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# **Disease Expenditure Study**

## **Overview of analysis and methodology**

**2015–16**

Australian Institute of Health and Welfare  
Canberra

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### **Australian Institute of Health and Welfare**

Board Chair  
Mrs Louise Markus

Chief Executive Officer  
Mr Barry Sandison

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

Australian Institute of Health and Welfare  
GPO Box 570  
Canberra ACT 2601  
Tel: (02) 6244 1000  
Email: [info@aihw.gov.au](mailto:info@aihw.gov.au)

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# 1 Introduction

As part of the annual health expenditure series, the Australian Institute of Health and Welfare (AIHW) publishes estimates of expenditure at the national and state and territory levels and, to an increasing extent is publishing data at the local area level. These data are used to monitor national health expenditure and assess the impact of policy changes, as well as being provided to the Organisation for Economic Co-operation and Development and the World Health Organization (WHO) to assist in international comparisons.

In addition to the annual expenditure series, the AIHW has periodically conducted additional studies into the nature of health expenditure, including the analysis of expenditure by the demographic characteristics of the population and the diseases or conditions being managed. This work has apportioned expenditure to population groups based on age, sex and Indigenous status, and to disease expenditure groups using the International Statistical Classification of Diseases and Related Health Problems and the AIHW's Australian Burden of Disease Study (ABDS) conditions (AIHW 2015). These studies have generally produced estimates for specific sectors of the Australian health system, including admitted patient care in hospitals, general practitioners and pharmaceuticals. These data provide important insights into the nature and drivers of health expenditure, including how an ageing population affects health expenditure and comparisons of health expenditure between Aboriginal and Torres Strait Islander Australians and non-Indigenous Australians.

For the current disease expenditure study, previously utilised methods have been updated and expanded. The methodology for the estimation of admitted patient costs, and the distribution of costs to additional diagnoses (as appropriate) as well as the principal diagnoses recorded for each episode of admitted patient care has been updated. Cost estimates for Medicare Benefits Schedule services and for prescription pharmaceuticals listed on the Pharmaceutical Benefits Scheme have been updated using updated estimation methods. The estimates were expanded to include emergency departments and outpatient clinics. Disease expenditure estimates are reported using the conditions in the ABDS (such as, coronary heart disease or stroke), an enhancement on previous reporting by ABDS group only (for example, 'cardiovascular diseases').

The product of this work has been the creation of several new data sets of expenditure estimates for the 2015–16 financial year. Expenditure information is added to hospital activity data for every admitted patient record in the National Hospital Morbidity Database, all emergency department presentations in the National Non-admitted Patient Emergency Department Care Database, and all service events in the National Non-admitted Patient Databases. Data sets have been constructed for all private hospital admitted patient separations. Aggregated data sets by sex, age group, state/territory and SA3 geographical area, including patient contributions, have been created for Medicare services by provider specialty and subgroup, and pharmaceuticals by Anatomical Therapeutic Classification. All of the data sets include expenditure estimates for each ABDS condition.

The purpose of this report is to outline the data sources and methods used to develop these data sets, to allow others to understand the potential uses for these data.

Chapter 2 outlines the methods used to map ABDS conditions. Chapter 3 outlines the methods used to analyse GP survey data. Chapter 4 outlines the data and methods used to create the hospital data sets. Chapter 5 outlines the data and methods used to create the medical and dental services and pharmaceutical data sets.

## 2 Health expenditure

Health expenditure estimates are published annually in the *Health expenditure Australia* series (AIHW 2018). These estimates cover most of the health system, and report expenditure by the source of funds and area of expenditure.

Expenditure on health is broadly categorised in terms of recurrent expenditure and capital expenditure. Recurrent expenditure can generally be thought of as goods and services consumed within a reporting period. It includes expenditure on health goods (such as, medications and health aids and appliances), health services (such as hospital, dental and medical services), public health activities, and other activities that support health systems (such as research and administration). Capital consumption or depreciation is also included as part of recurrent expenditure. Capital expenditure is expenditure on fixed assets such as new buildings or medical equipment.

Total expenditure on health goods and services in 2015–16 was \$170.5 billion, of which \$160.3 billion was recurrent expenditure (Table 2.1). The main areas of expenditure are hospitals (38.7% of total), primary health care (34.8%), and referred medical services (10.4%). Together they account for 84% of total expenditure (or 89.3% of recurrent expenditure).

**Table 2.1: Total health expenditure by area of expenditure, 2015–16 (\$ million)**

Area of expenditure	Total health expenditure	Proportion (%)
Hospitals	66,076	38.7
Public hospital services	51,064	29.9
Private hospitals	15,012	8.8
Primary health care	59,424	34.8
Unreferred medical services	11,835	6.9
Dental services	9,906	5.8
Other health practitioners	5,677	3.3
Community health and other	8,406	4.9
Public health	2,661	1.6
Benefit-paid pharmaceuticals	10,861	6.4
All other medications	10,077	5.9
Referred medical services	17,707	10.4
Other services	11,897	7.0
Patient transport services	3,729	2.2
Aids and appliances	4,307	2.5
Administration	3,861	2.3
Research	5,219	3.1
<b>Total recurrent expenditure</b>	<b>160,322</b>	<b>94.0</b>
Capital expenditure	10,205	6.0
<b>Total health expenditure</b>	<b>170,527</b>	<b>100.0</b>

Source: AIHW Health expenditure database.

The aim of the current disease expenditure study is to disaggregate as much as possible of the recurrent expenditure by disease and demographics, to better understand the nature and drivers of health expenditure.

## Areas included in disease expenditure study

It is not appropriate to allocate all expenditure on health goods and services by disease. For example, neither administration expenditure nor capital expenditure can be attributed to any particular condition in a meaningful way due to their nature. In addition, most community and public health programs, which support the treatment and prevention of many conditions, do not have sufficient data to allocate to conditions.

The areas of expenditure included in the disease expenditure study were hospital services, referred and unreferred medical services, dental and other health practitioner services that are funded by Medicare, and pharmaceuticals listed on the PBS (all benefit-paid pharmaceuticals, and 'under co-payment' pharmaceuticals classified as all other medications). This relates to approximately 70% of recurrent expenditure. Table 2.2 summarises the areas for which health expenditure can and cannot be allocated by disease in the 2015 disease expenditure database.

**Table 2.2: Areas of expenditure included and excluded in the disease expenditure analysis**

Area of expenditure	Inclusions	Exclusions
Hospitals	Cost of services for: <ul style="list-style-type: none"> <li>Admitted patients in public, private, and psychiatric hospitals</li> <li>Public emergency departments</li> <li>Public outpatient clinics</li> </ul>	Costs for: <ul style="list-style-type: none"> <li>Highly Specialised Drugs</li> </ul>
Referred and unreferred medical services	Cost of services provided by, or on behalf of, registered medical practitioners that are funded by: <ul style="list-style-type: none"> <li>Medicare Benefits Schedule (MBS)</li> <li>MBS co-payments and other out-of-hospital payments</li> <li>Department of Veterans' Affairs</li> </ul>	Costs for: <ul style="list-style-type: none"> <li>Residential aged care</li> <li>Health administration, health aids and appliances, and patient transport (ambulance)</li> <li>Private health insurance funds</li> <li>Australian Government premium rebates allocated to medical services</li> <li>Compulsory motor vehicle third-party insurance</li> <li>Non-MBS medical services (such as provision of vaccines for overseas travel)</li> </ul>
Benefit paid pharmaceuticals and all other medications	Costs for: <ul style="list-style-type: none"> <li>Pharmaceutical Benefits Scheme (PBS)</li> <li>Repatriation Pharmaceutical Benefits Scheme (RPBS)</li> <li>Under co-payment prescriptions (those pharmaceuticals listed in the PBS and RPBS, the total costs of which are equal to or less than the statutory patient contribution for the class of patient concerned)</li> <li>Highly Specialised Drugs</li> </ul>	Costs for: <ul style="list-style-type: none"> <li>Over-the-counter drugs (including pain medications, sexual health products, vitamins and herbs)</li> <li>Private prescriptions (pharmaceuticals dispensed through private prescriptions that do not fulfil the criteria for payment or benefit under the PBS or RPBS).</li> </ul>
Dental	<ul style="list-style-type: none"> <li>Costs for dental services funded through the MBS</li> <li>Self-funded dental services</li> </ul>	Nil
Other health practitioners and community health services	Costs for services funded through the MBS	Costs for self-funded services as categories of expenditure for allied health practitioners are aggregated
Public health	Nil	Excluded because not possible to allocate to specific diseases
Capital expenditure	Nil	Excluded because not possible to allocate to specific diseases
Indirect costs	Nil	Costs include: <ul style="list-style-type: none"> <li>Loss of productivity</li> <li>Travel costs of patients</li> <li>Costs incurred by carers and family</li> <li>Informal community care costs</li> <li>Costs relating to lost quantity and quality of life</li> <li>Community non-health services costs (for example, home help, Meals on Wheels)</li> </ul>

## **Allocation of expenditure**

Generally, the method for estimating disease expenditure is a mixture of ‘top-down’ and ‘bottom-up’ approaches, where total expenditure across the health system is estimated and then allocated to the relevant conditions based on the available service use data. This approach yields good consistency and coverage and provides totals that add up to known expenditure. However, this is not as comprehensive for any specific disease as a detailed ‘bottom-up’ analysis, which would include the actual costs incurred for that disease. In most cases, however, a lack of amenable data sources means that a more granular ‘bottom-up’ analysis is not possible.

This report outlines the methods used to map data to ABDS conditions, estimate the cost of service events in hospitals, and allocate aggregate expenditure to conditions where no direct diagnosis is available.

### 3 Condition mapping

To understand the reasons for health expenditure, it is necessary to understand the diseases and conditions associated with the expenditure. These groups are based on the AIHW's ABDS categorisation of diseases, referred to as the ABDS disease list, but incorporate some interventions and symptoms that are reported as the reasons for provision of health care, either as additions to the ABDS conditions or as additional categories.

The ABDS disease list is based on the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). The ABDS disease list was developed as part of the ABDS 2011 (AIHW 2016), with slight changes made in the ABDS 2015 update. The ABDS disease list covers the full spectrum of diseases and injuries and has been devised to be mutually exclusive (for example, non-overlapping diseases). The ABDS disease list consists of over 200 specific conditions, or sets of conditions, (such as, coronary heart disease or stroke), which are grouped into 17 disease groups of related diseases or conditions—such as cardiovascular diseases. Conditions that could not be individually specified are included in a residual category for each disease group—such as 'other cardiovascular conditions'.

Information about diseases and interventions being managed in different care settings has been determined using a range of approaches. Admitted patient and emergency department data includes principal diagnosis and additional diagnoses, which are determined by trained clinical coders after investigation. Conditions associated with non-hospital medical services, outpatient clinics, and pharmaceuticals are estimated using general practice survey data, with diagnoses made by the treating physicians when requesting diagnostic imaging and pathology, writing prescriptions, or making referrals.

