairs that entitles the holder to access a range of repatriation health care benefits, including access to prescription and other medications under the Pharmaceutical Benefits Scheme.

Rubric: The title of an individual code in ICPC-2.

Significant: This term is used to refer to a statistically significant result. Statistical significance is measured at the 95% confidence level in this report.

Torres Strait Islander: The patient identifies himself or herself as a Torres Strait Islander person.

Work-related problem: See *Diagnosis/problem*.

Appendices

Appendix 1: Example of a 2015–16 recording form

BEACH (Bettering the Evaluation And Care of Health) - Morbidity and Treatment Survey - National DOC ID

Encounter Number | Date of encounter ___/___/___ | Date of Birth ___/___/_ _ _ _ | Sex M ☐ F ☐ | Patient Postcode

START Time : AM / PM (please circle)

Patient Reasons for Encounter: 1. 2. 3.

	Yes	No
New Patient	☐	☐
Health Care/Benefits Card	☐	☐
Veterans Affairs Card	☐	☐
NESB	☐	☐
Aboriginal	☐	☐
Torres Strait Islander	☐	☐

PATIENT SEEN BY GP ☐
PATIENT NOT SEEN BY GP ☐
Medicare Item Nos: (if applicable) 1. ___ 2. ___ 3. ___
Home visit (not RACF) ☐
Workers comp paid ☐
Other paid ☐
No charge ☐

Diagnosis/ Problem ①: **Problem Status** New ☐ Old ☐

Drug Name AND Form for this problem	Strength of product	Dose	Frequency	No. of Rpts	OTC	GP Supply	Drug status New	Drug status Cont.
1.								
2.								
3.								
4.								

Procedures, other treatments, counselling this consult for this problem
1. Prac Nurse? ☐ 2. Prac Nurse? ☐

Diagnosis/ Problem ②: **Problem Status** New ☐ Old ☐

Drug Name AND Form for this problem	Strength of product	Dose	Frequency	No. of Rpts	OTC	GP Supply	Drug status New	Drug status Cont.
1.								
2.								
3.								
4.								

Procedures, other treatments, counselling this consult for this problem
1. Prac Nurse? ☐ 2. Prac Nurse? ☐

Diagnosis/ Problem ③: **Problem Status** New ☐ Old ☐

Drug Name AND Form for this problem	Strength of product	Dose	Frequency	No. of Rpts	OTC	GP Supply	Drug status New	Drug status Cont.
1.								
2.								
3.								
4.								

Procedures, other treatments, counselling this consult for this problem
1. Prac Nurse? ☐ 2. Prac Nurse? ☐

Diagnosis/ Problem ④: **Problem Status** New ☐ Old ☐

Drug Name AND Form for this problem	Strength of product	Dose	Frequency	No. of Rpts	OTC	GP Supply	Drug status New	Drug status Cont.
1.								
2.								
3.								
4.								

Procedures, other treatments, counselling this consult for this problem
1. Prac Nurse? ☐ 2. Prac Nurse? ☐

NEW REFERRALS, ADMISSIONS Problem(s)
1. ___ 1 2 3 4
2. ___ 1 2 3 4

IMAGING/Other tests Body site Problem(s)
1. ___ - ___ 1 2 3 4
2. ___ - ___ 1 2 3 4
3. ___ - ___ 1 2 3 4

PATHOLOGY Problem(s)
1. ___ 1 2 3 4
2. ___ 1 2 3 4
3. ___ 1 2 3 4

PATHOLOGY (cont) Problem(s)
4. ___ 1 2 3 4
5. ___ 1 2 3 4

Patient reported
Height: ___ cm
Weight: ___ kg

Approx. how many times has this patient seen any GP in the past 12 months (including today)? ___

To the patient if 18+: Which best describes your tobacco smoking status?
Smoke daily ☐
Smoke occasionally ☐
Previous smoker ☐
Never smoked ☐

To the patient if 18+: How often do you have a drink containing alcohol?
Never ☐
Monthly or less ☐
Once a week/fortnight ☐
2-3 times a week ☐
4+ times a week ☐

How many 'standard' drinks do you have on a typical day when you are drinking? ___

How often do you have 6 or more standard drinks on one occasion?
Never ☐
Less than monthly ☐
Monthly ☐
Weekly ☐
Daily or almost daily ☐

FINISH Time : AM / PM (please circle)

BA18

Appendix 2: GP characteristics questionnaire, 2015–16

THE UNIVERSITY OF SYDNEY

GP profile

Family Medicine Research Centre

Doctor Identification Number

Please answer the following questions ABOUT YOU

1. Sex ..... **Male / Female** *(Please circle)*

2. Age .....

3. How many years have you spent in general practice? .....

4. Country of graduation *(primary medical degree)*:

☐ Australia ☐ Other: *(specify)* _____

5. How many direct patient care hours do you work per week?

(Include hours of direct patient care, instructions, counselling etc and other services such as referrals, prescriptions, phone calls etc.) .....

6. Are you a GP Registrar *(i.e. in training)*? .... **Yes / No**

7. Do you hold FRACGP? ..... **Yes / No**

8. Do you hold FACRRM? ..... **Yes / No**

9. Do **YOU** use a computer at your major practice? ..... **Yes / No**

If '**yes**', which clinical software is used? *(specify)* _____

10. Over the past four weeks have you provided any patient care...

(a) in a residential aged care facility? ..... **Yes / No**

(b) as a salaried/sessional hospital medical officer? ..... **Yes / No**

11. At how many practice locations do you usually work, in a regular week .....

12. Did any of your BEACH consultations take place in an Aboriginal Community Controlled Health Service?

(Circle one option)

No 1

Yes - all 2

Yes - some (which dates?) _____ 3

Please answer the following questions ABOUT YOUR MAJOR PRACTICE

13. Is your major practice a teaching practice?

(Circle all that apply):

For undergraduates 1

For junior doctors 2

For GP registrars 3

No 4

14. Postcode of major practice? .....

15. Which Primary Health Network? _____

16. What was your Medicare Local? _____

17. Is the practice accredited? ..... **Yes / No**

18. How many individuals (ie. headcount) and how many full-time equivalents (FTE*) for each type of professional listed below?

**Each FTE is defined as working 35-45 hours per week e.g. 2 GPs each working 20 hours/wk is recorded as 2 individual GPs and 1 FTE; 1 practice nurse working 20 hours/wk is recorded as 1 individual and 0.5 FTE.*

	No. individuals	No. FTEs
(a) GPs (including yourself)		
(b) Practice nurses		

19. Health services located or available (on a daily or regular basis) at the practice site?

(Tick all that apply)	In the practice	Not in the practice, but in the building or within 50 metres
Physiotherapist	☐	☐
Psychologist	☐	☐
Dietitian	☐	☐
Podiatrist	☐	☐
Pathology collection centre/lab ..	☐	☐
Imaging	☐	☐
Diabetes educator	☐	☐
Specialist(s) *(specify)*: _____	☐	☐
_____	☐	☐
Other *(specify)*: _____	☐	☐
NONE	☐	☐

20. Normal after-hours arrangements?

(Circle all that apply)

Practice does its own 1

Co-operative with other practices 2

Deputising service 3

Other *(specify)* _____ 4

None 5

*Thank you for participating in the **BEACH PROGRAM.***

Please return this form with the completed BEACH pad.

FMRC, PO Box 533, Westmead Hospital, Wentworthville, 2145.

