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Use of medicines by older people with type 2 diabetes

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Authoritative information and statistics to promote better health and wellbeing

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Australian Institute of Health and Welfare
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Contents

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Abbreviations

ACE	angiotensin-converting enzyme
AIHW	Australian Institute of Health and Welfare
ARB	angiotensin II receptor blocker
ATC	Anatomical Therapeutic Chemical classification system
DPP4	dipeptidyl peptidase 4
GLP-1 RA	glucagon-like peptide-1 receptor agonist
NDSS	National Diabetes Services Scheme
PBS	Pharmaceutical Benefits Scheme
RPBS	Repatriation Pharmaceutical Benefits Scheme
SCD	standard coverage days
SSRI	serotonin reuptake inhibitor
TCA	tricyclic anti-depressant

Summary

This report examines the pharmacological management of type 2 diabetes in older Australians, using linked data from the Pharmaceutical Benefits Scheme and the National Diabetes Services Scheme. It explores, by age and time since diabetes diagnosis, supply patterns of blood glucose lowering medicines, blood pressure lowering and blood lipid modifying agents, and selected medicines for mental health and eye diseases. This study is limited to the specific cohort of people with type 2 diabetes *who were aged 65 and over and who claimed their medicines or management products at a concessional rate in 2012*.

This report fills an important information gap by documenting the supply patterns of glucose lowering medicines and medicines for associated conditions for an increasing older population with diagnosed type 2 diabetes. In this older population, the pharmacological treatment of type 2 diabetes is complex and challenging because of the need to weigh benefits and risks, due to high levels of comorbidities. The following findings were made within the population cohort in 2012:

Glucose lowering medicines

The majority were supplied with glucose lowering medicines (85%), mostly metformin (69%), followed by sulfonylureas (40%).

Metformin supply was lower for people aged 85 and over than for people in other age groups.

One in 5 (20%) were supplied with insulin.

Two in 5 (40%) were supplied with medicines as monotherapy (that is, using a single medication), one-third (33%) were supplied with dual therapy and 11% with triple therapy.

Dual therapy and triple therapy were less common for people aged 85 and over, who were more likely to be supplied with monotherapy.

Other medicines

Seventy-seven per cent (77%) of the cohort were supplied with blood pressure lowering agents and 74% with lipid modifying agents. In total, 68% were supplied with both medicine types.

Almost 1 in 4 (24%) were supplied with anti-depressants and 4% with anti-psychotics.

Generally, it was found that the longer the time since diagnosis with type 2 diabetes, the more likely it was that an individual would be supplied with all medicine types and the more intense (that is, more dual or triple therapy) their glucose lowering treatment regimens would be.

This report highlights the complexity of pharmacological management in older people with type 2 diabetes and the diversity of medicine supply patterns in relation to age and time since diabetes diagnosis. However, the study has limitations, which should be taken into consideration when interpreting the results. Notably, the study is limited to an older concessional population and uses medicine prescription claims as a proxy for medicine use.

1 Introduction

Diabetes is a chronic condition marked by high levels of glucose in the blood (see Box 1.1). In 2011–12, diabetes affected 5.4% of the adult population (916,500 people based on self-reported and measured data). The rate of self-reported diabetes has almost tripled over the last 2 decades (increasing from 1.5% to 4.4% between 1989 and 2014–15) (ABS 2015; AIHW 2014). This large increase in the rate of diabetes is due to a number of factors, including an increase in incidence of type 2 diabetes (the most common form of diabetes, which is largely preventable), increased prevalence of risk factors associated with diabetes, increased public awareness of diabetes, better detection of the disease, improved survival through better disease management and treatment, and an ageing population (Shaw & Tanamas 2012).

The increasing prevalence of type 2 diabetes in the Australian population and the high prevalence among older Australians—based on self-reported data, almost 1 in 6 people aged 65 and over had type 2 diabetes in 2014–15—suggests that a better understanding of the treatment of type 2 diabetes and other coexisting conditions in older people is crucial to identify gaps and potential risks in the management, treatment and care of people with this disease.

Effective management of diabetes and its associated conditions and risk factors is essential to reduce the economic and health impact of this condition on the population. This goal is a key focus of the Australian Government's National Diabetes Strategy, released in 2015 (Department of Health 2015a).

Box 1.1: What is diabetes?

Diabetes mellitus is a chronic disease characterised by high blood sugar, either because the body does not produce enough insulin (a hormone produced in the pancreas that enables the body to remove excess glucose from the blood to use it as its main energy source) or does not respond properly to insulin, or both. There are several types of diabetes with different causes and treatments.

Type 1 diabetes is a lifelong autoimmune disease that usually has its onset in childhood but can be diagnosed at any age; type 2 diabetes is usually associated with lifestyle factors and has a later onset; gestational diabetes is when higher-than-normal blood glucose is diagnosed in pregnancy.

Insulin replacement therapy is essential for all people with type 1 diabetes, as this condition is characterised by the destruction of insulin-producing cells. However, for people with type 2 diabetes and gestational diabetes, not enough insulin is produced or it is not used effectively, and these conditions are often managed through a combination of lifestyle modifications and pharmacological therapy.

While type 1 diabetes is believed to be caused by an interaction of genetic predisposition and environmental factors, type 2 diabetes is largely preventable by maintaining a healthy lifestyle. Modifiable risk factors for type 2 diabetes include physical inactivity, unhealthy diet, obesity, tobacco smoking, high blood pressure and high blood lipids.

Symptoms of untreated diabetes include frequent urination, increased thirst and hunger, fatigue, blurred vision, weight loss and delayed wound healing.

(continued)

Box 1.1 (continued): What is diabetes?

If not managed appropriately, diabetes may progress to a range of severe health complications (such as heart disease, stroke, kidney failure, limb amputations and blindness) and have a major impact on life expectancy and quality of life (Matthews 1999). Early identification and optimal management of people with diabetes is therefore critical.

Type 2 diabetes is the focus of this report

As type 2 diabetes is the most common type of diabetes, accounting for 86% of all diabetes cases in Australia, and the risk of developing it increases with age, type 2 diabetes in older people is the focus of this report (AIHW 2014).

Treatment of type 2 diabetes

The treatment of diabetes aims to alleviate symptoms and prevent longer term complications. These aims can be achieved by tight control of blood glucose levels through both non-pharmacological (blood glucose monitoring and lifestyle modification) and pharmacological approaches (blood glucose lowering medicines).

Lifestyle modification—comprising a healthy diet, physical activity, maintaining a healthy weight and stopping smoking—is usually used as a first-line treatment in the early stages of type 2 diabetes (RACGP 2014). These approaches may delay or prevent the need for medication. For more advanced stages of type 2 diabetes, these lifestyle approaches need to be combined with glucose lowering medications, such as metformin or insulin (Box 1.2).

For people with type 2 diabetes, the common abnormality is insulin resistance. When pharmacological therapy is first required, the blood glucose levels can often be managed by glucose lowering medicines other than insulin. Eventually, most people with type 2 diabetes will require insulin treatment as well as other treatments due to progressively reduced insulin production (Nisswender 2009). As the condition progresses, it is common to move on from monotherapy (using a single medication) to dual or triple therapy (using a combination of 2 or 3 blood glucose lowering medications) (Gunton et al. 2014). Improving blood glucose control has been shown to reduce the risk of complications in people with diabetes (Colagiuri 2012; Halter et al. 2014).

Diabetes treatment is complex and particularly challenging in older people due to high levels of comorbidities in this population. The Royal Australian College of General Practitioners 2014–15 guidelines for managing type 2 diabetes (RACGP 2014) recommend weighing the cost and benefits of blood glucose control in older people by assessing the main risks of such treatment: hypoglycaemia and hyperglycaemia and their consequences (such as falls and/or pain); and medicine-related adverse events. The guidelines recommend individualised therapeutic strategies, taking into account the functional status of the person, various comorbidities, and medical treatments. The guidelines also recommend a step-wise approach to the management of type 2 diabetes and regular review of pharmacological treatments prescribed to reduce the risk of over-prescribing and medicine interactions or their side effects.

For older people, the benefits of intensive glucose control need to be weighed against the associated risks (Dominguez et al. 2010; Punthakee et al. 2012). There are risks associated with the diabetes therapy itself, such as its impact on the kidneys and the risk of interaction with other medicines used for managing multiple conditions.

In Australia, type 2 diabetes in older people is increasingly being treated with diabetes medicines rather than managed through diet and lifestyle alone. Given that people with diabetes are at an increased risk of cardiovascular disease, anti-hypertensive and cholesterol lowering medicines are also widely used in people with type 2 diabetes (Tanamas et al. 2013).

Box 1.2: Definitions of blood glucose lowering medicines used to treat type 2 diabetes included in this report

Acarbose: tablets that help to slow down the digestion and absorption of certain dietary carbohydrates in the stomach.

DPP4 inhibitors: a group of tablets that work by inhibiting the enzyme dipeptidyl peptidase 4 (DPP4). This inhibiting action enhances the levels of active incretin hormones, which act to lower blood glucose levels by increasing insulin secretion and decreasing glucagon secretion (a hormone that has the opposite effect of insulin by increasing blood glucose levels).

Exenatide: an injected medicine that mimics the effects of the body's own 'incretin hormones', which help to control blood glucose levels after meals.

Glitazones: a group of tablets that help to lower blood glucose levels by increasing the effect of insulin produced by the body, especially on muscle and fat cells.

Insulin: a hormone made by beta cells in the pancreas. It is an injectable agent that helps lower blood glucose levels by moving glucose into cells to be used as energy.

Metformin: tablets that lower blood glucose levels by reducing the amount of stored glucose released by the liver, slowing the absorption of glucose from the intestine, and helping the body to become more sensitive to insulin so that it works better.

Sulfonylureas: tablets that lower blood glucose levels by stimulating the pancreas to release more insulin.

Source: Diabetes Australia 2016.

Aims of this study

Various national studies have described the use of medicines by people with type 2 diabetes in Australia, with a particular focus on the cost and total number of diabetes medicine prescriptions, as well as on the compliance of medicine supply with the Pharmaceutical Benefits Scheme (PBS) rules (Davis et al. 2005; Department of Health 2014; DUSC 2013; Vitry et al. 2010; AIHW: Webbie & O'Brien 2006). While these studies examined components of diabetes treatment, they did not present diabetes medicine patterns in relation to a population with diagnosed diabetes—in particular, by characteristics such as diabetes type and time since diagnosis. Moreover, only studies of the supply patterns in conjunction with the supply of medicines used for other conditions related to diabetes have been reported in the Australian veteran population (Caughey et al. 2009; Caughey et al. 2013; Vitry et al. 2010; Zhang et al. 2011).

This report aims to fill an important information gap by examining these issues—in particular, the pharmacological treatment of type 2 diabetes in older Australians through glucose lowering diabetes medicines and other medicines used to treat diabetes-related conditions. This study uses linked data to explore these issues based on National Diabetes Services Scheme (NDSS) data (which include demographic and disease information for the

diabetes population registered in this scheme) and PBS data (which include information on medicine claims) (see Box 1.3 for more detail on these schemes).

This is the first national study in Australia that uses linked NDSS and PBS data to explore the relationship between diabetes diagnosis and medication use. It demonstrates the power of data linkage to fill important evidence gaps to help inform key chronic disease policies for providing effective and appropriate care to optimise health outcomes. The use of linked data for examining medication use for people with diabetes fills an important information gap. Currently, the absence of diagnosis information in the PBS data set, and the lack of primary health care diagnostic data, mean that we can only infer likely diagnoses from the medications prescribed.

This study aims to answer the following specific questions in relation to the concessional population aged 65 and over with type 2 diabetes:

- What are the supply patterns of blood glucose lowering medications?
- What are the supply patterns of other medicines usually used to manage common conditions associated with diabetes?

These two questions are examined in relation to age and time since diabetes diagnosis, to explore whether the supply of medicines varies by age and disease characteristics.

Note that this study examines supply patterns for medicines. While this is a good proxy, it may differ from actual usage patterns, given that not all prescriptions that are written are dispensed, nor are all medicines supplied actually used. The clinical guidelines described in this report provide an overview of best practice clinical care and were included as a reference point. However, it would not be valid to infer appropriateness of care from the medicine supply patterns found in this study because clinical information other than time since diabetes diagnosis was not available.

Given the complexities involved in the treatment of type 2 diabetes and associated conditions in older people, the findings of this study will be of interest to clinicians, researchers, service providers and policy makers.

Overview of project scope

In this study, data are sourced from two national administrative data sets that have been linked so that medicine supply information can be examined for the population with diabetes:

1. the NDSS (see Box 1.3), which contains demographic characteristics of those diagnosed with diabetes, as well as information on the disease itself and the products supplied to this population
2. the PBS (see Box 1.3), which provides information on the medicines dispensed to people with diabetes over the period between February 2009 and January 2014.

The analysis in this study covers the period January 2011 to June 2013, to match the period during which NDSS products data were available.

The study is limited to the analysis of NDSS registrants who also have complete claim records for PBS dispensed medicines over the study period. For the data received by the Australian Institute of Health and Welfare (AIHW), people with concession status for their claims for medicines and diabetes products had the most complete records, particularly in older age groups. Hence, medicine supply patterns in this study are limited to people aged

65 and over diagnosed with type 2 diabetes who claimed their medicines or management products at a concessional rate throughout the study period. This study captures around three-quarters of older people with type 2 diabetes, as it excludes NDSS registrants with general PBS claim records, as well as those who had no PBS claim record or NDSS purchase record during the analysis period (Figure 1.1). As a result, it represents a subpopulation of older people with type 2 diabetes (see Chapter 2 for more details on the methods used during the study).

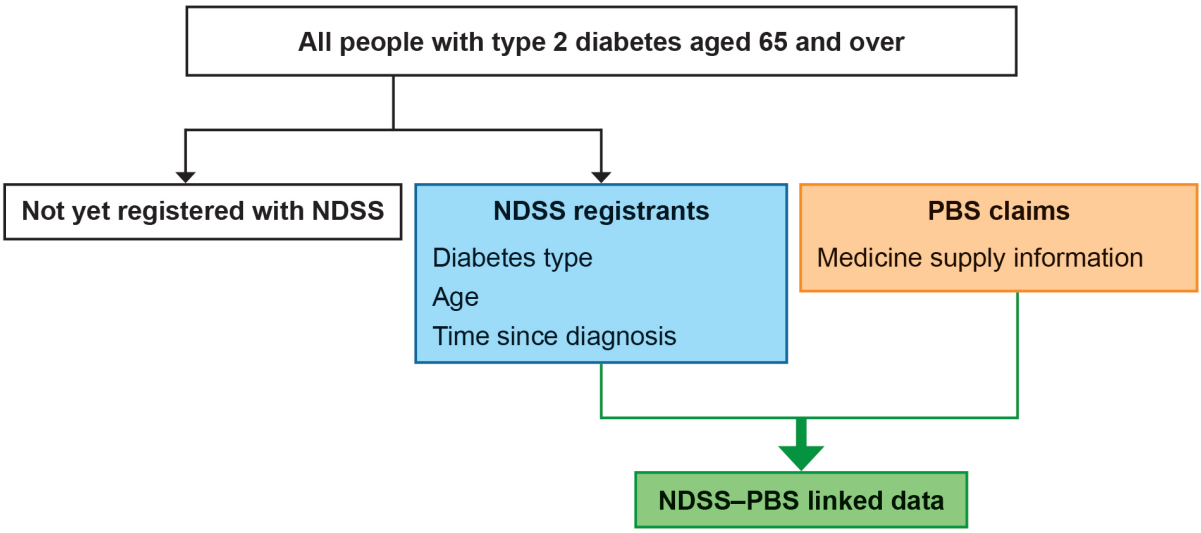


Figure 1.1: Overview of the scope of the study

People with type 1 diabetes were excluded as their claim records were less complete. Similarly, analysis by Aboriginal and Torres Strait Islander status was not undertaken, as the PBS extract available for this study did not include medicines supplied through Section 100 arrangements; these arrangements enable Indigenous people living in remote areas to obtain their medicines free of charge. This issue would have had an impact on the quality of the analysis for this important population.

Box 1.3: What are the National Diabetes Services and the Pharmaceutical Benefits schemes?

National Diabetes Services Scheme

The NDSS is an Australian Government funded initiative, established in 1987, which supplies diabetes-related products (blood glucose test strips, pen needles, syringes and insulin pump consumables) at subsidised cost and provides support services to Australians with diabetes. Registration with the NDSS is voluntary, and not all people diagnosed with diabetes are on the register. Where people manage their diabetes through diet and exercise only, or obtain their diabetes-related products through other programs, they may be less inclined to join the NDSS. Additional discounts are available to people with concession cards such as a Health Care card, Pensioner Concession card, Safety Net card or a Department of Veterans' Affairs card. Information on the type of diabetes diagnosed is provided by a doctor or a certified diabetes educator, while the date of diagnosis is provided by the registrant at the time of first registration with the scheme.

Pharmaceutical Benefits Scheme

The PBS subsidises the cost of a wide range of prescription medicines. Before a medicine can be subsidised by the PBS, it is assessed by the Pharmaceutical Benefits Advisory Committee. The price is negotiated between the manufacturer and the Department of Health.

The PBS has three main schemes allowing eligible populations to access certain medicine types: the general scheme under Section 85 for general access to medicines by the whole population, Section 100 for highly specialised medicines and the supply of medicines to populations living in remote areas, and the Repatriation Pharmaceutical Benefits Scheme (RPBS) for eligible war veterans and their dependants.

Beneficiary categories and co-payments

Broadly speaking, patients are grouped into two classes: *general* and *concessional*. Concessional patients receive a greater subsidy and pay less for medicines than general patients. Concessional status depends on income. Concessional beneficiaries typically include the aged, people with disabilities, single parents, pensioners, Health Care card holders, Commonwealth Seniors Health card holders and Veterans card holders. Under the PBS, Australians pay only part of the cost of most prescription medicines bought at pharmacies. The rest of the cost is covered by the PBS. The amount paid by the patient (the *co-payment*) varies; in 2012 it was $35.60 for general patients and $5.80 for those with a concession card.

If a medicine is not listed under the PBS schedule, the consumer has to pay the full price as a private prescription. Non-PBS medicines are not subsidised by the Australian Government. However, pharmaceuticals provided in public hospitals are generally free for public patients, with the cost covered by state and territory governments.

The PBS *safety net* is intended to protect patients against high cumulative costs. When an individual or family reaches the safety net threshold, they are entitled to discounted co-payments for the rest of the calendar year. If concessional beneficiaries reach the safety net threshold, medications listed on the PBS become free for the rest of the year. General beneficiaries reaching the safety net are entitled to pay the concessional co-payment rate for medications for the rest of the year. The implications of the co-payment system on the medicine coverage in the PBS are explained in more detail in Box 2.1 in Chapter 2.

Sources: Department of Health 2015b, 2015c.

Structure of this report

This report is structured as follows:

- Chapter 2 presents an overview of the data sources, the linkage process and the methods and measures used in this analysis.
- Chapter 3 presents the supply patterns of blood glucose lowering medicines to the concessional population aged 65 and over with type 2 diabetes. It looks specifically at the supply of the main types of blood glucose lowering medicines, initiation patterns of therapy for type 2 diabetes and treatment regimens and their common types.
- Chapter 4 presents the supply patterns of other medicines. It provides the supply patterns in 2012 for the following medicine classes: blood pressure lowering and lipid modifying medicines, anti-depressants, anti-dementia medicines, anti-psychotics, and selected ophthalmological (eye disease) medicines.
- Chapter 5 presents a discussion of the results and their main implications.
- Appendixes provide further information on data sources and methods as well as detailed statistical tables.

2 Data sources and methods

Data sources

This study used two main sources of data: the NDSS and the PBS.

The *NDSS registrant data* are held by Diabetes Australia, under the custodianship of the Department of Health. The NDSS records include demographic and diabetes information for all people registered with this scheme between 1987 and 2014 (see Box 1.3). Eligibility for registration with the NDSS is confirmed by a general practitioner, endocrinologist, other specialist or a credentialed diabetes educator. Information on the type of diabetes diagnosed is provided by a doctor or a certified diabetes educator, while the date of diagnosis is provided by the registrant at the time of first registration with the scheme. An extract of NDSS sales records of self-management products (blood and urine glucose test strips) for the period 1 July 2008 to 30 June 2013 was also used. However, the use of glucose lowering medicines other than insulin is not recorded in the NDSS.

The *PBS data set* is held by Medicare, under the custodianship of the Department of Health. Within the scope of this study, claim records chosen were those for glucose lowering medicines, glucose test strips and other medications used to treat or prevent conditions commonly associated with diabetes in people with at least 1 diabetes-related prescription supplied over the period February 2009 to January 2014. Note that the diagnostic information, or the reason for being supplied with a medication, is not available in the PBS data set. More information on the medication groups included in this data set is shown in Table 2.1.

Table 2.1: Medication classes for people who claimed a medicine used in diabetes or blood glucose monitoring strips from the PBS

Condition	Medication class	Medication type	ATC code
Diabetes	Drug used in diabetes	Glucose lowering drugs; insulin and analogues	A10A
		Glucose lowering drugs; excluding insulin	A10B
Cardiovascular disease	Anti-hypertensives		C02
	Diuretics		C03
	Beta blockers		C07
	Calcium-channel blockers		C08
	Renin-angiotensin system agents		C09
	Lipid modifying medicines		C10
Eye disease	Ophthalmologicals	Anti-glaucoma preparations and miotics	S01E
		Ocular vascular disorder agents	S01L
Mental disorders and neuropathy	Psychoanaleptics	Anti-depressants	N06A
		Anti-dementia	N06D
	Psycholeptics	Anti-psychotics	N05A

ATC = Anatomical Therapeutic Chemical classification system.

Note: While chronic kidney disease is also a common and serious health complication for people with diabetes, medicines used to treat kidney disease are often non-specific, could be used to manage a range of health conditions, and are often not dispensed through the general section of the PBS (Section 85). As a result, medicines associated with chronic kidney disease have not been included in this study.

Data linkage

The data linkage process is a statistical procedure in which identifying information contained in two data sets is compared to determine matching records. Further information regarding the data linkage process can be found at Appendix A. The NDSS data set was linked to the PBS data set so that the demographic and diabetes information for NDSS registrants could be linked to their PBS claim records for certain medicines. These linked data allowed us to investigate pharmaceutical management of type 2 diabetes in older people, according to demographic and disease characteristics.

Data quality checks

The AIHW undertook data validation and data quality checks with the linked data set. Data cleaning tasks included:

- checking data consistency between PBS and NDSS data. When discrepancies from both data sets on variables such as age and sex were found, demographic information from the PBS was used as it is believed to be updated more regularly than the NDSS database
- checking to reconcile unclassified PBS items with the version of the Anatomic Therapeutic Chemical classification system (ATC) available at that time
- checking possible misclassification of diabetes type by examining supply patterns of glucose lowering medicines. Over half (54%) of the concessional patients aged 65 and over and recorded as having type 1 diabetes in the NDSS data set were supplied with oral glucose lowering medicines within the PBS data set. People with type 1 diabetes are commonly managed with insulin only. Oral glucose lowering medicines are more likely to be recommended for people with type 2 diabetes. This suggests that a proportion of concessional patients with medicine dispensing indicative of type 2 diabetes may have been misclassified to type 1 diabetes in the NDSS data set. Note that before 2002–2003 the terminology used for diabetes differed from the current one, whereby registrants were classified as having either insulin-dependent diabetes or non-insulin-dependent diabetes. This terminology was changed to avoid confusion between type of diabetes and treatment of diabetes; however, its early use may have contributed to some of the misclassification
- checking the diagnosis date variable from the NDSS data for missing values. Analysis of the linked NDSS–PBS data showed that around 30% of concessional patients with type 2 diabetes were missing a diagnosis date. Missing data were mostly among older NDSS registrants who potentially were diagnosed before the register was established and therefore more likely to have a missing diagnosis date. For people with a missing diagnosis date, the NDSS registration date was used as a proxy. Analysis of the NDSS data showed that among all people with type 2 diabetes with recorded and complete data, 75% had a NDSS registration date within 1 year of their diagnosis date
- checking the date of death variable in NDSS against PBS claim records. Those who had PBS claim records after the date of death were deemed as invalid and excluded from analysis (0.6% of concessional patients with type 2 diabetes).

Study and analysis periods

Medicine supply patterns were reported for the study period between 1 January 2012 and 31 December 2012. A longer analysis period of 1 January 2011 to 30 June 2013 was used to estimate initiation of treatment and pharmaceutical treatment regimens for type 2 diabetes in 2012. This analysis period consists of the study period, a 1-year 'look back' (run-in) period and a 6-month 'look forward' period (over-run) so that treatment regimens can be correctly identified. The extended periods on either side of the study year were necessary to assess discontinuity, shift and initiation in the supply of any medicines.

Figure 2.1 shows the study period and analysis period for this report.