There are several health classification schemes currently used in Australia, which vary according to the data source and service type, for example:

- Hospital admitted patients are classified using the ICD-10-AM;
- Emergency department presentations are classified using the ICD-10-AM, the International Statistical Classification of Diseases and Related Health Problems, 9th Revision, Clinical Modification (ICD-9-CM), or the Systematized Nomenclature of Medicine – Clinical Terms, Emergency Department Reference Set (SNOMED CT [EDRS]);
- Outpatient clinics are classified by the Tier-2 clinic type, but conditions for individuals treated in the clinics are not coded; and
- Primary care (non-hospital medical services and pharmaceuticals) survey data is coded using the International Classification of Primary Care, Version 2 (ICPC-2 PLUS).

Some concordances have been developed for conversion between the classifications. Mapping files have been used to convert different classification types to the ICD-10-AM, and to convert the various editions of the ICD-10-AM to the 9th edition where necessary, described below.

All ICD-10-AM codes were mapped to the relevant ABDS condition by a clinical coder on the basis of the code description and relevant coding rules and standards. Four new groups—*Examination and observation NEC* (not elsewhere classified), *Physical, behavioural and social problems NEC*, *Interventions NEC* and *Symptoms NEC*—were included to complete the disease expenditure condition categorisation. Details on the mapping of ICD-10-AM codes are available in Appendix C.

## Mapping to ICD-10-AM 9th Edition

The majority of the diagnoses recorded in the input data sources have been coded according to the ICD-10-AM. The 9th edition of the ICD-10-AM was used for coding the records of patients admitted to hospitals over the 2015–16 reporting period, and is the foundation for much of the work attributing expenditure to the ABDS conditions. Once diagnosis codes were classified using the ICD-10-AM 9th edition, diagnoses were merged with the ABDS mapping file to assign the ABDS conditions.

The ICD-10-AM coding standard forms the basis of the diagnostic information included in the National Hospital Morbidity Database (NHMD), the National Non-admitted Patient Emergency Department Care Database (NNAPEDC), and the Private Hospital Data Bureau (PHDB).

The Bettering the Evaluation and Care of Health (BEACH) survey has been used to allocate non-hospital medical services and pharmaceuticals to conditions and is coded using the ICPC-2 PLUS (see section *Bettering the Evaluation and Care of Health Survey*).

For the 2015–16 reporting period, diagnosis information was not reported using a single classification scheme in the NNAPEDC. The majority of records (67%) were reported using various editions of ICD-10-AM. Some hospitals reporting emergency department data use software systems to classify diagnoses according to the SNOMED CT [EDRS], and some use the ICD-9-CM. Table 3.1 shows the numbers of presentations for which diagnosis information was reported in the NNAPEDC, by the type of classification scheme used.

**Table 3.1: Provision of diagnosis information for emergency presentations (NNAPEDC) by diagnosis classification scheme, 2015–16**

Classification	Total
SNOMED-CT-AU [EDRS]	2,091,976
ICD-9-CM, 2nd edition	33,181
ICD-10-AM, 6th edition	607,588
ICD-10-AM, 7th edition	263,030
ICD-10-AM, 8th edition	3,102,736
ICD-10-AM, 9th edition	982,875
ICD-10-AM edition not specified	32,564
Principal diagnosis not reported	351,919
<b>Total</b>	<b>7,465,869</b>

Source: AIHW National Non-Admitted Patient Emergency Care Department Database.

To provide comparability for the ABDS, mapping files have been used to convert the disease classifications in the SNOMED CT [EDRS], ICD-9-CM, ICPC-2 PLUS to the ICD-10-AM in use for the relevant year, using the mapping tables available from the Australian Consortium for Classification Development (ACCD) <https://www.accd.net.au/Downloads.aspx>. Table 3.2 shows the years that relevant ICD-10-AM editions were implemented.

**Table 3.2: ICD-10-AM editions, 2006–07 to 2015–16**

<b>Year</b>	<b>ICD-10-AM edition</b>
2006–07 to 2007–08	5th Edition
2008–09 to 2009–10	6th Edition
2010–11 to 2012–13	7th Edition
2013–14 to 2014–15	8th Edition
2015–16	9th Edition

Stepwise mapping to the 9th edition has been performed for diagnoses coded in earlier editions. For example, for diagnoses classified to the ICD-10-AM 5th edition, mapping was performed firstly from the 5th to the 6th, with the results of this then mapped to the 7th and 8th, and finally a mapping to the 9th edition. Diagnoses classified in the ICD-10-AM 9th edition were then assigned to ABDS conditions using the mapping file.

## 4 Bettering the Evaluation and Care of Health Survey

There is currently no national administrative data source in Australia that includes diagnostic information for non-hospital health services or outpatient clinics. For the current disease expenditure study, the decision was made to use available survey data to estimate the conditions that general practitioners (GPs) and medical specialists are treating, pharmaceuticals are prescribed for, and diagnostic imaging and pathology are requested.

The BEACH survey of GPs, which was previously conducted by the former Family Medicine Research Centre at the University of Sydney, has been used to estimate the proportion of health services that are attributable to each condition. BEACH was a nationally representative annual sample of approximately 100,000 patient encounters with 1,000 randomly selected GPs. Each GP recorded the details for 100 consecutive patient encounters. Information regarding the reason for encounter, types of prescriptions, referrals, imaging and pathology requests made during the encounter, and the associated diagnoses were recorded.

There are several limitations to the use of BEACH data for this analysis. The available survey data used in the analysis was collected prior to the 2015–16 reference period. Also, about 100,000 patient encounters are recorded each survey year, while there are many millions of GP and specialist services each year. Therefore, extrapolation of results from a relatively small sample may result in biases. This is particularly an issue for those conditions which are recorded relatively infrequently. Additionally, there may be multiple conditions associated with an action recorded in the survey, and these conditions are not always able to be mapped to the ICD-10-AM.

This section outlines how the BEACH data was analysed to overcome the limitations and create proportional mapping files, and includes:

1. Survey aggregation and weighting
2. Selecting conditions
3. Grouping actions and conditions.

### Step 1: Survey aggregation and weighting

In order to minimise potential variability in conditions encountered in the BEACH survey data due to small numbers associated with rarer conditions in a single year, and to maximise the representation of all conditions in the ABDS, several years of BEACH data have been aggregated for analysis.

The data used covers the period April 2006 to March 2011 and weights have been created for each year to account for changes in population structure between December of the survey year and December 2015. These weights are calculated as the percentage difference in the proportion of the population represented by each age and sex group for each year, relative to 2015. The patient weight in the survey data was then multiplied by the calculated population weight for the relevant year.

Previously, the University of Sydney published the rate of problems managed by ICPC chapter in the BEACH survey (Britt 2016). The adjusted patient weight was used to calculate the rate of problems managed per 100 encounters by ICPC chapter for each year. The percentage difference between the calculated rates in each year and the published rates for 2015–16 were calculated to create an adjustment factor. This adjustment factor for each

ICPC chapter is applied to the diagnoses recorded by GPs when creating the proportional mapping files.

## Step 2: Selecting conditions

BEACH data contains information on up to four problems managed and/or diagnoses per encounter. As such, each referral, prescription, imaging or pathology request has an associated variable stating whether the action related to each specific diagnosis. Each action by the GP is recorded as being related to any of the four diagnoses, and may be related to multiple.

Each encounter can have up to:

- two referrals;
- three imaging requests;
- three Medicare item numbers claimed;
- four prescriptions; and
- five pathology requests.

A summary of all of the GP actions and all the associated diagnoses was made. It should be noted that the same action, such as a referral, may be counted twice if the referral is related to two separate conditions.

**Table 4.1: Summary of BEACH data, 2006 to 2011**

Data items	Average per encounter	Total number	Proportion of related diagnoses mapped to ICD-10-AM
Diagnoses	1.56	754,820	92.0%
Medicare items 23 and 36	1.24	599,719	92.3%
Referrals	0.15	74,868	94.2%
Prescriptions	1.04	501,998	94.2%
Imaging requests	0.10	48,484	97.3%
Pathology requests	0.50	241,509	88.2%

Source: Bettering the Evaluation and Care of Health Survey.

The sum of all diagnoses listed by GPs were used to determine the conditions being treated by GPs, rather than the reasons for encounter variable. This approach was taken because the variables are coded using ICPC-2 PLUS, and these diagnosis codes can more frequently be mapped to the ICD-10-AM. A second GP mapping file was created using the diagnoses associated with the service when a GP claimed a general Medicare item (items 23 and 36).

The diagnoses coded in ICPC-2 PLUS were converted to the ICD-10-AM 9th edition, and the ICD-10-AM codes were mapped to the ABDS conditions. Only records with diagnoses that are able to be mapped to the ICD-10-AM were retained for creating mapping files. Sex specific restrictions were included in the mapping files for conditions such as prostate and ovarian cancer.

### Step 3: Grouping actions and conditions

BEACH data relating to the referrals, imaging and pathology requests was coded using the ICPC-2 PLUS codes. These codes have corresponding high-level groupings, as detailed in the BEACH annual report:

- Referral groups include: allied health services, emergency department, hospital, medical specialist, and other referrals.
- Pathology tests are grouped into MBS groups and subgroups, and several other high-level groups. The MBS and other groups are: haematology, chemistry, microbiology, immunology, histopathology, cytopathology, cytogenetics, infertility/pregnancy tests, simple tests, and other.
- Imaging requests are grouped to the MBS groups: ultrasound, computerised tomography, diagnostic radiology, nuclear medicine imaging, and magnetic resonance imaging.

Prescription data is coded using a 12 digit Coding Atlas for Pharmaceutical Substances (CAPS) code. These codes have corresponding codes in the Anatomical Therapeutic Chemical (ATC) classification system. Prescriptions were grouped at the 5th level of the ATC, the chemical substance (for example, all strengths of prescriptions for the drug Metformin would group to '*Metformin*').

### Step 4: Outpatient clinic groups

Nationally, diagnostic information is not collected and coded in a systematic way during outpatient service events. As an approach to addressing this limitation, a separate method of grouping BEACH data was developed to estimate the conditions treated in these settings. It has been assumed that referrals made by GPs relate to both private practitioners and for services delivered through outpatient clinics. The ICPC-2 PLUS codes for referrals, and grouped imaging and pathology requests were mapped to relevant Tier 2 classifications of outpatient clinics. It should be noted that as a code in BEACH may refer to multiple outpatient clinic types, there is the potential that the referral would then be captured more than once in the final mapping file for outpatient clinics by Tier 2 type. The diagnoses associated with the services mapped to outpatient clinic types were used to create a mapping file for disaggregating services by clinic type.

