Using PBS and MBS data to report on the treatment and management of chronic respiratory conditions

2016–17

AIHW

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Contents

Acknowledgments

Abbreviations

ACOS	asthma-COPD Overlap Syndrome
AIHW	Australian Institute of Health and Welfare
ATC	Anatomical Therapeutic Chemical Classification
COPD	chronic obstructive pulmonary disease
COPD-X	Australian clinical practice guidelines for COPD (an acronym for the key components of COPD management)
DALY	disability-adjusted life years
DVA	Department of Veterans' Affairs
FDC	Fixed dose combination
GP	General Practitioner
ICS	inhaled corticosteroids
IgE	immunoglobulin E
LABA	long-acting beta2-agonists
LAMA	long-acting muscarinic antagonists
LTRA	leukotriene receptor antagonists
MBS	Medicare Benefits Schedule
OCS	oral corticosteroids
PBS	Pharmaceutical Benefits Scheme
RPBS	Repatriation Pharmaceutical Benefits Scheme
SABA	short-acting beta2-agonists
SAMA	short-acting muscarinic antagonists

Symbols

. .	not applicable

Summary

Medication use is the mainstay of management for chronic respiratory conditions, of which chronic obstructive pulmonary disease (COPD) and asthma are 2 of the main conditions, contributing 43% and 29%, respectively, to the total disease burden from all respiratory conditions. Medications are used to minimise symptoms, reduce the risk of exacerbations and improve quality of life. The Pharmaceutical Benefits Scheme (PBS) and Medicare Benefits Schedule (MBS) claims data collected by the Department of Human Services and held by the Department of Health has great potential to provide further insight into how chronic respiratory conditions are treated and managed.

This report investigates the utility of PBS and MBS claims data in answering key research questions for reporting on the treatment and management of chronic respiratory conditions in Australia. It also includes high-level analysis of the dispensing of medications indicated for the treatment of chronic respiratory conditions in 2016–17.

Key findings

Following a review of the literature and consultation with the National Asthma and Other Chronic Respiratory Conditions Monitoring Advisory Group, 15 key research questions were identified as important for monitoring the treatment and management of chronic respiratory conditions in Australia.

Our assessment demonstrated that 10 out of 15 key questions can be answered. These relate to information on medication type; medication name; variation in dispensing patterns by demographic factors; time trends; speciality and prescriber; appropriate or irregular dispensing of medications; consistency with current clinical practice guidelines; uptake of new medications; and the cost of medications (patient contribution and PBS amount).

Five questions cannot be answered. These relate to the frequency of use of medications; adherence to treatment; reason for the prescription; whether PBS data can be used to estimate the prevalence of chronic respiratory conditions; and the rate of development of asthma action plans.

High-level analysis of PBS data shows that in 2016–17:

- over 16.5 million prescriptions were dispensed to more than 3.5 million individuals. The total benefits paid for these medications was around $471 million.

- main medication classes dispensed were combination medications (34% of total prescriptions dispensed for respiratory conditions); short-acting bronchodilators and short-acting muscarinic antagonists (SABA and SAMA) (25%); oral corticosteroids (22%); and long-acting bronchodilators and muscarinic antagonists (LABA and LAMA) (12%)

- the supply of medications was generally higher for females and for people aged 65 and over.

A limitation with the data presented in this report is that PBS and MBS claims data on their own do not include information about diagnosis of specific chronic conditions. Therefore, the presence of chronic respiratory conditions must be inferred—which could be achieved by identifying a pattern of use of certain medications in an effort to identify chronic respiratory conditions.

1 Introduction

1.1 Purpose

This report investigates the utility of the Pharmaceutical Benefits Scheme (PBS) and Medicare Benefits Schedule (MBS) claims data in answering key research questions of importance for reporting on the treatment and management of chronic respiratory conditions in Australia. It also includes high-level analysis of the dispensing of medications indicated for the treatment of chronic respiratory conditions. This report lays important ground work for future Australian Institute of Health and Welfare (AIHW) studies using PBS and/or MBS data. This includes detailed analysis, such as the number of prescriptions dispensed to individuals and to cohorts (such as concession card holders); and the number of people who have been dispensed more than 1 medication during that period.

1.2 About chronic respiratory conditions

Chronic respiratory conditions affect an estimated 7.1 million Australians (31% of the total population in 2014–15). The most commonly reported chronic respiratory conditions are allergic rhinitis (affecting an estimated 4.5 million people); asthma (affecting 2.5 million people); and chronic obstructive pulmonary disease (COPD), affecting 600,000 people. While asthma affects people of all ages, allergic rhinitis is more common in people aged 15–54 and COPD mainly affects middle-aged and older people (ABS 2015).

Asthma and COPD place a substantial burden on the individual and on the health system. According to the 2011 Australian Burden of Disease Study, respiratory conditions accounted for 8% (374,985) of disability-adjusted life years (DALYs), of which 43% (160,346 DALY) was attributed to COPD, and 29% (107,313 DALY) to asthma (AIHW 2017). In terms of general practice encounters from 2006–07 to 2015–16, asthma was managed in around 2 in every 100 encounters and COPD in around 1 in every 100 encounters (Britt et al. 2016). Given that asthma is 1 of the most common respiratory conditions and COPD is associated with poor health and wellbeing outcomes, this report focuses on asthma and COPD, which are 2 of the main chronic respiratory conditions.

COPD and asthma often coexist with each other, which is known as 'asthma-COPD overlap' (also called asthma-COPD overlap syndrome, or ACOS). Of people with asthma, 9% also have COPD, while 39% of people with COPD also have asthma (AIHW 2015). The 2 conditions have many similarities, especially in clinical symptoms, although they have marked differences at the pathological level. For example, people with COPD continue to lose lung function despite taking medication, which is not a common feature of asthma (Bateman et al. 2015; GINA 2017; GOLD 2015).

More information on chronic respiratory conditions in Australia can be found on the AIHW website.

At present there is no cure for asthma. Guidelines for the management of asthma focus on achieving asthma control, enabling a patient to live without functional limitations, impairment in quality of life, or risk of adverse events. Medication use is an integral component of asthma management. Asthma guidelines recommend that all people with asthma have a written asthma action plan, (which helps the person with asthma and/or their carer to recognise worsening asthma) and provides action advice (NACA 2017).

The goal of COPD management is to slow disease progression, reduce exacerbations and improve quality of life. Clinical practic guidelines—the COPD-X Plan—recommend a

multi-component approach to the management of COPD, including both oral and inhaled medications and non-pharmacological inteventions (for example, pulmonary rehabilitation, lifestyle advice and self-management techniques) (Yang et al. 2018). The pulmonary rehabilitation guidelines for Australia and New Zealand recommend patients be offerred pulmonary rehabilitation regardless of their disease severity (Alison et al. 2017).

Medications are the first line of treatment for managing asthma and COPD. Medicines used to manage chronic respiratory conditions are briefly described in Box 1. In Australian asthma guidelines, respiratory medications are classified as 'relievers'—short-acting beta2-agonists (SABA) and short-acting muscarinic antagonists (SAMA); 'preventers'—inhaled corticosteroids (ICS), combination of inhaled corticosteroids/long-acting beta2-agonists (ICS/LABA) and leukotriene receptor antagonists (LTRA), cromones); and 'other medications' (NACA 2017).

Box 1: Medicines used to manage chronic respiratory conditions

Short-acting bronchodilators are used to relax the muscles in the lungs, which allows the airways to widen and makes breathing easier. The 2 major types are:

- short-acting beta2-agonists (SABA), which are the most common class of medications dispensed and used to relieve breathlessness and wheeze due to airway narrowing and to prevent exercise-induced airway narrowing in people with asthma

- short-acting muscarinic antagonists (SAMA), which have a slower onset and are normally not used for immediate relief of symptoms (NACA 2017). SAMA are mostly not used in asthma for relief (except in emergency departments) but they may be used in COPD, as they work by cholinergic blocking mechanisms that are thought to be more important in COPD.

Corticosteroids are a class of medications that act to supress inflammation. They include:

- inhaled corticosteroids (ICS), which are used as long-term maintenance treatments for asthma. They are highly effective in reducing symptoms and preventing exacerbations

- oral corticosteroids (OCS), which are used for short-term treatment of exacerbations of asthma and COPD to reduce the duration and severity of episodes. Long-term use of systemic corticosteroids may cause side-effects such as weight gain, osteoporosis, hyperglycaemia and muscle weakness (Leuppi et al. 2013; Walters et al. 2014).

Long-acting bronchodilators include long-acting beta2-agonists (LABA) and long-acting muscarinic antagonists (LAMA).

Inhaled LABA are used in combination with ICS in the management of asthma, to improve asthma control, and in COPD to reduce exacerbation rates. Several combination ICS/LABA inhalers are available. Due to adverse effects (such as increased exacerbations and mortality), there is strong recommendation against use of LABA alone for the treatment of asthma (NACA 2017).

In the management of asthma, LAMA should be used in combination with ICS. Use of LAMA alone has been found to be associated with adverse outcomes, such as dry mouth, cardiovascular morbidity and mortality (NACA 2017; Weatherall et al. 2010).

For COPD, the use of LABA alone has been found to be effective for managing exacerbations and severe obstruction (GOLD 2017; Qaseem et al. 2011).

(continued)

Box 1 (continued): Medicines used to manage chronic respiratory conditions

In some cases, LAMA inhalers have also been shown to improve lung function and reduce exacerbations. (Combination of LABA/LAMA inhalers are also available.)

Note: From 1 August 2018, PBS restrictions have been applied to all COPD and (asthma ICS-LABA) medications. They are:

- for ICS-LABA combination medication: restriction level elevated from 'Restricted benefit' to 'Authority required'

- for LAMA-LABA combination medication: addition of clinical criteria to the current restrictions, allowing their use in patients who have not been previously stabilised on a combination of LAMA and LABA medicines, but who have failed to have their symptoms controlled by either.

For all COPD (and asthma ICS/LABA) medicines, any administrative advice or 'notes' on the PBS website will be updated in line with recommendations made by the Pharmaceutical Benefits Advisory Committee (PBAC) in August 2017. For more information see the Pharmaceutical Benefits Scheme.

Biologics for asthma

- Anti-immunoglobulin E therapy (anti-IgE) (Omalizumab) is a relatively new biological agent for managing moderate-to-severe allergic asthma that cannot be adequately controlled with the optimal dose of ICS/LABA (NACA 2017). This class of medication is recommended for people aged 12 and over.

- Interleukin 5 inhibitor therapy (anti-IL5) (Mepolizumab) is appropriate for patients with severe eosinophilic asthma that is not well controlled by inhaled treatments. This class of medication is recommended for people aged 12 and over (NACA 2017). (Note: this report does not include an analysis of Mepolizumab, as it was not dispensed for the full analysis period.)

Leukotriene receptor antagonists (LTRA) are the first-line preventer in the management of asthma in children aged 2–14. They are provided as tablets, and may be used as an alternative or adjunct to ICS. Data on leukotriene receptor antagonists are limited to children aged 0–14 because only children are approved for a PBS subsidy for this medication class.

Adrenergic medications are medications that stimulate certain nerves in the body. They do this either by mimicking the action of the chemical messengers adrenaline (epinephrine) and noradrenaline (norepinephrine), or by stimulating their release. These medications are used to manage asthma attacks. Two types used for treating chronic respiratory conditions are adrenergics in combination with corticosteroids or other medications (excluding anticholinergics); and adrenergics in combination with anticholinergics.

Other medications used for the management of chronic airways disease include cromones (only for asthma); xanthines (theophylline) (for COPD); antibiotics (for COPD); and mucolytics (used to loosen and clear mucus from the airways).

It is crucial that the medications are used effectively and appropriately in order to improve disease outcomes. Most medications used for asthma are also used for people with other respiratory conditions such as COPD. Similarly some medications for COPD are also used to manage asthma. The Department of Health undertook post-market reviews of COPD (DoH 2017) and asthma medications for children (DoH 2015) listed in the PBS. These reviews looked at the utilisation, safety, efficacy and cost-effectiveness of PBS-listed medicines.

As a result of these reviews, PBAC made a number of recommendations, including changes to the authority level of PBS-listed COPD and asthma ICS/LABA medicine combinations; and

changes to clinical criteria and administrative advice (see Box 1). Specific terms of reference (ToR) investigated in these post-market reviews—where relevant to key questions for monitoring identified in this report—are addressed in the discussion.

Appendix C provides the list of PBS medications for chronic respiratory conditions, also used for analysis in Chapter 5. The associated cost of 'benefits paid' for 2016–2017 for each class of medication is also provided, to give a general idea of how much each medication costs the Australian Government/PBS.

1.3 Structure of the report

This chapter outlines the purpose of the report and provides background information on chronic respiratory conditions. The respiratory conditions described in this report are asthma and COPD.

Chapter 2 details the outcome of a review of the recent literature and consultation with the AIHW National Asthma and Other Chronic Respiratory Conditions Monitoring Advisory Group to identify the key questions of importance for monitoring the treatment and management of chronic respiratory conditions.

Chapter 3 provides details of the PBS and MBS claims data.

Chapter 4 provides an assessment of the utility of PBS and MBS data in answering the identified key questions for monitoring. This includes data limitations and gaps restricting knowledge of this topic and potential ways of overcoming these.

Chapter 5 presents a high-level analysis of PBS data, which demonstrates the dispensing of medications for chronic respiratory conditions (with distributions by age and sex).

Chapter 6 discusses and summarises the overall findings; suggests future opportunities for data development; and reports on potential alternative data sources where required.

2   Key questions for monitoring

Following a review of the academic literature and consultation with the AIHW National Asthma and Other Chronic Respiratory Conditions Monitoring Advisory Group, the following 15 key questions were identified as important for monitoring the treatment and management of chronic respiratory conditions. Chapter 4 provides an assessment of the utility of the PBS and MBS data in answering the 15 key questions.

The key areas for monitoring include overuse and under-use of medications; concordance of treatment with evidence-based guidelines; and patterns of use, in order to identify poor quality treatment or practice that may require a policy response.

The 15 key questions:

1. What medications are used for the treatment and management of chronic respiratory conditions (class)?
2. What are the dispensing patterns of medications used for chronic respiratory conditions and do they vary by demographic factors (age, sex, socioeconomic status and remoteness of residence)?
3. What are the time trends in dispensing of medications for chronic respiratory conditions?
4. What is the frequency of use of medications for chronic respiratory conditions by individuals in Australia?
5. Who is prescribing medication for chronic respiratory conditions?
6. What are the circumstances (for example, following a hospital admission) for prescription of medications for chronic respiratory conditions?
7. Is there evidence of inappropriate or irregular dispensing of medications for chronic respiratory conditions?
8. Are dispensing patterns consistent with the guidelines for the management of chronic respiratory conditions?
9. Is a particular class of medication dispensed more frequently than another similar class of medication for chronic respiratory conditions?
10. What is the rate of adherence to treatment for chronic respiratory conditions?
11. What has been the uptake of new medications for chronic respiratory conditions?
12. What is the cost of specific medication—to the government and to the individual—for chronic respiratory conditions?
13. What is the total cost of all medications—to the government and to the individual—for chronic respiratory conditions?
14. Can dispensing, prescriber and patient information from PBS data be used to estimate prevalence of specific chronic respiratory conditions?
15. What is the rate of development of asthma action plans?