The analysis period and study period were used to identify the *population cohort – the concessional NDSS registrants aged 65 and over with type 2 diabetes*.

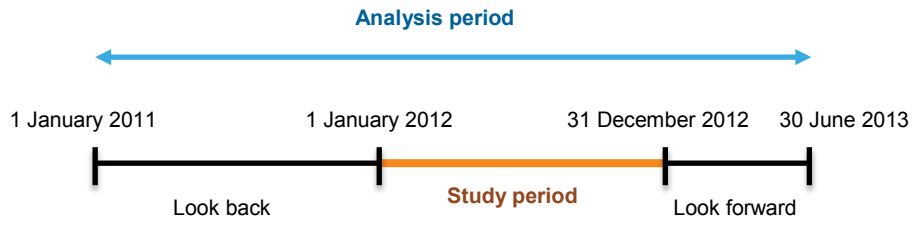


Figure 2.1: Time periods for analysis and study

Identifying the population cohort

The population cohort for this study included all concessional NDSS registrants aged 65 and over with type 2 diabetes between 1 January 2012 and 31 December 2012.

Analysis of this population cohort demonstrates the advantages of using linked data to understand and explore, in greater depth, the patterns of pharmacological management in a cohort of older people with type 2 diabetes in Australia.

A limitation of this study was the need to restrict the analysis to a subset of NDSS registrants—concessional patients—to address an important limitation of the PBS data extract. Collection of 'under co-payment prescription' data for the PBS started on 1 April 2012 and the PBS data extract supplied to the AIHW did not include complete 'under co-payment prescription' information. The PBS extract included complete records of the medicines supplied to concessional patients only (Box 2.1).

Box 2.1: Implications of co-payment category for medicines coverage on the PBS data set

Co-payments are the PBS patient contributions towards the cost of each prescribed medicine. PBS patients pay the full amount when the medicine price is below the co-payment threshold unless the patient is entitled to a concessional price. Until April 2012, dispensing of a medicine was recorded in the PBS database only if the price of the medicine was above the co-payment threshold for general beneficiaries, while all the medicines dispensed through the PBS were recorded for the concessional beneficiaries. Thus, for the general beneficiaries, the completeness of the PBS data set depends on whether the medicine price is above the co-payment threshold; for concessional beneficiaries, all medicine supply was recorded.

In 2011, the majority of blood glucose lowering medicines were subsidised through the PBS/RPBS and thus covered in the PBS data set, ranging from 77% (metformin) to 100% (pioglitazone) (see tables A7, A8 and A9 at Appendix A for more detail). Variation in coverage influenced by the cost of medicines is an important factor that this study had to account for by limiting the analysis to the concessional beneficiaries.

Concessional status

Concessional status was defined primarily according to the concessional status of PBS claims over the analysis period (January 2011 to June 2013). For those without any PBS claim, the type of card used to purchase self-management products for diabetes through the NDSS was used to derive concessional status. All PBS claims or, alternatively, all NDSS purchases had to be concessional during the period January 2011 to June 2013 in order for a person to be included in the population cohort in this study.

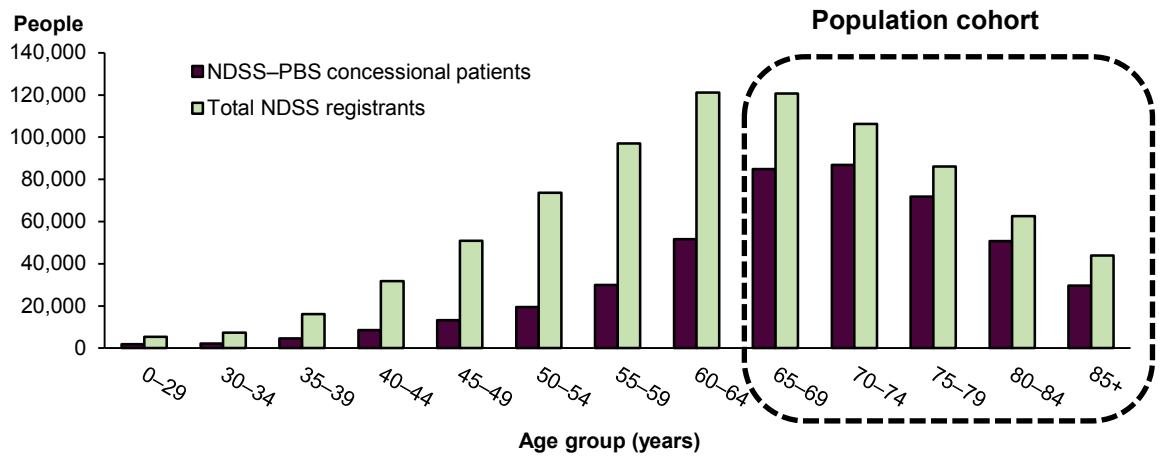
Type 2 diabetes

As noted earlier, a high proportion of people with type 2 diabetes in the NDSS data set may have been misclassified as having type 1 diabetes, raising concerns about the reliability and robustness of the data on type 1 diabetes. As a result, the scope of this study was restricted to concessional NDSS registrants with type 2 diabetes.

Older people with type 2 diabetes

To get an optimal representation of the total diabetes population by age and to maximise the coverage of medicine claims, this report limited analysis to concessional registrants aged 65 and over with type 2 diabetes.

The majority (77%) of NDSS registrants aged 65 and over with type 2 diabetes claimed their medicines or diabetes products under the concessional scheme as at January 2012 (ranging from 70% among those aged 65–69 to 80% for those aged 70–84—Figure 2.2). This compares with around 1 in 4 NDSS registrants aged 15–59 with type 2 diabetes (ranging between 26% and 31%). The vast majority of registrants in the 15–59 age group claimed medicines under the general scheme or did not claim any relevant medicine or diabetes product during the analysis period (see Appendix Table B1).



Notes

1. The concessional/general status of the population was defined based on the status of drug claims through the PBS by each individual over a given period of time. A person was given concessional status when all their drug claims were concessional.
2. The population cohort for this study includes all concessional NDSS registrants aged 65 and over with type 2 diabetes.

Sources: AIHW analysis of the NDSS–PBS linked data set and the NDSS registrant data set (see Appendix Table B1).

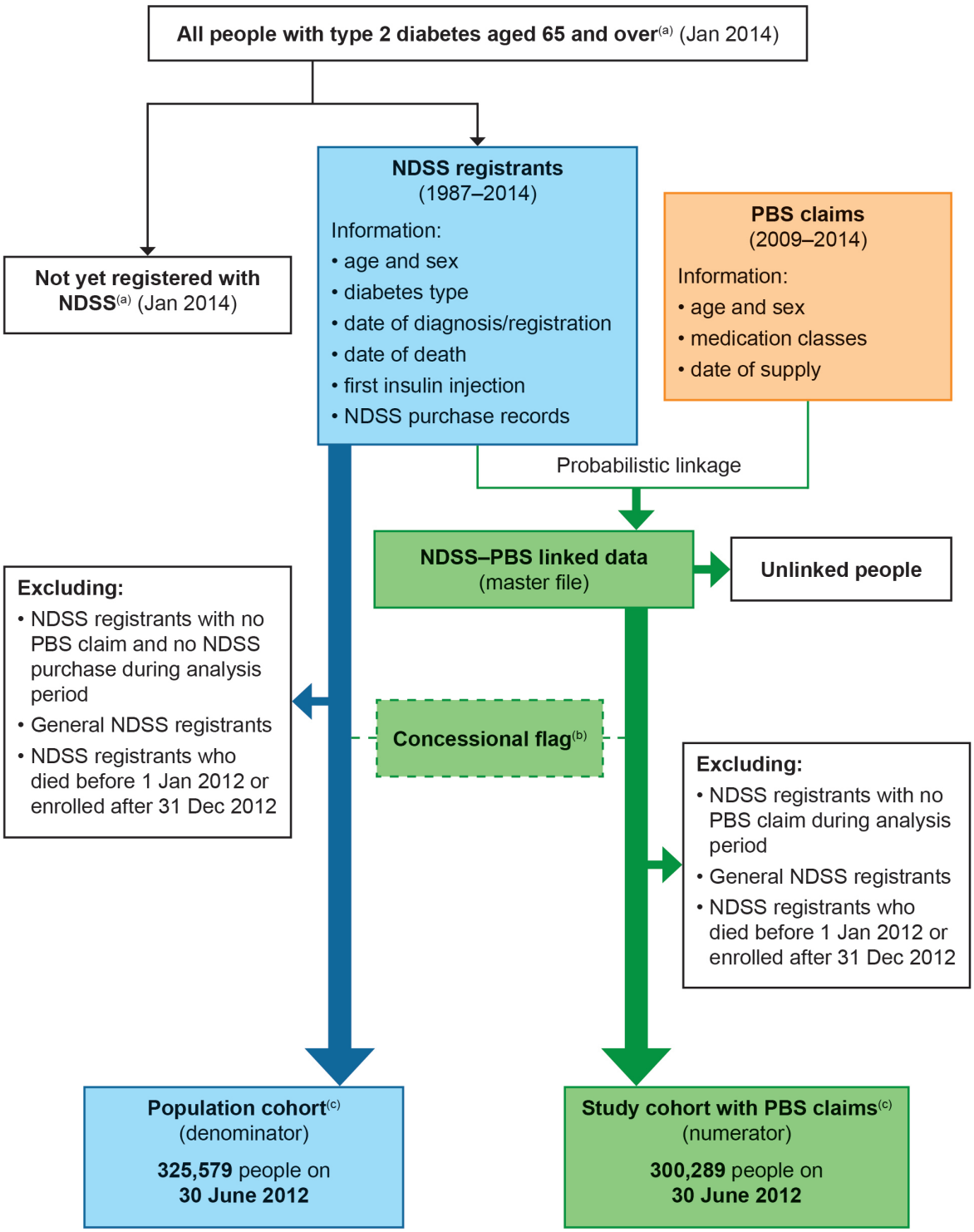
Figure 2.2: Type 2 diabetes by age group for the population cohort and all NDSS registrants, as at 1 January 2012

The population cohort defined in this study represents around three-quarters of people aged 65 and over with type 2 diabetes—77% based on denominator population of self-reported prevalence data from the Australian Bureau of Statistics 2011–12 Australian Health Survey (an estimated 423,000 people) and 71% based on treated type 2 diabetes according to NDSS and PBS records over the study period (455,625 people) (AIHW 2014).

Other exclusion criteria

Those who had no PBS claim record and no NDSS purchase record during the analysis period were excluded from the denominator population as their concessional status could not be determined. Around 6% (20,781) of NDSS registrants aged 65 and over were excluded due to missing concessional status. Sensitivity analysis suggests that the proportion of people with PBS claims decreases by 5% when these people are included in the population cohort. NDSS registrants who died before the study period or enrolled with the NDSS after the study period were also excluded.

Figure 2.3 illustrates the process used to identify the population and study cohorts. The study cohort is a subset of the population cohort and represents NDSS registrants with PBS claims, which is 92% (300,289) of the population cohort.



(a) The total number of people with diabetes or the number of those not yet registered with the NDSS is not available.

(b) The PBS/NDSS concessional flag was derived according to PBS claim records or NDSS purchase records for those without relevant PBS claims. Concessional population was defined as those who continually claimed subsidised medicines or NDSS products at a subsidised rate between January 2009 and June 2013.

(c) Includes concessional NDSS registrants aged 65 and over with type 2 diabetes. The study cohort includes people in the population cohort and with PBS claims.

Figure 2.3: Identification of the population cohort

Characteristics of the population cohort

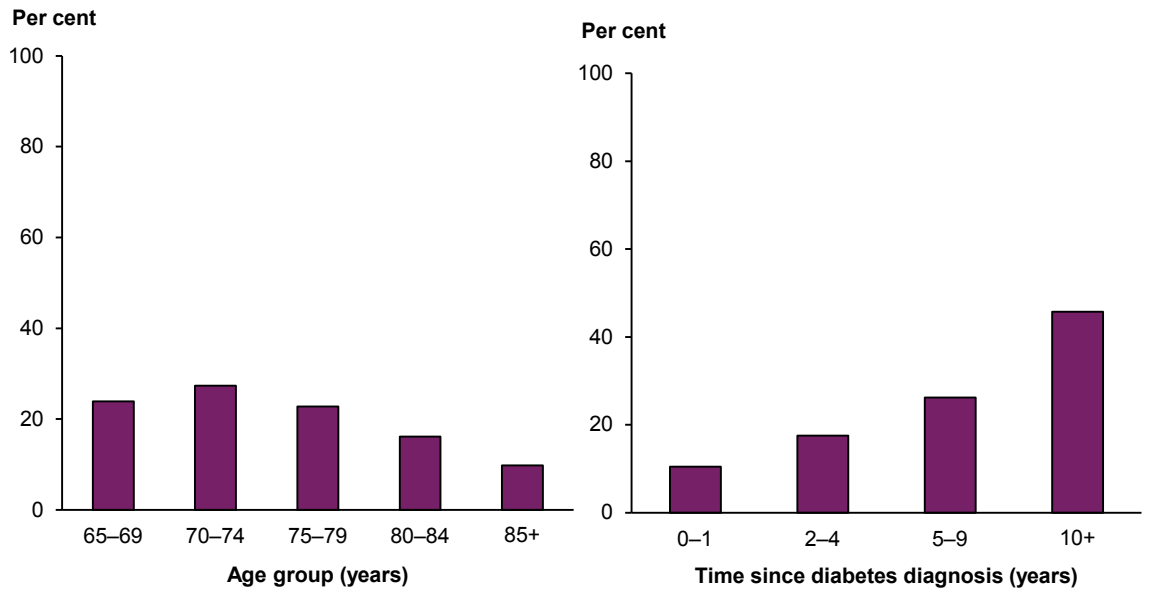
While this study has some limitations (as discussed in the previous section), the population cohort—all concessional NDSS registrants aged 65 and over with type 2 diabetes—captures 86% of the NDSS registrants claiming PBS diabetes medicines and products at a subsidised rate during the analysis period.

In this report, people with type 2 diabetes with a time since diagnosis of less than 2 years are referred to as 'newly diagnosed'.

As at June 2012, the population cohort comprised 325,579 people. Of these:

- almost three-quarters (74%, 241,166 people) were aged 65–79, while 26% (84,414 people) were aged 80 and over
- 11% (43,204 people) were newly diagnosed with type 2 diabetes (that is, had been diagnosed for less than 2 years) and 46% (148,846 people) had been diagnosed with type 2 diabetes for 10 years or more (Figure 2.4)
- 17,510 people (5%) were newly registered with NDSS and 14,294 people died during 2012.
- 92% (300,289 people) had PBS claim records for relevant medicines or diabetes products.

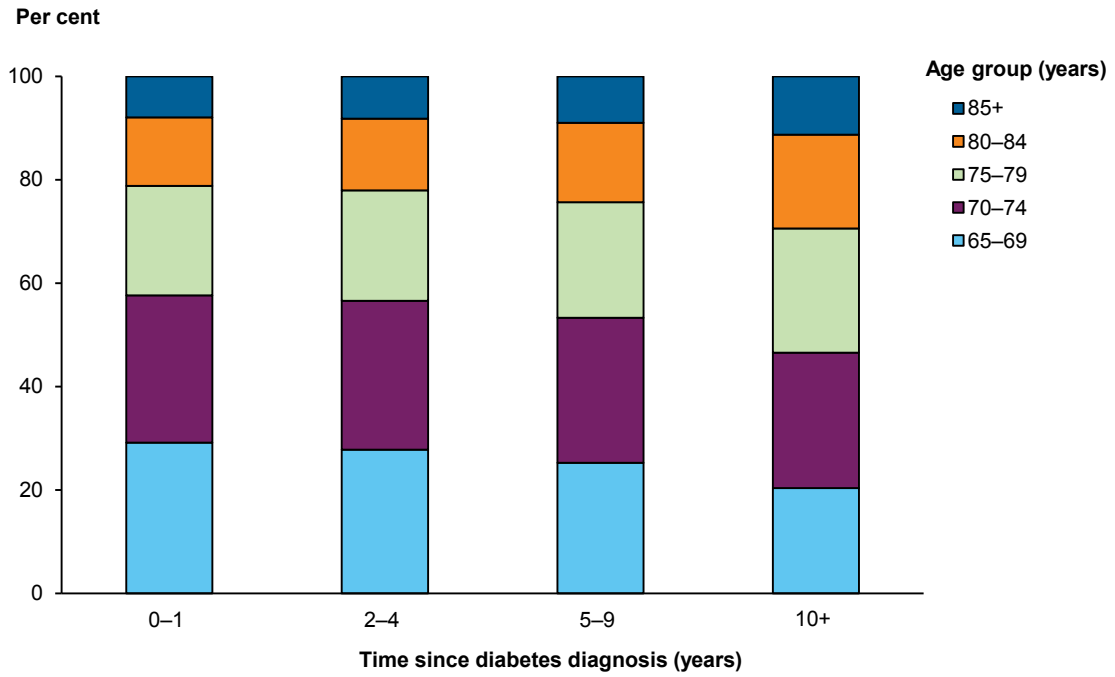
See Appendix Table B2 for further detail on the characteristics of the population cohort.



Sources: AIHW analysis of the NDSS–PBS linked data set and the NDSS data set (see Appendix Table B2).

Figure 2.4: Population cohort by age group and time since diagnosis, June 2012

People who had been diagnosed with type 2 diabetes for 10 years or longer were older, on average, than those who had been diagnosed for less than 10 years (Figure 2.5; Appendix Table B3). Age and time since diagnosis may have different impacts on the pharmacological management of type 2 diabetes in older people. Note that the independent effects of these two variables were not tested in this report. The medicine supply patterns in this report are presented by age and time since diagnosis separately, but not controlled for each other in the analyses.



Sources: AIHW analysis of the NDSS–PBS linked data set and the NDSS data set (see Appendix Table B3).

Figure 2.5: Age distribution of the population cohort, by time since diagnosis, 2012

Measures of medicine supply patterns

Four aspects of medicine supply patterns (see Box 2.2) were analysed in this study:

1. prevalent supply of medicines
2. initiating therapy—patterns of supply when patients initiated pharmaceutical therapy for type 2 diabetes
3. glucose lowering treatment regimens—estimated treatment regimens and commonly co-administered medicines
4. supply of medicines for associated conditions.

Box 2.2: Terminology used in defining measures of medicine supply patterns

Co-administration: assumed use (determined from prescriptions supplied) of 2 or more medicines at the same time.

Dual therapy: in the context of this report and as per the current guidelines, the use of first-line medicines (either metformin or a sulfonylurea) in combination with another anti-diabetic therapy to manage type 2 diabetes.

Initiation therapy: describes a patient with no prescription supplied for any glucose lowering medicine in the 12 months before their first supply of glucose lowering medicine in 2012.

Monotherapy: use of a single drug at any given time to manage type 2 diabetes.

Prevalent medicine supply: a measure of the number of people who had at least 1 claim of a specific medicine in 2012 divided by the mid-year population cohort.

Regimen: a drug or combination of drugs deemed to be taken at the same time by a patient over the study period.

Standard coverage days (SCD): the estimated medication coverage days associated with 1 prescription supply for each class of medication.

Stockpiling: a phenomenon that often occurs towards the end of the calendar year when a Safety Net Card holder fills prescriptions more often 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. Two types of stockpiling were adjusted for in this report: same day medication supply, and medication supply before the expected stop date of the previous supply.

Switch: changing from one subsidised therapy to another.

Triple therapy: in the context of this report and as per the current guidelines, the use of metformin or a sulfonylurea in combination with 2 other anti-diabetic therapies to manage type 2 diabetes.

Sources: Modified from DUSC 2013; RACGP 2014.

Note that this report focuses on descriptive analyses of administrative health data, and the results were not tested for statistical significance. Time of follow-up was not controlled for, as unequal exposure time is not commonly adjusted for in year-prevalence measures.

Prevalent supply of medicines

The prevalent supply of medicines is a measure of the number of people who had at least 1 claim of a specific medicine in 2012, divided by the mid-year population cohort

(325,579 people). This measure is reported as the proportion of the population cohort supplied with a specific medicine during the year 2012.

Prevalent supply patterns were examined for glucose lowering medicines and other relevant medicines by age group and time since diabetes diagnosis.

Initiating therapy

If patients in the population cohort had a claim of any diabetes medicines any time in 2012 and had not made any claim over the preceding 12 months, their claim was qualified as their first diabetes medicine claim and the start of their treatment.

This analysis presents:

- the overall proportion of people initiating diabetes therapy out of the population cohort of older people with type 2 diabetes
- the age profile, time since diabetes diagnosis, and the type of first diabetes medicine claimed
- the first diabetes medicine supply patterns, as a proportion of those initiating their diabetes therapy within each age group and time since diabetes diagnosis categories.

Glucose lowering treatment regimens

Use of medicines in older people with type 2 diabetes varies in complexity, often requiring co-administration of multiple medicines (for more details, see Chapter 3). Treatment regimen was defined as 1 medicine or multiple medicines taken at the same time by a patient over the study period. Treatment regimen types were identified and grouped according to the number of medicine types used: monotherapy, dual therapy and triple therapy.

According to *General practice management of type 2 diabetes – 2014–15* (RACGP 2014) (the Guidelines), dual therapy and triple therapy are defined as the use of the first-line medicines metformin or sulfonylureas in combination with another glucose lowering agent or 2 other glucose lowering agents. All combinations of blood glucose lowering agents were examined but only those related to the Guidelines are presented, noting that the proportions of other combinations were extremely low (<0.3%).

A method that was based on, but slightly modified, the approach used by the Drug Utilisation Sub Committee of the Pharmaceutical Benefits Advisory Committee post market review of medicines for type 2 diabetes (DUSC 2013) was applied to define treatment regimens. This method consisted of four major steps:

1. Estimate the SCD (Box 2.2) for each medicine, based on a median interval between prescriptions dispensed during a 12-month period (Appendix Table B4).
2. Identify treatment segments for each medicine by estimating the coverage start and end date for each prescription, based on the SCD calculation. Generally, a treatment segment started on the date of supply and stopped at the date of supply + SCD. However, if a new prescription was supplied before the expected end date of the previous prescription, it was assumed to be stockpiling and the stop date for the treatment segment (that is, current prescription) was extended accordingly. The adjusted stop date for a treatment segment is the greater of:
   - the stop date of previous supply + SCD
   - the date of supply + SCD.

Prescription coverage end dates were adjusted for multiple same day claims for a single medicine class, depending on prescription strength:

- Same day medicine claims of different strength were assumed to be parallel use and the coverage end date was not extended.
- Same day medicine claims of the same strength were assumed to be stockpiling and coverage end date was extended accordingly. Adjusted coverage end date was calculated as: *Date of supply + (number of same day prescriptions × SCD).*

3. Treatment episodes were identified according to start and end dates for each treatment segment.

   Treatment segments with a gap greater than 2 SCD was classified as a break in treatment. A gap less than 2 SCD was classified as a continuous single treatment episode.

   Figure 2.6 displays the method to determine treatment episodes for medicines A, B and C. The supply pattern of these 3 medicines is presented on a weekly, rather than a daily, basis for graphical purposes. On the diagram, the thin lines represent the estimated duration of prescriptions dispensed for each medicine and the thick lines represent the duration of an episode of treatment. An episode of treatment was made of at least 1 segment of time covered by 1 prescription claim.

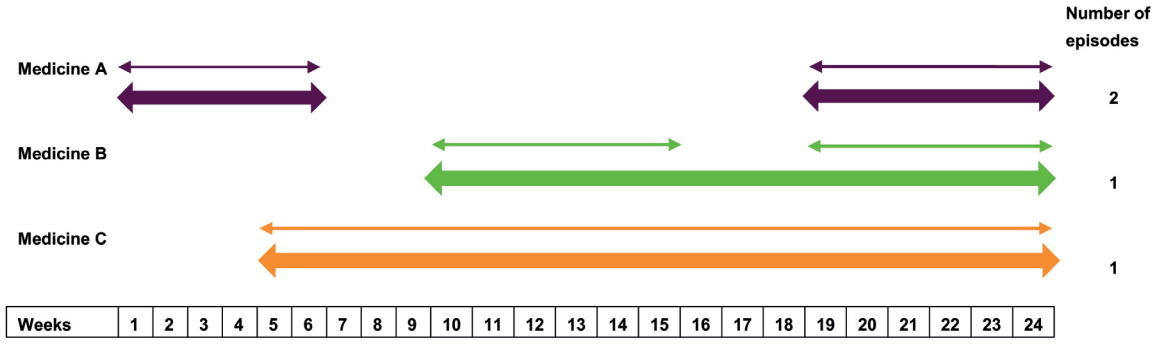


Figure 2.6: Example of identifying treatment episodes in a patient

4. Identify treatment regimen, looking at monotherapy, dual and triple medicine therapy as well as treatment switch or breaks. If a person changed treatment regimen during the study period, the treatment regimen was defined as the most intensive regimen during 2012.