The grouped data has been used to create a series of mapping files. The product of the adjusted patient weight and the adjustment factor for the ICPC chapter of the diagnosis was calculated for each record. The sum of these weights for each ABDS condition for each grouping was calculated, and divided by the sum of the weight for each grouping. The result is an estimate of the proportion of each service grouping that is attributable to each of the ABDS conditions.

## 5 Hospital-related activity

The main objective for the hospital-related component of the disease expenditure study is to estimate the contribution of each condition to the \$66 billion in hospital expenditure in 2015–16. The current study expands previous estimation methods to include emergency departments and outpatient clinics, and to incorporate new sources of data. Estimated expenditure has been added to the summary records from the NHMD, NNAPEDC and NAP (UR and AGG) for the 2015–16 reporting period. The main data sources that were used in this work are the:

- National Hospital Cost Data Collection (NHCDC) data set; specifically, average cost for all hospitals for Australian Refined Diagnosis Related Groups (AR-DRGs) and principal diagnosis, Urgency Related Groups (URGs), and Tier-2 Classification for 2015–16. This was accessed through the National Benchmarking Portal maintained by the Independent Hospital Pricing Authority (IHPA),
- National Public Hospital Establishments Database (NPHEd), which includes the total expenditure for each public hospital each year. It also provides an estimate of the fraction of the expenditure that was related to inpatient or admitted patient care (known as the admitted patient fraction or IFRAC),
- Private Hospital Data Bureau (PHDB) data set, which includes charge information for admitted patient services in private hospitals, and is managed by the Australian Government Department of Health, and
- AIHW's Health Expenditure Database, which provides the total expenditure on public and private hospitals within a jurisdiction in a given year. This allows integration with the total health system expenditure as published in the *Health expenditure in Australia* annual report.

This section outlines the steps used to create the component data sets for public admitted patients, emergency departments, and outpatient clinics, and private admitted patients. Details of the limitations of this method have been included in Appendix A.

### Public admitted patients

Estimates for admitted patients are based on separations in the NHMD. The NHMD is a compilation of summary records from admitted patient morbidity data collection systems in Australian hospitals which provides information on each public and private episode of admitted patient care (also referred to as a separation) in a given year. The information collected in the NHMD relates to the patient, the hospital, the activity that occurred during the patient's stay and the diagnoses that were associated with the separation—using the ICD-10-AM.

The expenditure information that was added for public hospitals includes an estimate of the expenditure related to each separation as well as an indication of how much of the expenditure was related to each diagnosis. The main steps used to create this new data set are outlined in the following sections and include:

1. estimating the cost of each separation;
2. assigning expenditure to diagnoses; and
3. scaling costs to total hospital expenditure.

## **Step 1: Estimating the cost of each separation**

A cost for every separation was estimated using the AIHW Hospital Morbidity Costing Model (HMCM). The HMCM estimates acute hospital admitted patient costs by apportioning the total admitted patient expenditure to individual episodes of hospitalisation with an adjustment for the resource intensity of treatment for the specific episode (using the AR-DRGs) and the length of stay. The length of stay adjustment is made in such a way as to reflect that some costs are proportional to length of stay (for example, ward costs and meals), whereas others are independent of length of stay (for example, theatre costs). The subdivision of episode costs into these cost 'buckets' was made using NHCDC data.

### **1.1: Assigning costs from the NHCDC**

Average cost buckets from the NHCDC for each hospital, AR-DRG, principal diagnosis, and care type are assigned to separations in the NHMD on the basis of the hospital, AR-DRG, principal diagnosis, and care type recorded for each separation. Records that did not match these specifications were assigned costs based on either the state or national average AR-DRG and principal diagnosis costs, depending on the differences in data reporting to the AIHW and to the IHPA. The AR-DRG 8.0x version was used in 2015–16.

The NHCDC contains separate cost estimates for separations with a care type classified as either acute or subacute and non-acute.

The HMCM estimates the cost of accommodation for a given separation by dividing the average accommodation costs by the average length of stay to obtain an estimate of the average accommodation cost per day. This estimate is then multiplied by the actual length of stay for each separation to provide an estimate of the cost of accommodation associated with the separation. The cost of accommodation was added to the costs associated with the other cost buckets to estimate the total cost of the separation.

### **1.2: Application of Indigenous loading**

The estimated cost of each separation was then adjusted according to the Indigenous status of the patient. Based on work by the IHPA that suggests that the cost of separations for Indigenous Australians tends to be higher than the average cost for all separations within an AR-DRG, a 4% loading was added to the estimated cost for Indigenous patients (IHPA 2015). This cost adjustment is independent of adjustment for under-identification of Indigenous patients that can be applied when reporting admitted patient expenditure for this population.

## **Step 2: Assigning expenditure to diagnoses**

Each separation in the NHMD has a principal diagnosis (METeOR id: 588987)—AIHW's Metadata Online Registry (METeOR)—which is the diagnosis established after study to be chiefly responsible for occasioning the patient's episode of care in hospital. In many cases, there are also one or more additional diagnoses, defined as a 'condition or complaint either coexisting with the principal diagnosis or arising during the episode of care' (METeOR id: 588981).

Previous methods for allocating admitted patient expenditure attributed the patient's total cost to a single diagnosis, the principal diagnosis, or distributing costs equally for all cost relevant diagnoses (AIHW 2017). Allocation to a single diagnosis only ignores the issue of comorbidity as well as the potential for diseases and conditions to arise during a hospital stay. Allocation of costs equally to all diagnoses improves the estimation but does not take into account differences in the relative cost of additional diagnoses. Essentially, both the principal and additional diagnoses can drive expenditure, but not in all cases. For example, in some cases,

the additional diagnoses may not be cost relevant and, in others, the additional diagnoses may be the most significant driver of cost (ACCD 2014).

## 2.1: Determining relevant diagnoses

As outlined in the section *ICD-10-AM ninth edition*, page 10, the list of ICD-10-AM 9th edition diagnosis codes have been mapped to the ABDS conditions. This work also identified which diagnoses were cost relevant for admitted patients, building on the work produced as part of the development of AR-DRG version 8. A number of diagnoses were designated as 'out-of-scope' on the basis that they:

- a) are of ill-defined and/or transient conditions or symptoms that may be best classified to other more specific chapters within the classification; or
- b) provide context rather than information critical to the clinical description of an acute admitted episode of care; or
- c) identify a characteristic that is already captured by other diagnosis codes present on the record of the acute admitted episode of care.

In developing the hospital admitted patient expenditure data, the principal diagnosis was almost always assumed to drive expenditure, even if considered out-of-scope, because of its role in occasioning the hospital stay. An exception is for radiotherapy and pharmacotherapy sessions for neoplasms, which were allocated to the associated neoplasm diagnosis. Some additional diagnoses were always considered out-of-scope.

The excluded diagnoses were not assumed to drive any of the expenditure unless they were reported as the principal diagnoses. Excluded codes appeared as the principal diagnosis in 940,053 separations (8.7%) in 2015–16.

The excluded codes that commonly appeared as a principal diagnosis were *Z51.1 Pharmacotherapy session for neoplasm*, or examinations, such as *Z09.0 Follow-up examination after surgery for other conditions* and *Z45.2 Adjustment and management of vascular access device* (Table 5.1).

**Table 5.1: Most common excluded codes that appeared as the principal diagnosis, 2015–16**

ICD-10-AM code	Description	Number of Separations
Z51.1	Pharmacotherapy session for neoplasm	488,850
Z09.0	Follow-up examination after surgery for other conditions	53,404
Z45.2	Adjustment and management of vascular access device	35,548

Source: Disease expenditure database.

## 2.2: Distributing separation costs to relevant diagnoses

Excluding particular diagnoses limits the potential for diagnosis codes to be allocated expenditure when they played little or no role in driving cost. For any given separation, the cost-relevant diagnosis codes are likely to have played a greater or lesser part than others in determining the overall cost.

In the previous disease expenditure study, the expenditure per separation had been divided evenly between each of the cost-relevant diagnoses. The 'even distribution method' may overstate or understate the contribution of some diagnoses, though this method was an improvement upon direct allocation to principal diagnosis in its aim to reflect the cost-relevant information recorded through additional diagnoses. Based on work done by Dieleman, et al. (2017) looking at the impact of additional diagnoses on admitted patient expenditure in the United States, the distribution method has been updated in this report using a regression

framework to estimate the relative contribution of each cost-relevant additional diagnosis to the cost of a separation.

The regression model is based on the ABDS conditions that the ICD-10-AM codes are mapped to, for the principal and cost-relevant additional diagnoses.

### **Calculating excess expenditure**

The excess expenditure for each principal diagnosis due to comorbidities has been modelled. A separation may contain multiple additional diagnoses that map to the same ABDS condition. A binary set of indicators was created to indicate the presence or absence of each ABDS condition as an additional diagnosis for each separation. Only cost-relevant additional diagnosis were included in the indicator set.

The logarithm of expenditure was calculated, and a log-linear regression model was estimated for each principal diagnosis (grouped by ABDS condition), with indicators of additional diagnoses as independent variables. To avoid overfitting the models, a maximum of  $N/10$  covariates were included in the model for a principal diagnosis with sample size  $N$ , with additional diagnoses selected for inclusion in (decreasing) order of their prevalence. The additional diagnoses excluded through this process, and additional diagnoses with fewer than ten occurrences (and ten non-occurrences), were not independently represented in the models, but were instead included in a count variable capturing a generic impact of 'other' diagnoses.

The estimated coefficients of the models quantify the impact of additional diagnoses on expected expenditure; that is, the extent to which the charge associated with a given separation for a given principal diagnosis is expected to increase in the presence of additional diagnoses (either specific diagnoses, for the most common ABDS conditions, or in a more general sense, for other less common conditions).

### **Redistributing costs to relevant diagnoses**

The results from the regression model were used to estimate the predicted proportion of expenditure associated with each diagnosis within each separation in the hospital data. Where a separation contained multiple additional diagnoses that map to the same ABDS condition, the proportion was divided evenly among the diagnoses. Actual expenditure due to each diagnosis was calculated as the product of the predicted proportion attributed to each diagnosis and total realised expenditure for that separation.

This approach marks one of the key differences between the current method and previously used methods for determining disease expenditure (outlined in the section '*Changes to the Hospital Morbidity Cost Model*' below). In summary, this method results in a redistribution of expenditure away from those diagnoses that are more commonly the principal diagnosis, towards diagnoses that are more expensive.

## **Step 3: Scaling costs to total hospital expenditure**

The cost estimates for all separations were then scaled so that the total cost reflects the cost estimates of the admitted patient expenditure for each state. The current disease expenditure study does not scale admissions to total admitted patient expenditure for each hospital, because the IFRAC includes costs relating to presentations at emergency departments for patients who are subsequently admitted to hospital. Emergency department costs are calculated separately (see *Emergency departments*, page 22).

Medicare in-hospital expenditure is calculated from the private hospital data (see *Private admitted patients*, page 21).