GP18 (V2) Ph: 02 9845 8151 fax: 02 9845 8155 email: beach@fmrc.org.au Web: sydney.edu.au/medicine/fmrc/

Appendix 3: Patient information card, 2015–16

THE UNIVERSITY OF SYDNEY

Family Medicine Research Centre

BEACH

INFORMATION FOR PATIENTS

The *BEACH* © Project

Today your doctor is taking part in a National Survey of general practice called *BEACH*© *(Bettering the Evaluation and Care of Health).* This study is being done by the Family Medicine Research Centre, University of Sydney.

Your Doctor will be recording information about each patient he/she sees (age, gender etc), the problems that you see the Doctor about and the treatments given to you. **There are no names on the forms so you cannot be identified.** The information about today's visit to the doctor will be one record in a set of 100,000 records collected in general practices across Australia every year.

This information will be used by researchers to describe what happens in general practice and to look at different aspects of health care; by government departments to help them plan for our future health; and by pharmaceutical companies to gain a picture of the problems being treated with the drugs they produce.

Remember: your name will not be on the form and no information will ever be released which could possibly let anyone know who you are. However, if you do not wish your doctor to record any unidentified information about you or your visit **please tell your Doctor as soon as you go in**. Such a decision will not affect the consultation with your doctor in any way.

SEE OVER FOR PROJECT DETAILS

(page 1 / 2)

FMRC, Acacia House, Westmead Hospital, PO Box 533,WENTWORTHVILLE, 2145.
Ph: 02 9845 8151 fax: 02 9845 8155 email: clare.bayram@sydney.edu.au Web: http://sydney.edu.au/medicine/fmrc/

BEACH © Program details

This program has been approved by the Ethics Committee of the University of Sydney. The data are being collected in accordance with the Privacy Act 1988 as amended.

Organisations contributing financially to the conduct of this study in 2015–2016 are:

- The Australian Government Department of Health
- AstraZeneca Pty Ltd (Australia)
- bioCSL (Australia) Pty Ltd
- Novartis Pharmaceuticals Australia Pty Ltd

BEACH is endorsed by the Royal Australian College of General Practitioners

BEACH is endorsed by the Australian Medical Association

AMA

FURTHER INFORMATION

Family Medicine Research Centre
The University of Sydney
Acacia House, Westmead Hospital
Westmead 2145

Phone: (02) 9845 8151
Fax: (02) 9845 8155
Email: clare.bayram@sydney.edu.au
Web: sydney.edu.au/medicine/fmrc/

Any person with concerns or complaints about the conduct of this research study can contact The Manager, Research Integrity and Ethics Administration, University of Sydney on +61 2 8627 8176 (Telephone); +61 2 8627 8177 (Facsimile); ro.humanethics@sydney.edu.au (Email).

(*page 2/2*)

Appendix 4: Code groups from ICPC-2 and ICPC-2 PLUS

Available at: <hdl.handle.net/2123/15514>.

Table A4.1: Code groups from ICPC-2 and ICPC-2 PLUS – reasons for encounter and problems managed

Table A4.2: Code groups from ICPC-2 and ICPC-2 PLUS – chronic problems

Table A4.3: Code groups from ICPC-2 and ICPC-2 PLUS – clinical treatments

Table A4.4: Code groups from ICPC-2 and ICPC-2 PLUS – procedures

Table A4.5: Code groups from ICPC-2 and ICPC-2 PLUS – clinical measurements

Table A4.6: Code groups from ICPC-2 and ICPC-2 PLUS – referrals

Table A4.7: Code groups from ICPC-2 and ICPC-2 PLUS – pathology test orders (MBS groups)

Table A4.8: Code groups from ICPC-2 and ICPC-2 PLUS – imaging test orders (MBS groups)

Appendix 5: Calculation methods for Table 14.1

Attending population weight

On the SAND recording form (see Appendix 1), there was a question asking the number of times the patient had seen a GP in the previous 12 months (including the current visit). An attending population weight was created by weighting each surveyed patient by their chance of being in our sample. The chance of being in our sample is based on how many times they had visited a GP in the previous year. A weight of X/(number of GP visits) was applied to each patient.

Management ratios

The management ratio was calculated by dividing the proportion of encounters at which the chronic condition was managed, by the prevalence of the condition among patients at general practice encounters.

Number of GP visits in previous 12 months

The average number of times patients aged 65+ with a certain chronic condition had seen a GP in the previous year was calculated using the attending population weight (described above).

Number of times condition was managed in general practice

The number of times a condition was managed in general practice was calculated by multiplying the management ratio by the average number of times patients with the selected chronic condition had visited a GP in the previous 12 months.

Population prevalence

Population prevalence was calculated by first applying the attending population weight to the data. A second weight was created so that when applied to the attending population weight, the proportion of surveyed patients in each age–sex group matched the proportion represented by that age–sex group in the Australian population.

The numerator of whether a patient had a specific chronic condition (1 = patient has chronic condition, 0 = patient does not have condition) was weighted by the proportion of people in that age–sex group that saw a GP at least once in the previous year. This adjusted the data for those who did not see a GP, who we assumed had not been diagnosed with that chronic condition.

Proportion of patients with a selected condition, who had 2 or more other chronic conditions

The proportion of people aged 65+ with a selected condition who had two or more other diagnosed chronic conditions was calculated using the attending population weight. This means that the results are representative of people in the population who have the selected diagnosed condition.

This book provides a summary of results from the 18th year of the University of Sydney's BEACH program, a continuous national study of general practice activity in Australia. The BEACH program closed in 2016, after 18 years of continuous data collection.

From April 2015 to March 2016, 965 general practitioners (GPs) recorded details of 96,500 GP–patient encounters, at which patients presented 149,084 reasons for encounter and 150,279 problems were managed. For an 'average' 100 problems managed, GPs recorded 66 medications (including 53 prescribed, 6 supplied to the patient and 7 advised for over-the-counter purchase), 11 procedures, 25 clinical treatments (advice and counselling), 6 referrals to specialists and 4 to allied health services, 31 orders for pathology tests and 7 for imaging tests.

A subsample study of measured risk factors in more than 31,000 patients suggests that in the adult (18 years and over) population who attended general practice at least once in 2015–16 the prevalence of obesity was 28%, overweight was 34%, daily smoking was 16%, and at-risk alcohol consumption was 25%. One in four people in the attending population had at least two of these risk factors.

This book also contains a feature chapter examining changes in the care of 'middle-aged' people (aged between 45 and 64 years) in general practice over 16 years 2000–01 to 2015–16.

SYDNEY UNIVERSITY PRESS
sydney.edu.au/sup

BEACH

ISBN: 978-1743325131

International Journal of
Environmental Research and Public Health

MDPI

Commentary

General Practice Statistics in Australia: Pushing a Round Peg into a Square Hole

Julie Gordon [1,*], Helena Britt [2], Graeme C. Miller [2], Joan Henderson [2], Anthony Scott [3] and Christopher Harrison [4]

1 WHO Collaborating Centre for Strengthening Rehabilitation Capacity in Health Systems, University of Sydney, Sydney, NSW 2006, Australia
2 Sydney School of Public Health, University of Sydney, Sydney, NSW 2006, Australia; helena.britt@sydney.edu.au (H.B.); graeme.miller@sydney.edu.au (G.C.M.); joan.henderson@sydney.edu.au (J.H.)
3 Melbourne Institute of Applied Economic and Social Research, University of Melbourne, Melbourne, VIC 3053, Australia; a.scott@unimelb.edu.au
4 Menzies Centre for Health Policy and Economics, Sydney School of Public Health, University of Sydney, Sydney, NSW 2006, Australia; christopher.harrison@sydney.edu.au
* Correspondence: julie.gordon@sydney.edu.au

Abstract: In Australia, general practice forms a core part of the health system, with general practitioners (GPs) having a gatekeeper role for patients to receive care from other health services. GPs manage the care of patients across their lifespan and have roles in preventive health care, chronic condition management, multimorbidity and population health. Most people in Australia see a GP once in any given year. Draft reforms have been released by the Australian Government that may change the model of general practice currently implemented in Australia. In order to quantify the impact and effectiveness of any implemented reforms in the future, reliable and valid data about general practice clinical activity over time, will be needed. In this context, this commentary outlines the historical and current approaches used to obtain general practice statistics in Australia and highlights the benefits and limitations of these approaches. The role of data generated from GP electronic health record extractions is discussed. A methodology to generate high quality statistics from Australian general practice in the future is presented.