   Figure 2.7 displays the method to determine treatment regimens based on treatment episodes for medicines A, B and C (determined in step 3). Co-administration of medicines was defined as an overlap of treatment episodes for more than 5 weeks (note this cut-off aligns with the SCD for the glucose lowering medications included in this report and was based on a previously published method; DUSC 2013). Where treatment episodes overlapped for 5 weeks or less, a switch was deemed to have occurred. As shown in Figure 2.7, weeks 5 and 6 are covered by medicine A and C; however, the overlap is only 2 weeks, so this would suggest that the person switched to treatment with medicine C. The period weeks 10–18 covered by medicines B and C was determined as dual therapy with medicines B+C, and the period weeks 19–24 covered by medicines A, B and C was defined as triple therapy with medicines A+B+C.

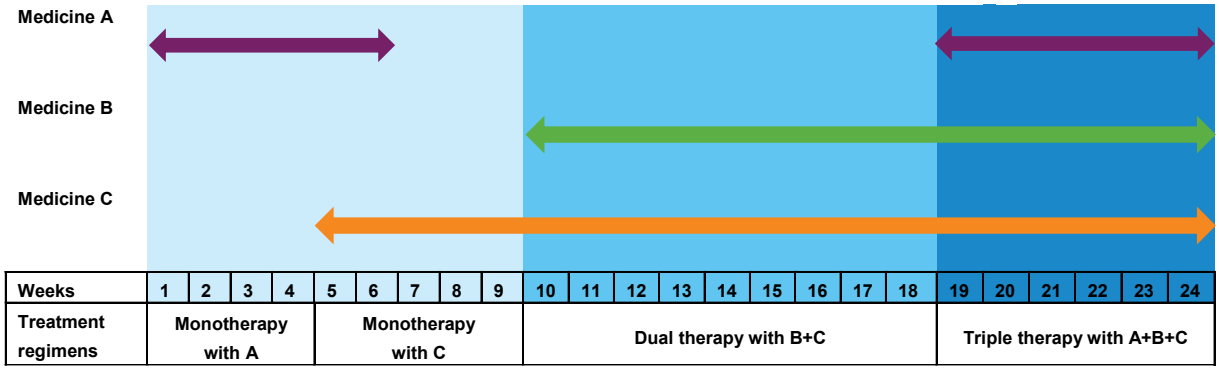


Figure 2.7: Example of identification of treatment regimens in a patient

The methodology used here differs from that used for other studies in two main respects:

a. It used the most intensive treatment regimen to capture most of the medicines supplied in 2012. Some studies use time point estimates, which capture breaks in treatment and may not reflect the treatment patterns during the whole study period.

b. It used a median interval (50%) between prescriptions dispensed as the SCD to reduce overestimation of dual therapy and triple therapy. Some studies used a 75% interval during which prescriptions were refilled, giving a longer SCD.

The treatment regimen estimations may differ depending on the method used to define treatment regimens. Additional sensitivity analysis was performed to look at the impact of using different methods to define treatment regimens (details provided at Appendix A). The method used in this report may provide a proxy for the most intensive treatment regimen that was prescribed to a patient during the study period.

Supply of medicines for associated conditions

The risk of complications and comorbid conditions increases as people with diabetes age, often requiring the use of medicines associated with conditions such as cardiovascular disease, eye disease, diabetic neuropathy, depression and dementia (for more detail see Chapter 4). In this report, supply of medicines for associated conditions is based on at least 1 claim of the selected single medicine class during the study period being supplied as individual or combined medicines.

Supply of multiple medicines for cardiovascular disease was defined as being supplied with blood pressure lowering medicines and lipid modifying medicines only. It included supply for each medicine type as individual or combined medicines. For multiple medicine supply, the measure is based on at least 1 claim for 2 or more medicines made during the study period. Figure 2.8 shows an example of how the supply of multiple classes of medicines was defined. Person 1 was supplied with a single class of medicine X. Persons 2 and 3 were supplied with multiple classes of medicines. Compared with the method used to derive the glucose lowering treatment regimen outlined in the previous subsection, this method did not measure concurrent coverage for each medicine. Further, it did not take into account switching or discontinuation of medicines, as it was assumed the medicines are intended for long-term use. It is important to note that blood pressure lowering medicines and blood lipid modifying medicines are usually prescribed on a long-term basis; therefore, the likelihood of a person being supplied with these drugs only once is very low (see Appendix Table B20).

However, it is possible that a person may switch medicines within the medicine class during the year.

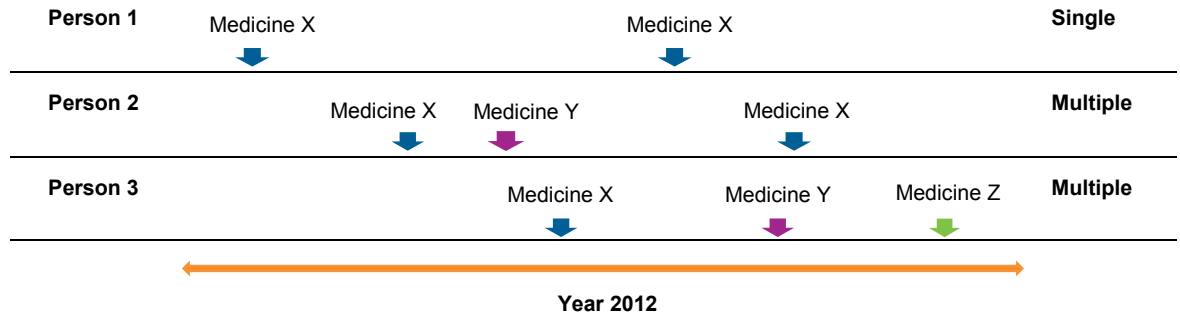


Figure 2.8: Example of the method used to classify the supply of multiple classes (blood pressure lowering and lipid lowering) of medications during 2012

3 Supply patterns of glucose lowering medicines

Key findings:

- Metformin was the most commonly supplied medicine to manage type 2 diabetes among older people (69%), followed by sulfonylureas (40%). One in 5 (20%) older people with type 2 diabetes were supplied with insulin, and 13% with DPP4 inhibitors, 5% with glitazones and 1% with exenatide.
- Supply of glucose lowering medicines varied by age. Metformin and DPP4 inhibitor supply rates were lower in those aged 85 and over than other age groups, while supply of insulin or sulfonylureas was relatively similar across the age groups.
- The supply of all classes of glucose lowering medicines was greater in people with a longer time since diagnosis than people with shorter times since diagnosis.
- Metformin (79%) was the most common medicine supplied as an initial treatment for type 2 diabetes. Older people with a longer time since diabetes diagnosis were less likely to start treatment with metformin, but more likely to start with sulfonylureas compared with those newly diagnosed.
- Those aged 85 and over were less likely to be supplied dual or triple therapy compared with the other age groups.

For most older people with type 2 diabetes, continuous treatment with glucose lowering medicines is required to reduce the risk of complications (Colagiuri 2012; Halter et al. 2014). As the condition progresses, more intensive glucose lowering treatment with multiple agents may be required to maintain normal or near-normal blood glucose concentrations.

Blood glucose lowering medicines for type 2 diabetes include non-insulin glucose lowering medicines and insulin/insulin analogues. Non-insulin blood glucose lowering medications are usually taken orally, but some are also injectable (glucagon-like peptide-1 receptor agonists [GLP-1 RA]).

Metformin and sulfonylureas have long been used as standard first-line and second-line treatments for type 2 diabetes (Figure 3.1). For people with type 2 diabetes, metformin is the preferred first-line treatment when diabetes is not adequately controlled with lifestyle approaches alone, with a sulfonylurea as an alternative if metformin is not tolerated or is contraindicated. Second- and third-line agents may be necessary in conjunction with the first-line medicine, and are chosen using an individualised approach. Sulfonylureas are recommended for second-line therapy in addition to metformin. The usual third-line treatments include triple oral therapy with acarbose or glitazones, or a DPP4 inhibitor (also known as gliptins) or insulin or GLP-1 RA (for example, exenatide), according to the individual's preference and clinical needs. There are a number of types of insulin and insulin analogues available, varying by how they were derived and the speed at which they work. See Appendix tables A4–A6 for more information on PBS listing dates, modes of action, and uses of glucose lowering medicines.

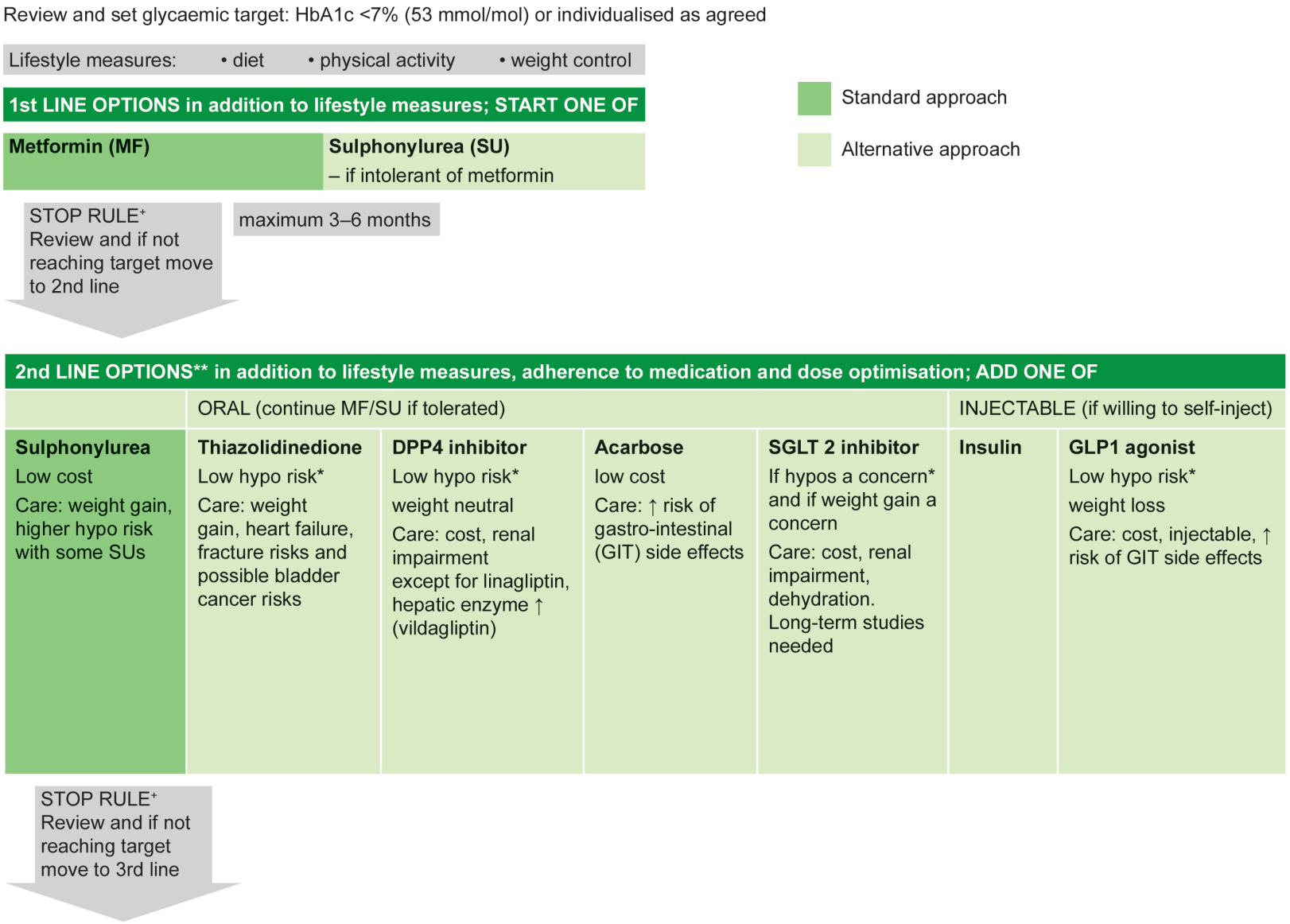


Figure 3.1: Blood glucose treatment algorithm for people with type 2 diabetes

(continued)

3rd LINE OPTIONS in addition to lifestyle measures, adherence to medication and dose optimisation; ADD OR SUBSTITUTE WITH ONE OF			
ORAL (continue MF/SU if tolerated)		INJECTABLE (if willing to self-inject)	
PBS	Non-PBS	**Insulin** (continue MF if tolerated) • If glycosuric symptoms or rising HbA1c (e.g >8.5%) • Basal insulin or premixed insulin initially • Add prandial insulin with time if required	**GLP-1 agonists** (continue MF/SU if tolerated) • If BMI >30 kg/m^2 • If a desire to lose weight • PBS listed (exenatide)
Thiazolidinedione (only pioglitazone is PBS listed) If no congestive heart failure	**DPP4 inhibitor** If weight gain a concern		
Acarbose	**SGLT 2 inhibitor** If other drugs are contraindicated		

[+]THE STOP RULE – If despite adequate titration doses of medication, blood glucose targets are not being attained after 6 months at the most – STOP and:

- check the patient's understanding of medical and self-management (health literacy) – reinforcement of lifestyle factors influencing health and fitness targets is appropriate
- review: non-adherence will affect ability to achieve targets and may increase risks of short-term and long-term complications
- exclude occult infection (e.g. urinary) or medications which may interfere with control (e.g. steroids) and consider alternate diagnoses such as LADA.

Ask at each visit about hypoglycaemia or other side effects of medication. This is especially relevant for patients who achieve lifestyle changes and are on SUs or insulin. When choosing an agent or agents, consider whether there has been either a prospective cardiovascular outcome trial or at least cardiovascular risk assessment trials.

Prescribers should refer to the PBS for updated guidance on licensed indications, full contraindications and monitoring requirements.

* Hypoglycaemia may affect driving, create occupational hazards and increase risk of falls (particularly in the elderly).

** Continue medication if EITHER individualised target achieved OR HbA1c falls more than 0.5% (5.5 mmol/mol) in 3–6 months.

Note: LADA = latent autoimmune diabetes in adults, Hba1c = haemoglobin A1c (glycated haemoglobin), mmol/mol = millimoles per mole, kg/m^2 = kilograms per square metre. SGLT 2 = sodium-glucose co-transporter 2, GLP1 = glucagon-like peptide 1.

Adapted from the Scottish Intercollegiate Guidelines Network. Management of diabetes. A national clinical guideline: 2010.64 Additional advice and agents added; some advice removed.

Source: RACGP 2014.

Figure 3.1 (continued): Blood glucose treatment algorithm for people with type 2 diabetes

This chapter explores glucose lowering medicine supply patterns in the population cohort—concessional NDSS registrants aged 65 and over with type 2 diabetes—in relation to:

- overall supply
- patterns of supply when the patient started pharmaceutical therapy for type 2 diabetes
- treatment regimens and commonly co-supplied medicines.

The medicine supply patterns were examined by age and time since diabetes diagnosis, as risk factors for disease progression.

Caveats

It is important to note that the results presented in this chapter should be interpreted with caution, as they do not reflect the patterns of medicine supply for all older people with type 2 diabetes. The concessional population, which is the focus of the analysis in this report, is likely to include a higher representation of those from lower socioeconomic groups and with poorer health status compared with the general population.

As well, the findings presented in this chapter cannot be used to assess whether the clinical guidelines are being implemented appropriately, as clinical information other than diabetes type and time since diabetes diagnosis was not available.

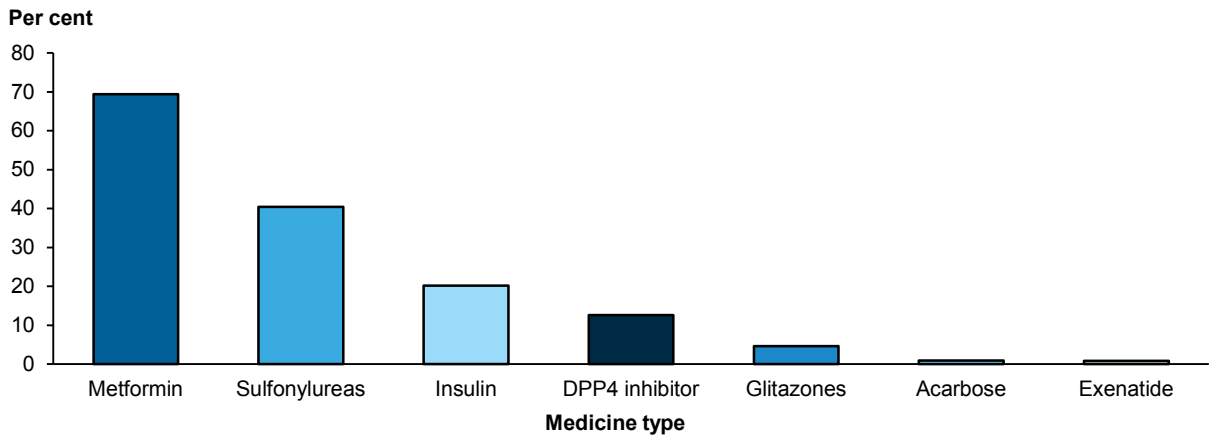
How common is the supply of glucose lowering medicines?

This part of the report examines the proportions of the population cohort (325,579 people) supplied with glucose lowering medicines. Note that a person can be supplied with more than 1 type of medicine, and as such the proportions presented are not mutually exclusive and do not add up to 100%.

Overall supply

In 2012, 85% of the population cohort had at least 1 claim of glucose lowering medicine. Generally, older people were supplied with recommended first-line medicines, while the supply of third-line medicines was lower (Figure 3.2).

- Metformin was the most commonly supplied medicine for the treatment of type 2 diabetes (being supplied to 69% of the cohort), while sulfonylureas were supplied to 40% of the cohort.
- One in 5 (20%) older people with type 2 diabetes were supplied with insulin.
- A total of 13% of the cohort was supplied with DPP4 inhibitors and 5% with glitazones.
- Exenatide was supplied to 1% of the cohort, as was acarbose.



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B5).

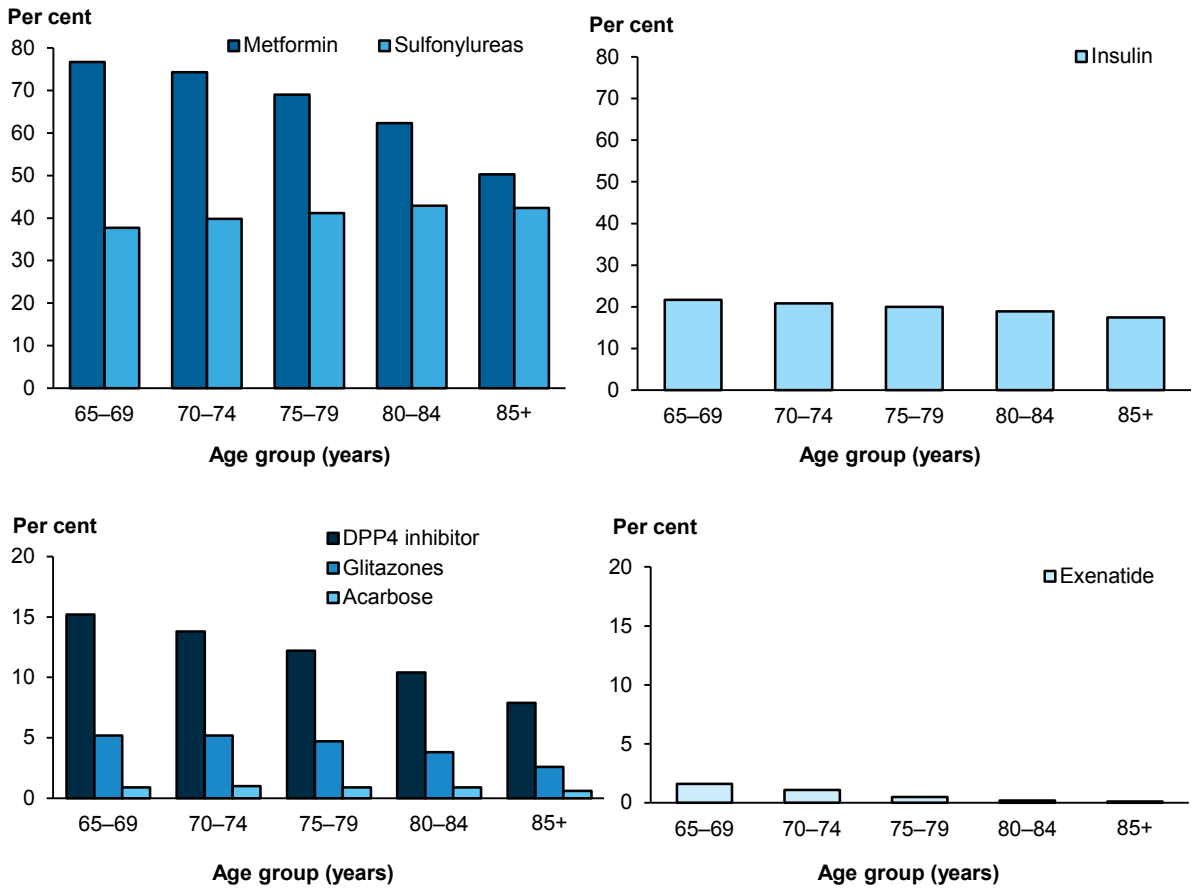
Figure 3.2: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, 2012

Supply patterns by age

While overall 85% of the population cohort had at least 1 claim of glucose lowering medicines, this varied by age, from 85–86% among 65–84 year olds to 76% among those aged 85 and over. The overall lower rate of glucose lowering medicine supply among those aged 85 and over should be taken into account when interpreting the patterns below.

The supply of most of the glucose lowering medicines varied with age (Figure 3.3):

- Metformin was supplied to 77% of the 65–69 age group, 74% of the 70–74 age group, with a lower supply rate of 50% among people aged 85 and over.
- Supply of insulin and sulfonylureas was relatively similar across the age groups.
- Supply of DPP4 inhibitors varied from 15% among the 65–69 age group to 8% among those aged 85 and over.
- Supply of glitazones, acarbose and exenatide was low across all age groups, especially in those aged 85 and over (2.6%, 0.6% and 0.1%, respectively).



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

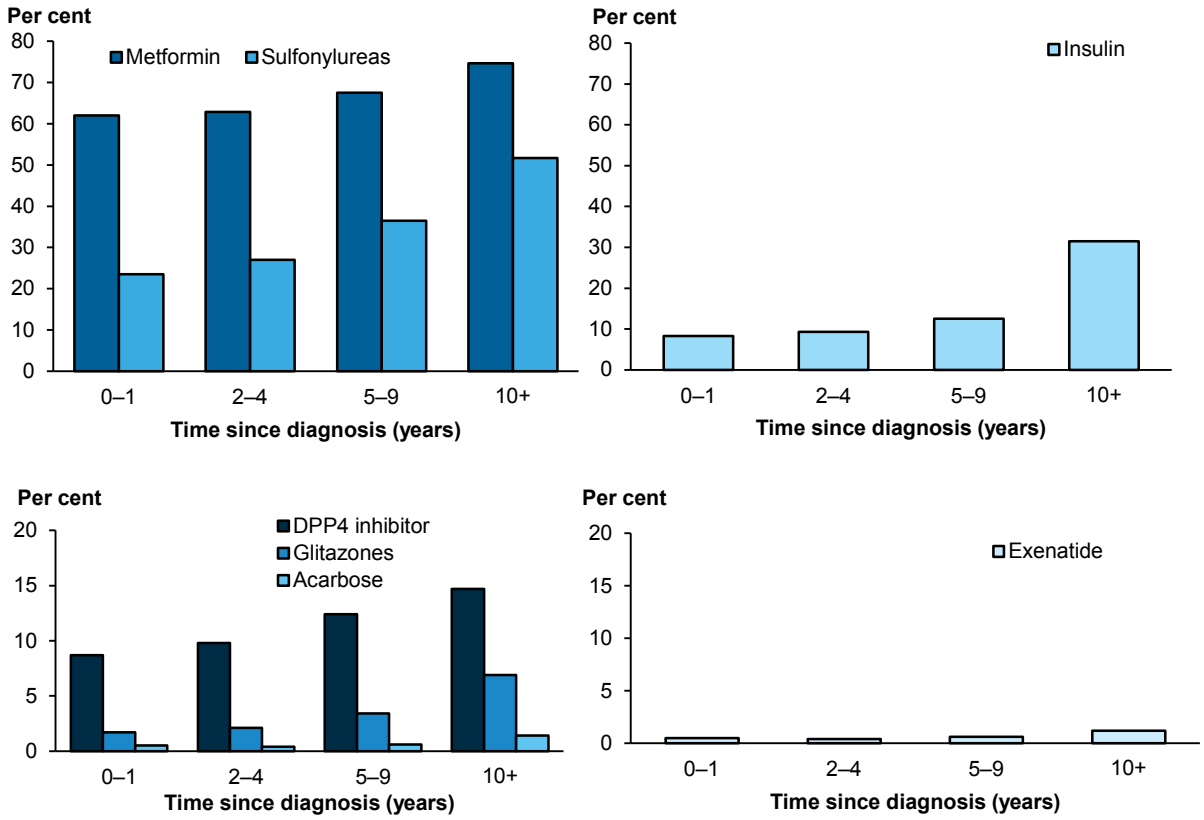
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B6).