The IFRACs reported by hospitals in the NPHEd were used to create an estimate of the admitted patient expenditure for each jurisdiction. Hospitals' total expenditure were multiplied by the IFRAC to estimate the admitted patient expenditure for those hospitals reporting an IFRAC. The average IFRAC for each jurisdiction was estimated from the aggregated hospitals admitted patient expenditure (Table 5.2).

**Table 5.2: Estimated inpatient fraction and relevant public hospital expenditure for each state, 2015–16**

State	Estimated IFRAC	Public hospital expenditure (\$ million)
New South Wales	64.8%	15,791
Victoria	78.2%	11,925
Queensland	66.4%	10,064
Western Australia	67.4%	5,484
South Australia	73.2%	3,876
Tasmania	67.5%	1,096
Australian Capital Territory	63.3%	1,108
Northern Territory	68.9%	742
<b>Total</b>	<b>72.1%</b>	<b>50,086</b>

Source: National Public Hospital Establishments Database, AIHW Health expenditure database.

Public hospital expenditure estimates for each state from the health expenditure database were multiplied by the state IFRAC to estimate the total admitted patient expenditure.

The estimated cost of each separation for each state was then summed. A scaling factor was then calculated by dividing the admitted patient expenditure by the sum of the estimated separation costs for that state, and applied to the cost estimates.

## Changes to the Hospital Morbidity Cost Model

The admitted patient cost estimates in the 2015 disease expenditure study were developed using an updated version of the existing HMCM. Details of the HMCM are included in the report *Australian health expenditure—demographics and diseases: hospital admitted patient expenditure 2004–05 to 2012–13* (AIHW 2017). A number of changes have been made to the HMCM previously used to estimate admitted patient expenditure, outlined in this section.

In previous disease expenditure studies, costs were based on the state average AR-DRG cost weight and National Efficient Price. In the current disease expenditure study, costs have been sourced directly from the NHCDC through the National Benchmarking Portal.

The HMCM previously employed different methodologies to estimate the cost of separations classified as acute or subacute and non-acute. The NHCDC includes the costs reported by hospitals for subacute and non-acute care. Costs for these care types were directly sourced from the NHCDC and used in the HMCM instead of being estimated.

Costs for private hospitals were not estimated using the NHCDC. The costs for private hospitals are calculated separately in this report, using data from the PHDB, which includes the charges for each separation and Medicare items billed.

Costs for care types reported as *newborn with no qualified days*, *hospital boarders* and *posthumous organ procurement* were estimated in the HMCM rather than excluded, as these costs are available through the NHCDC.

The IFRAC reported by hospitals in the NPHEd was not used to scale expenditure to an individual hospital's total reported expenditure. The IFRAC includes costs relating to emergency department care for patients who are admitted to hospital following presentation at an emergency department. In previous disease expenditure studies, emergency department costs were not estimated. As the current disease expenditure study expands estimates to include emergency department costs, using the IFRAC to scale expenditure for admitted patient separations to total admitted patient expenditure for each hospital would lead to an overestimation of admitted patient costs and underestimate the emergency department costs.

The distribution of separation costs across principal and additional diagnoses was undertaken using a regression model to determine the relative contribution to total cost of each. In the previous study, costs were proportionally distributed to each cost relevant diagnosis.

## Private admitted patients

Cost estimates for admitted patients in private hospitals are based on separations in the NHMD, and charges for separations in the PHDB. Admitted patient episodes of care in private hospitals were previously estimated using data in the NHMD and AR-DRG cost weights. The current disease expenditure study uses a new data source to estimate the cost of private separations, and represents an improvement on previous methodologies.

The expenditure information that was added for private hospitals includes an estimate of the expenditure related to each separation, as well as an indication of how much of the expenditure was contributed by Medicare, private health insurers, and out-of-pocket payments.

The main steps used to create this new data set are outlined in the following sections and include:

1. Calculating total cost by source of funds.
2. Assigning expenditure to diagnoses.
3. Scaling expenditure to total private hospital costs.

### Step 1: Calculating total cost by source of funds

The PHDB is a compilation of summary records from admitted patient morbidity data collection systems in Australian private hospitals, which is reported to the Australian Government Department of Health. The information collected in the PHDB relates to the patient, the activity that occurred during the patient's stay, the charges for components of care, Medicare items billed, and the diagnoses that were associated with the separation—using the ICD-10-AM.

The non-medical charge for each separation in the PHDB has been calculated as the sum of accommodation, theatre, labour ward, intensive care unit, prosthesis, pharmacy, other, and bundled charges. The average fee charged and benefit paid in hospitals for each state in 2015–16 for the Medicare items recorded for each separation was assigned to the separation, as the medical charge component is not reported in the PHDB. The total charge for each separation is calculated as the non-medical charge plus the Medicare fees charged.

The source of funds was calculated from the difference between the total charge and the Medicare benefits paid for each item number. The sum of the Medicare benefits was subtracted from the total charge per separation, with this difference being the fee paid by private health insurers or individuals.

The average charge and benefits paid was calculated for each jurisdiction, AR-DRG, principal diagnosis, care type, sex, and age, and assigned to separations in the NHMD on the basis of

these aggregations. Where separation costs were not able to be allocated using these aggregations, less specific groupings were used as necessary.

## **Step 2: Assigning expenditure to diagnoses**

Each separation in the NHMD has a principal diagnosis, which is the diagnosis established after study to be chiefly responsible for occasioning the patient's episode of care in hospital. In many cases, there may be additional diagnoses, defined as a 'condition or complaint either coexisting with the principal diagnosis or arising during the episode of care' (METeOR id: 588981). In 2015–16, diagnosis information was reported using the ICD-10-AM 9th edition. The diagnosis codes were then mapped to the ABDS conditions.

Both the principal and additional diagnoses can drive expenditure, but not in all cases. In developing the private hospital admitted patient expenditure data, the principal diagnosis was almost always assumed to drive expenditure, even if considered out-of-scope, because of its role in occasioning the separation and inconsistent reporting of additional diagnoses in private hospitals. The exception is for radiotherapy and pharmacotherapy sessions for neoplasms, which were allocated to the associated neoplasm diagnosis. The expenditure for each separation was allocated to the additional diagnoses using the regression model described in the section '*Public admitted patients*'.

## **Step 3: Scaling expenditure to total expenditure**

The cost estimates for all separations have been scaled so that the total cost of private hospital admitted patient separations reflects the cost estimates of the private hospital expenditure for each jurisdiction, and Medicare in-hospital expenditure.

Private hospital expenditure estimates for each jurisdiction were sourced from the health expenditure database. This component of expenditure does not include in-hospital Medicare funding and associated out-of-pocket payments. The estimated non-Medicare cost of each separation for each jurisdiction was then summed. A scaling factor was then calculated by dividing the admitted patient expenditure by the sum of the private hospital expenditure for that jurisdiction.

In-hospital Medicare expenditure for each jurisdiction and item number was derived from Australian Government Department of Health data. The total in-hospital Medicare fees charged and benefits paid reflects the expenditure for the Medicare items charged across both public and private hospitals. Medicare expenditure in public hospitals is related to the use of private health insurance in public hospitals. The public hospital component of the Medicare expenditure is estimated using the private hospital data, as the patient profile is likely more representative of patients using private health insurance in hospitals, and because the data contains information regarding Medicare items claimed for episodes of care.

The total in-hospital fees charged and benefit paid for Medicare items were summed for each jurisdiction. The proportion of non-medical private health insurance expenditure spent between public and private hospitals was calculated for each jurisdiction, and applied to the total in-hospital amounts to estimate the public and private components. The estimated Medicare cost of each separation for each jurisdiction was then summed. Scaling factors were then calculated by dividing the public and private hospital Medicare expenditures by the sum of the estimated Medicare expenditure for that state or territory.

Separation costs for each source of funds were then multiplied by the scaling factors for each state or territory to calculate the non-medical, and public and private medical components of care.

## Emergency departments

Emergency departments have not previously been included in cost estimates for disease expenditure studies. The current disease expenditure study has included this to expand the scope of the study with estimates for emergency department presentations based on data in the NNAPEDC. The NNAPEDC provides information on the care provided for non-admitted patients registered for care in emergency departments in public hospitals where the emergency department meets the following criteria:

- purposely designed and equipped area with designated assessment, treatment and resuscitation areas;
- ability to provide resuscitation, stabilisation and initial management of all emergencies;
- availability of medical staff in the hospital 24 hours a day; and
- designated emergency department nursing staff 24 hours per day 7 days per week, and a designated emergency department nursing unit manager.

For 2015–16, information on presentations from 287 public emergency departments is available. Data for private hospitals is not collected in the NNAPEDC. The information collected relates to the patient, the hospital, the type of visit, urgency of care, mode of arrival, episode end status, and principal diagnosis.

The main steps used to create this new data set are outlined in the following sections and include:

1. estimating the cost of each presentation;
2. assigning expenditure to diagnoses; and
3. scaling costs to total hospital expenditure.

### Step 1: Estimating the cost of each presentation

The NHCDC contains cost estimates for emergency department presentations. The IHPA classifies emergency department presentations using the Urgency Related Group (URG) emergency care classification, developed for activity-based funding purposes.

Costs are assigned to presentations on the basis of the:

- Average costs from the NHCDC for each hospital and URG, and
- URG recorded for each presentation in the same hospital in the NNAPEDC database.

Records that did not match these specifications were assigned costs that were based on either the jurisdiction or national average URG cost; depending on the differences in data reporting to the AIHW and to the IHPA. Presentations that were missing an URG were assigned the hospital or jurisdiction average Major Diagnostic Block (MDB) cost, the higher level category that diagnoses and URGs are grouped into.

Presentation costs were not adjusted for length of stay in the emergency department. The estimated cost of each presentation was adjusted according to the Indigenous status of the patient, based on the recommended 4% cost loading applied to hospital costs for Indigenous patients (IHPA 2015). This cost adjustment is independent of adjustment for under-identification of Indigenous patients that can be applied when reporting emergency department expenditure for this population.

## Step 2: Assigning expenditure to diagnoses

Each presentation in the NNAPEDC has a principal diagnosis (METeOR id: 590664)—AIHW's Metadata Online Registry (METeOR)—which is the diagnosis established at the conclusion of the patient's attendance in an emergency department to be mainly responsible for occasioning the attendance. There may also be up to two additional diagnoses recorded (METeOR id: 590658).

In 2015–16, diagnosis information was reported using a variety of classifications. The AIHW mapped the provided information to the ICD-10-AM classifications (see section *ICD-10-AM ninth edition*, page 2). The ICD-10-AM 9th edition diagnosis codes were then mapped to the ABDS conditions. In developing the emergency department expenditure estimates, the principal diagnosis was always assumed to drive expenditure, even if considered out-of-scope, because of its role in occasioning the presentation. All costs were allocated to the principal diagnosis.