Keywords: general practice; health services research; primary health care

Citation: Gordon, J.; Britt, H.; Miller, G.C.; Henderson, J.; Scott, A.; Harrison, C. General Practice Statistics in Australia: Pushing a Round Peg into a Square Hole. *Int. J. Environ. Res. Public Health* **2022**, *19*, 1912. https://doi.org/10.3390/ijerph19041912

Academic Editors: Richard Madden and Pentti Nieminen

Received: 15 December 2021
Accepted: 2 February 2022
Published: 9 February 2022

1. Introduction

General practice is the foundation of the Australian healthcare system, as general practitioners (GPs) are the gatekeepers for patient access to many other health services. Reliable data about GP clinical activity is needed for statistical analysis by primary care and public health researchers, those involved with health policy, health services planning and costing, GP educators, health consumers, and those involved in the development and production of health treatments and interventions. In this commentary article we will discuss the historical and current approaches used to obtain statistics in Australian general practice, highlight benefits and limitations in these approaches, and outline a proposed methodology to generate high quality statistics from general practice in the future.

2. Background

General practice forms a core part of the Australian healthcare system, often representing a patient's initial contact with the system. GPs in Australia manage patients across their lifespan, manage chronic health conditions and multimorbidity, and provide preventive healthcare. They also have a 'gatekeeper' role, providing referrals for patients to access other services including care from non-GP specialists, and subsidized care from allied

health professionals for patients with chronic conditions. Currently, patients are free to attend one or more GPs of their choice, and are not assigned to a particular GP or practice. While patients have this freedom, most attend the same practice for continuity of care ([1], Chapter 15). In Australia, general practices are usually private medical practices providing "comprehensive, coordinated and continuing medical care drawing on biomedical, psychological, social and environmental understandings of health" [2].

In 2019, there were over 37,000 GPs in Australia, working across 8147 general practices [3].

According to data from the World Bank, 86% of the Australian population lived in urban areas in 2020 [4], primarily along the East Coast. Accordingly, in 2019, approximately three-quarters (74.5%) of full-time equivalent GPs reported working in major cities [3]. In any one year, approximately 87% of the population see a GP, and on average, there were six GP visits per head of population in Australia in 2015–2016 [1].

In March 2021, Australia had a population of 25.7 million people [5]. Funding of health services in Australia is the responsibility of the federal (national) and state/territory (regional) governments. Spending on health totaled $197.7 billion (Australian) dollars in 2018–2019, equating to $7772 per head of population [6]. Health spending represented 10% of gross domestic product.

In 2018–2019 $65.5 billion was spent on primary health care [6], which incorporated general practice, allied and community health, and pharmacy (excluding Indigenous health care). General practice is primarily funded by the federal government on a 'fee for service' model, where GPs can charge any fee they wish, and patients receive a fixed subsidy according to the Medicare Benefits Schedule (MBS), a catalogue of medical services for which a rebate can be claimed from the government [7]. If the fee for a consultation or service provided is equal to the Medicare subsidy, then the consultation is 'bulk billed'. Around 87% of GP services are bulk-billed [3]. If not, then the patient pays an out-of-pocket cost decided by the GP. For patients with very high out-of-pocket costs for GP and non-GP specialist consultations, additional subsidies are provided through the Medicare Safety Net [8]. Medicare items for GP consultations are based on broad estimates of consultation length and complexity. Limited items are related to specific diseases or for specific population groups (e.g., annual health assessments for patients aged 75+ years, or chronic disease management plans for patients with diabetes). Other Medicare-rebatable services include pathology tests, imaging tests and procedures undertaken. A separate Pharmaceutical Benefits Scheme (PBS) provides public subsidies for most prescribed medications dispensed by pharmacists [9].

The important role of general practice within the wider healthcare system has been recognized for some time. White et al. introduced a framework in Britain in 1961 to depict the organization of health care, demonstrating that within a population of 1000 adults, 250 (or 25%) will consult a physician (i.e., a primary care doctor or GP) in any one month. Nine of these 250 patients seeking care will be hospitalized, and five referred to another physician for care [10]. The overall stability of this framework has been established over time [11,12]. The aim of generating statistics from general practice is therefore not only to understand clinical activity undertaken in this setting, but to understand the health of the population overall.

In August 2019, the Australian Government released 'Australia's long-term national health plan'. The plan contained four 'pillars' (focus areas), the first of which was to strengthen the role of primary health care in the Australian healthcare system [13]. Later that year, a Primary Healh Reform Steering Group was established, focusing on the development of a ten-year plan for primary health care [14]. The draft report for the 'Primary Health Care 10 Year Plan' was released in October 2021 for consultation. The draft reforms are wide-ranging, containing changes to the funding models used in general practice, methods of general practice care delivery, and the introduction of patient registration at a single GP practice. The need for data to guide policy and quality improvement is reinforced in the plan [15].

If the draft reforms are implemented, there will likely be a multitude of changes to the current model of general practice in Australia. The proposed introduction of patient registration at a GP practice might further the role of the GP as central to population health. High-quality evidence-based statistics are required, to establish a baseline dataset for current general practice care delivery, and to assess the impact and effectiveness of any implemented reforms. This presents a timely opportunity to review the current state of general practice statistics in Australia.

3. History of General Practice Statistics in Australia

A detailed history of general practice data collection and analysis in Australia has been described elsewhere [16]. The first general practice survey was conducted by Dr Clifford Jungfer (GP) and Dr John Last (epidemiologist) in 1959–1960, with support from the (then) Australian College of General Practitioners [17]. This was followed by a National Morbidity Survey in 1962 [18]. Meanwhile, Dr Kevin Cullen, a GP in the town of Busselton, Western Australia, began the Busselton Health Study, a longitudinal study of population groups within Busselton conducted between 1966 and 1981. The Busselton Health Study was based on repeated cross-sectional surveys comprising questionnaires and blood tests to investigate the health of the study population, and identify health indicators that predicted future disease [19].

The Australian General Practice Morbidity and Prescribing Survey was conducted from 1969 to 1974, started by the Royal Australian College of General Practitioners' research committee, and led by Dr Charles Bridges-Webb [20]. The methods used in this study became the foundation for subsequent surveys of general practice clinical activity, including the Australian Morbidity and Treatment Survey (1990–1991) [21] and the Bettering the Evaluation and Care of Health (BEACH) study (1998–2016) [1].