3 Data sources

3.1 Pharmaceutical Benefits Scheme (PBS) claims data

The PBS and Repatriation Pharmaceutical Benefits Scheme (RPBS) are national government-funded schemes designed to subsidise the cost of pharmaceutical medicines.

All Australian residents and overseas visitors covered by a reciprocal health-care agreement requiring immediate medical attention are eligible for subsided medicines under the PBS. Eligible veterans, war widows/widowers and their dependants can get PBS medicines and some other medicines at a lower cost under the RPBS.

For all dispensed medications covered by the PBS, the scheme pays the cost that is in excess of a defined co-payment amount (the maximum co-payment amount paid by the consumer). This amount is set by government policy and differs between general patients and those who hold certain government concession cards (such as, a pensioner concession card, Commonwealth seniors health card, or health-care card). As at 1 January 2018, for general patients the co-payment amount is $39.50, while for concession-card holders it is $6.40. Once a threshold value of co-payments (the Safety Net Threshold) has been accrued by a patient (and/or family) in a calendar year, the co-payment amount decreases for the remainder of the calendar year.

The PBS claims data contains detailed information about the dispensing of medicines outlined within the Schedule of Pharmaceutical Benefits. PBS data provide information on the type, cost and volume of medicine purchased. A detailed description of the PBS data elements is included in Table A1 in Appendix A.

Data includes all valid medications dispensed under the PBS or RPBS (including medications dispensed that are under the co-payment amount, known as '*Under co-payment* data'). Data excludes some programs subject to alternative arrangements (Section 100) where patient level details are not available. Section 100 programs are established where alternative distribution arrangements are considered appropriate (that is, not through community pharmacy). Excluded from the analysis are direct supply of medications to remote Aboriginal Health Services, or the Opiate Dependence Treatment Program).

The PBS/RPBS do not cover medicines supplied to public hospital in-patients, over-the-counter medicines or private prescriptions.

Limitations of PBS data

While the PBS data provide useful information on medications, there are inherent limitations to its utility for chronic disease monitoring:

- The PBS data do not generally include the reason a medicine has been prescribed and dispensed unless the medicine requires an authority approval (that is, prior approval from the Department of Human Services or the Department of Veterans' Affairs).

- 'Restricted Benefit' PBS items are also limited to a stated condition, but do not require authority approval. As such, it is generally not possible to determine the disease or condition for which the medicine was supplied. This can complicate data interpretation, because respiratory medications (such as inhaled corticosteroids (ICS) and bronchodilators) are used for the treatment of both asthma and COPD, so there is a risk of misclassifying asthma as COPD and vice versa.

- Similarly it can be difficult to interpret PBS data for people with asthma-COPD overlap as these people are treated using a different treatment regimen including both COPD and asthma treatments (NACA & LFA 2017).

- There is no information on the patient's level of disease severity, which makes it difficult to determine how appropriate particular medications are being used.

- It can be difficult to determine medication utilisation, such as co-administration or switching between medications.

- Medications that are purchased over-the-counter are not captured in these data—for example, short-acting bronchodilators such as Salbutamol (Ventolin) for the treatment of asthma) and Terbutaline for the treatment of asthma and COPD.

- Private prescriptions (that is, items that are not listed on the PBS, or not listed for the prescribed indication, and therefore not attracting a government subsidy) are not captured in these data.

- Data are not available on prescriptions written by a health professional that are not filled by the patient.

- It is not possible to determine whether or how often the medication was actually used.

- The data do not include medicines dispensed to hospital in-patients (or otherwise not PBS-claimable) for services provided in hospitals; or medicines provided as samples by pharmaceutical companies. (Anecdotal evidence suggests that this is prolific in COPD medications.)

- Caution should be taken when interpreting PBS data because the data does not allow the identification of patients who are 'stockpiling' (which occurs when a Safety Net card holder fills prescriptions more frequently than expected). This is most likely to happen towards the end of the calendar year, so as to avoid the higher co-payment in the first few months of the following calendar year (when the person loses Safety Net eligibility).

3.2 Medicare Benefits Schedule (MBS) claims data

The Medicare Benefits Scheme (Medicare) is Australia's universal health insurance scheme. Medicare provides access to:

- free or subsidised treatment by health professionals such as doctors, specialists, optometrists, and in specific circumstances, dentists, and other allied health practitioners

- free treatment as a public patient in a public hospital.

All Australian residents and overseas visitors covered by a reciprocal health-care agreement requiring immediate medical attention are eligible for subsided treatment under Medicare.

The Medicare Benefits Schedule (MBS) is a listing of services that qualify for a benefit under the *Health Insurance Act 1973*. The associated MBS claims data comprise information on MBS services claimed through Medicare. These include visits to a GP or to certain specialists and allied health professionals, and hospital visits by a private patient in a public or private hospital. The claims data do not include information on public patients in public hospitals or services that are not listed on the MBS.

Other information collected by the MBS claims data consists of demographic information about patients; providers; the type of services provided (MBS item number); the amount of benefit paid for that service (based on the scheduled fee); and the total amount charged for the service provided.

A detailed description of the MBS data elements is included in Table A2 in Appendix A.

Limitations of MBS data

While MBS data provide useful information on medical services used, there is limited information about why a service was used—and therefore it is not possible to determine, solely from MBS data, if the patient having the GP visit was a patient with a chronic respiratory condition. Nor does it include visits to the pharmacy/chemist.

4 PBS and MBS data for reporting on the treatment and management of chronic respiratory conditions

Using the information provided in Chapter 3 on PBS and MBS claims data, this chapter describes how the available data could be used to report on the treatment and management of chronic respiratory conditions in Australia. In this assessment, the following questions were considered:

1. What key questions *can* be answered using PBS and MBS data held by the AIHW?
2. What key questions *cannot* be answered using PBS and MBS data held by the AIHW?
3. What key questions could be answered in the *foreseeable future* using PBS and MBS data held by the AIHW?

It is important to highlight that some medications (such as inhalers) are available over the counter and not captured in the PBS data (as discussed in Chapter 3). While this has not been considered in this assessment, these missing data must be acknowledged as a key limitation regarding quantity. Data from IMS Health (further information in the Discussion under potential alternative data sources) may provide additional information—however, as these are wholesale supply data, they do not include any information about whether the medication (specifically short-acting beta agonists) was purchased over the counter without a prescription.

4.1 Questions that can be answered

Question 1: What medications are used for the treatment and management of chronic respiratory conditions (class)?

Question 9: Is a particular class of medication dispensed more frequently than another similar class of medication for chronic respiratory conditions?

PBS data can provide information on medications dispensed according to medication type, based on the Anatomical Therapeutic Chemical Classification System (ATC) and medication name (based on ATC and PBS item codes). 'Number of prescriptions' is the total number of times that the prescribed medicinal product is supplied, including repeats. (PBS data includes a repeat prescription indicator, which indicates whether a prescription is a repeat or an original prescription.) As the data do not generally include the reason a medicine has been dispensed (and it is not possible to determine whether the medication was used), they cannot be used to directly answer the question in relation to medications used for the treatment and management of chronic respiratory conditions. (In some instances, however, information on medication type and medication name can potentially be used to infer diagnosis.)

It is only possible to report on chronic respiratory conditions collectively, as some medications are also used for the treatment of other medical conditions (for example, asthma medications can also be used to treat COPD).

Information on medication type and name can be used to show whether the number of prescriptions for a particular medication is dispensed in greater numbers than another medication for chronic respiratory conditions.

Question 2: What are the dispensing patterns of medications used for chronic respiratory conditions and do they vary by demographic factors (age, sex, socioeconomic status and remoteness of residence)?

PBS data can be used to describe the dispensing patterns of medications for chronic respiratory conditions according to class, name, form and strength of medication. PBS data uses unique patient identifiers to link records for the same individual. Socio-demographic information about the individual at the time the medication was dispensed is also available—including age, sex, and postcode of usual residence.

Question 3: What are the time trends in dispensing of medications for chronic respiratory conditions?

Under an agreement with the Department of Health, the AIHW accesses PBS data the department maintains, via the Health Enterprise Data Warehouse (EDW). The Department of Health has given the AIHW access to elements of the PBS data from 1 July 2012 to the present, with data becoming available for reporting approximately 3 months after the end of the reporting period. It should be noted that 'under co-payment data' is only available from 1 April 2012.

Question 5: Who is prescribing medications for chronic respiratory conditions?

PBS data are available on the postcode and major specialty of the prescriber, which will enable an assessment of the types of health professionals prescribing medications for chronic respiratory conditions.

Question 7: Is there evidence of inappropriate or irregular dispensing of medications for chronic respiratory conditions?

An indication of inappropriate or irregular dispensing of medication (for example, overuse or underuse) for chronic respiratory conditions can be inferred using 'number of prescriptions dispensed' in the PBS data. For example, in Australia, 1 prescription of maintenance treatment at the typically recommended dose generally provides enough therapy for 1 month. For a patient taking a medication every day, this should equate to 12 prescriptions dispensed in a year. It is, however, generally considered that around 7 prescriptions of any 1 medication in a year is the minimum number of prescriptions consistent with regular use (AIHW: Correll et al. 2015). Fewer dispensing episodes of a medication in a year may indicate that it was either not used regularly by the patient; that the medication was not used at the standard dose; or that it was not prescribed for continuous use. Dispensing more than 12 prescriptions in a year may indicate prescribing of higher-than-standard doses and/or overuse by patients (AIHW: Correll et al. 2015).

Regarding potential overuse by patients, it is important to consider the phenomenon known as 'stockpiling'. This can occur towards the end of the calendar year, when a person who has reached their Safety Net Threshold fills prescriptions more frequently than expected, so as to stockpile the medicine and avoid a higher co-payment in the next calendar year when they lose Safety Net eligibility.

Question 8: Are dispensing patterns consistent with the guidelines for the management of chronic respiratory conditions?

As described in the analysis of Question 7, an indication of inappropriate or irregular dispensing of a medication (that is, overuse or under-use) for chronic respiratory conditions can be answered using 'number of prescriptions dispensed' data in the PBS. These data—along with other medications dispensed and time trends (Question 3)—can be compared to Australian asthma and COPD treatment guidelines (NACA 2017) and COPD-X (Yang et al. 2018) to investigate the concordance between clinical guidelines and management practices. For example, the post-market review of medicines used to

treat asthma in children (DoH 2015) followed the stepped approach of the *Australian asthma handbook* (7th edition, 2014) to adjusting asthma medication in children and prescribing according to the age of the child, in order to identify incorrect prescribing. Using this approach, the review was able to identify the prescribing of medicines inconsistent with age recommendations in the clinical guidelines. See DoH (2015) for more information.

PBS data do not provide information regarding diagnosis and there are difficulties in identifying patients as either 'asthma', 'COPD' or 'asthma-COPD overlap' (DoH 2017). When preparing this report, the AIHW sought expert advice on medications used for asthma and COPD. Key guidelines were also reviewed, as well as the Department of Health's post-market reviews of COPD medications and asthma medications in children, which can be used as indictors for the purposes of future work.

Question 10: What has been the uptake of new medications for chronic respiratory conditions?

PBS data can be used to determine the uptake of new medications for chronic respiratory conditions, once the drug has been approved for PBS subsidy and listed in the Schedule of Pharmaceutical Benefits. This includes medications listed under the Highly Specialised Drugs Program; for example, mepolizumab listed on 1 January 2017 for the treatment of severe asthma in people aged 12 and over; and, previously, omalizumab (an anti-immunoglobulin E monoclonal antibody therapy) listed in 2011.

Note

The Highly Specialised Drugs Program provides access to specialised PBS medicines for the treatment of chronic conditions which, because of their clinical use and other special features, have restrictions on where they can be prescribed and supplied. In most cases, medical practitioners are required to undertake specific training or be affiliated with a specialised hospital unit to prescribe these medicines.

This report does not include an analysis of mepolizumab as data is not available for the full 2016–17 analysis period.

Question 12: What is the cost of specific medication—to the government and to the individual—for chronic respiratory conditions?

Question 13: What is the total cost of all medications—to the government and to the individual—for chronic respiratory conditions?

Information on the cost of prescription medication for chronic respiratory conditions can be obtained from the PBS benefits-paid data and patient-contribution amount. Data are also available on the total cost of other medications dispensed to people, together with their medications for chronic respiratory conditions, to provide an indication of comorbidities. At this stage, this does not include medication that is available for purchase over-the-counter (that is, without a prescription).

4.2 Questions that cannot be answered

Question 4: What is the frequency of use of medications for chronic respiratory conditions by individuals in Australia?

Question 10: What is the rate of adherence to treatment for chronic respiratory conditions?

PBS data indicate that a medication was dispensed; however, it is not possible to determine whether or how often the medication was actually used or the rate of adherence to treatment. Data are also not available on prescriptions written by a health professional that are not filled by the patient.

An indication regarding frequency of use and rate of adherence could be provided through analysis of dispensing patterns, and whether they align with clinical guidelines (questions 7 and 8).

Question 6: What are the circumstances for prescription of medications of chronic respiratory conditions?

Information on the circumstances surrounding prescription would help provide a link between an event and prescription (for example, an out-of-hours GP visit or following hospital admission). While data are available on the health professional prescribing medications for chronic respiratory conditions, this cannot be linked to a setting (such as a GP clinic or home visit). PBS claims data also do not include medicines dispensed in hospital to admitted patients.

Question 14: Can dispensing, prescriber and patient information from PBS data be used to estimate prevalence of specific chronic respiratory conditions?

This question cannot be answered directly using PBS data alone, because they do not contain a 'diagnosis' field that directly indicates whether the patient had any or a specific chronic respiratory condition. This is 1 of the biggest challenges associated with using PBS data to report on specific chronic respiratory conditions. The medications used for asthma are also used for the treatment of COPD among older people and, as a result, proxies must be used for diagnosis. One option is to describe the dispensing of medications by age groups. For example, COPD is very uncommon in people aged 5–34, and therefore the medications dispensed in this age group are more likely to be used for asthma (ACAM 2011).

Question 15: What is the rate of development of asthma action plans?