## Step 3: Scaling costs to total hospital expenditure

The current disease expenditure study has not scaled presentations to total non-admitted patient expenditure for each hospital; because the IFRAC includes costs relating to presentations at emergency departments for patients who are subsequently admitted to hospital as admitted patient expenditure. About 29% of public emergency department presentations were subsequently admitted to hospital.

The cost estimates for all presentations are scaled so that the total cost of emergency department presentations and outpatient clinic service events reflects the cost estimates of the non-admitted patient expenditure for each jurisdiction.

The IFRACs reported by hospitals in the NPHEd were used to create an estimate of the non-admitted patient expenditure for each state or territory. Hospitals' total expenditure were multiplied by the IFRAC to estimate the admitted patient expenditure for hospitals reporting an IFRAC. The average IFRAC for each jurisdiction was estimated from the aggregated hospitals admitted patient expenditure (Table 5.2).

Public hospital expenditure estimates for each state or territory from the health expenditure database were multiplied by the jurisdiction's IFRAC to estimate the total admitted patient expenditure. The remaining expenditure is the expenditure estimated for non-admitted patient services (emergency department and outpatient clinic).

The estimated cost of each presentation and each outpatient clinic service event for each jurisdiction was then summed. A scaling factor was then calculated by dividing the non-admitted patient expenditure by the sum of the estimated non-admitted service costs for that jurisdiction. Emergency department presentation costs were then multiplied by the scaling factor for each jurisdiction.

## Outpatient clinics

Outpatient clinics have not previously been included in cost estimates for disease expenditure studies undertaken by the AIHW. The current disease expenditure study has included this data to increase the scope of expenditure estimates beyond those previously reported.

Non-admitted patient care provided in public hospitals includes care provided in outpatient clinics at which patients consult specialist medical practitioners, or have diagnostic or other procedures, or are provided with allied health or specialist nursing care. Estimates for outpatient clinic services events are derived from two data sources:

- clinic-level service events data from the NAPAGG, which describes overall non-admitted patient care reported for all public hospitals; and
- episode-level data for non-admitted patient service events in activity-based funded hospitals from the NAPUR, which provides more detailed information about patients and how services were delivered. Data was not available for Victoria and Queensland.

In 2015–16, the scope of these collections included service events in all public hospitals, including service events in both activity-based funded hospitals and block-funded hospitals.

Outpatient clinic service events are classified according to the type of clinic in which they are provided. Clinics are classified by Tier 2 clinic class, which is defined by the type of clinician who provided the service, and the nature of the service provided. A clinic may provide a range of services that fall into different classes, and when this occurs the clinic is classified based on its predominant activity. Diagnostic information is not recorded for outpatient clinics service events, and so this is estimated. The main steps used to create this new data set are outlined in the following sections and include:

1. estimating patient demography;
2. estimating expenditure for service events;
3. mapping to conditions; and
4. scaling costs to total hospital expenditure.

### Step 1: Estimating patient demography

Approximately half of the service events recorded in the NAPAGG are recorded in greater detail in the NAPUR (Table 5.3). The unit record demographic information has been used to estimate the demographics of the aggregate data in two ways:

- the proportion of all service events in each clinic type by sex and age groups was applied to aggregate data for Victoria and Queensland; and
- the proportion of service events in each clinic type in each hospital or state by sex and age groups was applied to service events not reported in the NAPUR by states that reported more services in the NAPAGG than the NAPUR.

The number of service events for each sex and age group in each clinic type was calculated from the NAPUR data. Service events for each sex and age group was divided by the total to calculate the proportion attributable to each group across Australia, for each clinic type. The proportion of service events in clinics by sex and age groups was calculated similarly for each hospital, and for each jurisdiction.

**Table 5.3: Outpatient clinic services reported in the NAPUR and NAPAGG data sources by jurisdiction, 2015–16**

State	Services in NAPUR	Services in NAPAGG
New South Wales	10,784,452	17,179,813
Victoria	–	5,175,246
Queensland	–	5,373,469
Western Australia	2,196,648	2,548,150
South Australia	1,380,173	2,237,321
Tasmania	520,324	521,322
Australian Capital Territory	1,069,046	–
Northern Territory	404,402	404,402
<b>Total</b>	<b>16,355,045</b>	<b>33,439,723</b>

Source: National Non-Admitted Patient Unit Record and Aggregate databases.

The sum of service events in the NAPUR by hospital and clinic type was subtracted from the total number of service events for hospitals in the NAPAGG. The proportions for each hospital were applied to the residual aggregate service events by clinic type, where the hospital and clinic reported service events in the NAPUR. Where a hospital reported in the NAPAGG only, the jurisdiction proportions were applied to the number of service events in each clinic type. Where information about a clinic type for a jurisdiction was only reported in the NAPAGG, the national proportions were applied to service events for the clinic type.

## Step 2: Estimating expenditure for service events

Average costs from the NHCDC for each hospital and clinic type are assigned to service events in the NAP disaggregated dataset on the basis of the hospital and clinic type for each service event. Records that did not match these specifications were assigned costs based on either the jurisdictional or national average clinic type cost (where cost data for clinic types in jurisdictions are not included in the NHCDC, but have reported activity data). The average cost for the clinic type was multiplied by the number of service events for each sex and age group, to estimate the total cost.

Costs were not assigned based on care type as this data is new for the 2015–16 reporting period and inconsistently reported between jurisdictions. The estimated cost of each unit record service event was adjusted according to the Indigenous status of the patient, based on the recommended 4% cost loading applied to hospital costs for Indigenous patients (IHPA 2015). This cost adjustment is independent of adjustment for under-identification of Indigenous patients that can be applied when reporting outpatient expenditure for this population.

## Step 3: Mapping to conditions

National outpatient clinic data does not contain diagnostic information. The ABDS conditions managed in outpatient clinics were estimated using BEACH data (see section *Bettering the Evaluation and Care of Health Survey*, page 12). The diagnosis associated with the ICPC-2 PLUS codes aligned to Tier 2 clinic type has been used to create a mapping file of the proportion of events in outpatient clinics represented by ABDS condition in each clinic type.

The costed NAPUR data was summed by sex and age groups for each hospital and clinic type, and combined with the disaggregated NAPAGG data. The proportions from the BEACH mapping file have been applied to these aggregations to give an estimated number of service events and cost by ABDS condition for each hospital and clinic type. Not all clinics were able to be allocated to ABDS conditions, such as at home ventilation (10.19). Conditions were

allocated for 132 of 140 of clinic types and 89% of service events. It should be noted that this is a new estimation method, and is intended to be indicative only. At a hospital level, this may give fractions of individuals and care should be taken when interpreting results.

#### **Step 4: Scaling costs to total hospital expenditure**

The current disease expenditure study does not scale outpatient service events to total non-admitted patient expenditure for each hospital; because the IFRAC includes costs relating to presentations at emergency departments for patients who are subsequently admitted to hospital as admitted patient expenditure. The cost estimates for all service events have been scaled so that the total cost of emergency department presentations and outpatient clinic service events reflects the cost estimates of the non-admitted patient expenditure for each jurisdiction.

The IFRACs reported by hospitals in the NPHEd were used to create an estimate of the non-admitted patient expenditure for each jurisdiction. Hospitals' total expenditure were multiplied by the IFRAC to estimate the admitted patient expenditure for hospitals reporting an IFRAC. The average IFRAC for each jurisdiction has been estimated from the aggregated hospitals admitted patient expenditure (Table 5.2). Public hospital expenditure estimates for each jurisdiction from the health expenditure database were multiplied by the jurisdictional IFRAC to estimate the total admitted patient expenditure. The remaining expenditure is the expenditure estimated for non-admitted patient services (emergency department and outpatient clinic).

The estimated cost of each presentation and each outpatient clinic service event for each jurisdiction was then summed. A scaling factor was then calculated by dividing the non-admitted patient expenditure by the sum of the estimated non-admitted service costs for that jurisdiction. Outpatient clinic service event costs were then multiplied by the scaling factor for each jurisdiction.

## 6 Medical services, dental, and pharmaceuticals

There is currently no national data source in Australia that includes diagnostic information for medical services outside of hospitals, dental services, or for pharmaceuticals. It is therefore necessary to create an estimate of the expenditure associated with the conditions being managed. Most medical services are funded either entirely or partially through the MBS and many prescription pharmaceuticals are listed on the PBS, and are often subsidised through the PBS. Most of the medical services and pharmaceuticals dispensed in Australia are captured in the MBS and PBS databases. Dental services are largely funded outside of government programs and there is no national data collection with service details available for analysis.

The data sources that were used in this work were:

- the BEACH survey of general practitioners for information regarding the conditions that prescriptions are written for (see section *Bettering the Evaluation and Care of Health Survey*, page 10);
- MBS claims for the 2015–16 financial year date of service;
- PBS dispensing data for the 2015–16 financial year date of supply; and
- HEA dental expenditure estimates.

This section outlines the steps used to create the component data sets for medical services, dental, and pharmaceutical expenditure. Details of the limitations of this method have been included in Appendix A.

### Medicare Benefits Schedule

The main objective for the medical services component of the disease expenditure study is to update previous estimates to the year 2015–16, and improve the methods used to assign expenditure to conditions. This section outlines the steps used to create the data sets for expenditure on medical services listed on the MBS.

The main steps used to create this new data set are outlined in the following sections and include:

1. aggregating MBS data;
2. classifying MBS items; and
3. mapping to conditions.

#### Step 1: Aggregating MBS data

The MBS dataset contains information on medical services that are eligible for subsidy under the Medicare scheme, patient demographics, service provider information, fees charged for services, and benefits paid. Not all services did have an MBS benefit paid (for example, ‘under co-payment’ services).

Medical services data are structured by group, subgroup, broad type of service, item number, and provider specialty. Each service event is recorded as being a service provided in a hospital or a non-hospital service. This component of the disease expenditure study uses only the non-hospital services.

The number of services, total benefit paid, and total fees charged was aggregated by the patient age group, sex, state or territory, SA3, MBS item number, and provider specialty (GP, specialist, and all other). The total benefit paid was subtracted from the total fees charged to calculate the total patient co-payment amount for each aggregation.

## Step 2: Classifying MBS items

Work was done by the AIHW to map, where feasible and appropriate, each of the MBS items claimed in 2015–16 to the ABDS groups. The goal of this approach is to enable more accurate estimation using the BEACH mapping files.

The approach taken was to review each of the codes in the MBS schedule and allocate codes to either a condition group or categorise as unclassified. Some items in the MBS schedule, due to their nature, relate specifically to a condition group. For example, item 30559 *Oesophagus, local excision for tumour of* can be justifiably categorised as relating to the *Cancer and other neoplasms* group of diagnoses. In addition, some items can be related to more than one condition group. However, many of the MBS items are unclassifiable, such as items 23 and 36, for generic short and long GP consultations. Approximately 64% of MBS items were able to be attributed to at least one ABDS group.