For 18 years, the BEACH study described the clinical activity undertaken by GPs in Australia [1]. In BEACH, 1000 randomly selected GPs were sampled in each year of the study. Each GP participant recorded de-identified data for about 100 consecutive patient encounters on structured paper forms. Data collected included some patient demographics (e.g., date of birth, patient sex, postcode, Indigeneity), the patients' reasons for encounter (up to three), problems managed at the encounter (up to 4), medications prescribed/supplied/advised for purchase, for each problem, other treatments provided for each problem (including procedures and clinical treatments, such as advice and counselling), and pathology and imaging requests for each problem. Importantly, each management action was explicitly linked to the problem for which that action was taken. More detailed methods for the BEACH study can be found elsewhere [1]. BEACH closed in 2016 due to the withdrawal of support from the federal government (both funding and loss of the random samples of GPs provided) and wider losses of research support from industry partners [16]. With a final database spanning 18 years and approximately 1.8 million GP–patient encounter records, BEACH data were used to investigate the problems managed by GPs, how GPs managed these problems during consultations, and how the quality of care provided by GPs compared to evidence-based guidelines. BEACH data also identified changes in general practice clinical activity over time [22] and provided evidence about numerous policy areas, including time spent on patient care not able to be claimed through the MBS [23], the potential cost of freezing MBS item rebates [24] and (using length of consultation data) disproved statements that GPs were providing so-called 'six minute medicine' [25]. It was widely recognized that the closure of BEACH created a gap in data available about general practice [26]. Irving et al., in their investigation of primary care physician consultation time, presented a rather thorough international comparison of general practice data collection methods through their systematic review of 67 countries, and concluded that the Australian BEACH study "represents the gold standard for consistent reporting" [27].

The end of BEACH coincided with the closure of a number of other sources of data about general practice in Australia. Government funding was withdrawn from the Aus-

tralian Primary Health Care Research Institute in 2015 [28]. The Medicine in Australia: Balancing Employment and Life (MABEL) study, a longitudinal study about the medical workforce, ended in 2019, after 11 waves of data collection. This study provided numerous insights on access to medical care from between 3000 and 4000 GPs, followed up each year, including the drivers of hours worked, job satisfaction, and factors influencing recruitment and retention in rural areas [29]. The Australian Government's Medical Research Future Fund, established to provide grants for health and medical research, is reported to allocate less than 1% of total funding to primary care research [30]. Currently, many gaps exist in the statistics available from general practice, both in terms of the data collected and the research conducted [31].

4. Current Status of General Practice Clinical Activity Data

Limited administrative data are available about general practice from the MBS and the PBS. The MBS has records of the consultation items claimed by GPs from Government, but these provide very limited understanding of the clinical content of the consultation or the characteristics of the GPs. Similarly, the PBS contains data about subsidized medications dispensed by pharmacies, but does not include data about the clinical indication (i.e., symptom or diagnosis) for which the medication was prescribed. To obtain data about the clinical content of GP consultations, we need to look elsewhere.

General practice was one of the early adopters of computerized clinical records, with government incentives to use computers available as early as 1998 [32]. Computerization began in the early 1990s, and some of the early systems developed (e.g., Medical Director) are still commonly used today [33]. There are now at least eight brands of electronic health records (EHRs) currently used in Australian general practice [33]. According to BEACH data, in 2014–2015, 97.5 % of Australian GPs reported that they used a computer for one or more purposes. However, only 70.7% used paperless medical records while 25.5% used hybrid (paper and electronic) records [22]. The MABEL survey in 2018 also asked about GPs' use of digital technology for a range of tasks, and found (for example) almost 90% of GPs using digital technology to view imaging pathology and results [34]. These data demonstrate that while GPs have a high uptake of computerized medical records and digital technologies, some still rely on paper for some activities.

While the BEACH study was conducted on paper, some GPs said they would have preferred to be able to download data from their practice electronic health records (EHRs) to be used in the study. There were two primary reasons that structured paper forms were used in BEACH. First, to facilitate the linkages between the problems managed and all management actions provided for each problem. The problem–management linkage in BEACH ensured the GP specifically linked the prescription of a medication to the problem for which it was prescribed. It remains extremely difficult, if not impossible, to obtain these linkages from EHR data. This has led some researchers, using GP EHR data, to secondarily link each medication to a problem in the record on the basis of 'probability'. However, medications will often have multiple possible indications, let alone other off-label uses, making it difficult to know what health problem it is treating, and making matching by assumption highly unreliable. Second, BEACH was a study of GP clinical activity. The structured paper forms were inherently transportable, so that GPs who worked in multiple practices could take the forms between practices, or to home visits or nursing home visits. Secondary data entry by trained clinical coders, while time consuming and costly, facilitated consistent coding of the data to improve data quality.

In the absence of BEACH data since 2016, statistics from general practice have become focused on data extracted from EHRs. There are numerous research programs in Australia that rely on de-identified data extracted from GP EHRs, including:

(1) MedicineInsight (NPS MedicineWise);
(2) Data for Decisions (University of Melbourne);
(3) Primary Health Insights (led by WA Primary Health Alliance).

Data extraction from EHRs may be as basic as a simple export tool. More complex extraction tools have been developed specifically for this purpose [35], for example GRHANITE (University of Melbourne) [36], the CAT4 tool (Pen Computing) [37] and POLAR GP [38]. These tools can be used at multiple levels—for clinical audit or quality improvement activities at the practice, or by the local health region (called Primary Health Networks or PHNs in Australia), or to provide data to research programs at a wider level.

5. The Use of EHR Data for Research and Statistics

The automated extraction of data already collected during the clinical patient encounter creates a database of 'passive' data that can be used for statistics and research. While the primary purpose of data collection in an EHR is for patient care, making these data available for research and statistics minimizes the effort for individual GPs (who are often poor in time [39,40]) to participate in studies for multiple research groups. However, organizing and performing data extraction does involve time and effort for the practice. GPs report that it is often practice staff who undertake these activities [40], so the process is not entirely automated and does have a cost, although this is not always perceived as a barrier [41].

Passively collected data creates large volumes of data that can be interrogated in many ways. This provides greater scope to examine the management of rare phenomena. Theoretically, for patients who regularly attend the same practice, EHR data extraction allows for the longitudinal analysis of a patient's journey over time, providing the potential to assess medical interventions and long-term health outcomes. This is limited though, if patients attend multiple practices (e.g., while travelling or for convenience) or change practices for any reason, resulting in incomplete data.

5.1. Variability in EHR Design

Interoperability of data requires standard approaches to data design structures, data field names and their associated definitions, and the coding and classification of relevant data fields. Standardization is required to enable data to be combined from different EHRs for clinical audits and research, and to facilitate the transfer of patient care between different healthcare providers (e.g., referrals). All of the GP EHRs used in Australia have been developed independently, which limits such interoperability and the ability to generate meaningful data from general practice EHRs, both for clinical and statistical purposes [33,35].

There are differences in the underlying designs of the EHR database structures, including the data field names, their definitions, and how data fields are or are not linked. There are also vast inconsistencies in the use of clinical classifications and terminologies, including the type of clinical terminology used (e.g., termsets developed by individual EHR developers, ICPC-2 PLUS [42] or SNOMED CT-AU [43]). In most EHRs, clinicians can choose whether to enter a term from one of these termsets or to enter free text [33]. As a result, most EHR research databases extract data from only some of the available EHRs, limiting the representativeness of the data. For example, MedicineInsight extracts data from the two most commonly used EHRs [44], each of which uses a different coding system.

5.2. Data Completeness

The quality of research and statistics is only ever as good as the quality of the data contained in the record from which the data are extracted. Data accuracy in EHRs has been found to be variable [35,41], which is likely to impact on research quality. In one recent Australian study, approximately 13% of probable cases did not have a coded diagnosis, and were identified through the presence of one or more other diabetes management indicators [45].

Bailie et al. (2015) identified difficulties in calculating denominators in patient data extracted from EHRs. Numerous reasons were given, including incomplete data entry, differing requirements and compatibility between EHRs and data extraction tools, and

differences in the definition used for active or regular patients. The authors concluded that the inconsistencies identified limited the usefulness and reliability of the EHR data [46].