The 'Asthma Cycle of Care' involves at least 2 asthma-related consultations with a GP within 12 months for a patient with moderate-to-severe asthma. There are 12 MBS items for GP consultations that relate to the completion of an Asthma Cycle of Care. These visits include the development of a written asthma action plan—however, these plans may also be developed outside of the Asthma Cycle of Care (for which there is no specific MBS item).

While there were about 64,000 claims for these 12 MBS items in 2016–17 (and hence an asthma action plan), data from the 2014–15 National Health Survey reveal that an estimated 500,000 people with asthma had a written asthma action plan. This indicates the MBS data captures only approximately 10% of people with asthma who have a written asthma action plan. It may be possible, however, to get an idea of the number of asthma action plans by looking at individuals who claimed at least 1 of the 12 MBS items for an asthma cycle of care, rather than all 12. This could be investigated in future work.

It should, however, be noted that—despite national guidelines recommending the use of written asthma action plan for the management of asthma (NACA 2017)—most people still

do not. In 2014–15, only 21% of people aged 15 and over, and 57% of children aged 0–14, with asthma, reported having a written asthma action plan (ABS 2017).

4.3 Questions that could be answered in the foreseeable future

This assessment has shown that the 15 key questions for monitoring either can or cannot be answered using the PBS or MBS data. Those that cannot be answered would benefit from linking with other data sets or future feasible enhancements to the available data. These questions relate to:

- adherence to treatment
- circumstances surrounding the prescription of medications
- estimating the prevalence of chronic respiratory conditions.

Determining the frequency of use of medications is difficult, as this would require self-reporting of whether a medication that was dispensed was actually taken. It is also difficult to determine the rate of development of asthma action plans, as evidence suggests that these are not widely used and anecdotal evidence suggests that asthma action plans are often not provided in written form.

5   Dispensing of medications for chronic respiratory conditions

This chapter describes the dispensing of medications indicated for the treatment of chronic respiratory conditions, based on PBS data for 2016–17. This includes high-level statistics on the class of respiratory medications, by age and by sex. Age was categorised into broad age groups: 0–4, 5–14, 15–34, 35–64, 65 and over, consistent with previous work by the Australian Centre for Airways Disease Monitoring (ACAM). The data presented provides an example of the use of PBS data to report on the medications dispensed for the treatment and management of chronic respiratory conditions and dispensing patterns (questions 1 and 2 in Chapter 2).

It should be noted that, because the information in the PBS data set is dispensing information and not clinical information, it is not possible to present results for a specific chronic respiratory condition. Furthermore, data for oral corticosteroids cannot be separated for chronic respiratory conditions from other indications. This should be taken into account when interpreting the findings for these medications in this chapter.

It is also important to reiterate that these data include information only on prescriptions for which a subsidy was paid, and do not include medications that are purchased over-the-counter.

5.1   Overall medications dispensed

In 2016–17, over 16.5 million (16,508,784) prescriptions for respiratory medications were dispensed to more than 3.5 million (3,527,436) individuals (see Appendix C for the full list of medications). The total benefits paid for these medications was around $471 million. The most common prescriptions were for combination medications (including inhaled corticosteroids and long-acting beta2-agonists (ICS-LABA) and long-acting beta2-agonists and long-acting muscarinic antagonists (LABA-LAMA) (34% of total prescriptions dispensed for respiratory medications); short-acting bronchodilators (25%); oral corticosteroids (22%); and long-acting bronchodilators (12%) (Figure 5.1). In terms of total expenditure, a substantial percentage (60%) was accounted for by combination medications, followed by long-acting bronchodilators (21%) and short-acting bronchodilators (10%) (Figure 5.2). The high representation of combination medications in total expenditure is due to the higher dispensed price for maximum quantity for these medicines.

The supply of most medications was higher for females, except for leukotriene receptor antagonists (Figure 5.3). This may be due, in part, to sex differences in the prevalence of asthma: among those aged 0–14 asthma is more common in males, but among those aged 15 and over, asthma is more common in females. The prevalence of COPD does not differ significantly between males and females.
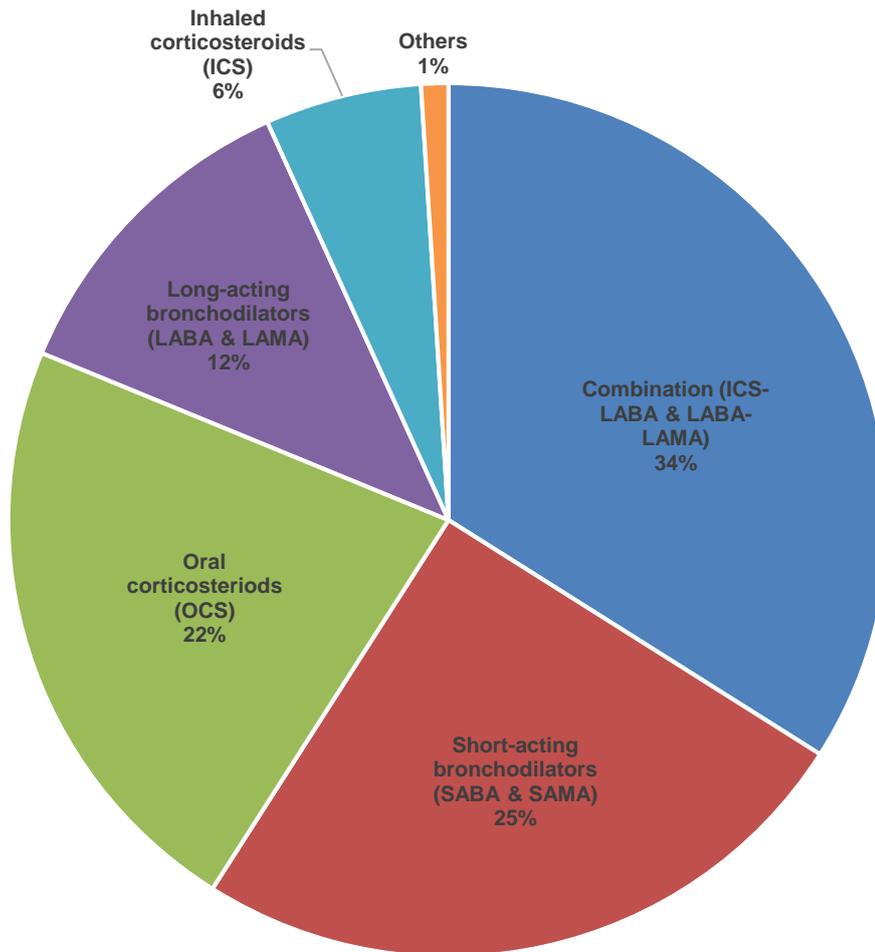
Note: 'Others' includes LTRA, Anti-IgE, cromones and xanthines.

Source: AIHW analysis of PBS data; Table B1.

Figure 5.1: Percentage of chronic respiratory condition medications dispensed, by medication class, 2016–17

Note: 'Others' includes LTRA, Anti-IgE, cromones and xanthines.

Source: AIHW analysis of PBS data; Table C1.

Figure 5.2: Percentage of total expenditure on chronic respiratory condition medications, by class of medication, 2016–17

Note: 'Others' includes anti-IgE, cromones and xanthines.

Source: AIHW analysis of PBS data; Table B2.

Figure 5.3: Chronic respiratory condition medications dispensed (number of prescriptions), by class of medication, by sex, 2016–17

5.2 Medications dispensed, by class of medication

This section describes the supply of medications by specific class of medication, by age and by sex. The classes of medications are:

- short-acting bronchodilators, including short-acting beta2-agonists (SABA) and short-acting muscarinic antagonists (SAMA)
- long-acting bronchodilators, including long-acting beta2-agonists (LABA) and long-acting muscarinic antagonists (LAMA)
- corticosteroids, including inhaled corticosteroids (ICS) and oral corticosteroids (OCS)
- combination medications including ICS-LABA and LABA-LAMA
- anti-immunoglobulin E therapy (anti-IgE)
- leukotriene receptor antagonists (LTRA)
- 'other' medications.

Results presented here for class of medications are ordered by the number of prescriptions dispensed. The full list of medications, by class, is provided in Appendix C.

Note: The results in this sub-section are provided by age group and by sex, and exclude 'unknown' responses. Therefore, they are not comparable with the estimates for overall medications (Figure 5.1 and Table B1).

Combination medications (ICS-LABA and LABA-LAMA)

In 2016–17, over 5 million (5,536,240) prescriptions for combination medications were dispensed. These were:

- ICS-LABA combination
- LABA-LAMA combination.

In 2016–17, the total benefits paid for combination medications were around $280 million, accounting for 60% of the total benefits paid for medications associated with chronic respiratory conditions.

ICS-LABA combination

In 2016–17, 5,256,487 ICS-LABA combination medications were dispensed, with a higher proportion dispensed to females (56% of the total amount dispensed) compared with males (44%). Supply was greatest to those aged 65 and over and to those aged 35–64 (46% and 40%, respectively) (Figure 5.4).

The most common medications in this class were fluticasone and salmeterol (55%) and budesonide and eformoterol (37%).

Source: AIHW analysis of PBS data; Table B3.

Figure 5.4: Number of prescriptions dispensed for combination medications (ICS-LABA), by age, by sex, 2016–17
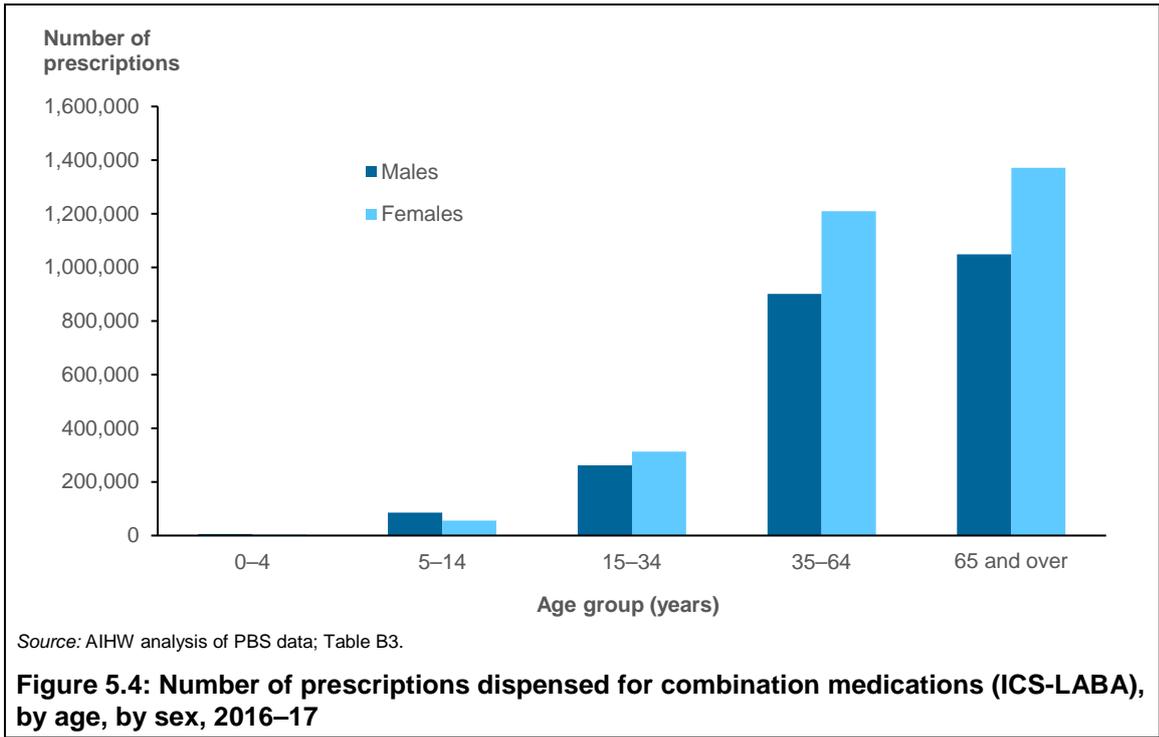
LABA-LAMA combination

In 2016–17, 279,753 prescriptions were dispensed for LABA-LAMA combination, with males accounting for a higher proportion (56% of the total amount dispensed) compared with females (44%). People aged 65 and over were the main recipients of this combination of medication (76%), followed by those aged 35–64 (24%) (Figure 5.5). The most common medications were indacaterol and glycopyrronium (71%) and a combination of umeclidinium and vilanterol (29%).

Source: AIHW analysis of PBS data; Table B4.

Figure 5.5: Number of prescriptions dispensed for combination medications (LABA-LAMA), by age, by sex, 2016–17
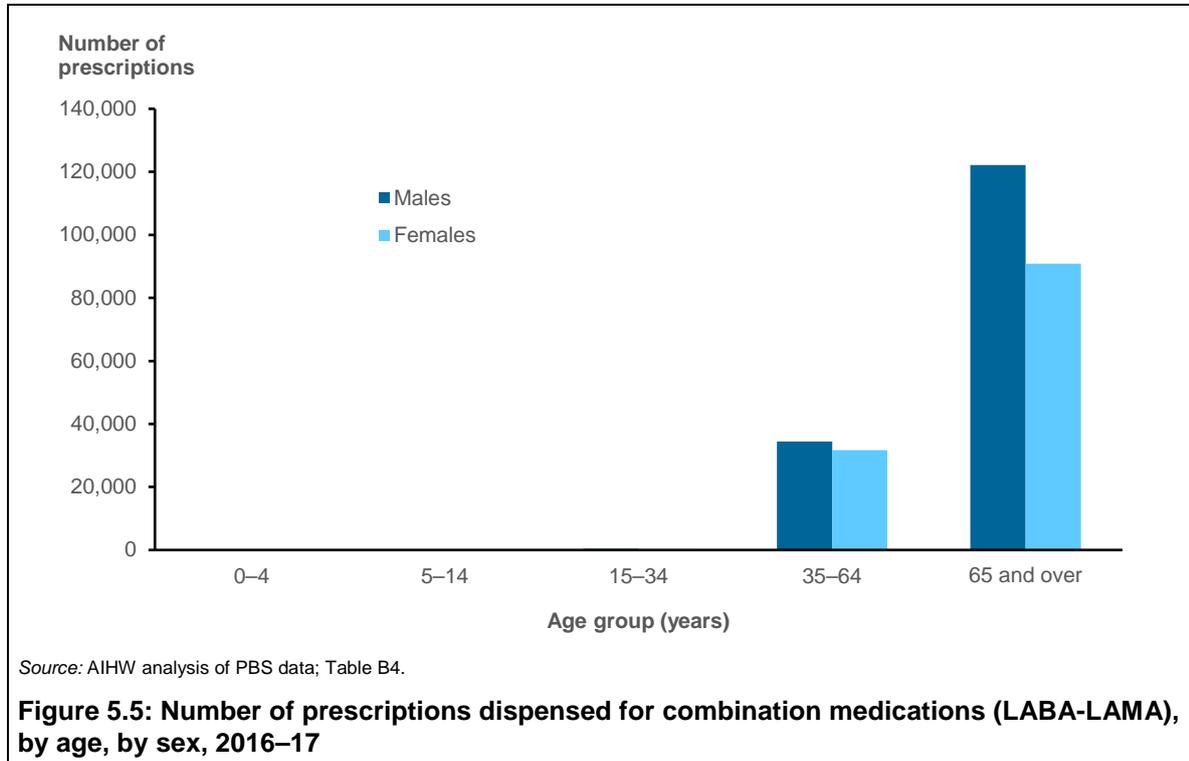
Short-acting bronchodilators (includes SABA and SAMA)

In 2016–17, over 4 million (4,012,222) prescriptions for short-acting bronchodilators (includes both SABA and SAMA) were dispensed, with females accounting for a higher proportion (57% of the total amount dispensed), compared with males (43%). Supply was greatest for those aged 65 and over, at 44%, followed by those aged 35–64 (34%) (Figure 5.6). The total benefits paid for these medications was around $47 million, accounting for 10% of the total benefits paid on medications for chronic respiratory conditions.