**Table 6.1: Summary of MBS items by ABDS group classification, 2015–16**

ABDS group	Number of MBS items
Unclassified	2,128
Infectious diseases	100
Infant and congenital conditions	234
Cancer and other neoplasms	741
Cardiovascular diseases	434
Respiratory diseases	71
Gastrointestinal disorders	295
Neurological conditions	149
Mental and substance use disorders	125
Endocrine disorders	54
Kidney and urinary diseases	295
Reproductive and maternal conditions	166
Musculoskeletal disorders	493
Hearing and vision disorders	299
Skin disorders	162
Oral disorders	87
Blood and metabolic disorders	5
Injury	407
<b>Total</b>	<b>6,257</b>

The aim in classifying the MBS schedule is to increase the accuracy of the proportional disaggregation of MBS service events to ABDS conditions by restricting the disaggregation to conditions in the relevant groups, where possible.

### **Step 3: Mapping to conditions**

Where it was not possible to directly map the MBS item to an ABDS group, a set of mapping files have been created using the BEACH survey of GPs to estimate expenditure by condition. The BEACH survey includes at least one diagnosis assigned by the GP for each of the referrals made, and imaging and pathology tests ordered. Where more than one diagnosis is given for an individual action, both diagnoses are included in the mapping file.

The mapping of conditions in the MBS was based on the provider specialty, the MBS group and subgroup, and the ABDS group of the MBS item (based on the below approaches).

The MBS claims data, after mapping to ABDS groups, was aggregated by patient age group, sex, state or territory, SA3, MBS group, provider specialty, and ABDS group.

#### **Pathology and Diagnostic Imaging**

Claims for MBS items in the Diagnostic Imaging Services category (Group I) were allocated to ABDS conditions using the BEACH mapping file for imaging requests, and claims in the Pathology Services category (Group P) were allocated using pathology tests ordered.

In the mapping file:

- imaging requests are grouped to the MBS groups (ultrasound, computerised tomography, diagnostic radiology, nuclear medicine imaging, and magnetic resonance imaging).
- pathology tests are grouped to the MBS groups (chemistry, microbiology, immunology, histopathology, cytopathology, cytogenetics, infertility/pregnancy tests, simple tests, and other).

The provider specialty was not used for these items. The proportion of bulk-billed services mapped to each condition was used to allocate the bulk billing incentive payments for pathology and imaging services. The proportion of total pathology services allocated to each condition was used to allocate initiation payments.

#### **GP and Medical Specialists**

Claims for MBS items that are not for pathology and diagnostic imaging have been allocated to ABDS conditions using the BEACH mapping file for GP management and referrals.

The referral groups in the BEACH mapping files that were used to allocate conditions were medical specialists and allied health. Conditions managed by GPs were based on all reported diagnoses, or diagnoses reported when claiming for items 23 and 36. The allocation of services to conditions has been based on the provider specialty in the MBS data (GP, medical specialist or allied health and other), and the ABDS group of the items.

Where MBS items were not able to be classified to an ABDS group, the proportion of referrals or services for each ABDS condition within the provider specialty was used to distribute the number of MBS claims, total cost, and patient co-payment across the conditions. Where MBS items were mapped to an ABDS group, the proportion of referrals or services within the provider speciality for each ABDS group and condition was used.

The resulting dataset contains the number of MBS services, total patient co-payment, and total Australian Government expenditure for each ABDS condition, by MBS group, provider specialty, and patient demographics.

# Pharmaceutical Benefits Scheme

The main objective for the pharmaceuticals component of the disease expenditure study is to update previous estimates to the year 2015–16. This section outlines the steps used to create the data sets for expenditure on pharmaceuticals listed on the PBS.

The main steps used to create this new data set are outlined in the following sections and include:

1. aggregating PBS data; and
2. application of mapping file for conditions.

## Step 1: Aggregating PBS data

The PBS database contains information on prescription medications that are listed on the PBS (private prescriptions are not included), patient demographics, co-payment amounts and total cost.

The number of prescriptions, total co-payment, and total cost was aggregated by patient age group, sex, state or territory, SA3, ATC classification and item code. The co-payment was subtracted from the total cost to calculate the Australian Government expenditure.

## Step 2: Mapping to conditions

There is no direct mapping available between the ATC classification of a pharmaceutical and the condition it is used to manage or treat. While some work has been undertaken to determine the ICD-10 chapter relating to each of the ATC classifications, many pharmaceuticals may be used to manage or treat multiple conditions. In addition, many pharmaceuticals are prescribed for management of conditions that are not 'listed on the label'. Restricting each classification to a single condition is therefore not appropriate.

A mapping file has been created from the BEACH survey data to estimate expenditure by condition. BEACH data includes at least one diagnosis assigned by the GP for each of the pharmaceuticals prescribed. If more than one diagnosis is given for an individual prescription, both diagnoses have been included in the mapping file. The mapping file contains the proportion of prescriptions in each 5th level ATC classification that are due to each of the ABDS conditions.

The number of prescriptions, total co-payment, and total cost within each of the disaggregations was multiplied by the proportion in the mapping file for each ABDS condition within the ATC classification for the item code. Where pharmaceuticals could not be allocated, the proportions of prescriptions aggregated at the next highest ATC classification were used.

It should be noted that not all pharmaceuticals were included in these aggregations. For example, daclatasvir, sofosbuvir, ledipasvir with sofosbuvir, and ribavirin for the treatment of Hepatitis C were listed on the PBS in April 2016. These four pharmaceuticals represented about \$1.1 billion in expenditure in 2015–16, and were allocated directly to Hepatitis C. The data relating to these pharmaceuticals was excluded from the allocation method described above, though the data was aggregated at the same level.

The resulting dataset contains the number of prescriptions dispensed, total patient co-payment, and total Australian Government expenditure for each ABDS condition, by item code, ATC classification and patient demographics. Costs were not scaled to total expenditure in the health expenditure database as the actual expenditure, not estimated costs, are used in this analysis. These costs represent more up-to-date information than the health expenditure database due to later processing of claims for service events over the relevant period.

## Dental services

The main objective for the dental component of the disease expenditure study is to create estimates for the \$9.9 billion of dental expenditure. This section outlines the steps used to create the data sets for expenditure on dental services outside of the MBS.

The main steps used to create this new data set are outlined in the following sections and include:

1. inclusions of dental expenditure; and
2. application of mapping files for conditions.

### Step 1: Calculating dental expenditure

The HEA database contains dental expenditure estimates that are derived using a range of data sources, including ABS survey data, reported expenditure by various sources of funds, and funding through the MBS. For the disease expenditure study, MBS expenditure on 'Oral and Maxillofacial' and 'Cleft lip and palate' dental services were excluded from the total dental calculations, as this data is included in the MBS expenditure. Child dental benefits are included in the total dental calculations.

There is no administrative data containing dental service use or expenditure by age or sex and so this analysis is limited to the total expenditure.

### Step 2: Mapping to conditions

Previous disease expenditure studies have allocated all dental expenditure to 'oral disorders'. However, there are various reasons that patients with conditions outside of those included under oral disorders may require dental services (for example, periodontal services for a patient with a jaw injury).

A proportional mapping file was created from the BEACH data using the conditions reported when a referral or recommendation was made for dentists or orthodontists. While this method excludes conditions for which patients self-refer to dentists, such as for dental checks, it allows the expenditure on non-oral conditions to be estimated. Based on this approach, approximately 75% of referrals are still for 'oral disorders', the bulk of which are dental caries. The cost profile of dental services for patients is likely to differ for each of the conditions and groups. This method assumes equal costs for each of the conditions. However, this cost difference is partially accounted for due to the higher weighting of non-oral conditions through exclusion of self-referrals for dental checks and minor dental work.

# Appendix A

## Limitations of the current disease expenditure method

It is acknowledged that any estimation methodology developed will have limitations, and the method outlined in this report is no different. This section presents an assessment of some of the key limitations in both the model used and the inputs that were available. This information has been structured around general limitations for each component and limitations relating to particular sub-steps in the process.

### Allocated expenditure

The disease expenditure study was only able to allocate 70% of recurrent expenditure to conditions. The main components of expenditure which remain unallocated are:

- over-the-counter pharmaceuticals;
- other health practitioners;
- dental services;
- community health;
- public health; and
- research.

These areas of expenditure could be included in future updates with appropriate estimation methods or data becomes available.

### Hospital-related activity

#### Admission practice variation

Using the NHMD, NNAPEDC and NAP databases as the basis for the calculation of expenditure requires assumptions that each state and territory has the same admission practices. For example, variations in admission practices and policies may lead to variation among providers in the number of admissions for some conditions.

For example, in some jurisdictions, certain services, such as chemotherapy, are provided through outpatient clinics, while in others the same service may be provided as an admitted patient service. Patients presenting at an emergency department may be either treated upon presentation, or admitted for further treatment or observation, depending on local admission practices. Each of these sectors has a different method of calculating expenditure and may contribute to variations in expenditure estimates for the same condition across jurisdictions.

In addition, variation may also occur over time and between the public and private sectors.

#### Estimating the cost of each separation/presentation/service event

Cost estimates for separations in some hospitals that do not report cost data for the NHCDC are based on average costs in the NHCDC. The actual cost for the services provided to each DRG or diagnosis may be more or less costly than the average.

## **Scaling costs to total hospital expenditure**

Total public hospital expenditure was calculated from the health expenditure database, excluding the cost of PBS Section 100 drugs. Total public hospital expenditure for each jurisdiction is divided into admitted and non-admitted patient related expenditure using the IFRAC reported in the NPHEd. Not all hospitals reported an IFRAC, and the IFRAC in some jurisdictions is reported for the LHN rather than the hospital. This creates a potential bias towards the admission practices in those hospitals or LHNs that reported an IFRAC within each jurisdiction.

The IFRAC includes the emergency department costs for patients which are subsequently admitted to the hospital. For hospitals with large emergency departments, this causes the total estimated admitted patient expenditure to be much larger than anticipated from the NHDC data. As emergency department costs are calculated separately, costs for each separation, presentation or service event are not scaled to the total cost (admitted or non-admitted) for the individual hospital. Costs are scaled to the total costs for each jurisdiction.

## **Diagnosis for Outpatient**

The diagnosis associated with outpatient service events is estimated using the diagnosis assigned to referrals, pathology and imaging requests in the BEACH survey data.

These referrals can relate to specialists in private practices or for outpatient clinics. This means that referrals are not necessarily representative of the referrals that would be made specifically for outpatient clinics, as patients can be referred to clinics from medical practitioners in an emergency department or following admission and discharge from the hospital as well. This is particularly true for the clinic types which are unable to be disaggregated using the survey data.