5.3. The Medical Record as an 'Aide Memoir'

The primary purpose of the EHR is to capture data that relates to the clinical care of the patient, not to obtain data for research purposes [47]. Henderson et al. (2019) suggest that time-poor GPs may only enter the data they regard as important for patient care, which may not always reflect the data that are important for research. This limits the capability of using EHR data for research purposes [45].

The medical record has long been regarded as an 'aide memoir', or memory aid, rather than as a complete record of the patient's care. Even with the advent of EHRs, this association has continued. In a benchmarking study that examined the prevalence of diabetes using BEACH data and extracted data from one Australian EHR, the prevalence of diabetes was lower when using the extracted EHR data from the 'diagnosis' data element. However, the authors found that they could obtain a comparable prevalence estimate by identifying proxies that indicate the presence of diabetes (e.g., free text searches for diabetes in other parts of the record, medications used to treat diabetes, use of MBS item numbers only used in relation to diabetes). Importantly, the authors noted that this approach would be less reliable for other clinical conditions where proxy measures may not work [45]. Interestingly, MedicineInsight does not extract free text data, as it may contain identifiable information that could compromise privacy [44].

5.4. Privacy and Information Protection

The extraction of data from EHRs for statistical and research purposes usually involves the transfer of the exported patient data to a third party (e.g., government department or University researcher). Concerns have arisen in Australia about patient privacy and information protection [35,40,41]. The removal of information from extracted data that would identify a patient has been highlighted as being of primary importance to researchers [35,41,48], GPs [40,41] and other practice staff [41]. The need for independent governance oversight of programs that involve extracted EHR data has also been emphasized [35,48].

At present, most data extraction from general practice EHRs involves the whole of practice data, where data are extracted about all patient encounters [44]. Concerns may arise if individual GPs within a practice are not willing to have data about their clinical activity included in a download, or when patients do not give permission for their data to be downloaded.

6. A Fresh Approach

We propose a new approach to improve the production of high-quality data about general practice clinical activity. This proposal is based on the following principles:

(1) Data from general practice can provide an excellent overview of the health of the population overall;
(2) Using the GP as an 'expert interviewer' to curate data can facilitate data with higher levels of accuracy than patient self-report;
(3) It is not necessary to collect data about all the patients, all the time. The BEACH study demonstrated that the production of structured data, about a sample of patients, can generate high-quality statistics from general practice for use in policy planning, education, and research;
(4) The sample of patients must be representative of the patient population to ensure validity and reliability;
(5) Data need to be longitudinal for the investigation of outcomes of care, including care provided by other health services (e.g., specialists, hospitals);
(6) The capacity to review the patient's experience with the health system overall, through linking general practice data to that from other health agencies, is encouraged.

Building on the structure of the BEACH interface for active data collection, we propose developing a hybrid active + passive data collection based on data extraction from EHRs with subsequent data curation from GPs to review the quality of extracted data and complete gaps in the dataset. A specialized data extraction tool would be required to extract relevant data from the GP EHR. To circumvent problems experienced with current EHR data extractions, the GP would curate the data for completeness and validity.

We propose that two data templates are required:

(1) A health summary template where the GP extracts a health summary from the EHR (similar to the patient summary currently contained in the EHR), followed by a 'check and curate' process, in which the GP reviews the accuracy and completeness of the data extracted. For example, is the patient's problem list accurate? Are medications listed that the patient no longer takes, or are there over-the-counter medications taken regularly that should be added? There are also additional data elements not currently included in GP EHRs that could be captured in this process. For example, capture of data about social determinants of health (e.g., education level, household income) would contribute to a greater understanding of a patient's health and related health outcomes;

(2) An encounter summary template where the GP extracts and curates data about an individual GP–patient encounter. This data extraction would be based on data elements that were collected in BEACH using a problem-oriented structure. The GP would curate the data by completing areas within the template that are missing and add linkages between problems managed and their treatments.

For each of these, minimum datasets based on a problem-oriented record structure with in-built coding and classification systems would be required for the purposes of data extraction, encryption and transfer to researchers, and subsequent data analysis.

Initially, these could be used to provide cross-sectional data from a representative sample of patients who attend general practice. A second stage of research would involve use of the tool as the basis for longitudinal data collection, whereby a sample of patients are recruited to the study and their data are extracted and curated at every visit. The addition of data about other health services received between GP visits (e.g., specialist, hospital or allied health visits), added and curated by the GP, would enhance knowledge about patients' broader experiences with the health system.

The strength of this approach is the focus placed on the importance of record structures, data linkages, coding and classification systems, and in the general application of standards required for the success of the model.

This approach will improve the understanding of morbidity and management within the general practice population and provide baseline data for further research and evaluation examining interventions to improve quality of care for general practice patients. It has some utility for use in GP clinical audits and quality assurance.

7. Conclusions

The Primary Health Care Reforms currently under consideration reference the 'quadruple aim' of health care, improving: (1) people's experiences with health care; (2) population health; (3) cost-efficiency of the health system; and (4) work life for healthcare workers [49]. The first three of these are quantifiable measures that rely on the availability of relevant data, and statistical analysis of these data, to assess the effectiveness of any reforms implemented to achieve these aims.

There is a reliance on data currently contained in GP EHRs to answer these questions, as shown in the reform policy and in initiatives such as the Australian Institute of Health and Welfare's Primary Health Care Data Asset. Current forms of data extraction from EHRs might be economically preferable and can answer some questions, but they cannot answer all of them. The temptation to use these datasets may equate to 'trying to fit a square peg into a round hole', an idiom that implies a solution that is unfit for purpose. Rather than accepting or ignoring the limitations of EHR data that currently exist, why not

be aspirational? How can we achieve better statistics from general practice that are able to inform both the patient and provider experience, and can be used for system planning?

COVID-19 has changed the way general practice services are conducted in Australia. The availability [50] and use [51] of telehealth services represents a dramatic shift in the way general practice services are provided to the public. However, there are little data available about how COVID-19 has changed the clinical activity undertaken by GPs and the quality of care provided through telehealth. Changes to the GP workforce resulting from COVID-19, and the future intentions of the GP workforce may have also been impacted by the pandemic, but with little data available it is impossible to quantify these. The approach presented in this paper for improving clinical activity data should be complemented by reinvestment in longitudinal data about the GP workforce, lost by the cessation of the MABEL study.

The approach to general practice data outlined in this paper may not answer every question that could be asked about general practice, but it would go a long way in overcoming the current deficiencies, and would produce national, valid, reliable statistics from Australian general practice.