The most commonly dispensed were SABAs—salbutamol (91%), followed by terbutaline (4%). The SAMA ipratropium accounted for 5% of prescriptions dispensed in this class. As stated previously, the PBS data underestimates the total use of salbutamol and terbutaline, as these medicines can also be purchased over the counter without prescription.

Source: AIHW analysis of PBS data; Table B5.

Figure 5.6: Number of prescriptions dispensed for short-acting bronchodilators (including SABA and SAMA), by age, by sex, 2016–17
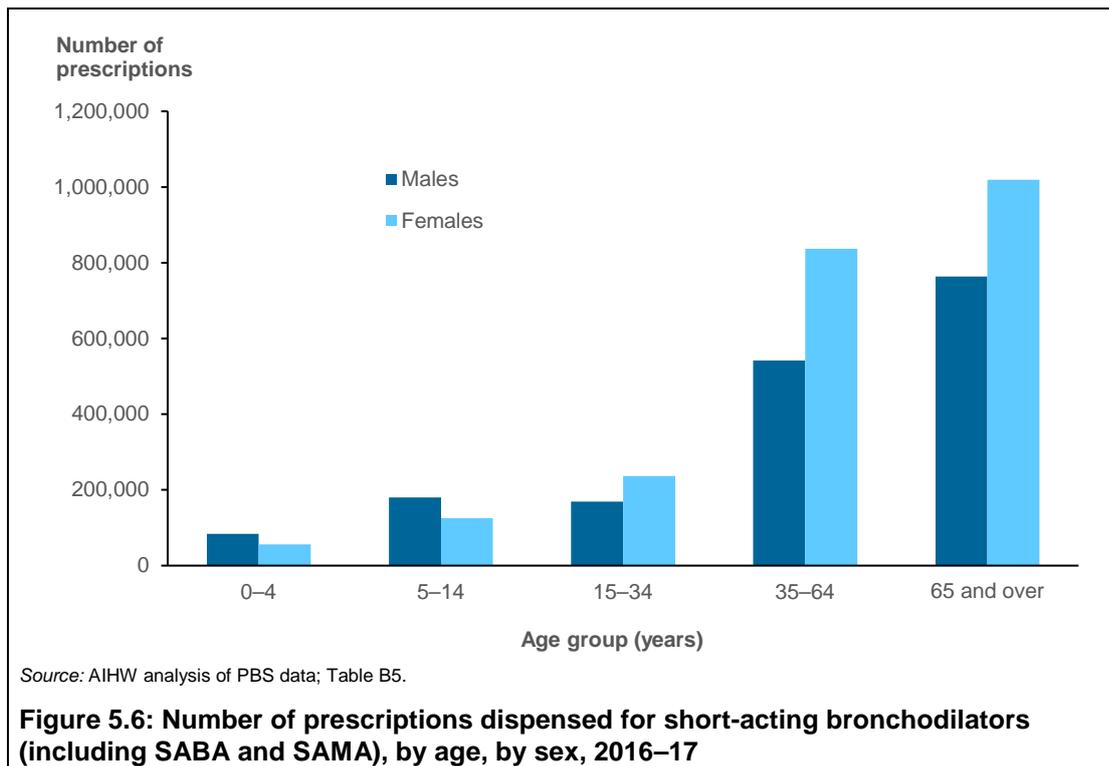
Long-acting bronchodilators (includes LABA and LAMA)

In 2016–17, nearly 2 million (1,905,191) prescriptions for long-acting bronchodilators (both LABA and LAMA) were dispensed, with similar proportions to males and to females (50% of the total amount dispensed). People aged 35 and over were the main recipients of this class of medication, with almost a quarter (23%) dispensed to people aged 35–64, and more than three-quarters (77%) dispensed to people aged 65 and over (Figure 5.7). The total of benefits paid for these medications was around $96.7 million, accounting for 21% of the total benefits paid for medications for chronic respiratory conditions.

LAMAs were the most commonly dispensed long-acting bronchodilators: tiotropium (73%) and glycopyrronium (6%), followed by the LABA medications indacaterol (7%) and eformoterol (2%).

Number of prescriptions

Source: AIHW analysis of PBS data; Table B6.

Figure 5.7: Number of prescriptions dispensed for long-acting bronchodilators (including LABA and LAMA), by age, by sex, 2016–17
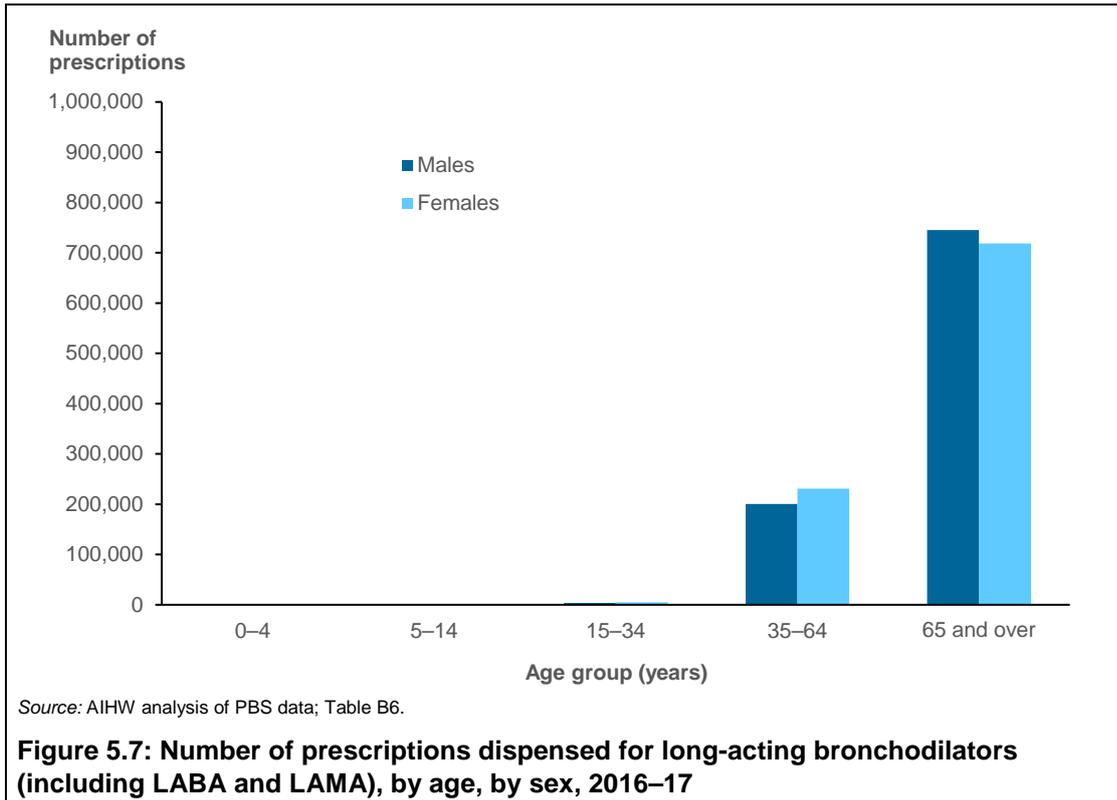
Corticosteroids

Corticosteroids can be divided into those administered by metered dose inhaler and those taken orally.

Inhaled corticosteroids (ICS) (alone)

In 2016–17, 939,916 prescriptions for ICSs (alone and not in combination with other medication) were dispensed, with females accounting for a higher proportion (52% of the total amount dispensed), compared with males (48%). Supply of ICS was greatest (at 30%) for those aged 65 and over, followed by 26% for those aged 5–14 and 24% for those aged 35–64 (Figure 5.8). In 2016–17, the total benefits paid for ICSs was around $15.7 million, accounting for 3% of the total benefits paid on medicines used to treat chronic respiratory conditions.

The most commonly dispensed ICSs were fluticasone (62%), ciclesonide and budesonide (16% each, respectively) and beclometasone (6%).

Source: AIHW analysis of PBS data; Table B7.

Figure 5.8: Number of prescriptions dispensed for inhaled corticosteroids (ICS) (alone), by age, by sex, 2016–17
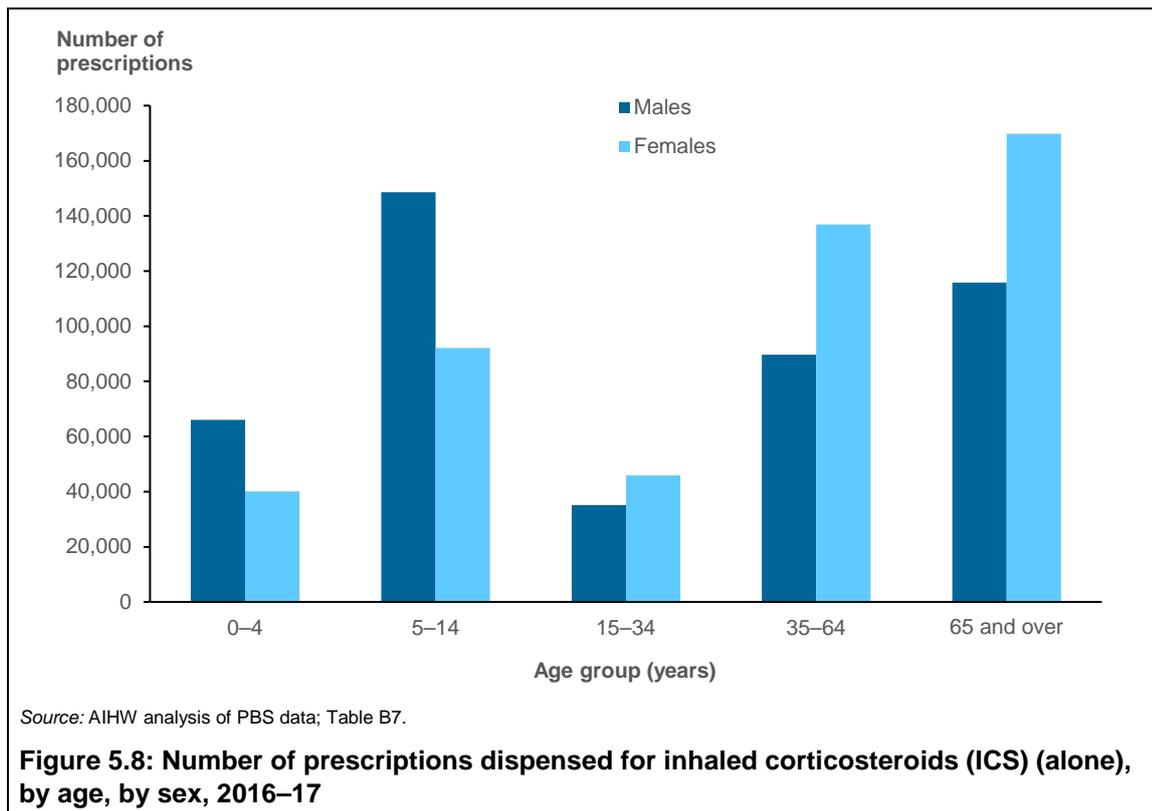
Oral corticosteroids (OCS)

In 2016–17, 3.6 million (3,625,889) prescriptions for OCS were dispensed, with females accounting for a higher proportion (54% of the total amount dispensed), compared with males (46%). Supply was greatest for those aged 65 and those aged 35–64 (38% and 33%, respectively) (Figure 5.9). In 2016–17, the total benefits paid for OCS was around $17.6 million, accounting for almost 4% of the total benefits paid on medicines for chronic respiratory diseases.

The most commonly dispensed OCS were prednisolone (80% of all OCS prescriptions) and prednisone (20%).

As previously mentioned, the use of OCS for chronic respiratory conditions cannot be separated from the use of OCS for other conditions (for example, for arthritis, colitis and allergic/inflammatory conditions).
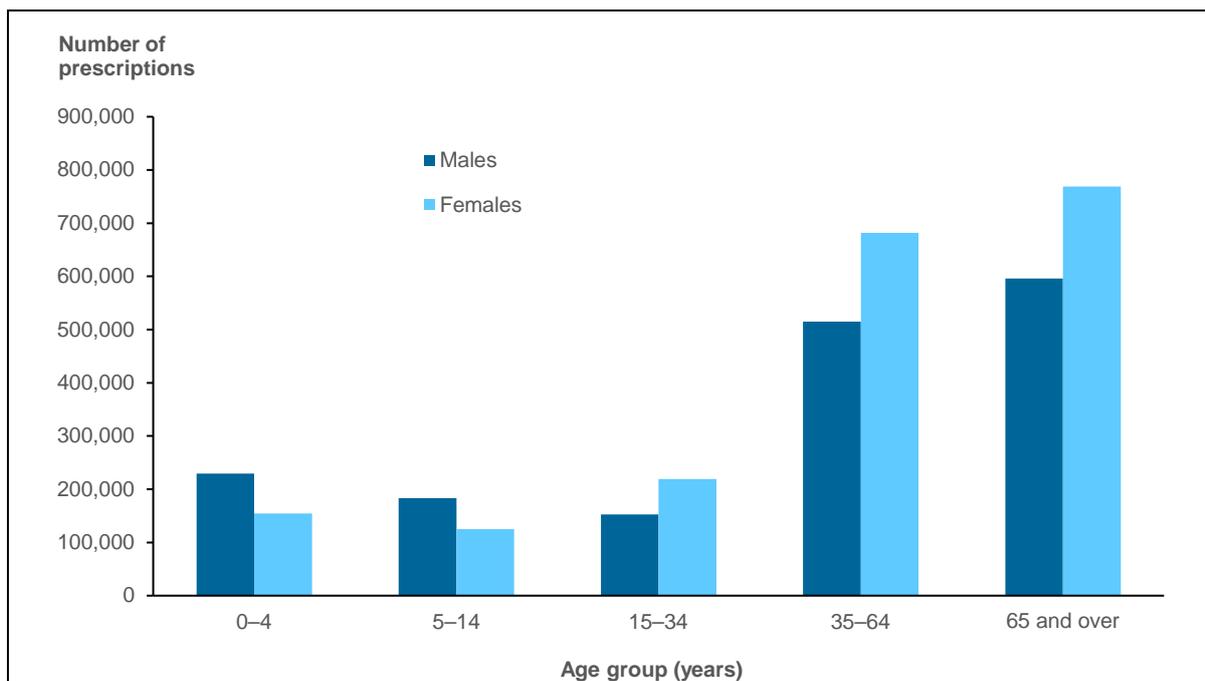
Source: AIHW analysis of PBS data; Table B8.