Figure 3.3: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, by age group, 2012

Supply patterns by time since diabetes diagnosis

The supply of all classes of glucose lowering medicines was higher with longer times since diabetes diagnosis in the population cohort (Figure 3.4).

Metformin supply was more common in those with a time from diagnosis of 10 years or more (75%) compared with those who had been diagnosed for less than 2 years (62%)—that is, who were newly diagnosed. This pattern was even more pronounced for the other types of glucose lowering medicines. For example, sulfonylureas and insulin supply rates in those with type 2 diabetes diagnosed for 10 years or more was 2–4 times as high as in those who had been newly diagnosed (sulfonylureas: 52% and 23%, respectively; insulin: 33% and 8%, respectively).



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B7).

Figure 3.4: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, by time since diabetes diagnosis, 2012

First treatment for type 2 diabetes

Treatment with glucose lowering medicines starts when blood glucose cannot be maintained at near-normal levels with lifestyle approaches alone. This section examines the initial glucose lowering medicine supplied when a patient starts pharmacological therapy for type 2 diabetes. Initial pharmacological therapy for type 2 diabetes was defined as having no claim of any type of diabetes medicine in 2011 and having the first claim of diabetes medicine in 2012. With a relatively short 'look-back' period, those who had a break in their treatment might be misclassified as 'starting therapy' and this should be taken into account when interpreting these results.

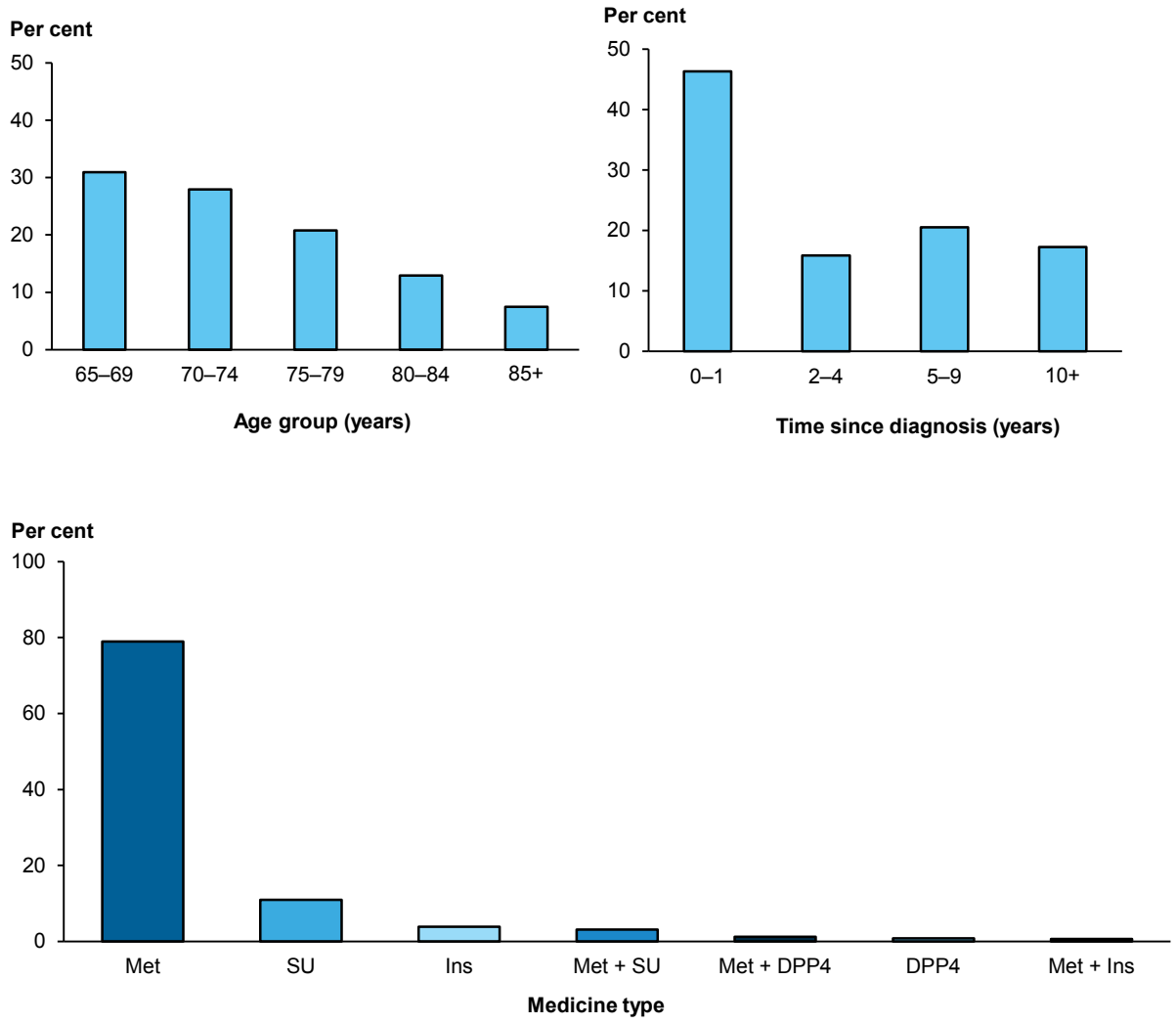
In 2012, almost 5% (14,623 people) of the population cohort started blood glucose lowering therapy. The patterns of their first treatment for type 2 diabetes are examined in this section.

Overall pattern

Of those who started blood glucose lowering therapy in 2012 (Figure 3.5):

- four in 5 (80%) were aged 65–79 and 1 in 5 (20%) were aged 80 and over
- more than half (54%) started treatment for type 2 diabetes at least 2 years after their diagnosis and, of these, 1 in 3 (32%) had been diagnosed for 10 years or more

- most (79%) started treatment for type 2 diabetes with metformin only
- around 1 in 10 started with sulfonylureas (11%), and much lower proportions started with both metformin and sulfonylureas (3.1%), with insulin (3.8%) or with other options such as DPP4 inhibitors (0.8%).



Met = metformin; SU = sulfonylureas; Ins = insulin; DPP4 = DPP4 inhibitor.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B8).

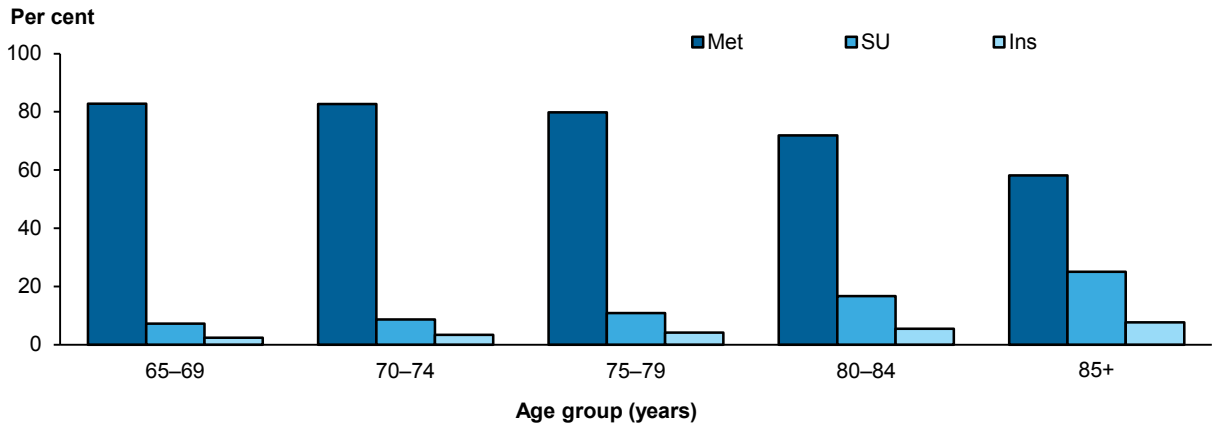
Figure 3.5: Characteristics of those who received initial therapy in 2012 and type of PBS-subsidised glucose lowering medicine supplied as initial therapy for type 2 diabetes

Initial therapy by age

The glucose lowering medicines supplied as initial therapy varied according to age in the population cohort (Figure 3.6).

The supply of metformin as an initial therapy was lower in those who started glucose lowering therapy at age 85 and over (58%) than in those who started treatment at younger ages (between 80% for 75–79 year olds and 83% for 65–69 year olds).

However, the supply of sulfonylureas as an initial treatment was higher in those aged 85 and over (25%) than in those aged 65–79 (ranging from 7.3% to 11%). Similarly, the use of insulin as an initial therapy was higher among those aged 85 and over than in other age groups, varying from 2.4% in those aged 65–69 to 7.7% in those aged 85 and over.



Met = metformin; SU = sulfonylureas; Ins = insulin.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

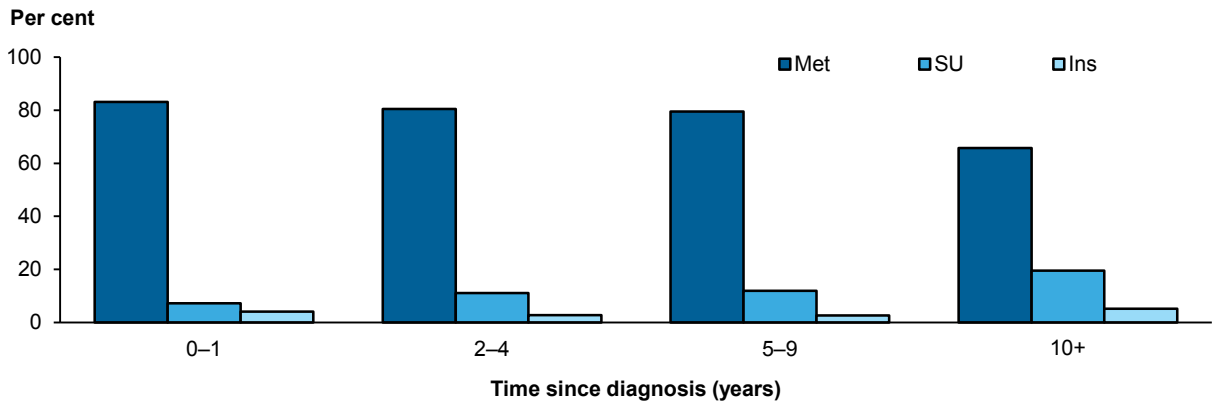
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B9).

Figure 3.6: People aged 65 and over with type 2 diabetes who started treatment with PBS-subsidised blood glucose lowering medicines, by medicine type and age group, 2012

Initial therapy by time since diabetes diagnosis

The medicine supplied for initial glucose lowering therapy also differed by time since diagnosis in the population cohort. The supply of metformin as initial therapy was 84% in those who started treatment within 2 years after being diagnosed with type 2 diabetes compared with 65% in those who started treatment at least 10 years after diagnosis (Figure 3.7).

Sulfonylureas was considerably more likely to be supplied as initial therapy in those with a longer time period since diabetes diagnosis—19% in those who started treatment at least 10 years after diagnosis, compared with 11% for those who had been diagnosed for 2–9 years and 7.2% for those who had been newly diagnosed. A similar pattern was also observed for insulin, with supply rates highest among those who started treatment at least 10 years after diagnosis, 5.2%, compared with 2.7% for those who had been diagnosed for 2–9 years after diagnosis and 4.1% for those who had been newly diagnosed.



Met = metformin; SU = sulfonylureas; Ins = insulin.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B10).

Figure 3.7: People aged 65 and over with type 2 diabetes who started treatment with PBS-subsidised blood glucose lowering medicines, by medicine type and time since diabetes diagnosis, 2012

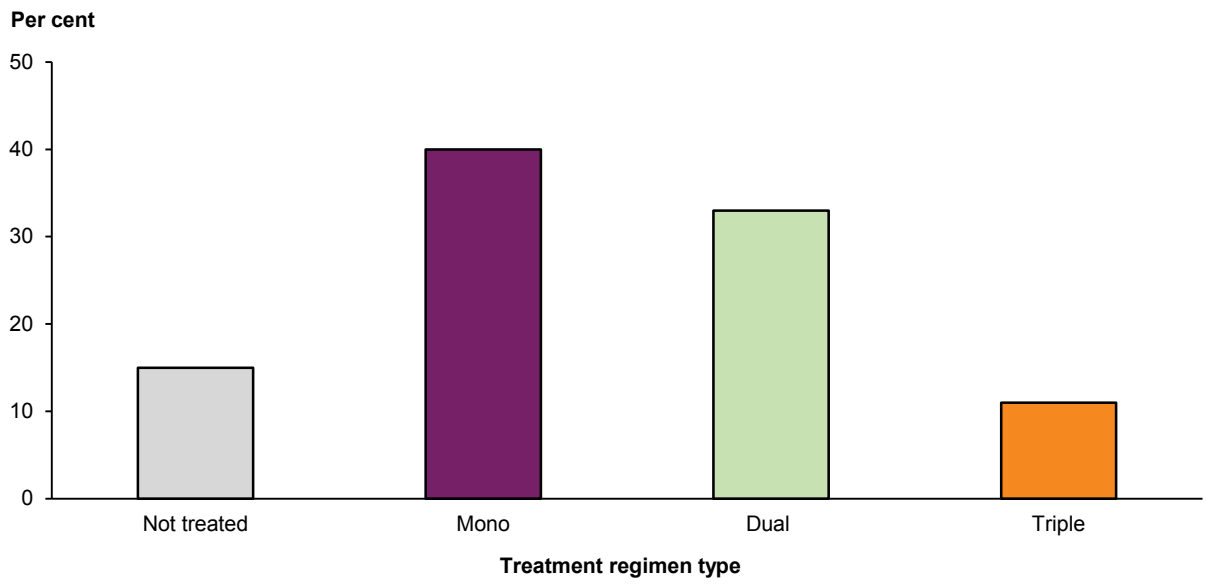
Glucose lowering treatment regimens

Use of medicines in people with type 2 diabetes varies in complexity, often requiring co-administration of multiple medicines. Treatment regimen was defined as 1 medicine or multiple medicines taken at the same time by a patient over the study period. Treatment regimen types in this study were identified and grouped according to the most intensive treatment regimen types in 2012: monotherapy, dual and triple therapy (see Chapter 2 for further details regarding the methods used).

This section examines the proportions of the population cohort (325,579 people) supplied with glucose lowering treatment regimens. It presents estimated treatment regimens based on PBS medicine supply records; however, there is no information on whether medicines were intended to be co-administered by the prescribing doctor. Therefore, the findings in this section should be interpreted with caution.

Overall

In 2012, an estimated 40% of the population cohort were supplied monotherapy, 33% were supplied dual therapy and 11% were supplied triple therapy for type 2 diabetes (Figure 3.8). Around 15% of the population cohort did not have any PBS claim for glucose lowering medication in 2012, suggesting that many were managing their diabetes with lifestyle measures alone.



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B11).

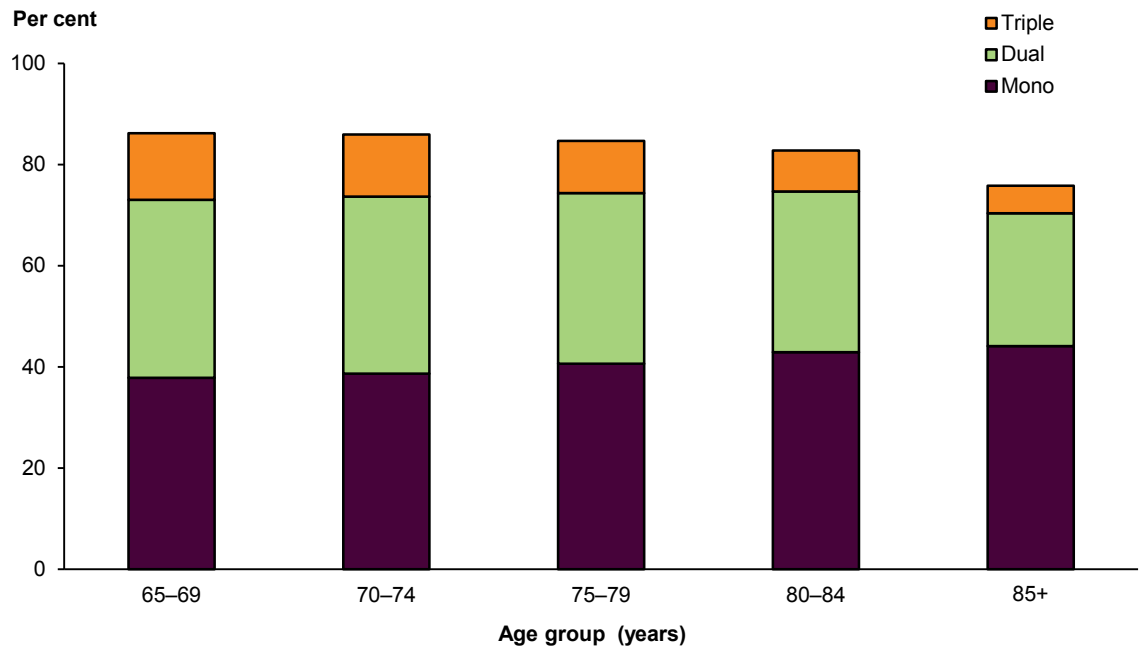
Figure 3.8: People aged 65 and over with type 2 diabetes, by glucose lowering treatment regimen type, 2012

Treatment regimen types by age

Treatment regimen types for type 2 diabetes varied by age. In the population cohort, a higher proportion of the 85 and over age group were supplied monotherapy while the proportions of dual and triple therapy were lower in this age group (Figure 3.9):

- The monotherapy proportion was 38% in those aged 65–69 compared with 44% in those aged 85 and over.
- The dual therapy proportion was 35% in the 65–69 age group compared with 26% for those aged 85 and over.
- Triple therapy proportions were 12–13% in the 65–74 age groups compared with 6% for those aged 85 and over.

Of those supplied triple therapy, 5% were aged 85 and over compared with 11% among those supplied monotherapy.



Notes

1. Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.
2. The residual is people who did not have any PBS claim for glucose lowering medication in 2012.

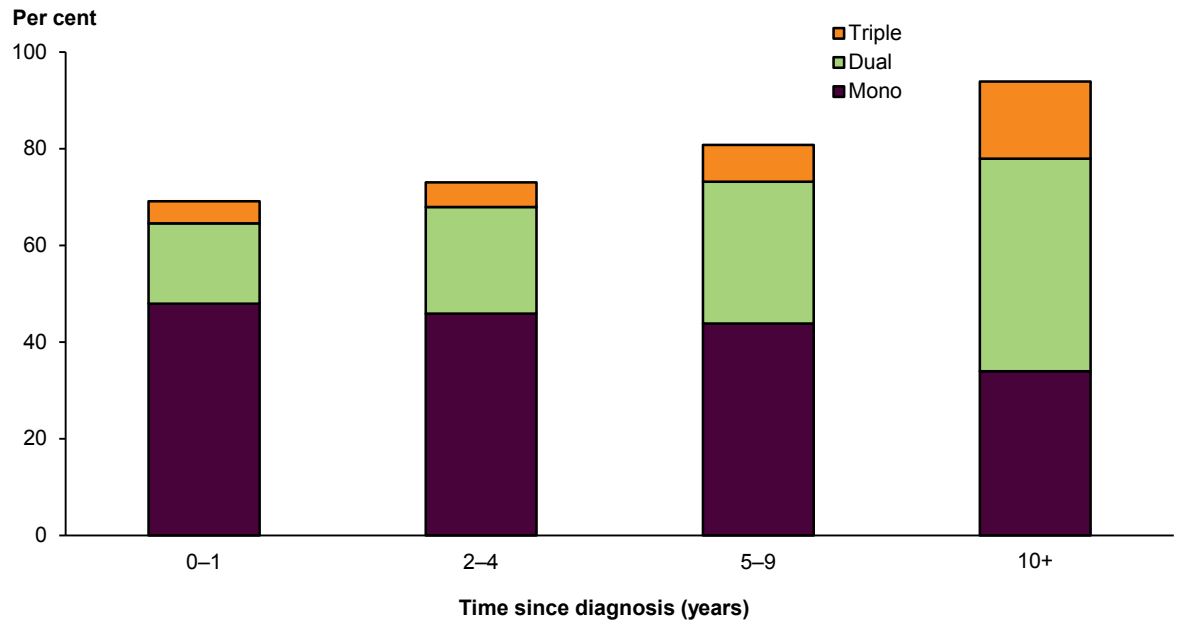
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B11).

Figure 3.9: People aged 65 and over with type 2 diabetes, by glucose lowering treatment regimen type and age group, 2012

Treatment regimen types by time since diabetes diagnosis

Supply of dual or triple therapies to manage type 2 diabetes was more common in the population cohort with a longer time since diagnosis (Figure 3.10). Of those diagnosed with type 2 diabetes for 10 years or more, 44% were supplied dual therapy and 16% were supplied triple therapy compared with 17% and 5%, respectively, in those newly diagnosed with type 2 diabetes.

Of those supplied triple therapy, 68% had had type 2 diabetes for 10 years or more, compared with 39% for those supplied monotherapy.



Notes

1. Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.
2. The residual is people who did not have any PBS claim for glucose lowering medication in 2012.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B11).

Figure 3.10: People aged 65 and over with type 2 diabetes, by glucose lowering treatment regimen type and time since diabetes diagnosis, 2012

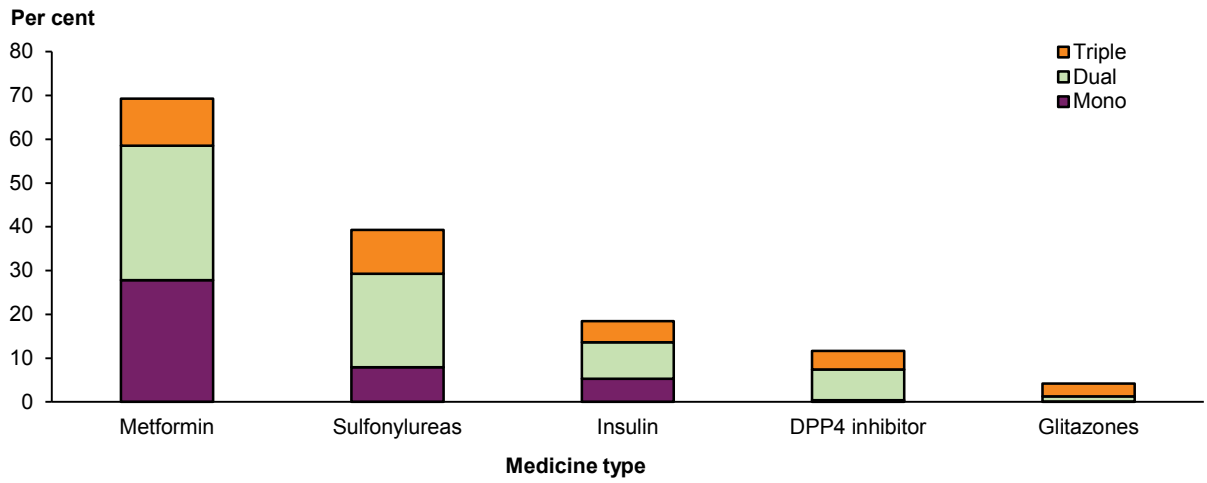
Treatment regimen types by main medicine classes

The estimated treatment regimen types are consistent with the supply patterns for each medicine class presented earlier in this report.

Around 70% of the population cohort was treated with metformin. However, among those who were treated with metformin, only 41% were supplied metformin monotherapy and 59% had metformin co-administered with other glucose lowering agents as dual or triple therapy. The other class of first-line medicines, sulfonylureas (used in 40% of the population cohort), was primarily used in dual or triple therapy (55% and 25%, respectively, among people supplied with sulfonylureas).

Almost 1 in 5 (20%) of the population cohort was treated with insulin. Almost 3 in 4 of these people were supplied a treatment regimen type involving insulin and oral glucose lowering medicines (72% for dual therapy or triple therapy).

Treatment regimens with other third-line medicines (that is, DPP4 inhibitors, glitazones and exenatide) were used in only a small proportion of older people and primarily in dual or triple therapies (Figure 3.11).



Notes

1. Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.
2. The residual is people who did not claim for the glucose lowering medication class in 2012.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B12).