Author Contributions: Conceptualization, J.G., H.B., G.C.M., J.H. and C.H.; investigation, J.G., H.B., G.C.M., J.H., A.S. and C.H.; writing—original draft, J.G., H.B. and G.C.M.; writing—review and editing, J.G., H.B., G.C.M., J.H., A.S. and C.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Britt, H.; Miller, G.C.; Henderson, J.; Bayram, C.; Harrison, C.; Valenti, L.; Pan, Y.; Charles, J.; Pollack, A.J.; Wong, C. *General Practice Activity in Australia 2015–16*; Sydney University Press: Sydney, Australia, 2016.
2. Royal Australian College of General Practitioners. General Practice Training Terms and Definitions. Available online: https://www.racgp.org.au/education/gps/supervisors-and-examiners/supervising-medical-students/definitions (accessed on 18 January 2022).
3. Australian Government Productivity Commission. Report on Government Services 2021: 10 Primary and Community Health. Available online: https://www.pc.gov.au/research/ongoing/report-on-government-services/2021/health/primary-and-community-health (accessed on 10 November 2021).
4. The World Bank. Urban Population (% of Total Population)-Australia. Available online: https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=AU (accessed on 10 November 2021).
5. Australian Bureau of Statistics. National, State and Territory Population. Available online: https://www.abs.gov.au/statistics/people/population/national-state-and-territory-population/mar-2021 (accessed on 9 November 2021).
6. Australian Institute of Health and Welfare. *Health Expenditure Australia 2018–19. Health and Welfare Expenditure Series*; No.66. Cat. No. HWE 80; AIHW: Canberra, Australia, 2020.
7. Australian Government Department of Health. MBS Online 04/21. Available online: http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Home (accessed on 20 September 2020).
8. Australian Government-Services Australia. Medicare Safety Nets. Available online: https://www.servicesaustralia.gov.au/medicare-safety-nets (accessed on 13 December 2021).
9. Pearson, S.-A.; Pratt, N.; de Oliveira Costa, J.; Zoega, H.; Laba, T.-L.; Etherton-Beer, C.; Sanfilippo, F.M.; Morgan, A.; Kalisch Ellett, L.; Bruno, C. Generating Real-World Evidence on the Quality Use, Benefits and Safety of Medicines in Australia: History, Challenges and a Roadmap for the Future. *Int. J. Environ. Res. Public Health* **2021**, *18*, 13345. [CrossRef] [PubMed]
10. White, K.L.; Williams, T.F.; Greenberg, B.G. The ecology of medical care. 1961. *Bull. N. Y. Acad. Med.* **1996**, *73*, 187. [PubMed]
11. Green, L.A.; Fryer, G.E., Jr.; Yawn, B.P.; Lanier, D.; Dovey, S.M. The Ecology of Medical Care Revisited. *N. Engl. J. Med.* **2001**, *344*, 2021–2025. Available online: https://10.1056/NEJM200106283442611 (accessed on 15 November 2021). [CrossRef] [PubMed]
12. Johansen, M.E.; Kircher, S.M.; Huerta, T.R. Reexamining the ecology of medical care. *N. Engl. J. Med.* **2016**, *374*, 495–496. [CrossRef]

13. Australian Government Department of Health. *Australia's Long Term National Health Plan to Build the World's Best Health System*; Department of Health: Canberra, Australia, 2019.
14. Australian Government Department of Health. Primary Health Care Reform. Available online: https://www1.health.gov.au/internet/main/publishing.nsf/Content/primary-health-care-reform (accessed on 14 November 2021).
15. Australian Government Department of Health. *Consultation Draft-Future Focused Primary Health Care: Australia's Primary Health Care 10 Year Plan 2022–2032*; Department of Health: Canberra, Australia, 2021.
16. Britt, H.; Miller, G.C. Measuring general practice activity in Australia: A brief history. *Aust. Fam. Physician* **2017**, *46*, 343–345.
17. Jungfer, C.; Last, J. Clinical performance in Australian general practice. *Med. Care* **1964**, *2*, 71–83. [CrossRef]
18. National Health and Medical Research Council. *Report on a National Morbidity Survey Part 1*; NHMRC: Canberra, Australia, 1966.
19. Busselton Population Medical Research Institute. Busselton Health Study-History. Available online: http://bpmri.org.au/about-us/history/busselton-health-study-history.html (accessed on 15 November 2021).
20. Bridges-Webb, C. The Australian general practice morbidity and prescribing survey, 1969 to 1974. *Med. J. Aust.* **1976**, *2*, 1–28.
21. Bridges-Webb, C.; Britt, H.; Miles, D.; Neary, S.; Charles, J. Morbidity and treatment in general practice in Australia 1990–1991. *Med. J. Aust.* **1992**, *157*, S1–S56. [CrossRef]
22. Britt, H.; Miller, G.C.; Bayram, C.; Henderson, J.; Valenti, L.; Harrison, C.; Pan, Y.; Charles, J.; Pollack, A.J.; Chambers, T. *A Decade of Australian General Practice Activity 2006–07 to 2015–16*; Sydney University Press: Sydney, Australia, 2016.
23. Henderson, J.; Valenti, L.A.; Britt, H.C.; Bayram, C.; Wong, C.; Harrison, C.; Pollack, A.J.; Gordon, J.; Miller, G.C. Estimating non-billable time in Australian general practice. *Med. J. Aust.* **2016**, *205*, 79–83. [CrossRef]
24. Harrison, C.; Bayram, C.; Miller, G.C.; Britt, H.C. The cost of freezing general practice. *Med. J. Aust.* **2015**, *202*, 313–316. [CrossRef]
25. Britt, H.; Valenti, L.; Miller, G. Byte from BEACH. No: 2014; 2. Debunking the Myth that General Practice is '6 Minute Medicine'. Available online: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.668.7183&rep=rep1&type=pdf (accessed on 15 November 2021).
26. Australian Institute of Health and Welfare. *Developing a National Primary Health Care Data Asset: Consultation Report*; Cat. No. PHC 1; AIHW: Canberra, Australia, 2019.
27. Irving, G.; Neves, A.L.; Dambha-Miller, H.; Oishi, A.; Tagashira, H.; Verho, A.; Holden, J. International variations in primary care physician consultation time: A systematic review of 67 countries. *BMJ Open* **2017**, *7*, e017902. [CrossRef] [PubMed]
28. Winzenberg, T.M.; Gill, G.F. Prioritising general practice research. *Med. J. Aust.* **2016**, *205*, 55–57. [CrossRef] [PubMed]
29. Russell, G.M.; McGrail, M.R.; O'Sullivan, B.; Scott, A. Improving knowledge and data about the medical workforce underpins healthy communities and doctors. *Med. J. Aust.* **2021**, *214*, 252–254.e1. [CrossRef]
30. Hendrie, D. New Wave of GP-Researchers Set to Tackle Vital Questions. Available online: https://www1.racgp.org.au/newsgp/racgp/new-wave-of-gp-researchers-set-to-tackle-vital-que (accessed on 10 December 2021).
31. Tran, B.; Straka, P.; Falster, M.O.; Douglas, K.A.; Britz, T.; Jorm, L.R. Overcoming the data drought: Exploring general practice in Australia by network analysis of big data. *Med. J. Aust.* **2018**, *209*, 68–73. [CrossRef]
32. Commonwealth Department of Health and Aged Care. *General Practice in Australia: 2000*; DHAC: Canberra, Australia, 2000.
33. Gordon, J.; Miller, G.; Britt, H. Reality Check-Reliable National Data from General Practice Electronic Health Records. Available online: https://ahha.asn.au/publication/issue-briefs/deeble-institute-issues-brief-no-18-reality-check-reliable-national-data (accessed on 29 August 2021).
34. Zaresani, A.; Scott, A. Does digital health technology improve physicians' job satisfaction and work–life balance? A cross-sectional national survey and regression analysis using an instrumental variable. *BMJ Open* **2020**, *10*, e041690. [CrossRef] [PubMed]
35. Youens, D.; Moorin, R.; Harrison, A.; Varhol, R.; Robinson, S.; Brooks, C.; Boyd, J. Using general practice clinical information system data for research: The case in Australia. *Int J Popul Data Sci.* **2020**, *5*, 1099. [CrossRef]
36. The University of Melbourne. GRHANITE (TM) Health Informatics Unit. Available online: https://grhanite.unimelb.edu.au/ (accessed on 13 December 2021).
37. PENCS. CAT4. Available online: https://www.pencs.com.au/products/cat4/ (accessed on 13 December 2021).
38. POLAR. POLAR. Cloud-Based Clinical Intelligence. Available online: https://polargp.org.au/ (accessed on 13 December 2021).
39. Brodaty, H.; Gibson, L.H.; Waine, M.L.; Shell, A.M.; Lilian, R.; Pond, C.D. Research in general practice: A survey of incentives and disincentives for research participation. *Ment. Health Fam. Med.* **2013**, *10*, 163. [PubMed]
40. Hodgkins, A.J.; Mullan, J.; Mayne, D.J.; Boyages, C.S.; Bonney, A. Australian general practitioners' attitudes to the extraction of research data from electronic health records. *Aust. J. Gen. Pract.* **2020**, *49*, 145–150. [CrossRef]
41. Monaghan, T.; Manski-Nankervis, J.-A.; Canaway, R. Big data or big risk: General practitioner, practice nurse and practice manager attitudes to providing de-identified patient health data from electronic medical records to researchers. *Aust. J. Prim. Health* **2021**, *26*, 466–471. [CrossRef]
42. The University of Sydney. ICPC-2 PLUS. Available online: https://www.sydney.edu.au/medicine-health/our-research/research-centres/who-collaborating-centre-for-strengthening-rehabilitation-capacity-in-health-systems/classifications-and-terminologies/icpc-2-plus.html (accessed on 13 December 2021).
43. Australian Digital Health Agency. National Clinical Terminology Service. SNOMED CT-AU. Available online: https://www.healthterminologies.gov.au/learn/clinical-terminology/snomed-ct-au/ (accessed on 13 December 2021).