Only those clinics that can be attributed to conditions are used in the estimation methods in this project, which may lead to certain biases in cost estimates for hospitals with a high volume of services in the unallocated outpatient clinic types.

It should be noted that future analysis using a linked data source may provide the opportunity to improve on the current estimates of the conditions that are managed in outpatient clinics. Until this analysis is able to be undertaken, this is the selected method for estimating the conditions managed in outpatient clinics.

## **Distributing costs to relevant diagnoses**

The cost of an episode of hospital care is only distributed between diagnoses for admitted patients, as the quality of diagnostic data for admitted patients is the most robust available. Diagnostic data for emergency departments is generally available for principal diagnosis, while additional diagnoses may be assigned in some cases. It is recognised that the coding of additional diagnoses is not consistent between hospitals and jurisdictions, and as such expenditure has been attributed to the principal diagnosis only.

Only emergency departments presentations that could be mapped to the ICD-10-AM were used in the estimation methods in this project. Approximately 5% of presentations that had been coded according to the SNOMED-EDRS were unable to be mapped to the ICD-10-AM, which may lead to bias in cost estimates by geographical area for hospitals using the SNOMED-EDRS.

## **Scaling for total costs in private hospitals**

Data on emergency department activity for private hospitals was not available for this project. There are about 30 private emergency departments in Australia that manage about 500,000 presentations.

In this study, private admitted patient costs have been scaled to total private hospital costs, due to the fact that there is no available indicator of the amount of expenditure allocated to admitted and non-admitted patients.

The average in-hospital fees and benefits for MBS items are allocated to the private hospital data. It should be noted that some of the MBS items claimed in private hospitals might also be claimed in public hospitals in certain circumstances, which could lead to biases in the estimated out-of-pocket component for these items if the public hospital fees for these items vary significantly from private hospitals.

As there is no available flag in the Medicare data to indicate if a service was provided in a public or private hospital, the proportion of non-medical private health insurance expenditure between public and private hospitals was used to split the total in-hospital Medicare fees charged and benefits paid. If the non-medical fees or gap payment arrangements for health insurers vary significantly between public and private hospitals, this may lead to biases in the estimation of this component.

## **Medical services, dental, and pharmaceuticals**

### **Using BEACH survey data for MBS and PBS**

The BEACH data used in this analysis related to several years prior to the study period. It would be preferable to have diagnostic information for the actual services used, but a suitable data source is not available at this time. A method is being developed to use linked data sources as they become available and the estimates will be refined in the future.

### **Mapping MBS to ABDS groups**

The mapping of MBS items to ABDS groups is based on a general understanding of the nature of procedures. There may be certain circumstances where a procedure relates to a condition outside of the group assigned. This will be refined when linked data is available.

### **Dental estimation**

There is no available data source which contains service use or expenditure on dental services by age and sex, or the conditions which are managed. The use of BEACH data to allocate expenditure to conditions is a crude proportional allocation of total expenditure to conditions. The method can be further developed using survey data or other such data to better allocate expenditure to conditions, across age and sex groups.

# Appendix B

## Adjusting for Aboriginal and Torres Strait Islander under-identification

Hospital records include data items which record whether a patient is Aboriginal and Torres Strait Islander or non-Indigenous. There is a recognised under-identification of Indigenous people in hospital records (AIHW 2013a).

The level of under-identification is assessed through data quality studies which compare the results of face-to-face interviews with the information recorded in the patient's administrative records. This provides an estimate of the level of under-identification, expressed in terms of under-identification correction factors. The *Indigenous identification in hospital separations data: Quality report* had correction factors for national, state and territory, national remoteness areas and remoteness within jurisdictions (AIHW 2013b). The under-identification of Indigenous people in public hospitals varies substantially between and within states and territories, as well as remoteness categories. For this reason, it is best to use correction factors calculated at the lowest level possible.

When conducting an analysis of hospital data involving Indigenous status as a variable, the data can be adjusted at the aggregate level based on these under-identification correction factors. This is done by multiplying the number of records for Indigenous persons by the appropriate correction factor and scaling down the number of records for non-Indigenous persons accordingly.

There are not, however, specific correction factors for diseases or condition groups to allow this approach to be used when analysing expenditure by disease or condition. In order to overcome this limitation, adjustments have been made at the record level rather than at the aggregated level. That is, the expenditure estimates for records for Indigenous persons have been inflated according to the selected correction factor for the jurisdiction in which the service occurred. This analysis is only used when reporting expenditure estimates for Indigenous people.

Consistent with the recommendation in the report that 'the correction factors provided in this report should be used to adjust total hospital data from the 2010–11 reference year onwards' (AIHW 2013b), these correction factors were used for the 2015–16 data. These factors were applied to public and private admitted patient separations, public emergency department presentations, and public outpatient clinic service events.

### Limitations

Ideally, any adjustments for under-identification are undertaken by specifically identifying records where the person is Indigenous but did not identify as such and reclassifying the record. In that way, cost information for both Indigenous and non-Indigenous people would remain unadjusted for under-identification. While the under-identification studies suggest that some of these records were in fact for Indigenous people, these studies are not able to identify exactly which ones, and the AIHW is not aware of any method for doing so. As such, there remains a question as to the appropriateness of applying the adjustment factors to expenditure data in this way.

For the above reasons, the under-identification-adjusted expenditure estimates are only used for analysis where Indigenous status is of interest and where there are a large number of

cases in the data being studied. Micro-level studies using the adjusted data should be avoided and all analyses where Indigenous status is not relevant should use the unadjusted data.

**Table B.1: Estimated correction factors for Aboriginal and Torres Strait Islander people, by remoteness levels within jurisdictions**

<b>State/territory</b>	<b>Remoteness category</b>	<b>Correction factor</b>
New South Wales	Major cities	1.37
	Inner regional	1.09
	Outer regional	1.08
	Remote and very remote	1.02
Victoria	Major cities	1.41
	Inner regional	1.06
	Outer regional	1.09
Queensland	Major cities	1.07
	Inner regional	1.12
	Outer regional	1.04
	Remote and very remote	0.97
Western Australia	Major cities	0.99
	Inner regional	1.02
	Outer regional	1.00
	Remote	1.07
	Very remote	1.00
South Australia	Major cities	1.16
	Inner regional and outer regional	1.03
	Remote and very remote	1.00
Tasmania	Inner regional	1.37
Australian Capital Territory	Major cities	1.69
Northern Territory	Outer regional	1.03
	Remote	0.99
	Very remote	1.00
<b>Total</b>		<b>1.09</b>

*Note:* A number of jurisdictions were unable to reach a specified sample within the time period for some levels of the remoteness level categories. In these instances a combined category has been created.

# Appendix C

## Mapping of ICD-10-AM codes

**Table C.1: Mapping of ICD-10-AM codes to disease expenditure groups**

Disease expenditure group	ICD-10-AM 3 character codes
Infections	A00–A09, A15–A28, A30–A44, A48–A60, A63–A71, A74–A75, A77–A99, B00–B09, B15–17, B18*, B19–B27, B30, B33–B60, B64–B83, B85, B87–B92, B94–B99, G00–G07, H65–H68, H70, J00–J06, J09–J18, J20–J22, J85, J86, K71*, N29*, N30, N33*, N34, N39*, N74, O98, P35*, P37*, R57*, R65, U90, Z03*, Z06, Z11, Z20, Z21, Z22, Z83*, Z86*
Infant and congenital conditions	G80, P00–P05, P07, P08, P10–P15, P20–P29, P35*, P36, P37*, P38, P39, P50–P61, P70–P72, P74–P78, P80, P81, P83, P90–P96, Q00–Q07, Q10–Q18, Q20–Q28, Q30–Q45, Q50–Q56, Q60, Q62–Q87, Q89–Q93, Q95–Q99, R95, U88, Z38, Z82*, Z87*
Cancer and other neoplasms	C00–C26, C30–C34, C37–C41, C43–C58, C60–C86, C88, C90–C97, D00–D07, D09–D24, D26–D48, Z07, Z08, Z12, Z80, Z85, Z86*
Cardiovascular diseases	G45, I00–I02, I05–I11, I13, I15, I20–I28, I30–I52, I60–I74, I77–I84, I86–I89, I95, I97–I99, R00–R03, R57*, U82, Z82*, Z86*, Z94*, Z95, Z99*
Respiratory diseases	D86, J30–J36, J37–J47, J60–J70, J80–J82, J84, J90–J96, J98, J99, R05, R06, R09, U04, U83, Z82*, Z83*, Z87*, Z90*, Z93*, Z94*, Z96*, Z99*
Gastrointestinal diseases	B18*, I85, K20–K23, K25–K31, K35–K38, K40–K46, K50–K52, K55–K67, K70, K71*, K72–K77, K80–K82, K83, K85–K87, K90–K93, R15, R18, U84, Z83*, Z87*, Z90*, Z93*, Z94*, Z98*
Neurological conditions	F00–F03, G08–G14, G20–G26, G30–G32, G35–G37, G40, G41, G43, G44, G46, G47, G50–G64, G70–G73, G81–G83, G90–G99, U80, Z82*, Z98*
Mental and substance use disorders	F04–F07, F09–F25, F28–F34, F38–F45, F48, F50–F55, F59–F66, F68–F73, F78–F84, F88–F95, F98, F99, R40–R46, U79, Z72*, Z81, Z83*, Z86*, Z91*
Endocrine disorders	E03–E07, E09, E10–E14*, E16, E20–E32, E34, E35, E89, O24*, U78, Z83*, Z86*, Z96*
Kidney and urinary diseases	E10–E14*, I12, N00–N08, N10–N23, N25–N28, N29*, N31, N32, N33*, N35–N37, N39*, N40–N42, Q61, R30–R36, R39, U87, Z49, Z84*, Z87*, Z90*, Z93*, Z94*, Z96*, Z99*
Reproductive and maternal conditions	D25, E28, K62, N43–N51, N60–N64, N70–N73, N75–N77, N80–N99, O00–O16, O20–O23, O24*, O25, O26, O28–O36, O40–O48, O60–O75, O80–O92, O94–O97, O99, Z30–Z36, Z39*, Z87*, Z90*, Z91*, Z97*
Chronic musculoskeletal disorders	M00–M03, M05–M25, M30–M36, M40–M43, M45–M51, M53, M54, M60–M63, M65–M68, M70–M73, M75–M77, M79–M96, M99, U86, Z82*, Z87*, Z89, Z94*, Z96–Z98*
Sense organs	H04–H06, H10, H11, H13, H15–H22, H25–H28, H30–H35, H40, H42–H55, H57–H59, H69, H71–H75, H80, H81, H83, H90–H95, Z82*, Z94*, Z96*, Z97*
Skin disorders	A46, B86, H00–H03, H60–H62, J34, L00–L05, L08, L10–L14, L20–L30, L40–L45, L50–L54, L56–L60, L62–L68, L70–L75, L80–L95, L97–L99, R20, R21, Z84*, Z87*, Z94*
Oral disorders	K00–K14, Z96*, Z97*
Blood metabolic disorders	D50–D53, D55–D77, D80–D84, D89, E00–E02, E40–E46, E50–E56, E58–E61, E63–E68, E70–E80, E83–E88, E90, R74, R75, Z83*, Z86*
Injuries	L55, S00–S99, T00–T71, T73–T75, T78–T98, U50–U73, V00–V06, V09–V99, W00–W61, W64–W70, W73–W81, W83–W94, W99, X00–X06, X08–X54, X57, X58, X60–X99, Y00–Y09, Y17, Y21, Y24, Y28, Y31, Y32, Y35, Y36, Y40–Y66, Y69–Y89, Y95–Y98
Examination and observation NEC	R54, R56, R57*, Y90, Y91, Z00–Z02, Z03*, Z04, Z09, Z10, Z13, Z37, Z39*, Z75*, Z82–Z84*, Z86*, Z87*, Z88, Z90, Z91*, Z92, Z93, Z94*, Z96–Z98*
Interventions NEC	Z23–Z27, Z29, Z40–Z48, Z50–Z55, Z70, Z71, Z74–Z76*
Physical, behavioural social problems NEC	Z57–Z65, Z72*, Z73, Z74*–Z76*, Z99*
Symptoms NEC	R04, R07, R10–R14, R16, R17, R19, R22, R23, R25–R27, R29, R47–R53, R55, R58–R64, R68, R69, R76–R87, R89–R94, R96, R98, R99