Figure 3.11: People aged 65 and over with type 2 diabetes, by glucose lowering treatment regimen type and medicine type, 2012

Common treatment regimens

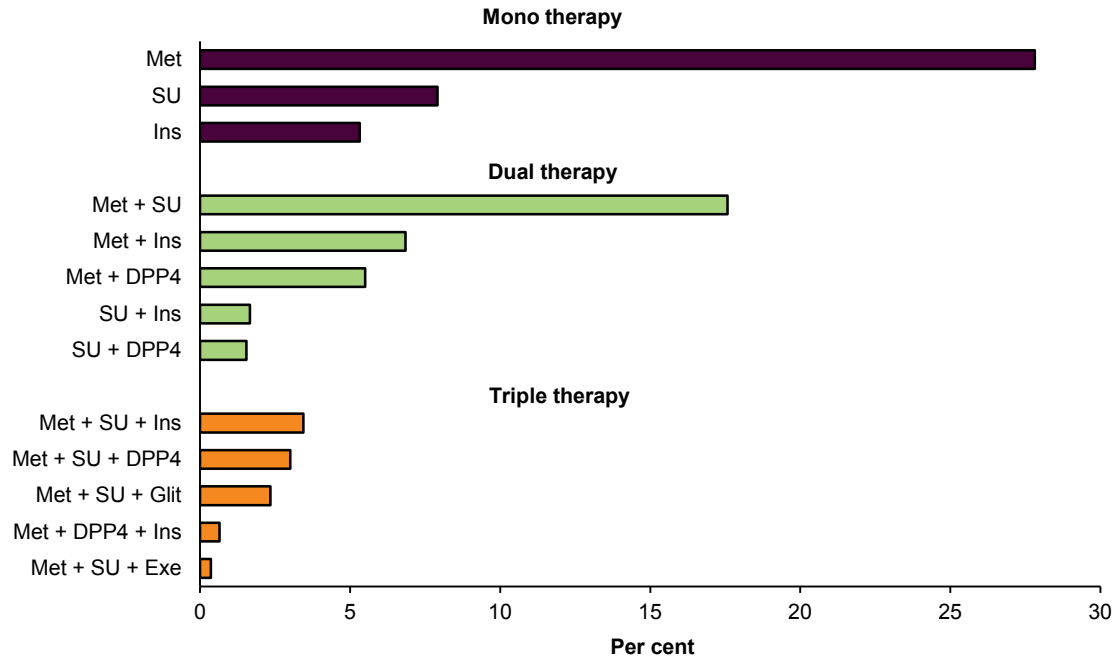
Overall

In 2012, the most common glucose lowering therapy used as monotherapy was metformin (in 28% of the population cohort) followed by sulfonylureas (7.9%) and insulin (5.3%) (Figure 3.12). Metformin monotherapy accounted for 67% of all monotherapy regimens in 2012.

The treatment regimen consisting of metformin and a sulfonylurea was the most common form of dual therapy (in 18% of the population cohort) in 2012, accounting for more than half (51%) of all dual therapy regimens.

Other common dual therapy regimens included metformin–insulin (in 6.8% of the population cohort) and metformin–DPP4 inhibitors (5.5%), accounting for 36% of all dual therapy regimens. Sulfonylureas were co-administered with insulin or DPP4 inhibitors in 1.7% and 1.5% of the population cohort, respectively, accounting for 10% of the dual therapy regimens.

Common triple therapies included metformin and sulfonylurea co-administered with insulin (in 3.4% of the population cohort) or DPP4 inhibitors (3.0%) or glitazones (2.3%), accounting for 81% of all triple therapy regimens.



Met = metformin; SU = sulfonylureas; Ins = insulin; DPP4 = DPP4 inhibitor; Glit = glitazones; Exe = exenatide.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B13).

Figure 3.12: People aged 65 and over with type 2 diabetes, by common glucose lowering treatment regimen, 2012

Common treatment regimens by age

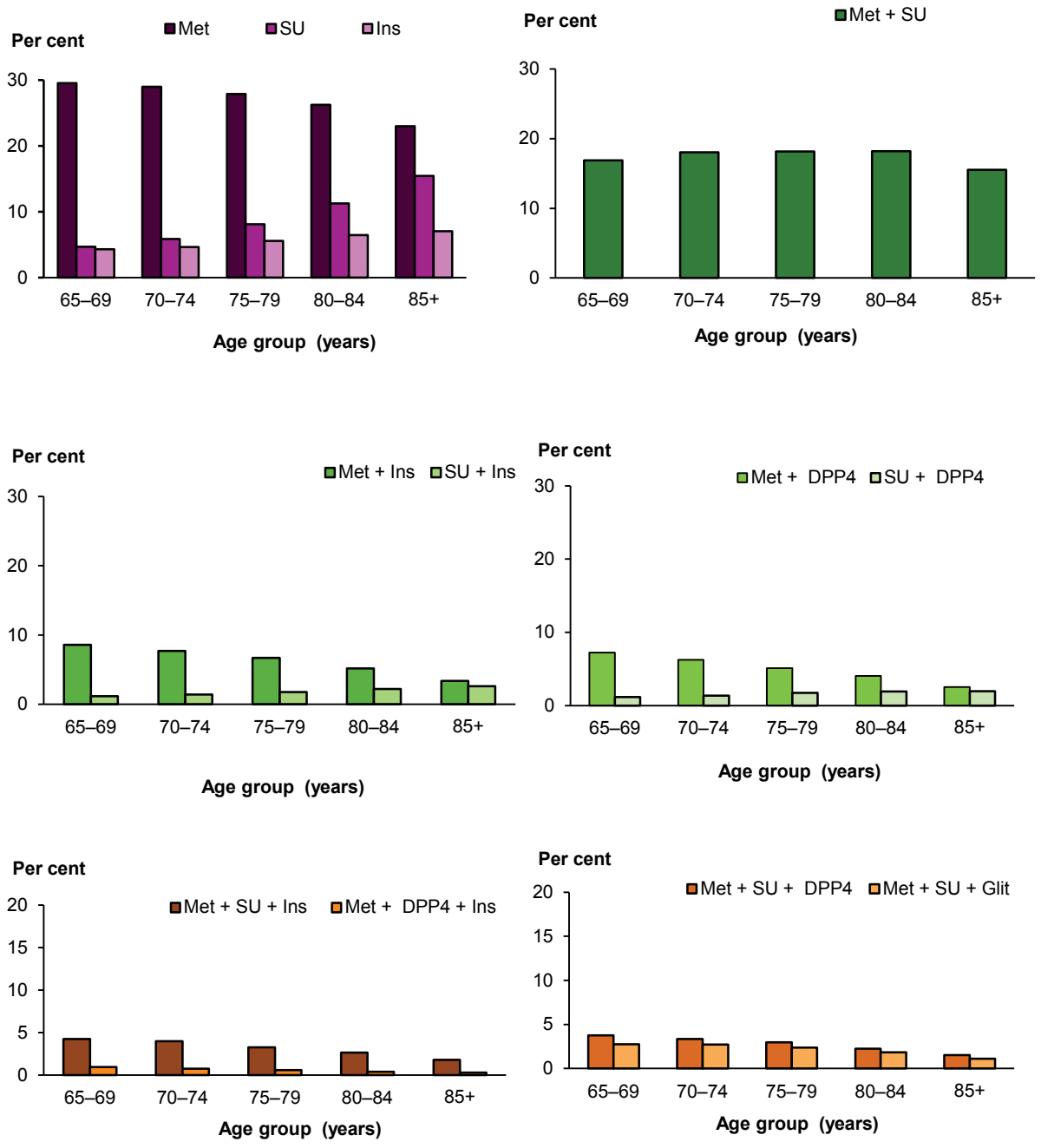
In 2012, in the population cohort, monotherapy with:

- metformin was lower in older age groups—23% of people aged 85 and over compared with 30% for 65–69-year-olds
- sulfonylureas or insulin was higher in older age groups. Sulfonylureas were supplied as monotherapy in 15% of people aged 85 and over and in 4.7% of people aged 65–69. Corresponding proportions for insulin were 7.1% and 4.3%, respectively (Figure 3.13).

The supply of metformin and a sulfonylurea as dual therapy was similar across age groups (between 16% and 18%) of the population cohort. Other types of dual therapy all varied by age in the population cohort:

- Metformin and insulin, or metformin and a DPP4 inhibitor, was less common in the oldest age groups.
- Sulfonylureas and insulin, or sulfonylureas and a DPP4 inhibitor, were more common in the oldest age groups.

All types of triple therapy were less common in older age groups among the population cohort.



Met = metformin; SU = sulfonylureas; Ins = insulin; DPP4 = DPP4 inhibitor; Glit = glitazones.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix tables B14, B16, B18).

Figure 3.13: People aged 65 and over with type 2 diabetes with common glucose lowering treatment regimens, by age group, 2012

Common treatment regimens by time since diabetes diagnosis

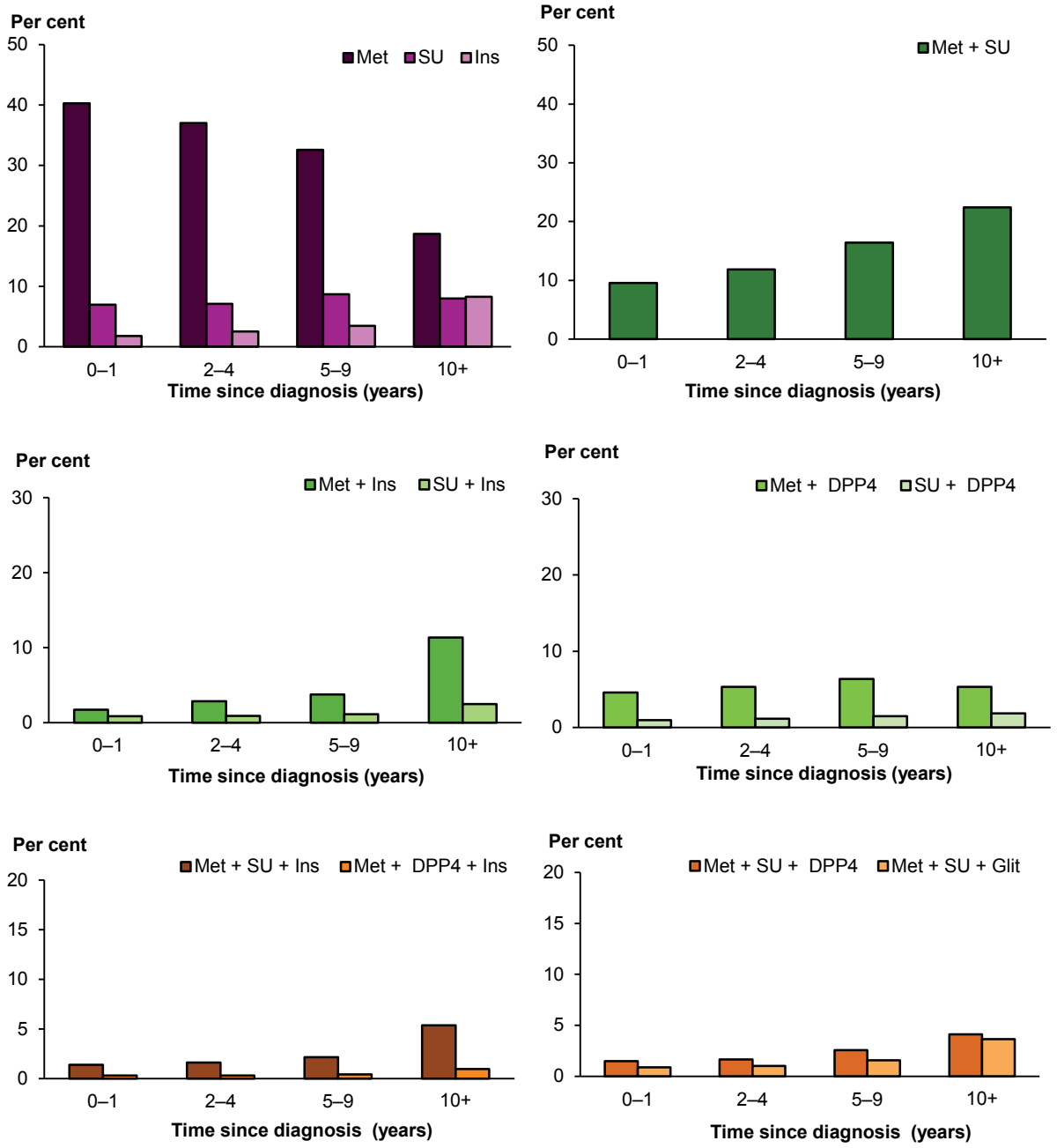
In 2012, in the population cohort, monotherapy with:

- metformin was twofold less in people who had been diagnosed with type 2 diabetes for 10 years or more (19%) compared with newly diagnosed people (40%)
- insulin was higher in people with a longer time since diabetes diagnosis. In people who had been diagnosed with type 2 diabetes for 10 years or more, 8.3% were supplied with insulin compared with 1.8% in the newly diagnosed
- sulfonylureas were fairly constant across time since diabetes diagnosis (ranging from 6.9% to 8.7%) (Figure 3.14).

Dual therapy with metformin and a sulfonylurea was higher in people with a longer time since diabetes diagnosis in the population cohort, varying from 9.6% in the newly diagnosed to 22% in people who had been diagnosed for 10 years or more.

In terms of dual or triple therapy, among the population cohort:

- insulin in combination with oral medicines was higher in people with a longer time since diagnosis. Metformin and insulin as dual therapy was between 1.7–3.8% in people who had been diagnosed for less than 10 years compared with 11% in people diagnosed for 10 years or more
- metformin and DPP4 inhibitor dual therapy did not vary markedly by time since diagnosis; however, other types of dual or triple therapy containing DPP4 inhibitors were higher in people with a longer time since diabetes diagnosis.



Met = metformin; SU = sulfonylureas; Ins = insulin; DPP4 = DPP4 inhibitor.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Sources: AIHW analysis of the NDSS–PBS linked data set (see Appendix tables B15, B17, B19).

Figure 3.14: People aged 65 and over with type 2 diabetes with common glucose lowering treatment regimens, by time since diabetes diagnosis, 2012

4 Supply of medicines for common conditions associated with type 2 diabetes

Key findings:

- In 2012, 77% of the population cohort was supplied with blood pressure lowering agents, 74% were supplied with lipid modifying agents and 24% were supplied with anti-depressants.
- Of the more specific blood pressure lowering agents, calcium channel blockers (37%) were most commonly supplied.
- Statins were the most commonly supplied blood lipid modifying agents (72%).
- The supply of beta blockers, calcium channel blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor antagonists (ARBs) and other anti-hypertensives was similar across most age groups but the supply of thiazides/thiazide-like diuretics was lowest in those aged 85 and over.
- Statin supply patterns were similar across most age groups, except for those aged 85 and over, where the supply was the lowest compared with other age groups.
- Over two-thirds of the population cohort (68%) was supplied with both blood pressure lowering and lipid modifying agents, with statins and calcium channel blockers (30%) being the most common medicine pairs supplied from these classes.
- Anti-depressants were supplied to 24% of the population cohort, anti-psychotics to 4.1% and anti-dementia medicines to 1.2%.

Diabetes is associated with a range of long-term conditions and complications, which may result in a shortened life expectancy and reduced quality of life among people with the disease. The main long-term conditions associated with diabetes include diseases of the large blood vessels—such as coronary heart disease, stroke and peripheral arterial disease—and disease of the small vessels—such as retinopathy, kidney diseases and neuropathy (peripheral nerve disease) (Bates & Jerum 2003). Other common conditions associated with diabetes are digestive diseases, infections and mental health conditions, such as depression and anxiety (DUK 2015a, 2015b).

Improving the management and care of people with diabetes—particularly through early identification of the disease and by reducing risk factors (such as persistently high blood glucose, high blood pressure and abnormal blood lipids)—can delay the onset, or slow the progression of, conditions commonly associated with diabetes.

The analysis presented in this chapter provides an insight into the supply of selected medicines to manage conditions commonly associated with type 2 diabetes in older people.

This chapter focuses on selected medicines associated with some of the more common and severe diabetes-related conditions, risk factors and complications (including cardiovascular disease, eye disease, diabetic neuropathy, depression and dementia). While chronic kidney disease is also a common and serious health complication for people with diabetes, medicines used to treat kidney disease are often non-specific, could be used to manage a range of health conditions and are often not dispensed through the general section of the PBS

(Section 85). As a result, medicines associated with chronic kidney disease have not been included in this study.

Based on the available data requested and received by the AIHW, the analysis was restricted to:

- blood pressure lowering medicines for cardiovascular and kidney problems
- lipid modifying medicines for cardiovascular problems
- anti-depressants (some of which are used for mental health disorders, while some are used for neuropathy), anti-dementia medicines and anti-psychotics
- selected ophthalmological medicines for eye diseases such as glaucoma or macular degeneration.

See Appendix Table A3 for further details on the therapeutic classifications for the selected medicines.

The supply patterns presented in this chapter are based on the proportion of the population cohort (325,579 people) who had at least 1 claim of the selected single medicine class during the study period.

Caveats

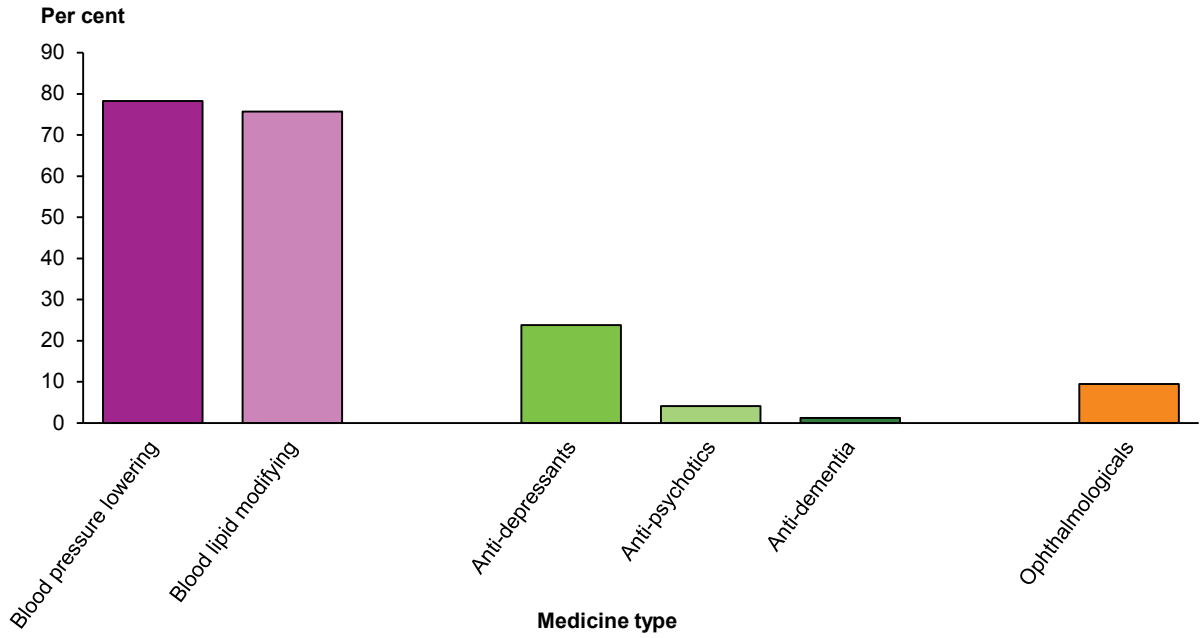
It is important to note the following limitations of the analysis in this section:

- Information on the specific condition for which these medicines were supplied was not available and some medicines can be used to treat multiple conditions.
- The supply of these medicines may differ from that in the general population with diabetes, as our study focuses on the concessional population only. The concessional population is often from a lower socioeconomic group and may have poorer health than the general population.
- Some medicines that are recommended for the treatment of retinopathy or diabetic peripheral neuropathy were not obtained in the PBS data extract for this study; thus, triamcinolone, pregabalin and gabapentin supply was not assessed.

Overall patterns

In 2012, among the population cohort—all being concessional NDSS registrants aged 65 and over with type 2 diabetes:

- 77% were supplied with blood pressure lowering agents
- 74% were supplied with blood lipid modifying agents
- 24% were supplied with anti-depressants
- 10% were supplied with medicines to treat selected eye diseases
- 4.1% were supplied with anti-psychotic medicines and 1.2% with anti-dementia medicines (Figure 4.1).



Notes

1. Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.
2. Includes selected ophthalmological medicines to treat glaucoma (ATC code S01E for anti-glaucoma preparation and miotics) or macular degeneration (ATC code S01L for ocular vascular disorder agents).

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix tables B21 and B30).

Figure 4.1: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised medicines for conditions associated with diabetes, by medicine type, 2012

Blood pressure lowering medicines

Blood pressure lowering medicines are medicines used to treat hypertension—to prevent disease and death from stroke, coronary heart disease, heart failure and aortic aneurysm and to reduce microvascular disease affecting the kidneys, brain and retina (Rossi 2014).

The blood pressure lowering medicines in this section include:

- ACE inhibitors
- ARBs
- diuretics, including thiazides and thiazide-like diuretics and others
- beta blockers
- calcium channel blockers
- other blood pressure lowering medicines.

Note that some diuretics, such as loop diuretics or potassium sparing agents, can be used to treat conditions other than high blood pressure. For instance, they can be used to treat conditions such as oedema (swelling due to excessive fluid retention in the body as a result of circulatory problems, heart failure or peripheral oedema), which does not necessarily coexist with high blood pressure (Rossi 2014). The thiazides and thiazide-like diuretics are specifically used to treat high blood pressure.

For detailed information on the therapeutic indications of these individual classes of medicines, refer to the NPS Medicinewise website <www.nps.org.au/>.

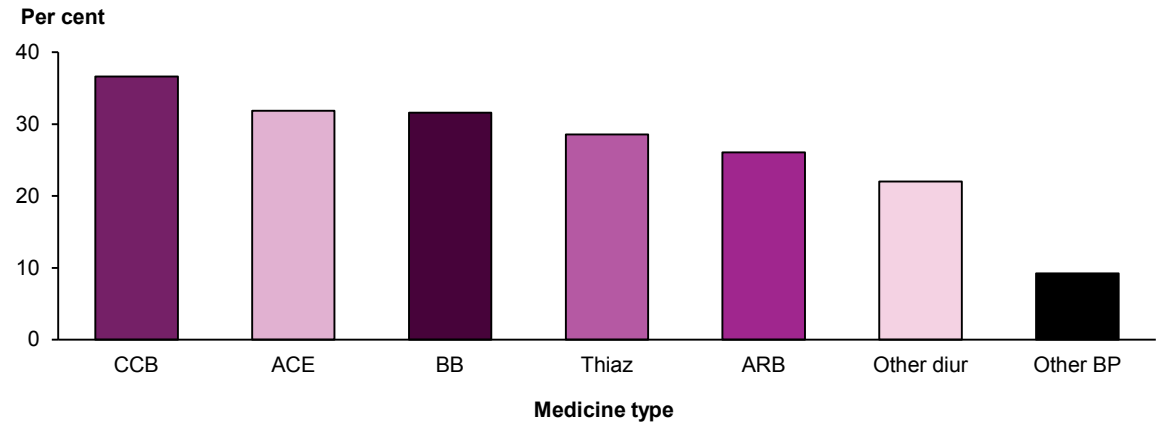
The 2012 Guidelines for the Management of Absolute Cardiovascular Disease Risk, cited in *General practice management of type 2 diabetes – 2014–15* (RACGP 2014), recommend ACE inhibitors or ARBs as first-line medicines to control high blood pressure in people with diabetes. If this monotherapy fails, it is recommended to add a calcium channel blocker or low-dose thiazide or thiazide-like diuretics (NVDPA 2012; RACGP 2014).

Overall supply

In 2012, blood pressure lowering agents were supplied to 77% of the population cohort.

Of the more specific blood-pressure lowering agents, calcium channel blockers (37%) were most commonly supplied, followed by ACE inhibitors (32%) and beta blockers (32%). Thiazide or thiazide-like diuretics (either alone or in combination with other agents), ARBs and other anti-hypertensives were less commonly supplied (28%, 26% and 9%, respectively) (Figure 4.2). The supply of other diuretics (used to treat conditions other than high blood pressure) was at 22%.

The supply of blood pressure lowering agents to the population cohort mostly consisted of multiple types of agents during the year. The proportion of people supplied with a single type of blood pressure lowering agent was very low and varied between 0.3% (other anti-hypertensives) and 7% (ACE inhibitors). This indicates older people with type 2 diabetes have their blood pressure managed with multiple types of blood pressure lowering agents.