44. Busingye, D.; Gianacas, C.; Pollack, A.; Chidwick, K.; Merrifield, A.; Norman, S.; Mullin, B.; Hayhurst, R.; Blogg, S.; Havard, A. Data Resource Profile: MedicineInsight, an Australian national primary health care database. *Int. J. Epidemiol.* **2019**, *48*, 1741–1741h. [CrossRef]
45. Henderson, J.; Barnett, S.; Ghosh, A.; Pollack, A.J.; Hodgkins, A.; Win, K.T.; Miller, G.C.; Bonney, A. Validation of electronic medical data: Identifying diabetes prevalence in general practice. *Health Inf. Manag. J.* **2019**, *48*, 3–11. [CrossRef] [PubMed]
46. Bailie, R.; Bailie, J.; Chakraborty, A.; Swift, K. Consistency of denominator data in electronic health records in Australian primary healthcare services: Enhancing data quality. *Aust. J. Prim. Health* **2015**, *21*, 450–459. [CrossRef] [PubMed]
47. Barnett, S.; Henderson, J.; Hodgkins, A.; Harrison, C.; Ghosh, A.; Dijkmans-Hadley, B.; Britt, H.; Bonney, A. A valuable approach to the use of electronic medical data in primary care research: Panning for gold. *Health Inf. Manag. J.* **2017**, *46*, 51–57. [CrossRef] [PubMed]
48. Canaway, R.; Boyle, D.I.; Manski-Nankervis, J.A.E.; Bell, J.; Hocking, J.S.; Clarke, K.; Clark, M.; Gunn, J.M.; Emery, J.D. Gathering data for decisions: Best practice use of primary care electronic records for research. *Med. J. Aust.* **2019**, *210*, S12–S16. [CrossRef]
49. Bodenheimer, T.; Sinsky, C. From triple to quadruple aim: Care of the patient requires care of the provider. *Ann. Fam. Med.* **2014**, *12*, 573–576. [CrossRef]
50. Australian Government Department of Health. COVID-19 Temporary MBS Telehealth Services. Section 16 July 2021. Available online: http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Factsheet-TempBB (accessed on 30 September 2021).
51. Scott, A.; Bai, T.; Zhang, Y. Association between telehealth use and general practitioner characteristics during COVID-19: Findings from a nationally representative survey of Australian doctors. *BMJ Open* **2021**, *11*, e046857. [CrossRef]

Type 2 diabetes and obesity in young adults

Janice Charles, Allan Pollack, Helena Britt

CPD

Introduction

Type 2 diabetes mellitus (T2DM) occurs when there is an inadequate secretion of insulin in response to varying degrees of overnutrition, inactivity, consequential overweight or obesity, and insulin resistance.[1] T2DM is generally regarded as a disease of older adults but a recent study in the United States found a sharp increase since 1990 in the prevalence and incidence of the disease among a younger population.[2] This earlier onset of the disease is important because of the effect on productive life years and long-term burden on the healthcare system. In 2003, T2DM accounted for 5.1% of the total burden of disease in Australia.[3] Australia's Health 2014 reported that, although 92% of new cases of T2DM occurred in those aged ≥40 years, in 2011–12 there were 430 new cases among children and young people aged 10–24 years.[4] The Australian Diabetes, Obesity and Lifestyle study from 2002 found that 5.7% of participants aged 25–34 years had abnormal glucose tolerance.[5] Our aims were to determine whether changes had occurred over time in the frequency of T2DM management at Australian general practice encounters with patients aged 18–39 years, and to examine the proportion of obese (body mass index [BMI] ≥30 kg/m^2) patients in that age group. To put our findings in context, we also looked at T2DM and obesity trends in patients aged ≥40 years.

Method

BEACH is a continuous national, cross-sectional survey of general practice activity in Australia. The methods have been described in detail elsewhere[6] but in summary, each year a new random sample of approximately 1000 general practitioners (GPs) each record details of 100 consecutive encounters with consenting patients.

We used BEACH encounter data April 2000–March 2014 to examine trends in management rates of non-gestational T2DM at 330,478 GP encounters with patients aged 18–39 years. From a substudy of about 40% of these encounters, where patients reported height and weight, we also calculated changes in the proportion that were obese. Results from 839,790 GP encounters with patients aged ≥40 years were analysed in the same manner to provide a comparison. Using logistic regression corrected for cluster and GP activity, we determined whether significant change (P <0.05) had occurred over the period.

Results

Between April 2000–March 2001and April 2013–March 2014, the proportion of encounters at which T2DM was managed among patients aged 18–39 years rose significantly from 0.42% to 0.69% (P = 0.0013; Wald chi square = 10.36, 1 degree of freedom [df]). The trend line (line of best fit; not shown) for the data over 14 years demonstrated an average absolute increase of approximately 0.013 percentage points per year. It indicated a relative increase in the management rate of T2DM of about 40% over the 14 years.

The frequency of T2DM management also increased significantly at encounters with patients aged ≥40 years. In 2000–01 T2DM was managed at 4.3% of encounters but by 2013–14 the proportion had grown to 5.7% (P <0.0001; Wald chi square = 147.0, 1 df; *Figure 1*). The trend line (not shown) over the 14 years measured an average absolute increase of approximately 0.13 percentage points per year and the relative increase was also about 40% over the 14 years.