Figure 5.9: Number of prescriptions dispensed for oral corticosteroids (OCS), by age, by sex, 2016–17

Leukotriene receptor antagonists (LTRA)

In 2016–17, 218,753 prescriptions for LTRA were dispensed, primarily to children aged 0–14 (97% of the total amount dispensed), of which 74% was for those aged 5–14 and 23% for those aged 0–4—of which the majority was to males (61%) (Figure 5.10). The total benefits paid for LTRA in 2016–17 was $1.3 million, accounting for less than 1% of the total benefits paid relating to medicines for chronic respiratory conditions.
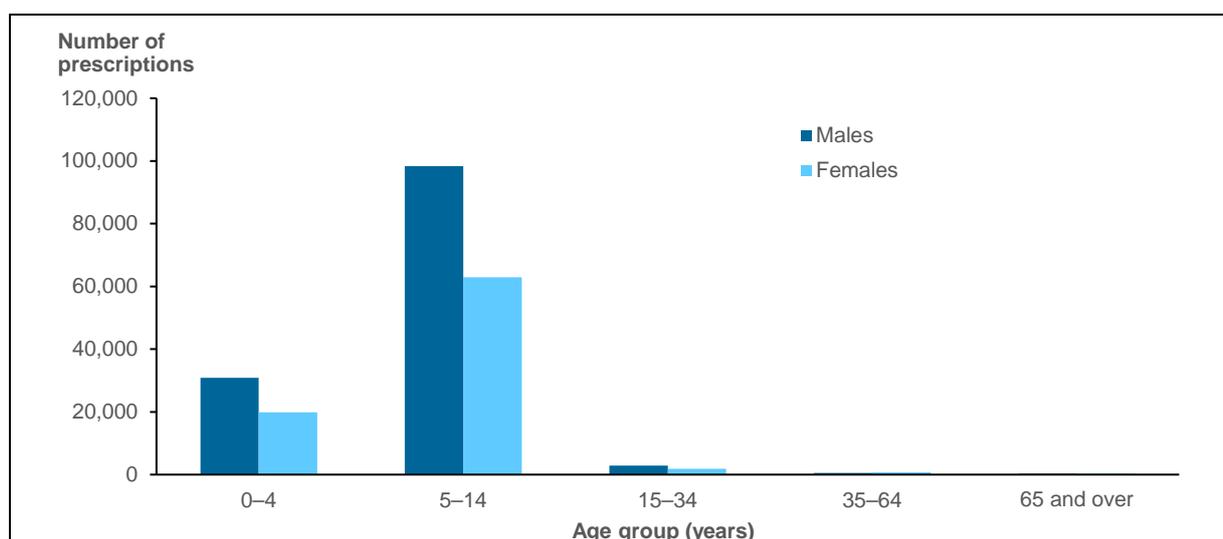
Note: Mainly prescribed to children aged 0–14.

Source: AIHW analysis of PBS data; Table B9.

Figure 5.10: Number of prescriptions dispensed for leukotriene receptor antagonists (LTRA), by age, by sex, 2016–17

Anti-immunoglobulin E therapy (IgE)

Anti-immunoglobulin therapy (anti-IgE) medication makes up a small proportion of respiratory medication dispensed. In 2016–17, 9,820 prescriptions were dispensed for omalizumab, the only available anti-IgE therapy medication. Almost two-thirds (60%) of the total prescriptions dispensed were to females. Dispensing of anti-IgE therapy medication was highest for people aged 35–64 (60%), followed by people aged 65 and over (26%) (Figure 5.11). In 2016–17, the total benefits paid for anti-IgE therapy was around $10.6 million, which accounted for 2% of the total benefits paid on medicines for chronic respiratory conditions.

Note: Prescribed to people aged 12 and over.

Source: AIHW analysis of PBS data; Table B10.

Figure 5.11: Number of prescriptions dispensed for anti-IgE-therapy, by age, by sex, 2016–17
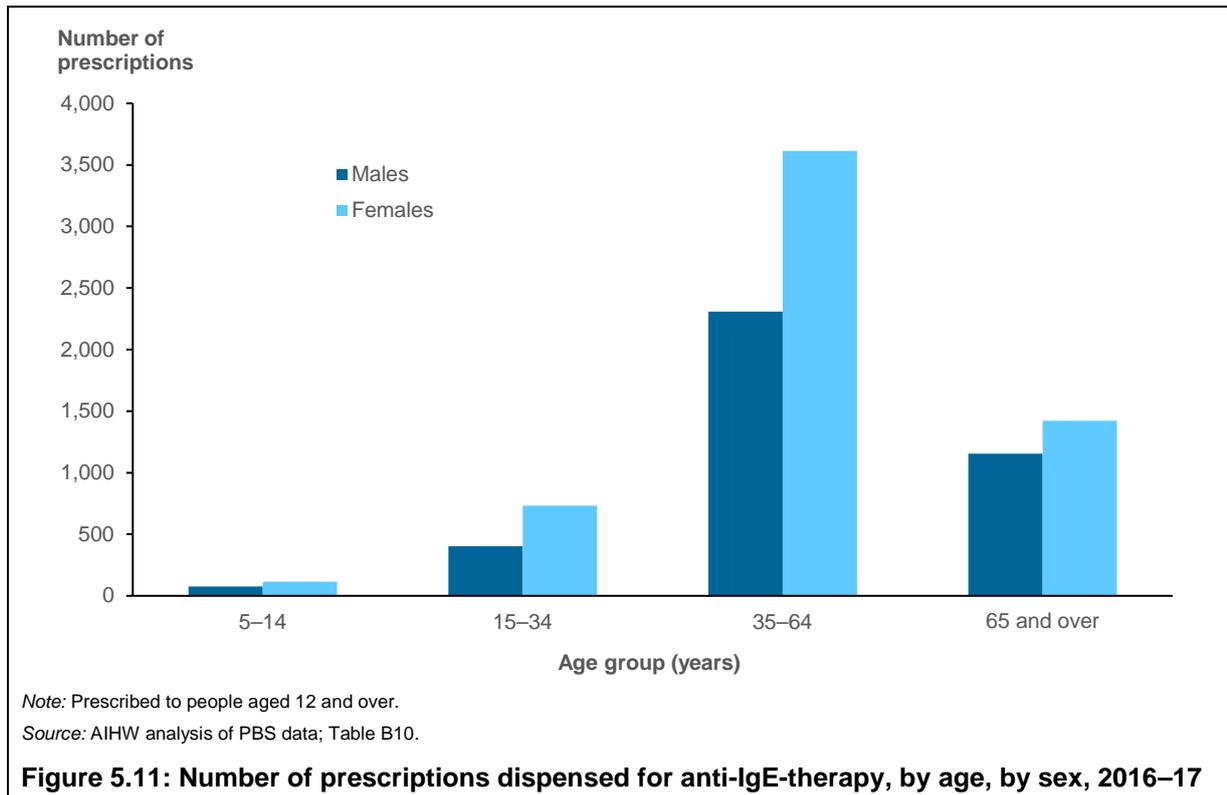
Other medications

In 2016–17, 115,226 prescriptions were dispensed for other medications (includes cromones and xanthine) used to treat chronic respiratory conditions, with a higher proportion dispensed to females (59% of the total), compared with males (41%) (Figure 5.12). Supply was greater in older age groups, with over a third (35%) for people aged 35–64, and over half (54%) for people aged 65 and over. The most common medications were cromones (65%)—including nedocromil (45%) and cromoglycate (20%)—followed by xanthine (theophylline 35%). In 2016—17, the total benefits paid for these medications was around $2 million, accounting for less than 1% of the total benefits paid on medicines for chronic respiratory conditions.

Number of
prescriptions

Source: AIHW analysis of PBS data; Table B11.

Figure 5.12: Number of prescriptions dispensed for other medications for chronic respiratory conditions, by age, by sex, 2016–17
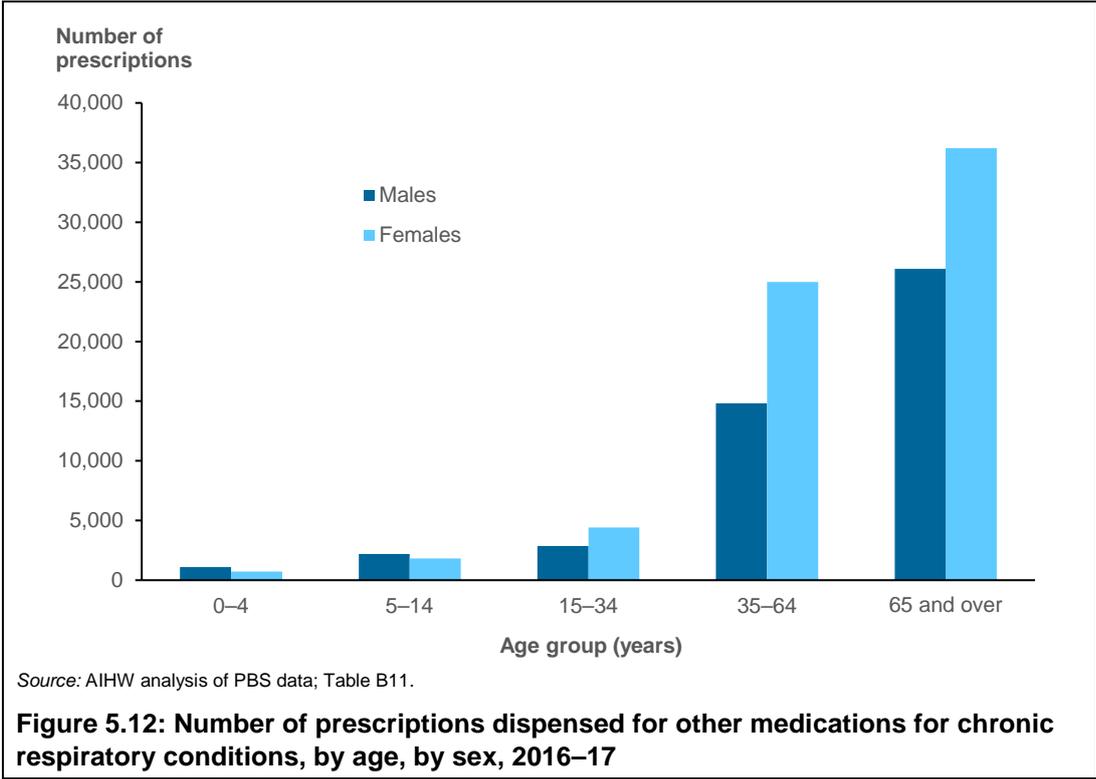
6   Discussion

This assessment has demonstrated that 10 of the 15 key questions identified for monitoring the treatment and management of chronic respiratory conditions can be answered using the PBS and MBS claims data. An inherent limitation with the data is that some medications used for the treatment of asthma can be bought over the counter and are not captured in the PBS data. As an example, approximately half of the data for short-acting bronchodilators may be missing due to over-the-counter purchases (Reddel et al. 2017).

There are 5 questions that, at present, cannot be answered using PBS data alone—but would benefit from enhancements to the available data or linking with other data sets such as hospitals, the National Integrated Health Service Information Analysis Asset, and the Coordination of Health Care Study. These questions relate to adherence to treatment; circumstances surrounding the prescription of medications; and whether PBS data can be used to estimate prevalence of chronic respiratory conditions.

High-level analysis of data on the dispensing of medications indicated that, for the treatment of chronic respiratory conditions in Australia 2016–17, over 16.5 million prescriptions were dispensed to more than 3.5 million individuals. Over a third (34%) were for combination medications (ICS-LABA and LABA-LAMA), followed by a quarter (25%) for short-acting bronchodilators (SABA and SAMA). Supply of medications was higher for females, except for leukotriene receptor antagonists (LTRA). Dispensing of most medications increased with age, and was highest for people aged 65 and over, with the exception of anti-immunoglobulin E therapy (IgE therapy), which was highest for people aged 35–64; and for LTRA, which was highest for children aged 5–14.

As mentioned in the introduction, the Department of Health has conducted 2 post-market reviews of COPD (DoH 2017) and of asthma medications for children (DoH 2015), listed in the Pharmaceutical Benefits Scheme (PBS), to ensure most appropriate management in clinical practice. The Terms of Reference from these reviews that are relevant to questions 7 and 8 in this report are shown in Box 2.

Box 2: Post-market reviews: terms of reference relevant to key questions

COPD medications

ToR 5: Analyse the current utilisation of PBS-listed COPD medicines to identify the extent of co-prescribing and use that is inconsistent with clinical guidelines and/or PBS restrictions. Evaluate if the current utilisation of multiple therapies and the latest evidence relating to safety and efficacy justifies a review of cost-effectiveness of some or all medicines indicated for COPD.

Asthma medications in children

ToR 2: Review the Drug Utilisation Sub-Committee report on utilisation of combination inhaled corticosteroid (ICS)/LABA considered by the Pharmaceutical Benefits Advisory Committee (PBAC) and supplement this analysis with any additional data and clinical information sources in Australia.

ToR 3: Identify areas of prescribing for childhood asthma in Australia where clinical practice is inconsistent with clinical guidelines; and if there is evidence that supports this practice.

The findings of the post-market review of COPD medicines draft technical report showed that the percentage of patients in the COPD cohort (people aged 35 and over who were treated for COPD) initiating to combinations outside COPD-X guidelines was 13.2% in 2010 and 25.7% in 2016. The percentage of use outside COPD-X guidelines is dominated by initiation to combinations of LABA/LAMA (15.4%) and ICS/LABA plus LAMA (8.3%) in 2016 (DoH 2017).

In the stakeholder forum, concerns were raised over the exclusion of the ICS/LABA initiations in the identification of the COPD cohort in PBS data, as this would significantly underestimate the COPD only population. Analysis of SAMA, SABA and ICS/LABA patient utilisation including initiations is required to better understand the overall use of all medications for the treatment of COPD.