BB = beta blockers; CCB = calcium channel blockers; Thiaz = thiazides/thiazide-like diuretics; Other diur = other diuretics; Other BP = other anti-hypertensives.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

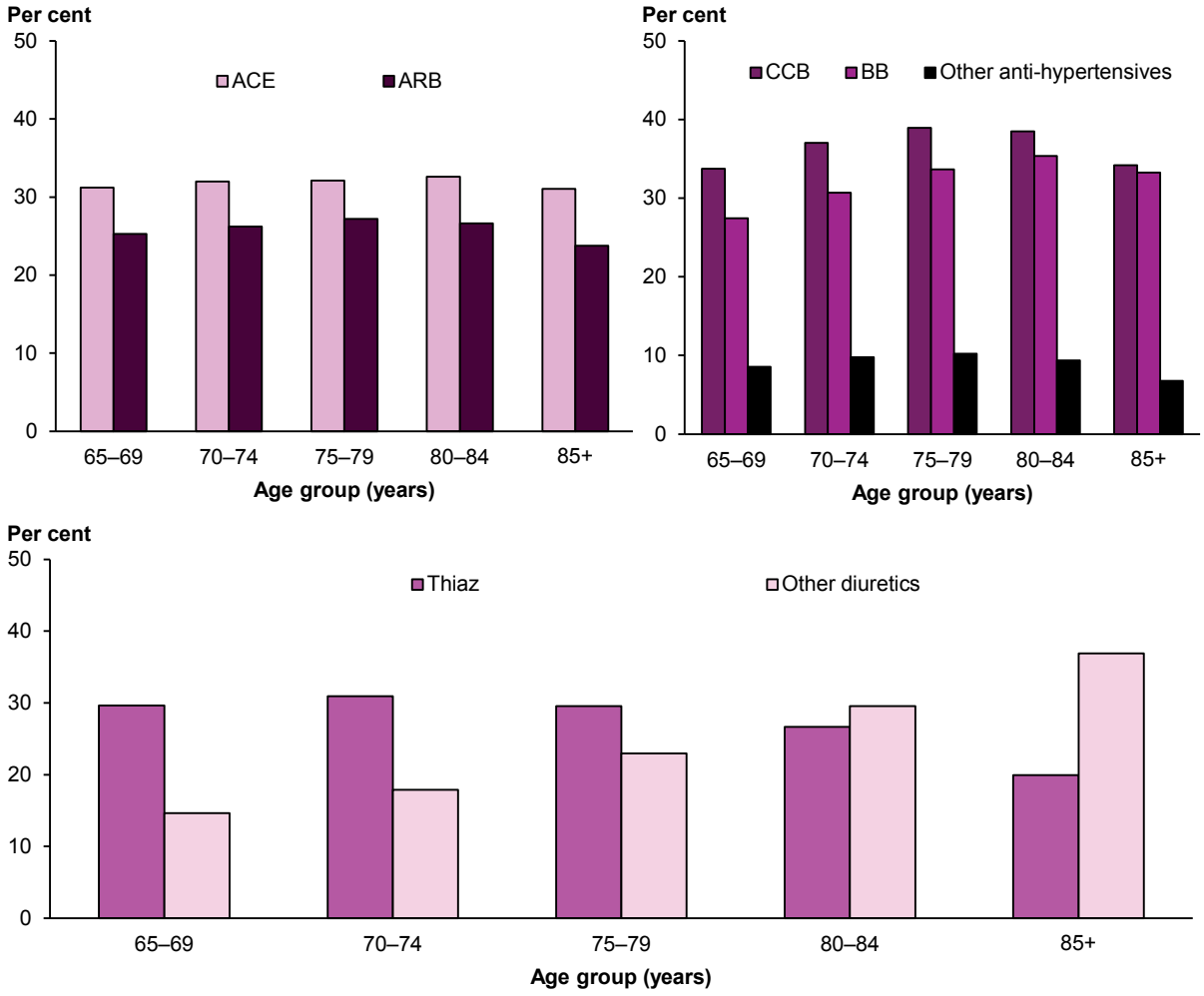
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B21).

Figure 4.2: People aged 65 and over with type 2 diabetes who were supplied with PBS-subsidised blood pressure lowering medicine, 2012

Supply by age

In 2012, in general, the supply of beta blockers, calcium channel blockers, ACE inhibitors, ARBs and other anti-hypertensives was similar across most age groups in the population cohort.

The supply of thiazide or thiazide-like diuretics was lower in those aged 85 and over (20%) than in the youngest age group (30%). In contrast, the supply of other diuretics was 2.5 times as high in those aged 85 and over than in those aged 65–69 (37% and 15%, respectively) (Figure 4.3).



BB = beta blockers; CCB = calcium channel blockers; Thiaz = thiazides/thiazide-like diuretics.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

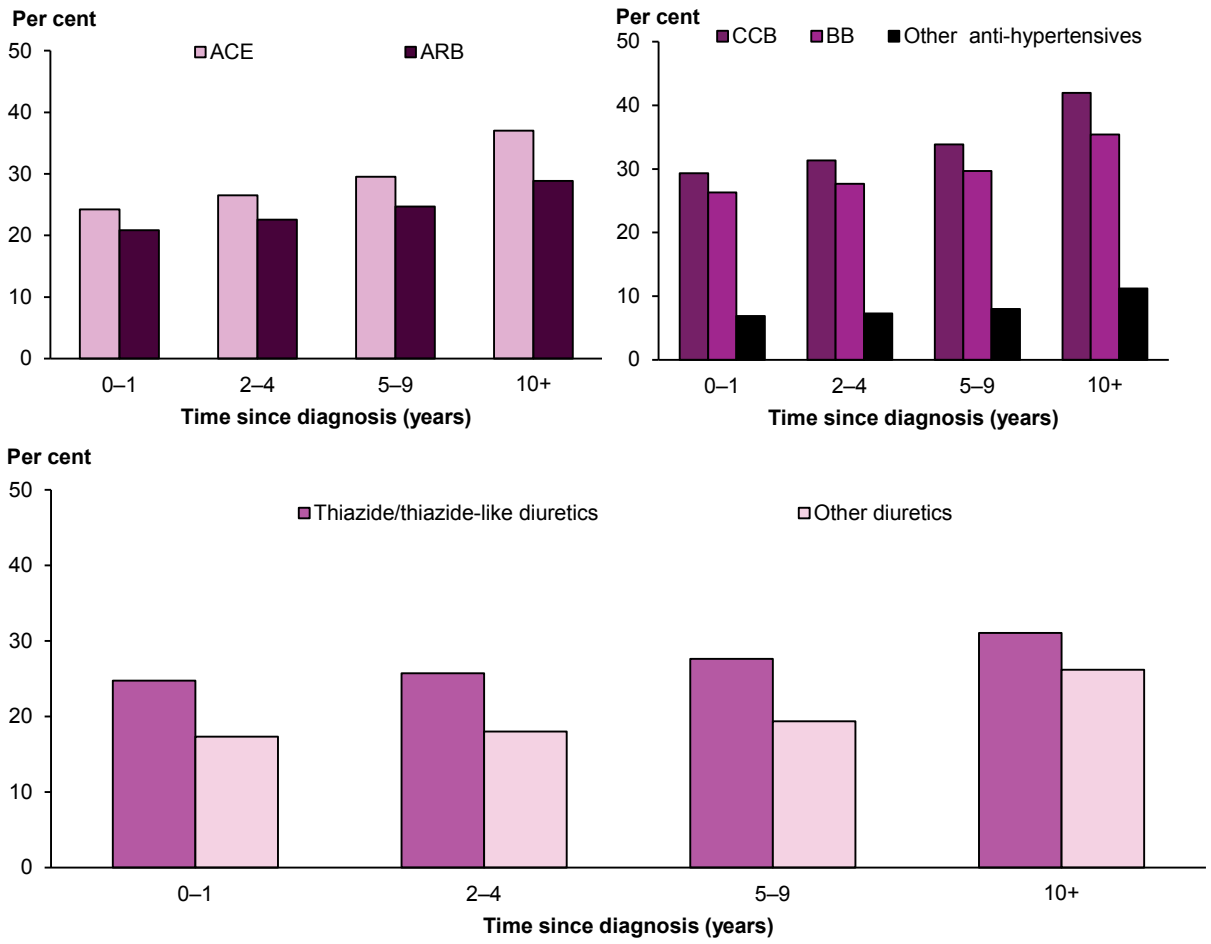
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B21).

Figure 4.3: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood pressure lowering medicine, by age group, 2012

Supply by time since diabetes diagnosis

The supply of all blood pressure lowering medicines increased with longer periods of time since diagnosis of diabetes in the population cohort.

In 2012, those with a time since diagnosis of 10 years or more were around 40–50% more likely to be supplied with blood pressure lowering medicines than those newly diagnosed. For example, calcium channel blockers and ACE inhibitors were supplied to 42% and 37%, respectively, of older people who had been diagnosed with diabetes for 10 years or more, compared with 29% and 24%, respectively, of those newly diagnosed (Figure 4.4). Thiazide or thiazide-like diuretic supply followed similar patterns but the gap in supply between newly diagnosed and those who had been diagnosed with diabetes for 10 years or more was smaller than for the other blood pressure lowering agents (25% compared with 31%, respectively).



BB = beta blockers; CCB = calcium channel blockers.

Notes: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B22).

Figure 4.4: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood pressure lowering medicine, by time since diabetes diagnosis, 2012

Supply of multiple blood pressure lowering agents

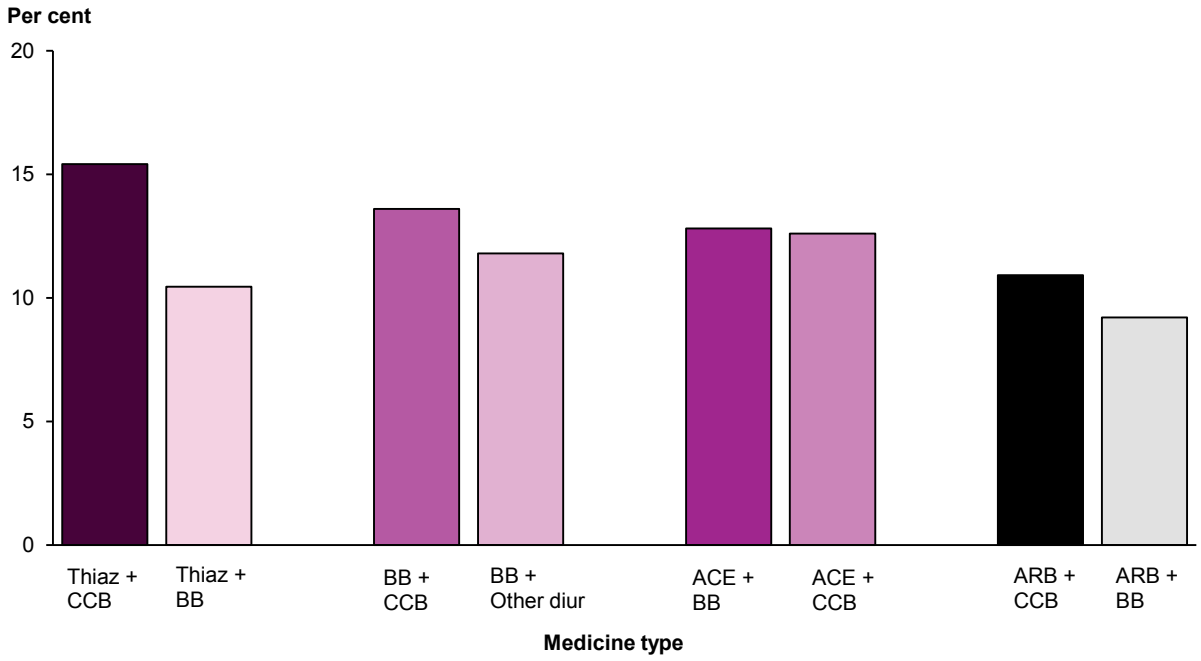
Combinations of blood pressure medicines are recommended when blood pressure is not being well managed by a single agent. This section presents selected common combinations of recommended first-line (ACE inhibitors and ARBs) and second-line agents (calcium channel blockers and/or thiazide or thiazide-like diuretics) for people with diabetes. The most common pairs observed among the population cohort (325,579 people) are presented (Figure 4.5).

Overall supply

In 2012, 58% of the population cohort was supplied with at least 2 different blood pressure lowering medicines across the year. The most common pairs of medicines supplied across the year for the control of high blood pressure were:

- thiazide or thiazide-like diuretics and calcium channel blockers (15%)
- beta blockers and either calcium channel blockers (14%) or other diuretics (12%)

- ACE inhibitors and either calcium channel blockers or beta blockers (13%)
- ARBs and either calcium channel blockers (11%) or beta blockers (9%).



BB = beta blockers; CCB = calcium channel blockers; Thiaz = thiazides/thiazide-like diuretics; Other diur = other diuretics.

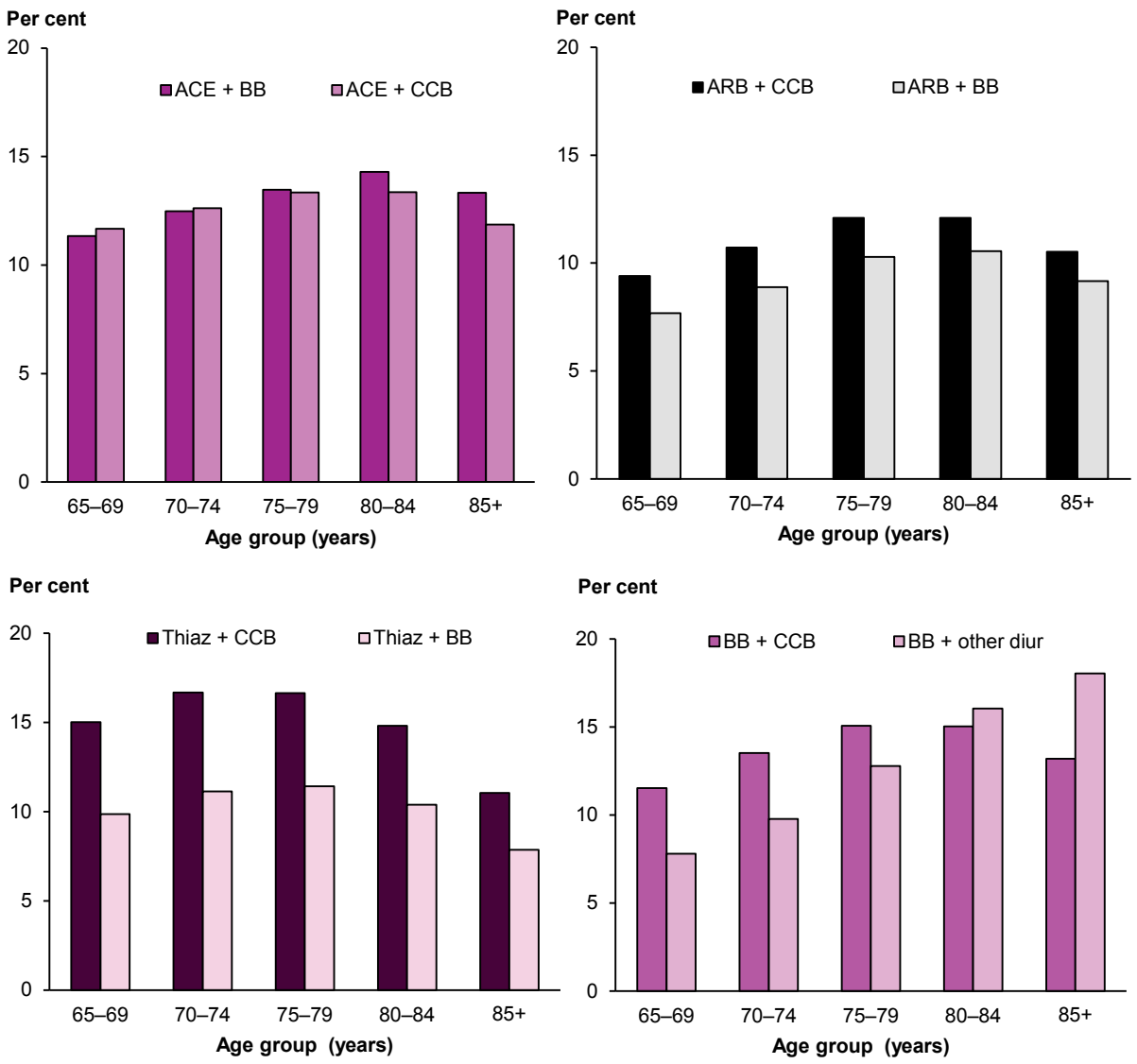
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B23).

Figure 4.5: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, 2012

Supply by age

The supply of ACE inhibitors and either beta blockers or calcium channel blockers was highest in the 75–84 age group of the population cohort. A similar pattern was observed for the supply of ARBs and beta blockers or calcium channel blockers. Thiazide or thiazide-like diuretic supply and either calcium channel blockers or beta blockers was lowest among those aged 85 and over, while beta blockers with other diuretic supply was highest in the 85 and over age group (Figure 4.6).



BB = beta blockers; CCB = calcium channel blockers; Thiaz = thiazides/thiazide-like diuretics; other diur = other diuretics.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

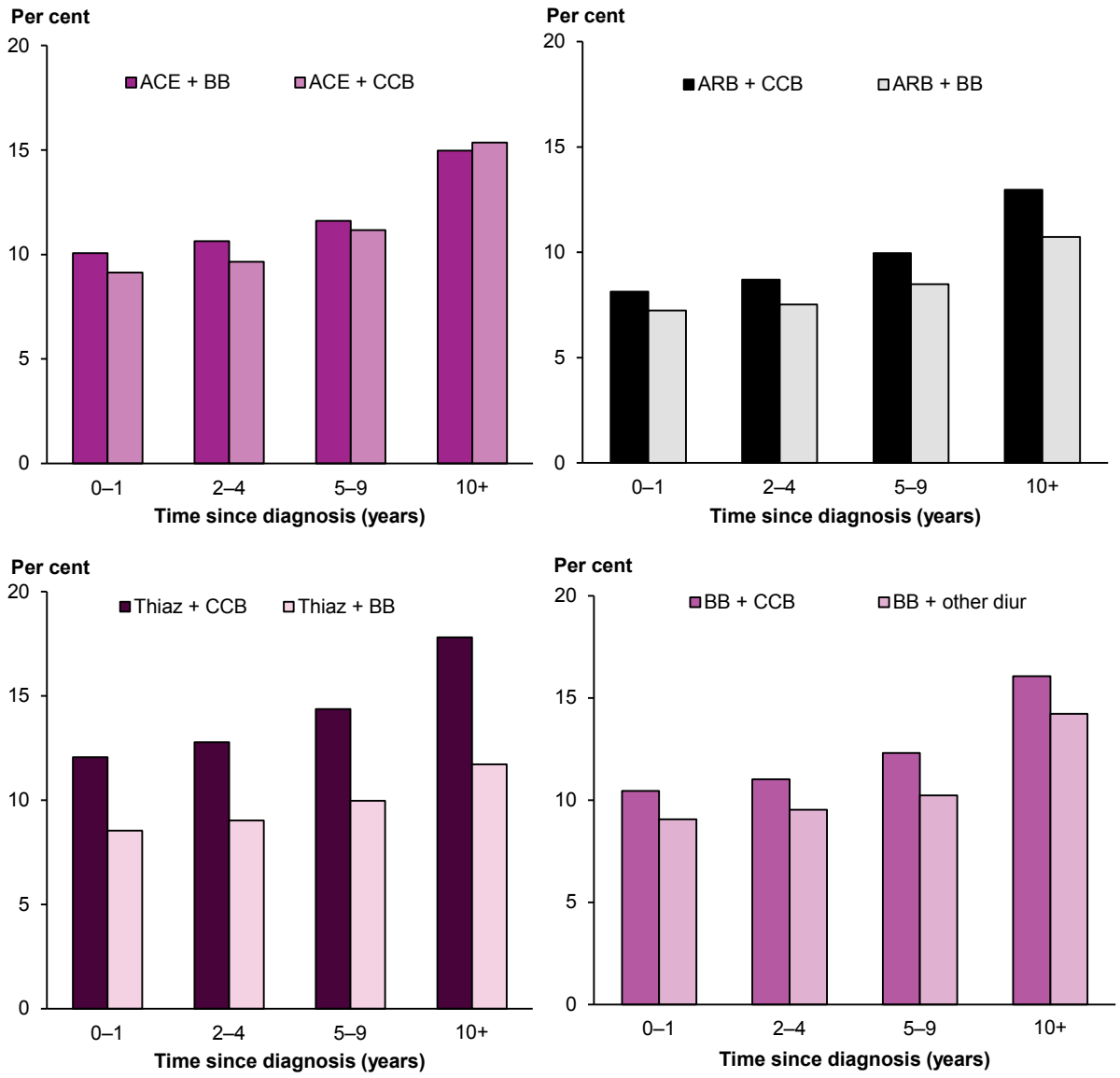
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B24).

Figure 4.6: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, by age group, 2012

Supply by time since diabetes diagnosis

In the population cohort, the supply of multiple blood pressure lowering agents was more common in those whose diabetes had been diagnosed for 10 years or more (Figure 4.7) than in those with less time since diagnosis. Those people with a time since diabetes diagnosis of 10 years or more were around 1.5–1.7 times as likely to be supplied with multiple blood pressure lowering agents as those newly diagnosed. ACE inhibitors and either beta blockers or calcium channel blockers were supplied to 15% of those who had been diagnosed with diabetes for 10 years or more compared with around 10% of those more recently diagnosed. Similar patterns were also observed across the year for people supplied ARBs and beta

blockers or calcium channel blockers, and people supplied thiazides and either calcium channel blockers or beta blockers (Figure 4.7).



BB = beta blockers; CCB = calcium channel blockers; Thiaz = thiazides/thiazide-like diuretics; other diur = other diuretics.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B25).

Figure 4.7: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, by time since diagnosis, 2012

Blood lipid modifying medicines

Blood lipid modifying medicines reduce the level of cholesterol or triglycerides in the blood to reduce the risk of coronary heart disease.

They include the following medicines types:

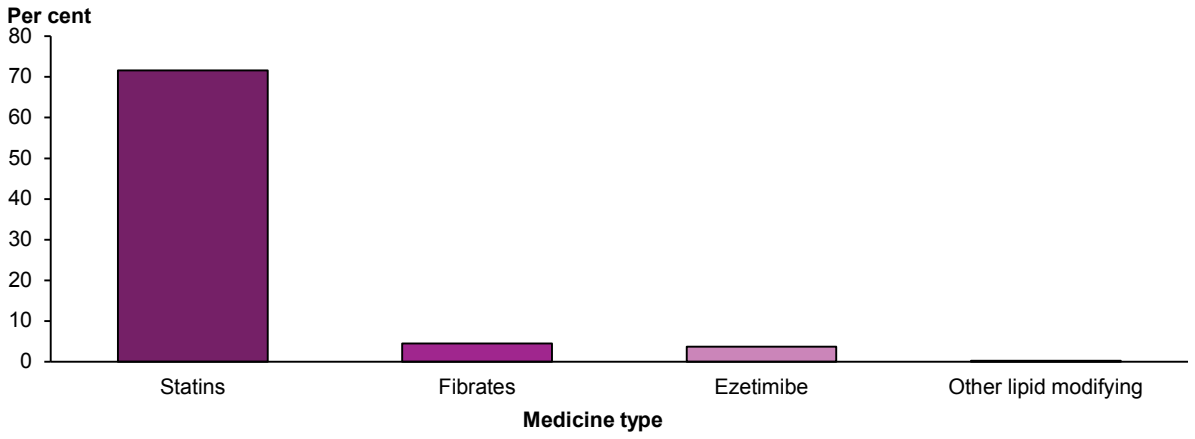
- statins
- fibrates
- ezetimibe
- other lipid modifying agents.

Statins are recommended as first-line therapy to manage dyslipidaemia in people with type 2 diabetes (RACGP 2014). Fibrates and ezetimibe are recommended when statins are not tolerated or not sufficient.

Overall supply

In 2012, blood lipid modifying medicines were supplied to 74% of the population cohort.

Statins were the most common blood lipid modifying medicines supplied to the population cohort, being supplied to 72% of people compared with 4.4% for fibrates and 3.7% for ezetimibe (Figure 4.8).



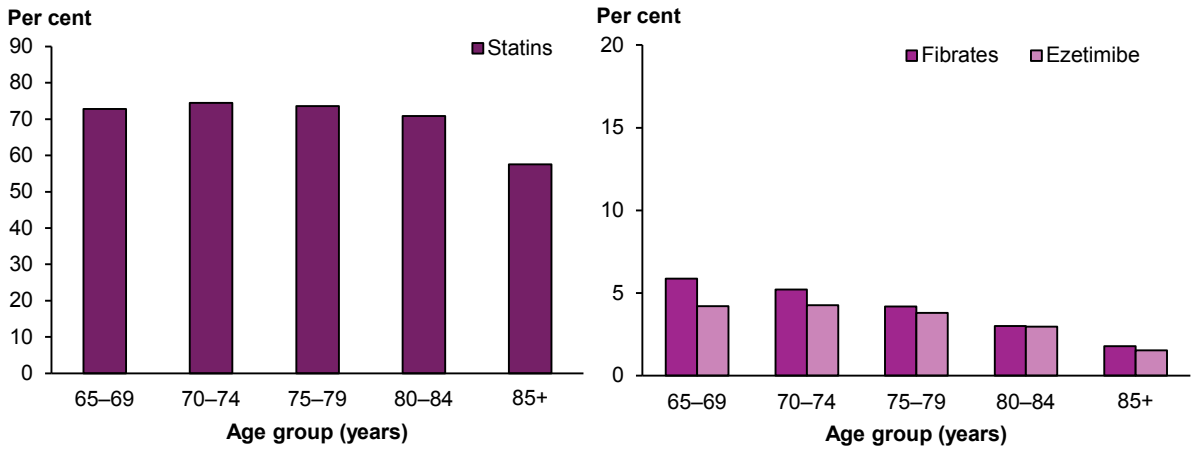
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B21).