In the substudy of BMI, we found that the prevalence of obesity had increased significantly in both age groups. In 2000–01, 15.6% of patients aged 18–39 years were obese and by 2013–14 the prevalence had increased to 20.9%. Among those aged ≥40 years, 22.3% were obese in 2000–01 and 30.7% in 2013–14 (*Figure 2*). The trend line (not shown) showed an average absolute increase of approximately 0.4 percentage points per year for those aged 18–39 years and 0.65

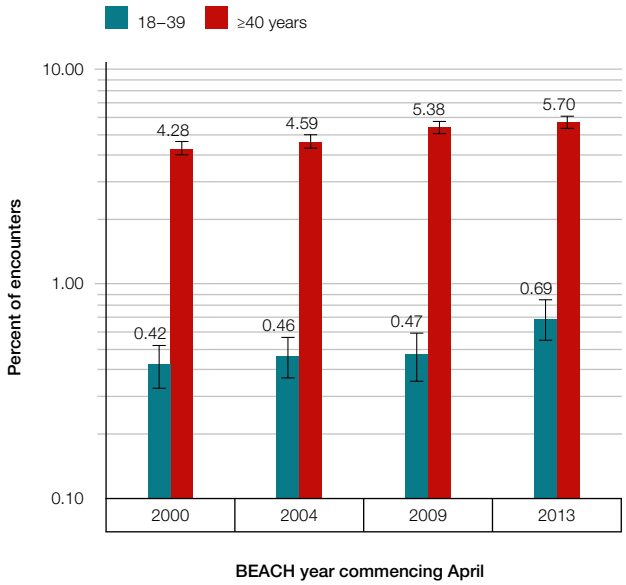


Figure 1. Percentage of encounters at which type 2 diabetes was managed (95% CIs) for patients aged 18–39 years vs ≥40 years
BEACH years 2000, 2004, 2009 and 2013; semi-log plot

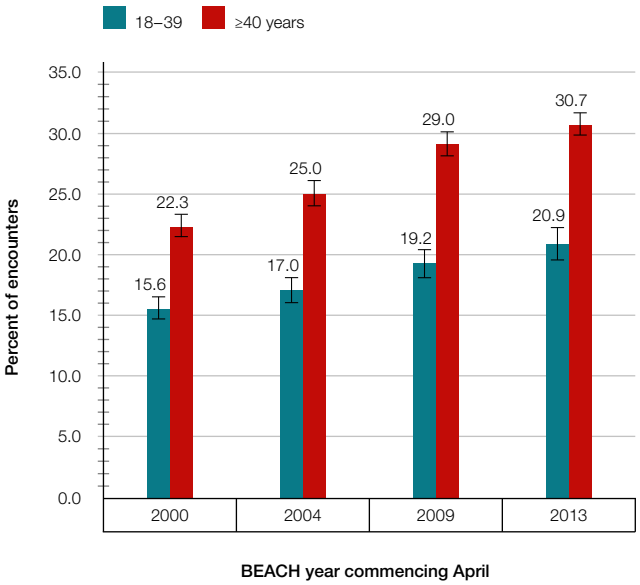


Figure 2. Percentage of encounters (BMI substudy) at which patient's BMI was ≥30 kg/m^2 (95% CIs) for patients aged 18–39 years vs ≥40 years
BEACH years 2000, 2004, 2009 and 2013

percentage points per year for those aged ≥40 years. It indicated a relative increase in obesity of approximately 35% in the younger group and almost 40% in the older group.

Discussion

Non-gestational T2DM was the third most commonly managed chronic problem in BEACH in 2013–14, recorded at 4.2% of encounters.[7] The increased management rate over time is consistent with the international literature. Focusing on younger adults, we found that although the management rate was approximately one-tenth that of older patients, a definite increase occurred, and the relative rate of increase was about the same for both groups considering the different prevalence in each group. The increase in T2DM coincided with the growth we found in the prevalence of obesity, again consistent with other published findings.

There has been little published research in Australia on trends over time in the prevalence of T2DM among young adults. We showed there has been a relative increase of 40% in the management rate in general practice among patients aged 18–39 years over the past 14 years, which has coincided with a relative increase of 35% in obesity prevalence. These two increases suggest that, as a society, we should focus more attention on dietary and lifestyle change in younger adults.

Authors

Janice Charles BA, MSc (Med), Senior Researcher, Family Medicine Research Centre, School of Public Health, Faculty of Medicine, University of Sydney, NSW. janice.charles@sydney.edu.au

Allan Pollack MB BS (Hons), M Biomed E, FRACS, MPH (PP), Research Analyst, Family Medicine Research Centre, School of Public Health, Faculty of Medicine, University of Sydney, NSW.

Helena Britt BA PhD, Associate Professor and Director, Family Medicine Research Centre, School of Public Health, Faculty of Medicine, University of Sydney, NSW.

Competing interests: None

Provenance and peer review: Commissioned, not peer reviewed.

References

1. Nolan CJ, Damm P, Prentki M. Type 2 diabetes across generations: from pathophysiology to prevention and management. Lancet 2011;378:169–81.
2. Roach Z. The prevalence and distribution of diagnosed and undiagnosed type two diabetes mellitus among young adults aged 20–40, utilizing NHANES data from 1999–2010. Thesis. Georgia USA: Georgia State University, 2014.
3. Begg S, Vos T, Barker B, Stevenson C, Stanely L, Lopez A. The burden of disease and injury in Australia 2003. Canberra: AIHW, 2007.
4. Australian Institute of Health and Welfare. Australia's health 2014. Canberra: AIHW, 2014. Report No.: Cat. no. AUS 181.
5. Dunstan DW, Zimmet PZ, Welborn TA, et al. The rising prevalence of diabetes and impaired glucose tolerance: the Australian Diabetes, Obesity and Lifestyle Study. Diabetes Care 2002;25:829–34.
6. Britt H, Miller GC. The BEACH program: an update. Aust Fam Physician 2015;44 (in press).
7. Britt H, Miller GC, Henderson J, et al. General practice activity in Australia 2013–14. General practice series no. 36. Sydney: Sydney University Press, 2014.

Acknowledgements

The authors thank the GP participants in the BEACH program and all members of the BEACH team. Financial contributors to BEACH between 2000 and 2014: Abbott Australasia; AstraZeneca Pty Ltd (Australia); Australian Government Department of Health and Ageing; Australian Government Department of Veterans' Affairs; Bayer Australia Ltd; CSL Biotherapies Australia Pty Ltd; GlaxoSmithKline Australia Pty Ltd; Janssen-Cilag Pty Ltd; Merck, Sharpe and Dohme (Australia) Pty Ltd; National Occupational Health and Safety Commission; National Prescribing Service; Novartis Pharmaceuticals Australia Pty Ltd; Pfizer Australia; Roche Products Pty Ltd; Sanofi-Aventis Australia Pty Ltd; Wyeth Australia Pty Ltd. BEACH is approved by the Human Research Ethics Committee of the University of Sydney.

From: Liam Ferney
To: Committee, Health (REPS)
Subject: Additional information requested during hearing
Date: Thursday, 7 December 2023 3:46:35 PM

To the Secretariat,

I am writing on behalf of the RACGP to provide additional material requested by the Committee regarding the appearance of Dr Gary Deed, Chair of the RACGP's Diabetes Specific Interest Group.

Dr Ananda-Rajah asked about funding required to support the ongoing development of the RACGP's *Management of Type 2 Diabetes: A handbook for general practice*. We estimate funding required would be about $250,000 over the three-year cycle of Guideline development. This would include supporting an expert advisory group, evidence identification and review, writing the handbook and publication.

Dr Deed also agreed to supply Chair Dr Freelander with studies outlining the impact of diabetes on general practice. Please see attached.

Additionally, Dr Deed has provided a paper on the impact of consumption of ultra-processed food which highlights the need for policy interventions that address the ready and cheap availability of these products.

We would also like to bring some of the College's work in the social prescribing space to the Committee's attention: https://www.racgp.org.au/advocacy/advocacy-resources/social-prescribing-report-and-recommendations

Warm regards,

Liam

Liam Ferney
Senior Government Relations Manager
Government Relations | Advocacy Policy & Research

RACGP | racgp.org.au

The Royal Australian College of General Practitioners Ltd
Turrbal / Jagera Country
Level 7, 410 Queen St, Brisbane QLD 4000

The RACGP acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land and waterways in which we live and work. We recognise their continuing connection to land, water and culture and pay our respects to Elders past, present, and emerging.