Similarly, the post-market review of PBS medicines to treat asthma in children found that, for ToR 2, the use of fixed-dose combinations (FDC) of inhaled corticosteroid and long-acting beta2 agonist was higher than any other non-reliever asthma medicine (DoH 2015). Fluticasone was the most commonly dispensed ICS inhaler and fluticasone/salmeterol was the most commonly dispensed FDC in this age group.

For ToR 3, the post-market review of asthma medicines to treat asthma in children found over 25% of FDC prescribing in children is below age recommendations of the clinical guidelines (DoH 2015). In addition, there are more prescriptions for FDC than there are for ICS, which is inconsistent with clinical guidelines as ICS are first-line preventers and FDC are predominantly second line preventers, which generally require a failed trial of ICS (DoH 2015).

Findings from future work using the PBS and MBS data to report on the treatment and management of chronic respiratory conditions can build upon findings reported in these post-market reviews.

6.1 Data linkage

Future research questions may depend on linking MBS and PBS data—together and with other data sets. Described below is the scope for linkage and resultant projects related to the treatment and management of chronic respiratory conditions. This linkage could also facilitate expansion of some of the research questions that can currently be answered (outlined above).

Data linkage between PBS and MBS

It is possible to link PBS and MBS data held by the AIHW at a patient level with AIHW Ethics Committee approval. Both data collections use the same patient identifier, thereby making linkage processes easier and more accurate than name-based linkages. The AIHW is able to provide more information, upon request, regarding what linkages can and cannot be performed, for what purposes, and for whom.

As an example of how data linkage could provide useful insight to research questions, users of a specific medication could be identified using the PBS data. This cohort could then be linked to MBS data to examine use of other services/providers and to draw inferences about relationships between medication use and service use and/or patient demographics (such as age, sex and geography), as well as any available prescriber/provider demographics.

Data linkage between PBS, MBS and other data sources

In order to determine their utility and effectiveness, it is important to investigate the outcomes of medication treatments. This can be made possible by linking PBS and MBS data with other data sources—for example, linking prescription data to outcomes such as mortality, hospitalisations and visits to emergency departments. Exploration in this area would be valuable for understanding the effectiveness of management strategies for chronic respiratory conditions in Australia.

PBS–MBS linked data sources at the AIHW

The National Integrated Health Services Information (NHISI) Analysis Asset (AA)

The AIHW is working with the Department of Health and state and territory health authorities to create the NIHSI Analysis Asset (AA). The NIHSI AA will contain de-identified data, from 2010–11 onwards, on admitted patient care services (in public and private hospitals where available); emergency department services; and outpatient services in public hospitals, for all participating states and territories, along with MBS data, PBS and RPBS data, residential aged care data and National Deaths Index data. The incorporation of data into the NIHSI AA will be staged, and will be dependent on timing of receipt of the required data.

These de-identified data will initially be available to selected analysts nominated by the data providers: the Department of Health, state and territory health authorities, and the AIHW. It is anticipated that, in the second half of 2019, other users will be able to apply for access to the NIHSI AA, or to data extracted from the NIHSI AA, provided their proposed use of the data complies with the AIHW Ethics Committee - approved purposes for the NIHSI AA (see the AIHW website for further information).

The NHISI-AA may have the ability to further elaborate on key questions that can't currently be addressed by PBS or MBS data. For instance, on the question of adherence to treatment, the NHISI-AA could be interrogated to investigate circumstances around prescriptions—such as whether a prescription was dispensed following a GP appointment, specialist appointment or hospital/ED visit. To assist in estimating prevalence, respiratory medicines can be included in case definitions to estimate prevalence of certain respiratory conditions using the NHISI-AA data.

Coordination of Health Care Study (to be linked with PBS-MBS)

The Coordination of Health Care (CHC) Study was developed by the AIHW to fill a national data gap and to provide information on patients' experiences of coordination of care across Australia. The study focuses on patients' experiences with health-care providers. Measuring coordination of care from a patient's perspective is a crucial step in identifying common themes and areas for improvement and for monitoring the impact of change. Patients' experiences also provide insights for the development of new health-care performance indicators.

The study was designed so that coordination of health care can be explored both nationally, and at smaller geographic areas, including Primary Health Network areas. The study has 2 components:

- the 2016 Survey of Health Care, which sampled people aged 45 and over who had seen a GP in the previous 12 months
- looking at participants' responses and their use of health services and pharmaceuticals 12–24 months before and after the survey (through data linkage), drawn from MBS, PBS and hospital records.

The study started with the 2016 Survey of Health Care. The survey was conducted by the Australian Bureau of Statistics (ABS) between April and June 2016. Participants gave information about their health; health service use; experiences with access; continuity and coordination of care; and demographic characteristics.

The survey is the first in Australia to record whether people had a usual GP or usual place of care, as well as their experiences with:

- information-sharing between their usual GP/usual place of care and other health-care providers they may have seen
- health professionals for their physical health
- health professionals for their emotional and psychological health.

The CHC, linked to MBS, PBS and hospitalisations data, may provide valuable insights into adherence to treatment. The survey component of the CHC can provide insights into why people with respiratory conditions may not have visited a GP, or why they may have visited the ED. This can be linked to records of prescription-dispensing, as well as hospitalisations, to potentially gain insight into treatment adherence.

6.2 Potential alternative data sources

Other potential data sources could be used to complement or provide insight into the treatment and management of chronic respiratory conditions that may not be available through PBS and MBS data. These are described briefly below and relevant data items identified.

National Health Survey

The National Health Survey (NHS) is conducted by the ABS to obtain national information on the health status of Australians, their use of health services and facilities, and health-related aspects of their lifestyle. The most recent NHS was conducted in 2014–15, with previous surveys conducted in 2011–12 (as part of the Australian Health Survey), and in 2007–08, 2004–05, 2001, 1995, 1989–90, 1983 and 1977–78. The NHS collects specific information on COPD, asthma, asthma action plans, and medications used for respiratory conditions. The next NHS (2017–18) will be available in the first half of 2019.

NSW Population Health Survey

The NSW Population Health Survey collects self-reported information about the types and frequency of medications used by people with current asthma. The surveys from 2009, 2010, 2012 and 2014 included information about respondents' asthma status, frequency of use of specific medications for asthma, and asthma action plans. As the information is self-reported, survey responses may be influenced by the respondent's ability to recall and by their ability to interpret the questions as intended. However, in contrast to the dispensing information recorded on the PBS, this survey may have the advantage of providing more accurate indication of whether the medication was actually taken by the respondent.

NPS MedicineWise MedicineInsight data

Funded by the Department of Health, MedicineInsight is the first large-scale, national primary-care data program in Australia that collects longitudinal patient information from participating general practices. Data include information on reason for encounter, diagnosis and prescriptions prescribed by GPs—which enable links between prescriptions and

conditions to be explored. The data does not, however, include samples from pharmaceutical companies provided by GPs; prescriptions dispensed; or prescriptions by specialists or from hospitals.

Longitudinal Study of Australian Children

This cohort study collects detailed health and demographic information from children aged 0–15. The study began in 2003 with a representative sample of children (who are now teens and young adults) from urban and rural areas of all states and territories in Australia. Data are collected from 2 cohorts every 2 years. The first cohort of 5,000 children was aged 0–1 in 2003–04, and the second cohort of 5,000 children was aged 4–5 in 2003–04. It uses linkage to the PBS to accurately attribute information about dispensing of prescription medications. Therefore, it includes comprehensive information about participant characteristics and medication dispensing.

IMS Health data

IMS Health—a commercial market information company—provides information on the wholesale supply of medications in the community. It collects data from all pharmaceutical wholesalers about the sale of both prescription and non-prescription medications to the hospital and community sectors. However, since these are wholesale supply data, they do not include any information about the individuals who purchased the medications or whether the medications (specifically short-acting beta agonists) were purchased over the counter (that is, without a prescription).

My Health Record

A My Health Record (MHR) is an electronic summary of a patient's key health information, drawn from their existing records. Subject to consumer controls, the MHR system allows health-care providers to access important summary health information about individuals, such as doctor visits (under MBS); medical conditions; medication details (such as medicine dispensed from PBS claims history); and test or scan reports in digital form in 1 place.

Bettering the Evaluation and Care of Health Survey

The Bettering the Evaluation and Care of Health (BEACH) survey, which began in 1998 and concluded in 2016, has been the only detailed national data source about general practitioner activity in Australia. The BEACH survey linked management actions (for example, prescriptions and referrals) to the problem being managed.

BEACH data include those medications prescribed, those supplied to the patient directly by the GP, and those advised for over-the-counter purchase. Each prescription recorded reflects the GP's intent that the patient receives the prescribed medication and the specified number of repeats. The prescription is counted only once, irrespective of the number of repeats ordered. Hence, the medication is directly linked to the problem being managed by the GP. However, BEACH survey data do not provide information on the number of prescriptions not filled by the patient (a limitation which also applies to PBS and IMS Health data).

7 Conclusion

This report investigated the utility of PBS and MBS claims data in answering key research questions of importance for reporting on the treatment and management of chronic respiratory conditions in Australia—of which asthma and COPD are 2 of the most burdensome conditions. While PBS and MBS data lack information on diagnoses, information on types of medications prescribed, and on patterns of prescribing, can be used as proxies for diagnoses, as has been done in recent work (DoH 2015, 2017).

Fifteen questions were identified, of which ten were evaluated as able to be answered using the PBS data. These questions pertained to information relating to medication type; variation in dispensing patterns by demographic factors; costs of medications; consistency of prescribing with clinical guidelines; and the uptake of new medications. High-level analysis of PBS claims data provided a snapshot of the reporting potential using this data source. This information will provide valuable additional insight into the management and treatment of chronic respiratory conditions, and would benefit from future analysis and reporting.

Appendix A: PBS and MBS data elements

Table A1: PBS data elements

Type of information	Data item	Description
PBS claim	PBS item number	The PBS item prescribed in a claim for a benefit under the PBS, as represented by a 6-digit item code.
	Medication name	Generic name of the active ingredient in the PBS item prescribed. This is not the brand or trade name of the medication.
	Form and strength	The form and strength of the medication in the PBS item prescribed. For example, atorvastatin is available in 'tablet' form in 4 different strengths (10 mg, 20 mg, 40 mg and 80 mg).
	ATC code	The Anatomical Therapeutic Chemical (ATC) code of the PBS item to the fifth level of the classification system, as represented by a 7-digit code.
	Number of prescriptions	The total number of times that the prescribed medicinal product is supplied to the patient.
	Patient category	The derived entitlement status of the patient at the time the PBS item is supplied. This status determines the maximum contribution payable by the patient. Note: The AIHW's PBS claims data do not include Repatriation Pharmaceutical Benefits Scheme (RPBS) data. Requests for RPBS claims data must be approved by the Department of Veterans' Affairs and may take longer to process and retrieve.
	Under co-payment indicator	The type of benefit claim made under the PBS for the prescription medicinal product, as represented by a code. Codes 'E' and 'U' are for '*Under co-payment*' claims. Code 'C' is for PBS claims eligible for Closing the Gap (CTG) co-payment relief. All other records are blank, for standard (above) co-payment claims. Collection of *Under co-payment* data commenced 1 April 2012 (date of processing). Prior to April 2012, PBS claims data were only collected for prescriptions that attracted a government subsidy. Note: The AIHW's PBS claims data do not include PBS *Under co-payment* data. Requests for PBS *Under co-payment* data will be sourced from the Department of Health, where it is approved, and may take longer to process and retrieve.
	Form category	The type of form used when claiming a pharmaceutical benefit for a prescription under the PBS, as represented by a code that can be used to distinguish original and repeat prescriptions.
	Streamlined authority code	On 1 July 2007, a large number of Pharmaceutical Benefits Scheme (PBS) subsidised medicines that previously required an authority approval before being prescribed, moved to a new streamlined authority process. The streamlined authority process is designed to reduce the administrative burden on prescribers, as they don't need to seek prior telephone or written approval from the Department of Human Services (DHS) or the Department of Veterans' Affairs (DVA) to prescribe some PBS authority-required items. To prescribe a streamlined authority item, a prescriber is required to include a 'streamlined authority code' on the authority prescription. Specific 'streamlined authority codes' could be used to identify reason or indication for prescription (for example, certain conditions).
Dates	Dates of processing, supply, and prescribing	Dates associated with processing of the claim, supply of the medication to the patient, and the date that the prescriber signs the prescription.
Pharmacy	Pharmacy identifier and postcode	Postcode and unique identifier for the supplying pharmacy.
Prescriber	Prescriber number and postcode	Postcode and unique identifier for the prescriber. This unique identifier is different to the MBS provider number.

Type of information	Data item	Description
	Prescriber major specialty	The major field of specialty and sub-specialty of the authorised health professional responsible for the writing and signing of a prescription for a medicinal product included in the PBS, as represented by a code. 'Derived major specialty' is a data element for every quarter and indicates; for example, rheumatologist.
	Prescriber type	The broad field of specialty of the PBS prescriber responsible for the writing and signing of the prescription, as represented by a code—for example, dentist, optometrist, medical, nurse practitioner, midwife.
	Pharmacy approval type	Used to identify items dispensed in a hospital or community pharmacy. However, this is not consistently applied in all jurisdictions.
Patient	Patient date of birth	Date of birth of patient used to calculate patient age at date of service.
	Patient sex	Gender of patient.
	Patient postcode	Postcode of patient.
	Patient PIN (scrambled)	Personal identification number. This unique identifier is the same as the MBS patient PIN.
Costs	Net benefit	For a given PBS prescription, the total amount of the Commonwealth government contribution towards the cost of prescription medicinal products supplied via the PBS.
	Patient contribution	For a given PBS prescription, the total amount paid by the patient to the approved pharmacy for a prescription, exclusive of any special patient contributions—for example, brand price premiums or therapeutic group premiums. This amount also excludes any optional fees imposed at the discretion of the pharmacy and payable by the patient—for example, fees associated with the maintenance of Safety Net records by the pharmacy on behalf of the patient.

Table A2: MBS data elements

Type of information	Data item	Description
MBS claim	MBS item number	A unique numeric identifier and associated description for an item for which a MBS benefit is paid for a provided service. Each number has an associated description.
	MBS item category	The categories which represent the service events within the MBS. The service events within the MBS are structured into categories, groups and subgroups, with categories being the broadest level and subgroups being the finest level of detail.
	Broad type of service	Broad classifications of the MBS used for reporting: the categories for the Broad Type of Service (BTOS) hierarchy in reporting order, as represented by a code. A key use of this variable is to distinguish between services provided by a GP versus a specialist.
	Hospital indicator	An indicator of whether the service is delivered within a hospital, as represented by a code. Code 'H' is for admitted patients only. All other records are blank, for non-admitted patients.
	Number of services	Number of services rendered.
Dates	Dates of processing, service, and referral	Dates associated with processing of the claim, when the Medicare service was provided, and the referral or request date recorded by the service provider.