Figure 4.8: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood lipid modifying medicines, by medicine type, 2012

Supply by age

The supply of blood lipid modifying medicines was lowest in the oldest age groups of the population cohort—for statins, 57% in those aged 85 and over compared with 70–74% in younger age groups. For fibrates and ezetimibe, the corresponding proportions were 1.5% and 1.8% in those aged 85 and over compared with 5.9% and 4.2% for those aged 65–69 (Figure 4.9).



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

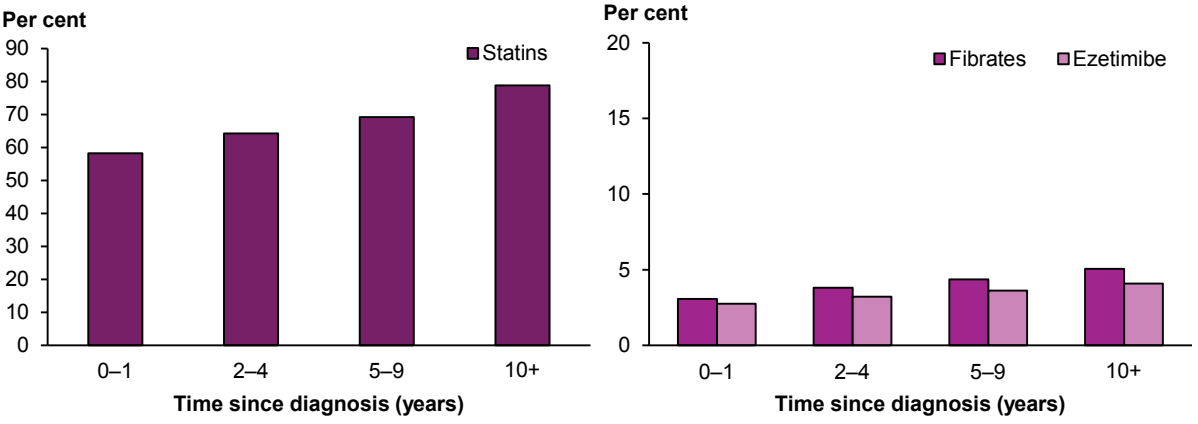
Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B21).

Figure 4.9: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood lipid modifying medicines, by medicine type and age group, 2012

Supply by time since diabetes diagnosis

The supply of all lipid modifying agents was more common in people in the population cohort with a longer time since diabetes diagnosis (Figure 4.10).

Those people diagnosed with type 2 diabetes for 10 years or more were 1.3 times as likely to be supplied with statins as those newly diagnosed (79% and 58%, respectively). Similarly, people with longer times since diabetes diagnosis were 1.7 times and 1.5 times as likely to be supplied with fibrates and ezetimibe, respectively, than those newly diagnosed.



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B22).

Figure 4.10: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood lipid modifying medicines, by medicine type and time since diabetes diagnosis, 2012

Supply of multiple blood lipid modifying agents

In 2012, the supply of statins and other lipid-lowering agents for the same person in the calendar year was quite uncommon in the population cohort—3% of people received both statins and fibrates and 2% received both statins and ezetimibe throughout the year.

The supply of statins and other lipid-lowering agents varied by age in the population cohort. The proportion of people supplied with statins and fibrates was lower in the oldest age groups—5 times as high among those aged 65–69 than among people aged 85 and over. The supply of statins and ezetimibe was fairly constant across age groups but lowest in those aged 85 and over (see Appendix Table B26).

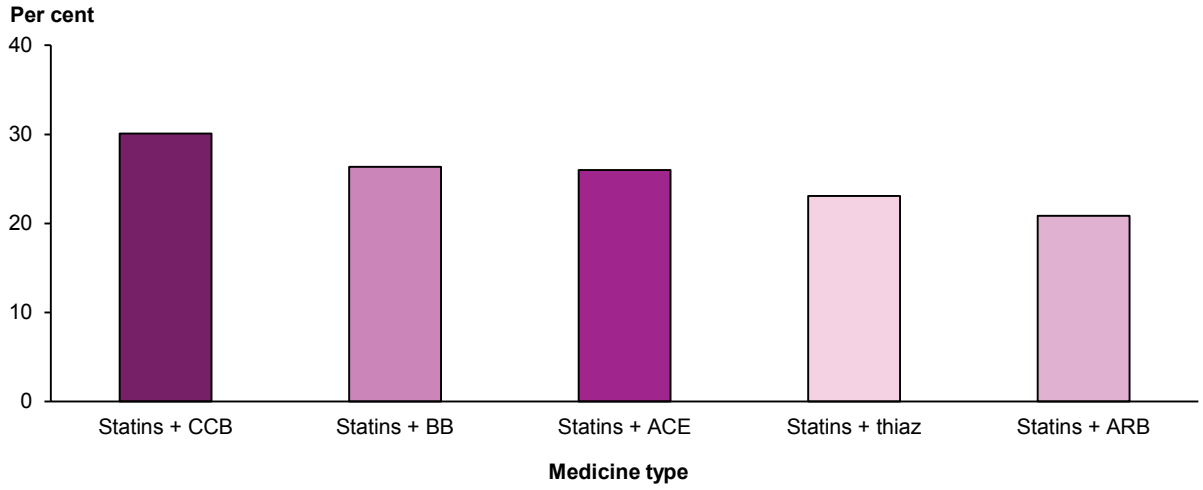
Supply of blood pressure lowering and blood lipid modifying agents

Multiple medicines can be supplied either to treat existing multiple conditions, or to prevent or delay these conditions from occurring. This section explores the supply of multiple medicines from blood pressure lowering and blood lipid modifying classes that took place anytime during the study period for the population cohort (325,579 people).

The supply of multiple medicines in this section is measured as a proportion of the population cohort with at least 1 claim for 2 or more medicines made during the study period. It is possible that a person claimed more than the 2 or 3 selected medicines, but less than 3% of the population cohort were supplied with 4 or more medicine classes across these two therapeutic groups (see Chapter 2 for further details). Multiple medicine patterns include people who might have switched or discontinued their medicines and the concurrent coverage of multiple medicines was not estimated in the analysis.

Overall supply

In 2012, around 2 in 3 (68%) of the population cohort were supplied with both blood pressure lowering medicines and blood lipid modifying medicines. The supply of statins with different types of blood pressure lowering agents ranged from 21% for ARBs to 30% for calcium channel blockers (Figure 4.11).



BB = beta blockers; CCB = calcium channel blockers; thiaz = thiazides/thiazide-like diuretics.

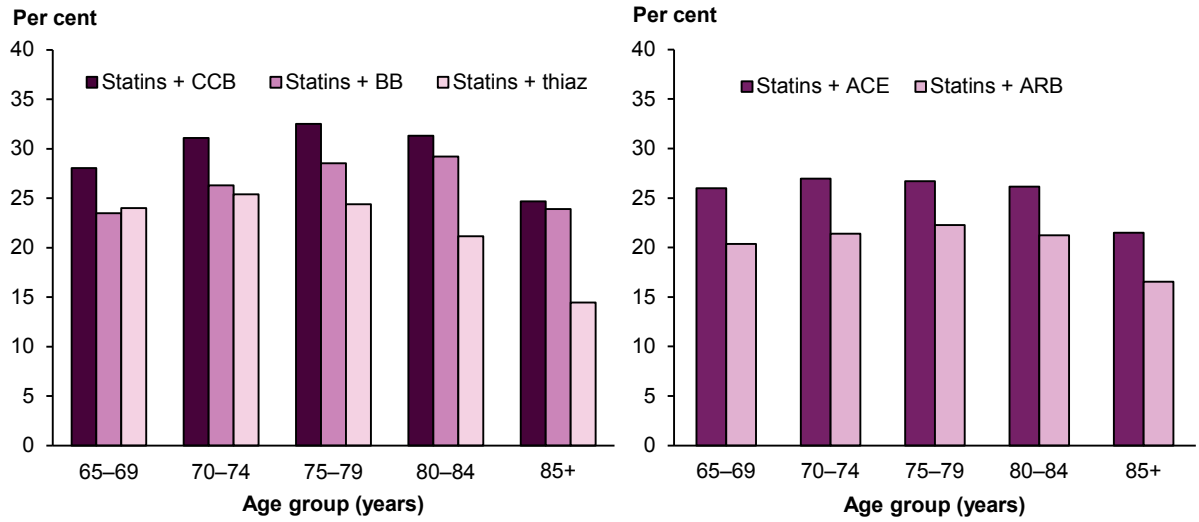
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B28).

Figure 4.11: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicine and statins, 2012

Supply by age

The supply of blood lipid modifying and blood pressure lowering agents in the population cohort varied by age. For example, the supply of statins and blood pressure lowering agents such as calcium channel blockers, ACE inhibitors or beta blockers was highest in the 75–79 age group and lowest for those aged 85 and over (Figure 4.12).



BB = beta blockers; CCB = calcium channel blockers; thiaz = thiazides/thiazide-like diuretics.

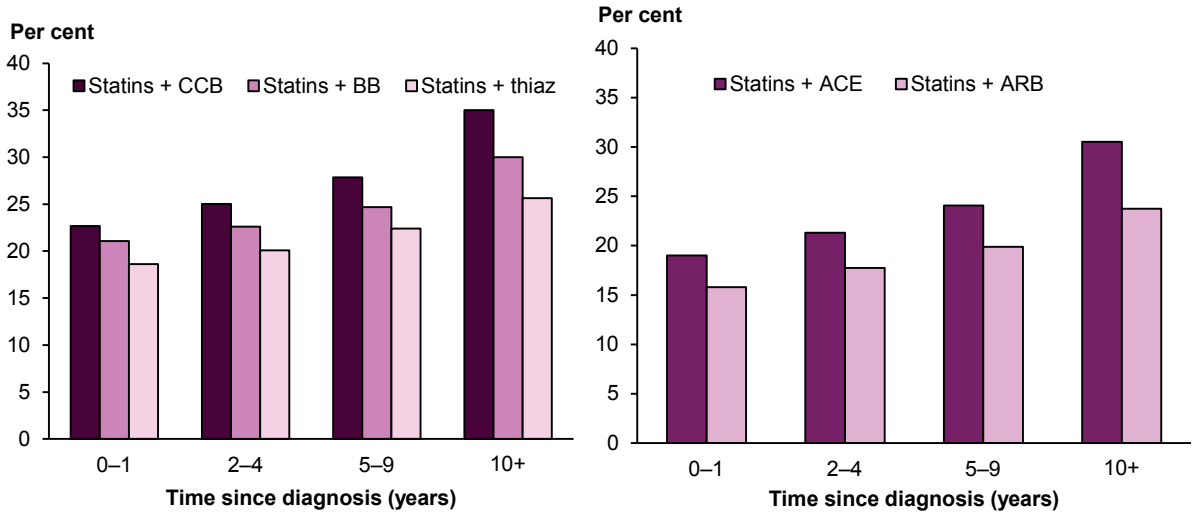
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B28).

Figure 4.12: People aged 65 and over with type 2 diabetes supplied with the most common pair of any 2 PBS-subsidised blood pressure lowering medicine and statins, by age group, 2012

Supply by time since diabetes diagnosis

Among the population cohort, those with a time since diagnosis of 10 years or more had higher supply rates for medicines to manage both blood pressure and lipid levels than those newly diagnosed. The supply of blood pressure lowering and blood lipid modifying agents was 1.4 times as high for those diagnosed with diabetes for 10 years or more as for those diagnosed with the condition for less than 2 years. The supply of statins and the most common pairs of blood pressure lowering agents showed the same general patterns (Figure 4.13).



BB = beta blockers; CCB = calcium channel blockers; thiaz = thiazides/thiazide-like diuretics.

Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B29).

Figure 4.13: People aged 65 and over with type 2 diabetes supplied with the most common pair of any 2 PBS-subsidised blood pressure lowering medicine and statins, by time since diabetes diagnosis, 2012

Anti-depressants, anti-psychotics and anti-dementia medicines

The relationship between depression and diabetes is complex. Several studies have shown that people with depression are at higher risk of developing type 2 diabetes and people with type 2 diabetes are at increased risk of developing depression (Berge et al. 2015; Brown et al. 2005; Mezuk et al. 2008; Pan et al. 2010; Waitzfelder et al. 2010). Depression can adversely affect the management and care of people with diabetes and the severity of diabetes and its complications (Bruce et al. 2016; Caughey et al. 2013). Depression may contribute to inadequate compliance with pharmacological therapy, poor diet, physical inactivity, poor glucose control, disability and lower quality of life, as well as independently increasing the risk of all-cause and cardiovascular mortality (IDF 2013; Petrak et. al 2015).

Treatment of depression with cognitive behavioural therapy and other psychological therapies or anti-depressants improves mood and function. Selective serotonin reuptake inhibitors (SSRIs) are usually recommended as first-line pharmacological treatment for depression in the general population as well as in the population with diabetes (IDF 2013; RANZCP 2009). Anti-depressants can also be used to manage other mental health conditions such as panic and other mood disorders (RANZCP 2009).

As well as treating symptoms of depression, some anti-depressant medicines may be prescribed to people with diabetes to manage pain associated with peripheral neuropathy. Anti-convulsant medicines are also considered at times for treating patients with painful diabetic peripheral neuropathy (RACGP 2014). Note that anti-convulsant medicines were not in the PBS extract obtained for analysis so they are not covered by this study.

Evidence also suggests that people with diabetes are at higher risk for dementia (Chatterjee et al. 2016). Anti-dementia medicines, anti-psychotics and anti-depressants can all be used to

manage the behavioural and psychological symptoms of dementia (Laver et al. 2016). Anti-psychotic medicines are used to manage a range of mental health and mood disorders, including schizophrenia and the behavioural symptoms of dementia in certain circumstances.

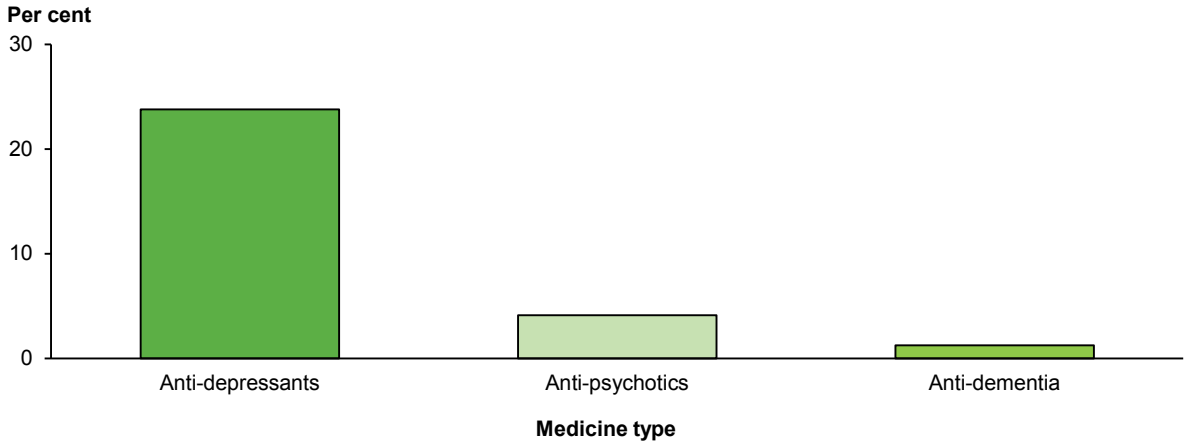
The medicines included in this study were:

- anti-depressants
- anti-dementia medicines
- anti-psychotics.

Overall supply

In 2012, 24% of the population cohort (325,579 people) was supplied with anti-depressants, 4.1% with anti-psychotics and 1.2% with anti-dementia medicines (Figure 4.14).

Of those supplied with anti-depressants, 44% were supplied with SSRIs, which are largely recommended for treating depression, and 35% were supplied with tricyclic anti-depressants (TCAs) that can also be used to treat neuropathic pain in diabetic patients (IDF 2013; RACGP 2014).



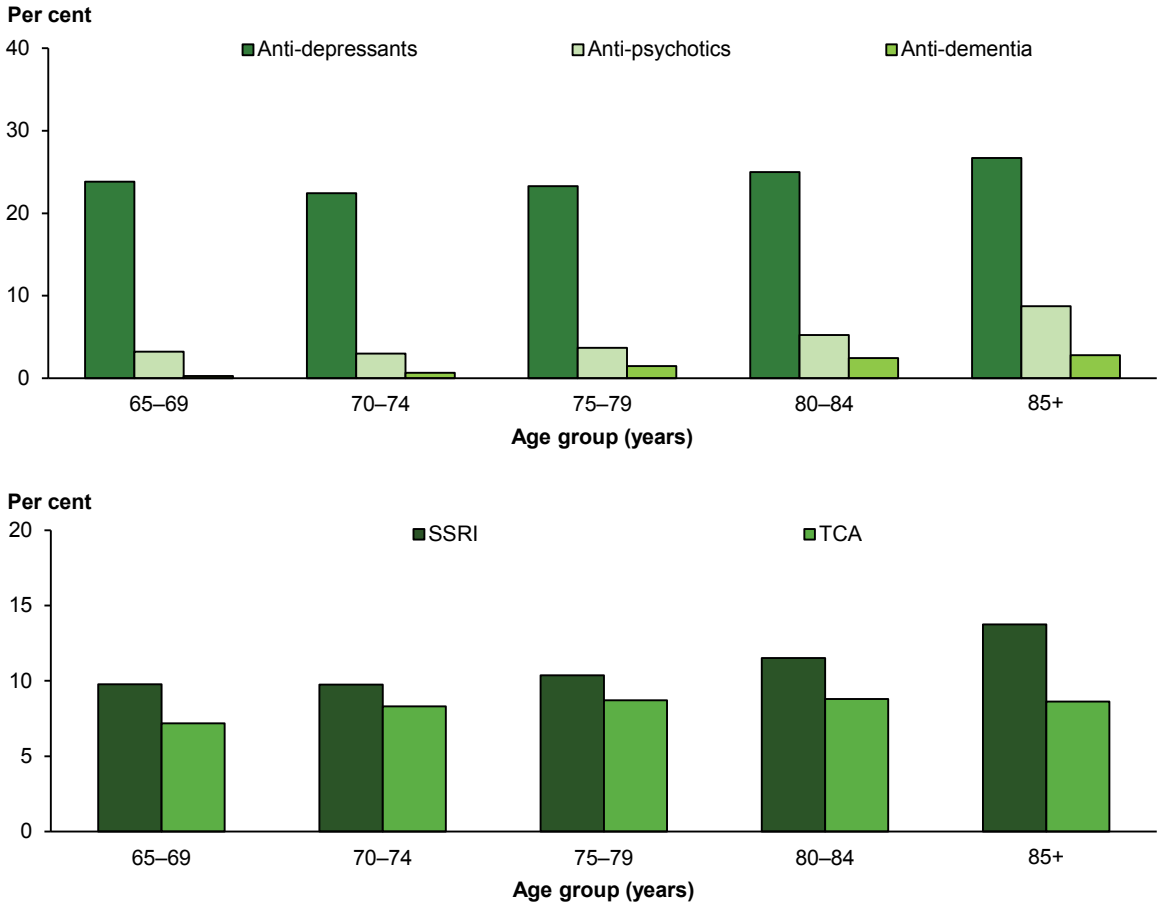
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B30).

Figure 4.14: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised anti-depressants, anti-psychotics and anti-dementia medicines, 2012

Supply by age

Among the population cohort, the supply of anti-psychotics was highest among those aged 85 and over (9%) and lowest in the younger age groups (around 3%). Anti-dementia medicine supply was very low in all age groups but highest in those aged 85 and over (2.8%). Similarly, the supply of anti-depressants, including SSRIs and TCAs, was relatively similar across all age groups (Figure 4.15) in the population cohort.



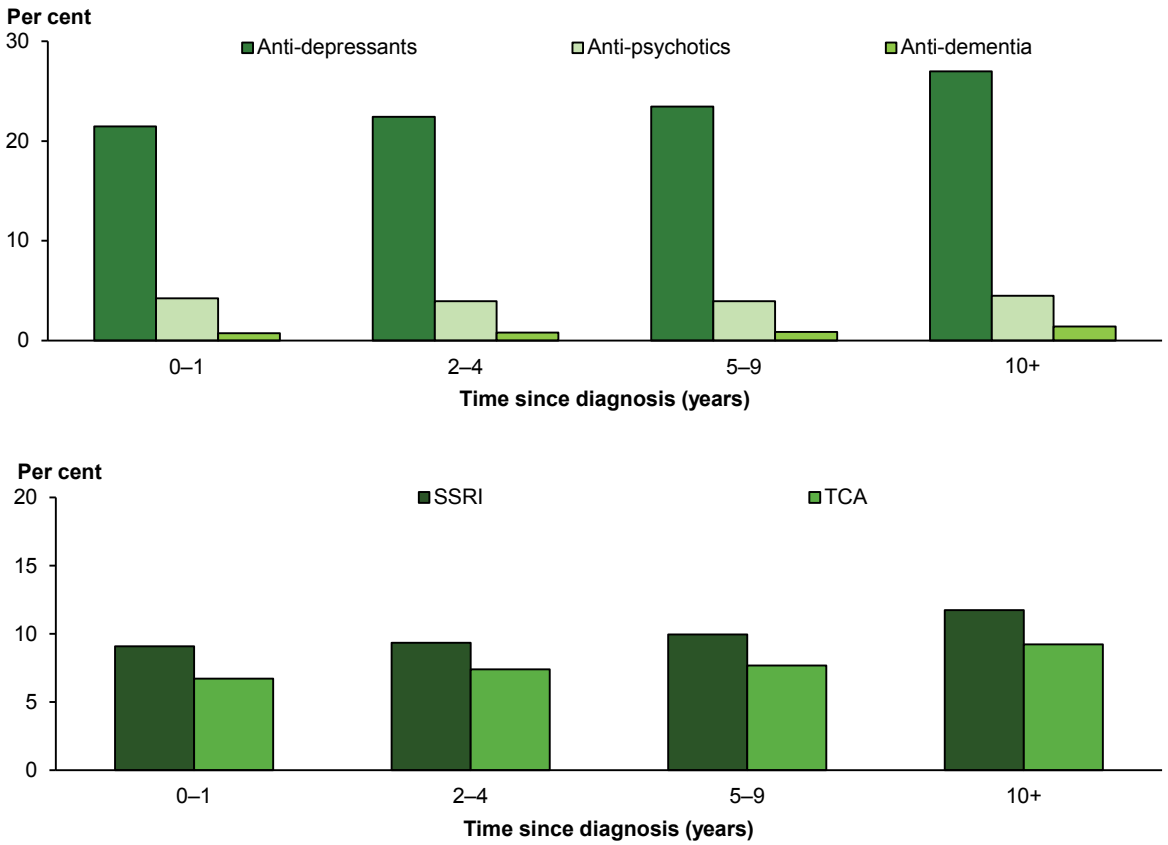
Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS-PBS linked data set (see Appendix Table B30).

Figure 4.15: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised anti-depressants, anti-psychotics and anti-dementia medicines, by age group, 2012

Supply by time since diabetes diagnosis

The supply of anti-depressants and anti-psychotics did not vary greatly by time since diabetes diagnosis in the population cohort (Figure 4.16). The only notable difference was the higher supply of anti-depressants for people who had been diagnosed with type 2 diabetes for 10 years or more compared with that for those newly diagnosed (26% and 21%, respectively). Similar patterns were observed for the two main types of anti-depressants examined: SSRIs and TCAs.



Note: Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix Table B31).

Figure 4.16: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised anti-depressants, anti-psychotics and anti-dementia medicines, by time since diabetes diagnosis, 2012

Selected eye disease medicines (ophthalmologicals)

Optimal control of blood glucose, blood lipid and blood pressure is critical to reduce the progression of diabetic eye disease. Existing national guidelines recommend that all people with diabetes have a dilated fundus and visual acuity assessment at diagnosis and every 2 years following diagnosis (NHMRC 2008).