### Notes

1. Indicates code is split across more than 1 cause group.
2. Detailed tables are available on request.

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# Abbreviations

ABDS	Australian Burden of Disease Study
ACCD	Australian Consortium for Classification Development
AIHW	Australian Institute of Health and Welfare
AR-DRG	Australian Refined Diagnosis Related Group
ATC	Anatomical Therapeutic Classification
BEACH	Bettering the Evaluation and Care of Health Survey
CAPS	Coding Atlas for Pharmaceutical Substances
DALY	Disability Adjusted Life Year
GP	General practitioner
HMCM	Hospital morbidity costing model
ICD	International Statistical Classification of Diseases and Related Health Problems
ICD-9-CM	International Statistical Classification of Diseases and Related Health Problems, 9th Revision, Clinical Modification
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification
ICPC-2 PLUS	International Classification of Primary Care, Version 2
IFRAC	Fraction of expenditure related to inpatient or admitted patient care
IHPA	Independent Hospital Pricing Authority
MBS	Medicare Benefits Schedule
METeOR	Metadata Online Registry
NAPAGG	National Non-admitted Patient Databases (Aggregate)
NAPUR	National Non-admitted Patient Databases (Unit record)
NEC	not elsewhere classified
NEP	National Efficient Price
NHCDC	National Hospital Cost Data Collection
NHMD	National Hospital Morbidity Database
NNAPEDC	National Non-admitted Patient Emergency Department Care Database
NPHEd	National Public Hospital Establishments Database
OECD	Organisation for Economic Co-operation and Development
PBS	Pharmaceutical Benefits Scheme

PHDB	Private Hospital Data Bureau
SNOMED-CT [EDRS]	Systematized Nomenclature of Medicine – Clinical Terms, Emergency Department Reference Set
URG	Urgency Related Group
WHO	World Health Organization

## Symbols

—	nil or rounded to zero
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# Glossary

**Aboriginal or Torres Strait Islander:** A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Indigenous**.

**activity-based funding:** A method of funding health services based on the amount and type of activity.

**acute:** Coming on sharply and often brief, intense and severe.

**additional diagnosis:** A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care, episode of residential care or attendance at a health care establishment.

**admission:** An admission to hospital. The term **hospitalisation** is used to describe an episode of hospital care that starts with the formal admission process and ends with the formal **separation** process. The number of separations has been taken as the number of admissions; hence, admission rate is the same as separation rate.

**admitted patient:** A patient who undergoes a hospital's formal admission process to receive treatment and/or care. This treatment and/or care is provided over a period of time and can occur in hospital and/or in the person's home (for hospital in the home patients).

**Australian Refined Diagnosis Related Groups (AR-DRGs):** An Australian system of diagnosis-related groups (DRGs). DRGs provide a clinically meaningful way of relating the number and type of patients treated in a hospital to the resources required by the hospital. Each AR-DRG represents a class of patients with similar clinical conditions requiring similar hospital services.

**average length of stay:** The average of the length of stay for admitted patient episodes. Calculated by dividing total patients days in a given period by the total number of hospital **separations** in that period.

**block-funding:** A method of funding health services for which activity-based funding is not applicable due to low volumes, the absence of 'economies of scale' or the inability to satisfy the technical requirements of activity-based funding.

**burden of disease and injury:** Term referring to the quantified impact of a disease or injury on an individual or population, using the **disability-adjusted life year (DALY)** measure.

**care type:** The care type defines the overall nature of a clinical service provided to an admitted patient during an episode of care (admitted care), or the type of service provided by the hospital for boarders or posthumous organ procurement (other care). Admitted patient care consists of the following categories:

- acute care
- rehabilitation care
- palliative care
- geriatric evaluation and management
- psychogeriatric care
- maintenance care
- newborn care
- other admitted care—that is, where the principal clinical intent does not meet the criteria for any of the above.

Other care services include:

- posthumous organ procurement
- hospital boarder.

**clinic type:** The type of service through which an establishment provides health care to a non-admitted patient in a non-admitted setting.

**comorbidity:** A situation where a person has two or more health problems at the same time.

**condition (health condition):** A broad term that can be applied to any health problem, including symptoms, diseases and certain risk factors, such as high blood cholesterol and obesity. Often used synonymously with disorder or problem.

**Co-payment:** A payment made by an individual who has health insurance, usually at the time a health service is received, to offset some of the cost of care.

**cost weight:** The costliness of an Australian Refined Diagnosis Related Group (AR-DRG) relative to all other AR-DRGs such that the average cost weight for all separations is 1.00. A separation for an AR-DRG with a cost weight of 5.0, therefore, on average costs 10 times as much as a separation with a cost weight of 0.5. There are separate cost weights for AR-DRGs in the public and private sectors, reflecting the differences in the range of costs in the different sectors.

**demographics:** Statistical data relating to population characteristics, such as age, sex, economic status, education level and employment status, among others.

**disability-adjusted life year (DALY):** A year of healthy life lost, either through premature death or equivalently through living with disability due to illness or injury. It is the basic unit used in **burden of disease and injury** estimates.

**disease:** A physical or mental disturbance involving symptoms (such as pain or feeling unwell), dysfunction or tissue damage, especially if these symptoms and signs form a recognisable clinical pattern.

**episode:** The period of admitted patient care between a formal or statistical admission and a formal or statistical separation, characterised by only one care type (see **care type** and **separation**).

**establishment type:** Type of establishment (defined in terms of legislative approval, service provided and patients treated) for each separately administered establishment.

**hospital services:** Services provided to a patient who is receiving admitted patient services or non-admitted patient services in a hospital, but excludes non-admitted dental services, community health services, patient transport services, public health activities and health research undertaken within the hospital. Can include services provided off-site, such as hospital in the home, dialysis or other services.

**hospitalisation:** Synonymous with **admission** and **separation**; that is, an episode of hospital care that starts with the formal admission process and ends with the formal separation process. An episode of care can be completed by the patients being discharged, transferred to another hospital or care facility, or dying, or by a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute to rehabilitation).

**IFRAC (inpatient fraction):** The ratio of admitted patient costs to total hospital costs—also known as the admitted patient cost proportion.

**Indigenous:** A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Aboriginal or Torres Strait Islander**.

**Indigenous status:** Whether a person identifies as being of **Aboriginal and/or Torres Strait Islander** origin.

**inpatient:** See **admitted patient**.

**International Classification of Diseases (ICD):** The World Health Organization's (WHO) internationally accepted statistical classification of death and disease. The 10th revision (ICD-10) is currently in use. The Australian modification of the ICD-10 (ICD-10-AM) is used for diagnoses and procedures recorded for patients admitted to hospitals.

**Medicare Benefits Schedule (MBS):** The funding source reported for Medicare eligible non-admitted patients presenting at a public hospital outpatient department for whom services are billed to Medicare. Includes both bulk-billed patients and patients with out-of-pocket expenses.

**non-admitted patient:** A patient who receives care from a recognised non-admitted patient service/clinic of a hospital, including emergency departments and outpatient clinics.

**non-Indigenous:** People who have declared they are not of Aboriginal or Torres Strait Islander descent.

**Organisation for Economic Co-operation and Development (OECD):** An organisation of 36 countries, including Australia—mostly developed and some emerging (such as Mexico, Chile and Turkey). The OECD's aim is to promote policies that will improve the economic and social wellbeing of people around the world.

**outpatient:** See **non-admitted patient**.

**Pharmaceutical Benefits Scheme (PBS):** A national, government-funded scheme that subsidises the cost of a wide variety of pharmaceutical drugs, and that covers all Australians to help them afford standard medications. The PBS lists all the medicinal products available under the PBS and explains the uses for which they can be subsidised.

**principal diagnosis:** The diagnosis listed in hospital records to describe the problem that was chiefly responsible for **hospitalisation**.

**private hospital:** A health-care provider facility, other than a public hospital, that has been established under state or territory legislation as a hospital or freestanding day procedure unit and authorised to facilitate the provision of hospital services to patients. A private hospital is not defined by whether it is privately owned but by whether it is not a public hospital (as defined below). Private hospital expenditure includes expenditures incurred by a private hospital in providing contracted and/or ad hoc treatments for public patients.

**private patient:** Person admitted to a private hospital, or person admitted to a public hospital who decides to choose the doctor(s) who will treat them or to have private ward accommodation. This means they will be charged for medical services, food and accommodation.

**procedure:** A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training and/or requires special facilities or equipment available only in an acute care setting.

**public hospital:** A health-care provider facility that has been established under state or territory legislation as a hospital or as a freestanding day procedure unit. Public hospitals are operated by, or on behalf of, the government of the state or territory in which they are established and are authorised under that state/territory's legislation to provide or facilitate the provision of hospital services to patients. Public hospitals include some denominational hospitals that are privately owned. Australian Defence Force hospitals are not included in the scope of public hospitals.

**separation:** The formal process where a hospital records the completion of an episode of treatment and/or care for an admitted patient. In this report, described by the term **hospitalisation**.

**Tier 2:** The Tier 2 non-admitted services classification is a hierarchical classification comprising 2 levels, namely the clinic classes (4 broad categories) and clinic types (the most detailed level of the classification).

**total health expenditure (spending):** The sum of health expenditure for all conditions (that is, allocated recurrent health expenditure). This excludes expenditure that cannot be allocated to a specific disease (for example, ambulance services) and capital expenditure (non-recurrent).

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