Service provider	Service provider number (scrambled) and postcode	Postcode and unique identifier for the service provider. This unique identifier is different to the PBS prescriber number.
	Service provider registered specialty	The field of specialty of the authorised health professional who provided the service. A provider can have multiple registered specialties.
	Service provider-derived major specialty	Derived major specialty for each quarter, based on MBS activity, used for reporting. Each provider has a single derived major speciality.
Referring provider	Referring provider number (scrambled) and postcode	Postcode and unique identifier for the referring provider.
Patient	Patient date of birth	Date of birth of patient used to calculate patient age at date of service.
	Patient sex	Gender of patient.
	Patient postcode	Postcode of patient.
	Patient PIN (scrambled)	Personal identification number. This unique identifier is the same as the PBS patient PIN.
	Aboriginal & Torres Strait Islander Identifier	Aboriginal and Torres Strait Islander indicator. Note: the AIHW does not currently have this field, but would like to in future. Also known as 'Voluntary Indigenous Identifier'.
Costs	Bill type	The type of Medicare billing issued for the provided service, as represented by a code. Code 'D' is for direct billed (bulk billed). Code 'P' is for patient billed. Code 'H' is for simplified billing.

Bulk-billed claims are when the provider of the service accepts the Medicare benefit as full payment for the service. This occurs when the patient assigns their right to the benefit to the provider. There is no out-of-pocket cost for these services (unless a bulk-billing co-payment is applied). |
	Fee charged	The total amount charged as contained on accounts submitted by the practitioner to claim payment for a service provided. The provider determines the fee they charge the patient for services they provide.
	Schedule Fee	The fee listed in the MBS for each approved medical service. The Schedule Fee is the fee used in calculating Medicare benefits for services provided, while the charge is the fee charged by the provider. The charge may be above, below or equal to the Schedule Fee for a particular item.
	Benefit paid	The total amount of Medicare benefit paid for services performed by a Medicare service provider. In general, the Medicare benefit is 85% of the Schedule Fee. Services to private patients in a public hospital attract a flat Medicare benefit of 75% of the Medicare Schedule Fee.

Appendix B: Detailed statistical tables

The statistical tables provided in this appendix present data that were used to draw the figures in the report. A reference to the respective Figure is also given.

Table B1: Percentage of chronic respiratory condition medications dispensed (distribution), by medication class, 2016–17

Medication class	Number of prescriptions	% of all medications for chronic respiratory conditions
Combination medications (ICS-LABA and LABA-LAMA)	5,575,671	33.8
Short-acting bronchodilators (SABA and SAMA)	4,048,427	24.5
Oral corticosteroids (OCS)	3,670,098	22.2
Long-acting bronchodilators (LABA and LAMA)	1,918,445	11.6
Inhaled corticosteroids (ICS)	949,470	5.8
Others	346,673	2.1
Total	**16,508,784**	**100**

Note: See Figure 5.1.

Source: AIHW analysis of PBS data.

Table B2: Chronic respiratory condition medications dispensed (number of prescriptions), by class of medication, by sex, 2016–17

Medication class	Males		Females		Persons	
	Number of prescriptions	%	Number of prescriptions	%	Number of prescriptions	%
Combination (ICS-LABA and LABA-LAMA)	2,459,972	33.0	3,076,268	34.6	5,536,240	33.8
Short-acting bronchodilators (SABA and SAMA)	1,738,605	23.3	2,273,617	25.6	4,012,222	24.5
Oral corticosteroids (OCS)	1,676,793	22.5	1,949,096	21.9	3,625,889	22.2
Long-acting bronchodilators (LABA and LAMA)	950,096	12.7	955,095	10.7	1,905,191	11.6
Inhaled corticosteroids (ICS)	455,111	6.1	484,805	5.4	939,916	5.7
Leukotriene receptor antagonists (LTRA)	133,020	1.8	85,733	1.0	218,753	1.3
Anti-immunoglobin E therapy (anti-IgE therapy)	3,940	0.1	5,880	0.1	9,820	0.1
Other	47,058	0.6	68,168	0.8	115,226	0.7
Total	**7,464,595**	**45.6**	**8,898,662**	**54.4**	**16,363,257**	**99.9**

Notes

1. Excludes people with unknown age group and/or sex.

2. Total percentage may not sum to 100% due to rounding.

3. See Figure 5.3.

Source: AIHW analysis of PBS data.

Table B3: Number of prescriptions dispensed for combination medications (ICS-LABA), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	6,358	0.3	3,939	0.1	10,297	0.2
5–14	85,246	3.7	55,628	1.9	140,874	2.7
15–34	261,806	11.4	313,274	10.6	575,080	10.9
35–64	900,954	39.1	1,209,255	40.9	2,110,209	40.1
65 and over	1,048,645	45.5	1,371,382	46.4	2,420,027	46.0
Total	**2,303,009**	**43.8**	**2,953,478**	**56.2**	**5,256,487**	**99.9**

Notes

1. Excludes people with unknown age group and/or sex.

2. Percentages for persons may not sum to 100% due to rounding.

3. See Figure 5.4.

Source: AIHW analysis of PBS data.

Table B4: Number of prescriptions dispensed for combination medications (LABA-LAMA), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	4	0.0	0	0.0	4	0.0
5–14	24	0.0	0	0.0	24	0.0
15–34	378	0.2	307	0.3	685	0.2
35–64	34,446	21.9	31,644	25.8	66,090	23.6
65 and over	122,111	77.8	90,839	74.0	212,950	76.1
Total	**156,963**	**56.1**	**122,790**	**43.9**	**279,753**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. Percentages for persons may not sum to 100% due to rounding.

3. See Figure 5.5.

Source: AIHW analysis of PBS data.

Table B5: Number of prescriptions dispensed for short-acting bronchodilators (both SABA and SAMA), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	83,635	4.8	56,074	2.5	139,709	3.5
5–14	180,063	10.4	125,439	5.5	305,502	7.6
15–34	168,891	9.7	236,318	10.4	405,209	10.1
35–64	542,137	31.2	836,791	36.8	1,378,928	34.4
65 and over	763,879	43.9	1,018,995	44.8	1,782,874	44.4
Total	**1,738,605**	**43.3**	**2,273,617**	**56.7**	**4,012,222**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. See Figure 5.6.

Source: AIHW analysis of PBS data.

Table B6: Number of prescriptions dispensed for long-acting bronchodilators (both LABA and LAMA), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	30	0.0	18	0.0	48	0.0
5–14	454	0.0	294	0.0	748	0.0
15–34	3,775	0.4	5,099	0.5	8,874	0.5
35–64	200,429	21.1	231,073	24.2	431,502	22.6
65 and over	745,408	78.5	718,611	75.2	1,464,019	76.8
Total	**950,096**	**49.9**	**955,095**	**50.1**	**1,905,191**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. Percentages for persons may not sum to 100% due to rounding.

3. See Figure 5.7.

Source: AIHW analysis of PBS data.

Table B7: Number of prescriptions dispensed for inhaled corticosteroids (ICS) (alone), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	66,016	14.5	40,084	8.3	106,100	11.3
5–14	148,557	32.6	92,084	19.0	240,641	25.6
15–34	35,060	7.7	45,898	9.5	80,958	8.6
35–64	89,656	19.7	136,913	28.2	226,569	24.1
65 and over	115,822	25.4	169,826	35.0	285,648	30.4
Total	**455,111**	**48.4**	**484,805**	**51.6**	**939,916**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. See Figure 5.8.

Source: AIHW analysis of PBS data.

Table B8: Number of prescriptions dispensed for oral corticosteroids (OCS), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	229,707	13.7	154,405	7.9	384,112	10.6
5–14	183,262	10.9	124,938	6.4	308,200	8.5
15–34	152,901	9.1	218,994	11.2	371,895	10.3
35–64	515,029	30.7	681,893	35.0	1,196,922	33.0
65 and over	595,894	35.5	768,866	39.4	1,364,760	37.6
Total	**1,676,793**	**46.2**	**1,949,096**	**53.8**	**3,625,889**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. See Figure 5.9.

Source: AIHW analysis of PBS data.

Table B9: Number of prescriptions dispensed for leukotriene receptor antagonists (LTRA), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	30,911	23.2	19,876	23.2	50,787	23.2
5–14	98,343	73.9	62,916	73.4	161,259	73.7
15–34	2,913	2.2	1,859	2.2	4,772	2.2
35–64	544	0.4	757	0.9	1,301	0.6
65 and over	309	0.2	325	0.4	634	0.3
Total	**133,020**	**60.8**	**85,733**	**39.2**	**218,753**	**100.0**

Notes

1.   Excludes people with unknown age group and/or sex.

2.   See Figure 5.10.

Source: AIHW analysis of PBS data.

Table B10: Number of prescriptions dispensed for anti-immunoglobulin E therapy (anti-IgE-therapy), by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	%	Sum of prescriptions	%	Sum of prescriptions	%
0–4	. .	. .	. .	. .	. .	. .
5–14	76	1.9	115	2.0	191	1.9
15–34	402	10.2	732	12.4	1,134	11.5
35–64	2,308	58.6	3,612	61.4	5,920	60.3
65 and over	1,154	29.3	1,421	24.2	2,575	26.2
Total	**3,940**	**40.1**	**5,880**	**59.9**	**9,820**	**100.0**

. .   Not applicable. This class of medication is recommended for people aged 12 and over.

Notes

1.   Excludes people with unknown age group and/or sex.

2.   Percentages for persons may not sum to 100% due to rounding.

3.   See Figure 5.11.

Source: AIHW analysis of PBS data.

Table B11: Number of prescriptions dispensed for other medications, by age, by sex, 2016–17

Age group	Males		Females		Persons	
	Sum of prescriptions	**%**	**Sum of prescriptions**	**%**	**Sum of prescriptions**	**%**
0–4	1,088	2.3	731	1.1	1,819	1.6
5–14	2,194	4.7	1,835	2.7	4,029	3.5
15–34	2,863	6.1	4,407	6.5	7,270	6.3
35–64	14,818	31.5	24,986	36.7	39,804	34.5
65 and over	26,095	55.5	36,209	53.1	62,304	54.1
Total	**47,058**	**40.8**	**68,168**	**59.2**	**115,226**	**100.0**

Notes

1. Excludes people with unknown age group and/or sex.

2. See Figure 5.12.

Source: AIHW analysis of PBS data.

Appendix C: Chronic respiratory conditions PBS medications

This appendix lists the class of PBS medications used to treat chronic respiratory conditions. Information is provided by class of medication (based on the Anatomical Therapeutic Classification System, or ATC; name and strength of the medicine; and ATC and PBS item codes (Table C1). The associated cost 'total benefits paid' (for 2016–2017) for each medication is also provided to give a general idea of how much each medication costs the Australian Government/PBS.

Note: Some of these medication classes are used to treat other diseases and conditions.

Table C1: Chronic respiratory conditions medications listed on the PBS, by drug name, form and strength of the drug, ATC and PBS item codes, and total benefits paid

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
Short-acting beta2-agonists (SABA)				
SALBUTAMOL	Pressurised inhalation equivalent to 100 micrograms salbutamol per dose, 200 doses	R03AC02	01096Q	39,905,684
SALBUTAMOL	Pressurised inhalation equivalent to 100 micrograms salbutamol per dose, 400 doses	R03AC02	01097R	
SALBUTAMOL	Capsule containing powder for oral inhalation 200 micrograms (as sulfate) (for use in Ventolin Rotahaler)	R03AC02	01099W	
SALBUTAMOL	Nebuliser solution 2.5 mg (as sulfate) in 2.5 mL single-dose units, 30 x 2.5mL ampoules	R03AC02	02000G	
SALBUTAMOL	Nebuliser solution 5 mg (as sulfate) in 2.5 mL single-dose units, 30 x 2.5mL ampoules	R03AC02	02001H	
SALBUTAMOL	Nebuliser solution 5 mg (as sulfate) per mL, 30 mL	R03AC02	02003K	
SALBUTAMOL	Pressurised inhalation in breath-actuated device equivalent to 100 micrograms salbutamol per dose, 400 doses	R03AC02	02004L	
SALBUTAMOL	Pressurised inhalation 100 micrograms per dose, 200 doses	R03AC02	03087L	
SALBUTAMOL	Pressurised inhalation 100 micrograms (as sulfate) per dose, 200 doses (CFC-free formulation)	R03AC02	03495Y	
SALBUTAMOL	Nebuliser solution 2.5 mg (as sulfate) in 2.5 mL single-dose units, 30 x 2.5mL ampoules	R03AC02	03496B	
SALBUTAMOL	Nebuliser solution 5 mg (as sulfate) in 2.5 mL single-dose units, 30 x 2.5mL ampoules	R03AC02	03497C	
SALBUTAMOL	Powder for oral inhalation, refill disks (for use in Ventolin Diskhaler), equivalent to 200 micrograms salbutamol per dose, 8 doses per disk, 15	R03AC02	08036Y	
SALBUTAMOL	Pressurised inhalation 100 micrograms (as sulfate) per dose, 200 doses (CFC-free formulation)	R03AC02	08288F	

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
SALBUTAMOL	Pressurised inhalation in breath-actuated device 100 micrograms (as sulfate) per dose, 200 doses (CFC-free formulation)	R03AC02	08354Q	
SALBUTAMOL	Capsule containing powder for oral inhalation 200 micrograms (as sulfate) (for use in Ventolin Rotahaler)	R03AC02	10143W	
TERBUTALINE	Pressurised inhalation 250 micrograms per dose, 400 doses	R03AC03	01240G	1,616,555
TERBUTALINE	Nebuliser solution 10 mg per mL, 50 mL	R03AC03	01243K	
TERBUTALINE	Nebuliser solution containing terbutaline sulfate 5 mg in 2 mL single-dose units, 30	R03AC03	01251W	
TERBUTALINE	Powder for oral inhalation in breath-actuated device containing terbutaline sulfate 500 micrograms per dose, 200 doses	R03AC03	01252X	
TERBUTALINE	Powder for oral inhalation in breath-actuated device containing terbutaline sulfate 500 micrograms per dose, 100 doses	R03AC03	02817G	
Short-acting muscarinic antagonists (SAMA)				
IPRATROPIUM	Pressurised inhalation 20 micrograms (anhydrous) per dose, 200 doses	R03BB01	01540C	5,405,529
IPRATROPIUM	Nebuliser solution containing ipratropium bromide 250 micrograms (anhydrous) per mL, 20 mL	R03BB01	01541D	
IPRATROPIUM	Nebuliser solution containing ipratropium bromide 250 micrograms (anhydrous) in 1 mL single-dose units, 30 x 1 mL ampoules	R03BB01	01542E	
IPRATROPIUM	Nebuliser solution 500 micrograms (anhydrous) in 2 mL single-dose units, 30	R03BB01	01543F	
IPRATROPIUM	Pressurised inhalation 40 micrograms (anhydrous) per dose, 200 doses	R03BB01	08135E	
IPRATROPIUM	Nebuliser solution containing ipratropium bromide 500 micrograms (anhydrous) in 1 mL single-dose units, 30 x 1 mL ampoules	R03BB01	08238N	
IPRATROPIUM	Pressurised inhalation in breath-actuated device 20 micrograms (anhydrous) per dose, 200 doses	R03BB01	08279R	
IPRATROPIUM	Pressurised inhalation containing ipratropium bromide 21 micrograms per dose, 200 doses (CFC-free formulation)	R03BB01	08671J	
Long-acting beta2-agonists (LABA)				
SALMETEROL	Pressurised inhalation 25 micrograms (as xinafoate) per dose, 120 doses	R03AC12	03027H	597,574
SALMETEROL	Powder for oral inhalation, refill disks (for use in Serevent Diskhaler), equivalent to 50 micrograms salmeterol per dose, 4 doses per disk, 15	R03AC12	08005H	
SALMETEROL	Powder for oral inhalation in breath-actuated device 50 micrograms (as xinafoate) per dose, 60 doses	R03AC12	08141L	

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
EFORMOTEROL	Capsule containing powder for oral inhalation containing eformoterol fumarate dihydrate 12 micrograms (for use in Foradile Aerolizer)	R03AC13	08136F	1,009,910
EFORMOTEROL	Powder for oral inhalation in breath-actuated device containing eformoterol fumarate dihydrate 6 micrograms per dose, 60 doses	R03AC13	08239P	
EFORMOTEROL	Powder for oral inhalation in breath-actuated device containing eformoterol fumarate dihydrate 12 micrograms per dose, 60 doses	R03AC13	08240Q	
INDACATEROL	Capsule containing powder for oral inhalation 150 micrograms (as maleate) (for use in Breezhaler), 30 capsules	R03AC18	05134F	6,838,945
INDACATEROL	Capsule containing powder for oral inhalation 300 micrograms (as maleate) (for use in Breezhaler), 30 capsules	R03AC18	05137J	
Long-acting muscarinic antagonists (LAMA)				
TIOTROPIUM	Capsule 18 ug (base) (oral inhalation), 30 capsules	R03BB04	08626B	71,747,546
ACLIDINIUM	Powder for oral inhalation in breath-actuated device 322 micrograms (as bromide) per dose, 60 doses	R03BB05	10124W	5,564,187
GLYCOPYRRONIUM	Capsule containing powder for oral inhalation 50 micrograms (as bromide) (for use in Breezhaler), 30 capsules	R03BB06	10059K	6,409,540
UMECLIDINIUM	Powder for oral inhalation in breath actuated device 62.5 micrograms (as bromide) per dose, 30 doses	R03BB07	10187E	4,489,822
Inhaled corticosteroids (ICS)				
BECLOMETASONE	Capsule containing powder for oral inhalation 100 micrograms (for use in Becotide Rotahaler)	R03BA01	01649T	945,707
BECLOMETASONE	Pressurised inhalation 50 micrograms per dose, 200 doses	R03BA01	01650W	
BECLOMETASONE	Pressurised inhalation 100 micrograms per dose, 200 doses	R03BA01	01651X	
BECLOMETASONE	Pressurised inhalation 250 micrograms per dose, 200 doses	R03BA01	01652Y	
BECLOMETASONE	Pressurised inhalation in breath actuated device 50 micrograms per dose, 200 doses	R03BA01	08142M	
BECLOMETASONE	Pressurised inhalation in breath actuated device 100 micrograms per dose, 200 doses	R03BA01	08143N	
BECLOMETASONE	Pressurised inhalation in breath actuated device 250 micrograms per dose, 200 doses	R03BA01	08237M	
BECLOMETASONE	Pressurised inhalation containing beclomethasone dipropionate 50 micrograms per dose, 200 doses (CFC-free formulation)	R03BA01	08406K	

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
BECLOMETASONE	Pressurised inhalation containing beclomethasone dipropionate 100 micrograms per dose, 200 doses (CFC-free formulation)	R03BA01	08407L	
BECLOMETASONE	Pressurised inhalation in breath-actuated device containing beclomethasone dipropionate 50 micrograms per dose, 200 doses (CFC-free formulation)	R03BA01	08408M	
BECLOMETASONE	Pressurised inhalation in breath actuated device containing beclomethasone dipropionate 100 micrograms per dose, 200 doses (CFC-free formulation)	R03BA01	08409N	
BUDESONIDE	Nebuliser suspension 500 micrograms in 2 mL single-dose units, 30 x 2 mL ampoules	R03BA02	02065Q	3,609,250
BUDESONIDE	Nebuliser suspension 1 mg in 2 mL single-dose units, 30 x 2 mL ampoules	R03BA02	02066R	
BUDESONIDE	Pressurised inhalation 50 micrograms per dose, 200 doses	R03BA02	02067T	
BUDESONIDE	Pressurised inhalation 100 micrograms per dose, 200 doses	R03BA02	02068W	
BUDESONIDE	Pressurised inhalation 200 micrograms per dose, 200 doses	R03BA02	02069X	
BUDESONIDE	Powder for oral inhalation in breath-actuated device 100 micrograms per dose, 200 doses	R03BA02	02070Y	
BUDESONIDE	Powder for oral inhalation in breath-actuated device 200 micrograms per dose, 200 doses	R03BA02	02071B	
BUDESONIDE	Powder for oral inhalation in breath-actuated device 400 micrograms per dose, 200 doses	R03BA02	02072C	
FLUTICASONE	Pressurised inhalation 250 micrograms per dose, 120 doses	R03BA05	02716Y	7,395,492
FLUTICASONE	Powder for oral inhalation, refill disks (for use in Flixotide Diskhaler), 500 micrograms per dose, 4 doses per disk, 15	R03BA05	02717B	
FLUTICASONE	Pressurised inhalation 125 micrograms per dose, 120 doses	R03BA05	08091W	
FLUTICASONE	Pressurised inhalation 50 micrograms per dose, 120 doses	R03BA05	08145Q	
FLUTICASONE	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 100 micrograms per dose, 60 doses	R03BA05	08147T	
FLUTICASONE	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 250 micrograms per dose, 60 doses	R03BA05	08148W	
FLUTICASONE	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 500 micrograms per dose, 60 doses	R03BA05	08149X	
FLUTICASONE	Pressurised inhalation containing fluticasone propionate 125 micrograms per dose, 120 doses (CFC-free formulation)	R03BA05	08345F	

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
FLUTICASONE	Pressurised inhalation containing fluticasone propionate 250 micrograms per dose, 120 doses (CFC-free formulation)	R03BA05	08346G	
FLUTICASONE	Pressurised inhalation containing fluticasone propionate 50 micrograms per dose, 120 doses (CFC-free formulation)	R03BA05	08516F	
CICLESONIDE	Oral pressurised inhalation 80 ug per dose, 120 doses	R03BA08	08853Y	3,700,900
CICLESONIDE	Oral pressurised inhalation 160 ug per dose, 120 doses	R03BA08	08854B	
Oral corticosteroids (OCS)				
PREDNISOLONE	Tablet 25 mg	H02AB06	01916W	13,467,997
PREDNISOLONE	Tablet 5 mg	H02AB06	01917X	
PREDNISOLONE	Tablet 1 mg	H02AB06	03152X	
PREDNISOLONE	Oral solution equivalent to 5 mg prednisolone per mL	H02AB06	08285C	
PREDNISONE	Tablet 1 mg	H02AB07	01934T	4,145,935
PREDNISONE	Tablet 5 mg	H02AB07	01935W	
PREDNISONE	Tablet 25 mg	H02AB07	01936X	
Combination medications (LABA-LAMA)				
UMECLIDINIUM + VILANTEROL	Umeclidinium 62.5 microgram/actuation + vilanterol 25 microgram/actuation powder for inhalation, 30 actuations	R03AL03	10188F	6,735,032
INDACATEROL + GLYCOPYRRONIUM	Indacaterol 110 microgram + glycopyrronium 50 microgram powder for inhalation, 30 capsules	R03AL04	10156M	16,646,400
Combination medications (ICS-LABA)				
FLUTICASONE + SALMETEROL	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 100 micrograms with salmeterol 50 micrograms (as xinafoate) per dose, 60 doses	R03AK06	08430Q	139,048,714
FLUTICASONE + SALMETEROL	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 250 micrograms with salmeterol 50 micrograms (as xinafoate) per dose, 60 doses	R03AK06	08431R	
FLUTICASONE + SALMETEROL	Powder for oral inhalation in breath-actuated device containing fluticasone propionate 500 micrograms with salmeterol 50 micrograms (as xinafoate) per dose, 60 doses	R03AK06	08432T	
FLUTICASONE + SALMETEROL	Pressurised inhalation containing fluticasone propionate 50 micrograms with salmeterol 25 micrograms (as xinafoate) per dose, 120 doses (CFC-free formulation)	R03AK06	08517G	
FLUTICASONE + SALMETEROL	Pressurised inhalation containing fluticasone propionate 125 micrograms with salmeterol 25 micrograms (as xinafoate) per dose, 120 doses (CFC-free formulation)	R03AK06	08518H	

Medication name	Form/strength	ATC code	PBS item code	Total benefits paid ($) (2016–17)
FLUTICASONE + SALMETEROL	Pressurised inhalation containing fluticasone propionate 250 micrograms with salmeterol 25 micrograms (as xinafoate) per dose, 120 doses (CFC-free formulation)	R03AK06	08519J	
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 200 micrograms with eformoterol fumarate dihydrate 6 micrograms per dose, 120 doses	R03AK07	02866W	95,939,187
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 50 micrograms with eformoterol fumarate dihydrate 3 micrograms per dose, 120 doses	R03AK07	02867X	
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 100 micrograms with eformoterol fumarate dihydrate 3 micrograms per dose, 120 doses	R03AK07	02938P	
BUDESONIDE + EFORMOTEROL	Powder for oral inhalation in breath-actuated device containing budesonide 200 micrograms with eformoterol fumarate dihydrate 6 micrograms per dose, 120 doses	R03AK07	08625Y	
BUDESONIDE + EFORMOTEROL	Powder for oral inhalation in breath-actuated device containing budesonide 400 micrograms with eformoterol fumarate dihydrate 12 micrograms per dose, 60 doses	R03AK07	08750M	
BUDESONIDE + EFORMOTEROL	Powder for oral inhalation in breath-actuated device containing budesonide 100 micrograms with eformoterol fumarate dihydrate 6 micrograms per dose, 120 doses	R03AK07	08796Y	
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 100 micrograms with eformoterol fumarate dihydrate 3 micrograms per dose, 120 doses	R03AK07	10015D	
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 200 micrograms with eformoterol fumarate dihydrate 6 micrograms per dose, 120 doses	R03AK07	10018G	
BUDESONIDE + EFORMOTEROL	Pressurised inhalation containing budesonide 50 micrograms with eformoterol fumarate dihydrate 3 micrograms per dose, 120 doses	R03AK07	10024N	
FLUTICASONE + VILANTEROL	Powder for oral inhalation in breath-actuated device containing fluticasone furoate 200 micrograms with vilanterol 25 micrograms (as trifenatate) per dose, 30 doses	R03AK10	10167D	16,654,524
FLUTICASONE + VILANTEROL	Powder for oral inhalation in breath-actuated device containing fluticasone furoate 100 micrograms with vilanterol 25 micrograms (as trifenatate) per dose, 30 doses	R03AK10	10199T	
FLUTICASONE + EFORMOTEROL	Pressurised inhalation containing fluticasone propionate 50 micrograms with eformoterol fumarate dihydrate 5 micrograms per dose, 120 doses	R03AK11	02827T	5,384,904
FLUTICASONE + EFORMOTEROL	Pressurised inhalation containing fluticasone propionate 125 micrograms with eformoterol fumarate dihydrate 5 micrograms per dose, 120 doses	R03AK11	10007Q	
FLUTICASONE + EFORMOTEROL	Pressurised inhalation containing fluticasone propionate 250 micrograms with eformoterol fumarate dihydrate 10 micrograms per dose, 120 doses	R03AK11	10008R	

Anti-immunoglobulin E therapy (anti-IgE)				
OMALIZUMAB	Injection 150 mg in 1 mL single-dose pre-filled syringe, 1	R03DX05	10109C	10,596,191
OMALIZUMAB	Injection 75 mg in 0.5 mL single-dose pre-filled syringe, 1	R03DX05	10110D	
OMALIZUMAB	Injection 75 mg in 0.5 mL single-dose pre-filled syringe, 1	R03DX05	10118M	
OMALIZUMAB	Injection 150 mg in 1 mL single-dose pre-filled syringe, 1	R03DX05	10122R	
OMALIZUMAB	Powder for injection 150 mg with diluent	R03DX05	09745X	
OMALIZUMAB	Powder for injection 150 mg with diluent	R03DX05	09746Y	
Leukotriene receptor antagonists (LTRA)				
MONTELUKAST	Chewable tablet 4 mg (base), 28	R03DC03	08627C	1,319,612
MONTELUKAST	Chewable tablet 5 mg (base), 28	R03DC03	08628D	
Other medications (cromones, xanthines)				
SODIUM CROMOGLYCATE	Capsule 20 mg (oral inhalation)	R03BC01	02878L	497,054
SODIUM CROMOGLYCATE	Oral pressurised inhalation 5 mg per dose, 112 doses	R03BC01	08334P	
SODIUM CROMOGLYCATE	Oral pressurised inhalation 1 mg per dose, 200 doses	R03BC01	08767K	
NEDOCROMIL	Oral pressurised inhalation 2 mg, 112 doses	R03BC03	08365G	1,119,332
THEOPHYLLINE	Syrup 80 mg per 15 mL, 500 mL	R03DA04	02614N	419,468
THEOPHYLLINE	Tablet 250 mg (sustained release)	R03DA04	02634P	
THEOPHYLLINE	Tablet 200 mg (sustained release)	R03DA04	08230E	
THEOPHYLLINE	Tablet 300 mg (sustained release)	R03DA04	08231F	
Total (all PBS medications for chronic respiratory conditions)				471,210,991

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List of tables

List of figures

This report investigates the utility of the Pharmaceuticals Benefits Scheme (PBS) and Medicare Benefits Schedule (MBS) claims data in answering key research questions for reporting on the treatment and management of chronic respiratory conditions in Australia. It also includes high level analysis on medications dispensed for the treatment and management of chronic respiratory conditions in 2016–17, and dispensing patterns.

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