The medicines for eye disease covered in this section include:

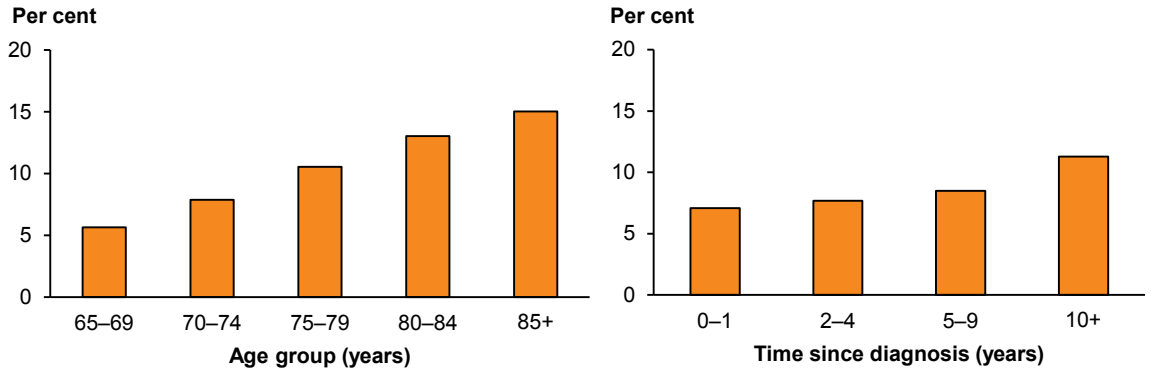
- anti-glaucoma preparations and miotics used to treat glaucoma and control ocular hypertension
- ocular vascular disorder agents used to treat age-related macular degeneration or any visual impairment due to macular oedema or secondary to retinal vein occlusion.

The National Health and Medical Research Council *Guidelines for the management of diabetic etinopathy* (NHMRC 2008) also recommend considering using intravitreal triamcinolone for diabetic macular oedema that persists after laser treatment (or in case of extensive macular hard exudate deposition), or as an adjunct to pan retinal photocoagulation for proliferative diabetic retinopathy. Note that triamcinolone was not in the PBS extract obtained for this analysis so it is not covered in this study.

Supply patterns

In 2012, 10% of the population cohort (325,579 people) were supplied with medicines to treat the selected eye diseases. Of these, almost all (94%) were supplied with anti-glaucoma agents. The supply of these medicines varied with age, from 6% among the 65–69 age group to 15% for those aged 85 and over (Figure 4.17).

The supply of eye disease medicines was also higher in people who had been diagnosed for 10 years or more than for those newly diagnosed (11% and 7%, respectively).



Notes

1. Includes only people who claimed subsidised medicines or NDSS products at a concessional rate for all claims between January 2009 and July 2013.
2. Includes selected ophthalmological medicines to treat glaucoma (ATC code S01E for anti-glaucoma preparation and miotics) or macular degeneration (ATC code S01L for ocular vascular disorder agents).

Source: AIHW analysis of the NDSS–PBS linked data set (see Appendix tables B30, B31).

Figure 4.17: People aged 65 and over with type 2 diabetes supplied with selected PBS-subsidised eye disease medicines, by age group and time since diabetes diagnosis, 2012

5 Discussion

The primary aim of this report is to provide a better understanding of the supply patterns of blood glucose lowering medicines and medicines for treating conditions commonly associated with diabetes among a concessional cohort of older Australians with type 2 diabetes. It describes how the supply of medicines varies across age groups and by time since diabetes diagnosis. This study linked pharmaceutical claim records from the PBS to the NDSS to obtain diabetes-related information, including diabetes type and time since diabetes diagnosis. This analysis is restricted to a specific cohort of people with type 2 diabetes, representing around three-quarters of all older people with type 2 diabetes in Australia, and a limited number of medicines. The findings presented in this report cannot be used to determine if the clinical guidelines for the management of diabetes and its associated conditions are being appropriately implemented because clinical information other than diabetes type and time since diabetes diagnosis was not available.

This study shows that, in Australia in 2012, of the concessional cohort of people aged 65 and over with type 2 diabetes (325,579 people), 85% were supplied with glucose lowering medicines; 15% had no recorded supply of glucose lowering treatment through the PBS, with many of these people likely to be managing their diabetes with lifestyle measures alone.

Supply of glucose lowering medicines

The use of glucose lowering therapy in older people with type 2 diabetes is complicated due to the progressive nature of diabetes and risks associated with ageing and comorbidity. There are several glucose lowering treatment regimens consisting of different combinations of diabetes medicines available in Australia. Each class of medicines has its own side effect profile. The benefits of glucose control need to be balanced with common contraindications in older age groups and associated risks such as hypoglycaemia.

This report found that the population cohort was mostly supplied with metformin (69%). Metformin is usually recommended as first-line therapy for older people with no contraindications (such as kidney impairment or heart failure) due to its low risk of hypoglycaemia. The results also show that metformin supply was lowest in people aged 85 and over. Contraindications for metformin are more likely to be observed in this age group due to decreased kidney function or the increased risk for this age group of developing other conditions that reduce kidney function further, such as heart attack, stroke, heart failure and pneumonia (Caughey et al. 2009; Kirkman et al. 2012).

Forty per cent (40%) of the population cohort in this study was supplied with sulfonylureas. Sulfonylureas are often the first-line therapy for individuals with contraindications to metformin and are the first choice as a second-line medicine added to metformin. In this study, supply of sulfonylureas was higher in the oldest age groups, possibly because the sulfonylurea was being used as an alternative in people with contraindications to metformin. Numerous studies have shown that sulfonylureas should be used with caution in frail older patients vulnerable to hypoglycaemia, as hypoglycaemia is a major side effect and even a mild episode of it may lead to adverse outcomes (IDF 2013; Lipska et al. 2015).

One in 5 of the population cohort was supplied with insulin (20%), with the supply being more common in people with a longer time since diabetes diagnosis. Usually, the addition of insulin to manage type 2 diabetes indicates intensification in diabetes treatment. This study

showed that 72% of the study population supplied with insulin were also supplied with 2 or more medications concurrently.

The results also suggest that people who had been diagnosed with diabetes for longer had a greater number of glucose lowering medicine types supplied, indicating more intensive treatment regimens. Dual therapy and triple therapy were less common in people aged 85 and over, who were more likely to be supplied monotherapy. The lower frequency of dual and triple therapy in the oldest age group could be due to several factors including simplification of therapy due to issues such as difficulties with polypharmacy and/or cognitive impairment, clinical preference for less tight glucose control, personal preference, or cost of medicines (Gellad et al. 2010; Horne 2006; Lipska et al. 2015; Noble 1998). Another factor may be consideration of the increasing cardiovascular disease risk that is associated with ageing. Evidence suggests that tight glucose control may not be appropriate in a person at high risk for cardiovascular disease, as intensive therapy may increase both all-cause mortality and cardiovascular mortality (Gerstein et al. 2008).

Supply of medicines for conditions associated with diabetes

Older people with type 2 diabetes are also at high risk of other conditions related to diabetes, such as cardiovascular disease, mental health disorders and eye disease. These conditions may require complex pharmacological treatment. This study has focused on the supply of blood pressure lowering and blood lipid modifying agents, anti-depressants, anti-psychotics, anti-dementia medicines and selected medicines to treat eye diseases.

This report found that, in 2012, the majority of the population cohort was supplied with blood pressure lowering agents (77%). Calcium channel blockers and ACE inhibitors were the most common blood pressure lowering agents, supplied to over one-third of the population cohort with type 2 diabetes (37% and 32%, respectively). Several studies have shown that blood pressure lowering treatment reduces the risk of diabetes-related retinopathy and kidney diseases and further lowers the risk of cardiovascular morbidity and mortality (Emdin et al. 2015; Halter et al. 2014).

The supply of blood pressure lowering medicines was generally similar across the age groups in the population cohort. However, the supply of thiazide/thiazide-like diuretics was lowest in the 85 and over age group and the supply of other diuretics highest in this age group, reflecting the higher rates of heart failure, coronary heart disease and peripheral oedema among the very old (Ramsay et al. 2011). Similarly, people who had been diagnosed with diabetes for longer were more likely to be supplied with blood pressure lowering agents, likely to be a result of the fact that the longer a person has diabetes the more likely they are to develop cardiovascular complications (Huang et al. 2014).

Almost three-quarters (74%) of the population cohort was supplied with blood lipid modifying agents, with 72% of the population cohort supplied with statins. Several studies have shown that lowering of blood lipid levels with statins can help reduce the relative cardiovascular disease risk for people with diabetes (Brugts et al. 2009; Chen et al. 2012; de Vries et al. 2014). The supply of statins was lower in people aged 85 and over with type 2 diabetes. This may reflect the fact that there is limited evidence for the benefits of statins among people aged over 80, as well as clinical decisions being based on the individual needs of the patient (IDF 2013). The supply of statins was higher in people with a longer time since diabetes diagnosis.

This study has shown that 2 in 3 (68%) of the population cohort was supplied with both blood pressure lowering and lipid modifying agents. The proportions of blood pressure lowering agents supplied in addition to statins ranged from 21% for ARBs to 30% for calcium channel blockers. The variation in choice of blood pressure lowering agents prescribed may be due to the clinical requirements of individual patients. It may also represent a shift towards more efficient treatment strategies, as shown by the more common supply of second-line blood pressure lowering agents (such as calcium channel blockers, which are recommended to be added if a monotherapy with ACE inhibitors fails).

As well as cardiovascular disease risk, older people with type 2 diabetes are exposed to an increased risk of depression and dementia (Berge et al. 2015; Brown et al. 2005; Mezuk et al. 2008; Pan et al. 2010; Strachan et al. 2008; Waitzfelder et al. 2010). Studies have shown that people with diabetes are more likely to have depression and anxiety than the general population (Atlantis et al. 2010; Berge et al. 2015; Bruce et al. 2016; IDF 2013). Further, in people with diabetes, treatment for depression has been found to be associated with non-compliance with anti-diabetic medicines (Caughey et al. 2013; Gentil et al. 2015).

This study has shown that, in 2012, almost 1 in 4 of the population cohort (24%) were supplied with anti-depressants and, of those, 44% were supplied with SSRIs and 35% with TCAs. Only a small proportion of people in the study were supplied with anti-psychotics and anti-dementia medicines (4% and 1%, respectively), with supply patterns highest in the 85 and over age group. These findings are most likely due to the increase in prevalence of dementia, and behavioural and psychological symptoms of dementia, in the oldest age groups (Liperoti et al. 2008; AIHW 2012).

Supply of medicines to older people

Among the population cohort, the supply of most of the medicines examined for conditions associated with diabetes were higher in the oldest age groups and in those with longer times since diabetes diagnosis. The few exceptions observed may reflect variation in the therapeutic strategies to simplify treatment in very old people with diabetes, as shown with the less common supply of statins in those aged 85 and older. As described earlier, therapeutic priorities for very old people with diabetes can shift towards less aggressive treatment goals for better quality of life, as perceived by both the patient and the doctor (Lipska et al. 2016).

Limitations of the study

In interpreting the results of this study, it is important to bear in mind the following limitations:

- The supply patterns were based on a concessional population cohort, which is more likely to include people from a lower socioeconomic group or who have poorer health than the general population with type 2 diabetes.
- Medicine prescription claims are proxies for medicine use but this study could not determine the actual use of medicines by individuals.
- Apart from time of diabetes diagnosis, no other clinical information on diabetes diagnosis, other coexisting conditions or health outcomes was available for this population cohort; therefore, the results in this study should not be used to infer appropriateness or effectiveness of care.

- The lack of diagnosis information in this study could result in misclassification of people, as some medicines can be used to treat multiple conditions (for instance anti-depressants, such as the TCAs, may be prescribed to treat depression or neuropathy). Given this limitation, the results in this study should not be used to infer presence of a condition based on medicine supply.

Despite its limitations, this study has demonstrated the power of data linkage to describe supply patterns of diabetes medicines, diabetes treatment regimens and other medicines for common conditions coexisting with diabetes in a specific population with type 2 diabetes. The findings underline the importance of extending the knowledge on the complex health profile of older people with diabetes and the supply of other medicines in relation to diabetes therapy.

What's missing?

Building on the current study, the limitations of this study could be potentially overcome by using more recent PBS data, which includes information on medications dispensed below the co-payment amount (which became available in early 2012). Inclusion, through data linkage, of other data sets such as Medicare Benefits Services data, disease registers, hospitalisations and deaths would provide additional valuable information on disease diagnosis, treatment and interaction with the health-care system. The implementation of the My Health Record currently underway also has the potential to serve as a source of information on the management of complex chronic diseases in the future, as it may provide a more complete patient profile.

Further work in this area could explore in more depth and for the general population the following topics:

- the supply patterns of medicines for conditions associated with diabetes, by diabetes treatment regimens
- disparities in medicine supply by sex, socioeconomic groups and geographical areas and across population groups (such as for Aboriginal and Torres Strait Islander people and populations from diverse cultural backgrounds)
- variation in adherence to diabetes medicines alone and in relation to other medicines used to treat or prevent conditions associated with diabetes
- the relationships between supply of diabetes medicines or other medicines and adverse health outcomes (such as hospitalisations and death)
- medicine supply patterns for people with type 1 diabetes and type 2 diabetes of all ages
- initiation patterns for insulin by all people with type 2 diabetes
- supply patterns of medicines not examined in this report, such as steroids and anti-thrombotics
- trends in medicine supply over time.

Conclusion

This study has highlighted some important aspects of the complex pharmacotherapy found in older people with type 2 diabetes and the diversity of medicine supply patterns in relation to age and time since diabetes diagnosis. As people with type 2 diabetes age, they face increasing cardiovascular disease risk as well as risks associated with the intensification of

their diabetes therapy. The lower supply of glucose lowering medicines and statins, plus the lower prevalence of triple therapy observed in those aged 85 and over with type 2 diabetes in this study, likely indicates the simplification of treatment to manage competing risks associated with all medicines and ageing.

As people age, their diabetes progresses and the risk of complications and comorbid conditions increases, including those related to interaction between pharmacological therapies. The ability to monitor these issues is currently limited by the absence of comprehensive diagnosis information. Further research into the areas described above, as well as using PBS data linked to other data sources, would improve our knowledge of this complex area, and may assist with policy development, health-care planning and service provision to improve the outcomes for people with diabetes in Australia.

Appendix A: Data sources and methods

Data sources

The primary data set for this project is an extract of prescription supply records from the PBS data set (data items shown in Table A1). The records chosen are those for diabetes products (insulin, oral anti-hyperglycaemics, glucose test strips) and other medications to treat conditions commonly associated with diabetes. The extract covers the period February 2009 to January 2014 and for all people who made a claim for a diabetes-related product during that period.

Secondary data sets included in the analysis are the purchase data records contained in the NDSS file of diabetes product (blood and urine glucose test strips) purchases for the period 1 July 2008 to 30 June 2013, and the NDSS file of demographic and disease information for all people registered with the scheme (outlined in Table A2).

Variables included in the PBS and NDSS data sets

Table A1: Description of requested PBS data items

Category	Data item	Description
Demographic	Date of birth	
	Sex	
	Patient postcode	
Prescription details	PBS item number	Product identifier
	Date of supply	Timing of supply
	Quantity	Volume of medicine supplied/quantity at each supply
	Number of prescriptions	If more than 1 filled for the same medication
	Payment category	Concessional status at time of supply

Table A2: Description of data items from the NDSS data set

Category	Data item	Description
Demographic	Date of birth	
	Sex	
	Postcode	Area of residence of user (not parent/carer)
	Date of registration	Registration date with the NDSS
	Date of diagnosis	
	Diabetes type	
	Date of first insulin injection	
	Date of first insulin-related product purchase	
	Insulin type—injection	
	Insulin type—pump	
	Month and year of death	
Purchase	Insulin required—doctor	Insulin required as advised by certifying health professional
	Line order date	Date of purchase
	Inventory posting group	Type of product (for example, blood glucose test strip)
	Quantity	Quantity of consumable at each supply
	Non-insulin injectable allowed	
	Concession type	Concessional status
	Contribution	Payment for product by purchaser or on purchaser's behalf

Data linkage

There are two commonly used methods in the data linkage process: deterministic and probabilistic linkage. Deterministic linkage is applied when there is one or several identifiers, such as Medicare numbers, that match completely between data sets. Probabilistic linkage involves the matching of partially identifying variables, such as name, age and sex. It is used when a unique identifier is not available. Agreement and disagreement weights for each variable are calculated according to standardised formulas. Links are accepted as true matches, or rejected based on predetermined weights thresholds. The probabilistic linkage method was used in this report.

Both the Department of Health Human Research Ethics Committee and the AIHW Ethics Committee approved this project.

Anatomical Therapeutic Chemical classification system

ATC of medicines included in this study

Table A3: Medicines for which prescription information was sought for people purchasing a drug used in diabetes, or a blood glucose monitoring strip, from the PBS

Condition	Medication group	Medication type	ATC code
Diabetes	Drug used in diabetes	Glucose lowering drugs; insulin and analogues	A10A
		Glucose lowering drugs; excluding insulin	A10B
	Diagnostic agents	Tests for diabetes	V04CA
		Urine tests	V04B
	Pancreatic hormones	Glycogenolytic hormones	H04AA
Cardiovascular disease	Anti-hypertensives		C02
	Diuretics		C03
	Beta blockers		C07
	Calcium channel blockers		C08
	Renin-angiotensin system agents		C09
	Lipid modifying medicines		C10
Eye disease	Ophthalmologicals	Anti-glaucoma preparations and miotics	S01E
		Ocular vascular disorder agents	S01L
Depression and neuropathy	Psychoanaleptics	Anti-depressants	N06A
		Anti-dementia	N06D
	Psycholeptics	Anti-psychotics	N05A

Blood glucose lowering medicines historical PBS listing

Table A4: Non-insulin blood glucose lowering medicines and date of PBS listing, 2000–2012

ATC codes	Generic name	Listing date
A10BB—Sulfonylureas		
A10BB12	Glimepiride	November 2000
A10BG—Thiazolidinediones		
A10BG02	Rosiglitazone maleate	November 2003
A10BG03	Pioglitazone hydrochloride	November 2003
A10BH—DPP4 inhibitors		
A10BH01	Sitagliptin	August 2008
A10BH02	Vildagliptin	August 2010
A10BH03	Saxagliptin	June 2011
A10BH05	Linagliptin	March 2012
A10BX—Other blood glucose lowering drugs, excl. insulins		
A10BX04	Exenatide	August 2010
A10BD—Combinations of oral blood glucose lowering drugs		
A10BD02	Metformin hydrochloride with glibenclamide	April 2005
A10BD03	Rosiglitazone maleate with metformin hydrochloride	December 2006
A10BD07	Sitagliptin with metformin hydrochloride	August 2009
A10BD08	Vildagliptin with metformin	April 2011

Note: Sodium-glucose transporter inhibitors have been recently introduced but are outside the scope of the supplied PBS data set (canagliflozin and capagliflozin—December 2013; empagliflozin—January 2015).

Source: PBS item histories provided by the Drug Utilisation Sub Committee Secretariat.

Pharmaceutical Benefits Scheme listing and restrictions

Table A5: Insulin and insulin analogues: restrictions and common use

Types	Generic names	Common use
Fast acting	Insulin aspart Insulin lispro Insulin glulisine Insulin neutral human Insulin neutral bovine	Injected before meal or delivered via insulin pumps
Intermediate acting	Insulin isophane human Insulin isophane bovine	Often injected with a fast-acting insulin (no need to be given with a meal)
Mixed (short-acting in combination with intermediate-acting)	Insulin isophane human + insulin neutral human Insulin lispro + insulin lispro protamine Insulin aspart + insulin aspart protamine	
Long-acting analogues	Insulin determir Insulin glargine	Injected once or twice a day and last up to 24 hours (no need to be given with a meal)

Source: NPS Medicinewise 2014.

Table A6: Oral blood glucose lowering medicines: mode of action

Medications	Generic names (date of PBS listing)	Mode of action	Comments
Biguanides	Metformin (May 1963)	Improve cell response to insulin Lower hepatic glucose production Delay intestinal absorption of glucose	Recommended first-line medication in type 2 diabetes, especially in those who are overweight Improves cardiovascular outcomes and reduces the overall death rate in people with type 2 diabetes Does not lead to weight gain and may help to manage weight
Sulfonylureas	Glibenclamide (August 1993) Gliclazide (August 1993) Glipizide (August 1993) Glimepiride (November 2000)	Stimulate insulin secretion	Used as first-line medication in type 2 diabetes if metformin not tolerated Low cost Higher risk of hypoglycaemia Can cause weight gain
Alpha-glucosidase inhibitors	Acarbose (November 1997)	Delay intestinal absorption of glucose	Second- or third-line line medication in type 2 diabetes Low cost Higher risk of gastrointestinal side effects
Thiazolidinediones	Pioglitazone (November 2003) Rosiglitazone (November 2003)	Improve cell response to insulin	Second- or third-line medication in type 2 diabetes Low risk of hypoglycaemia Higher risk of heart failure and bone fracture Can cause weight gain
DPP4 inhibitors	Alogliptin (October 2003) Sitagliptin (August 2008) Vildagliptin (August 2010) Saxagliptin (June 2011) Linagliptin (March 2012)	Lower hepatic glucose production Stimulate insulin secretion (only when blood glucose level is high)	Second- or third-line medication Long-term outcome data are lacking
Sodium-glucose transporter inhibitors	Canagliflozin (December 2013) Dapagliflozin (December 2013) Empagliflozin (January 2015)	Decrease renal reabsorption of glucose	Second- and third-line medication in type 2 diabetes Long-term outcome data are lacking
GLP-1 RA (injectable)	Exenatide (August 2010) Liraglutide (Not listed)	Lower hepatic glucose production Stimulate insulin secretion (only when blood glucose level is high) Slow down gastric emptying Reduce appetite	Second- or third-line medication in type 2 diabetes Long-term outcome data are lacking
Combined diabetes medications	Metformin + Glibenclamide Metformin + Rosiglitazone Sitagliptin + metformin Vildagliptin + metformin	Action of 2 different classes of medicine	
Diabetes medications in combination with lipid-lowering drugs	Simvastatin + Sitagliptin (delisted from the PBS on 1 April 2014)	Action of 2 different types of medicine	

Source: NPS Medicinewise 2014.

Analysis of selected medicine prescriptions under co-payment

Table A7: Glucose lowering medicines supplied and subsidised through the PBS/RPBS, Australia, 2011[a]

Drug type	% PBS/RPBS[b] (included in data extract)	% non-subsidised (not included in data extract)
Insulin and analogues		
Fast-acting	99	1
Intermediate-acting	87	13
Intermediate-acting combined with fast-acting	99	1
Long-acting	99	1
Blood glucose lowering drugs		
Biguanides		
Metformin hydrochloride	77	23
Sulfonamides urea derivatives	81	19
Glibenclamides	78	22
Glicazides	82	18
Glimepiride	80	20
Glipizide	83	17
Alpha glucosidase inhibitors		
Acarbose	97	3
Thiazolidinediones		
Pioglitazone hydrochloride	100	0
Rosiglitazone	99	1
DPP4 inhibitors	99	1
Saxagliptin	98	2
Sitagliptin	99	1
Vildagliptin	99	1
Other blood glucose lowering drugs		
Exanitide	97	3
Repaglinide	0	100

(a) These utilisation data do not include a large proportion of public hospital drug usage, over-the-counter purchases (except for S3 Recordable), or the supply of highly specialised drugs to outpatients through public hospitals under Section 100 of the *National Health Act 1953*. Some extemporaneously prepared items may also not be included.

(b) The PBS extract for this study does not include prescriptions claimed under the RPBS; however, these represent a small proportion (about 5%) of total prescriptions claimed.

Source: Australian statistics on medicines 2011 <http://www.pbs.gov.au/info/statistics/asm/asm-2011>.

Table A8: Prescriptions for glucose lowering medicines[a] supplied through the PBS by patient category, Australia, 2012–13[b]

Patient category	Number of prescriptions	%
Concessional	6,827,985	67.1
General	1,119,184	11.0
RPBS	250,323	2.4
Under co-payment	1,938,617	19.1
Closing-the-gap under co-payment	37,335	0.4
Prescriber bag (‘doctor's bag’)	0	0.0
Total	**10,173,444**	**100.0**

(a) Glucose lowering drugs; insulins and analogues (ATC code A10A) and glucose lowering drugs; Excluding insulin (ATC code A10B).

(b) By date of supply.

Source: Analysis based on PBS and RPBS Scheme Section 85 supply data, Department of Health, <www.pbs.gov.au>.

Table A9: Prescriptions for metformin[a] supplied through the PBS by patient category, Australia, 2012–13[b]

Patient category	Number of prescriptions	%[c]
Concessional	3,259,519	66.1
General	137,461	2.8
RPBS	115,705	2.3
Under co-payment	1,392,761	28.2
Closing-the-gap under co-payment	25,833	0.5
Prescriber bag (‘doctor's bag’)	0	0.0
Total	**4,931,276**	**100.0**

(a) PBS item codes: 01801T, 02430X, 03439B, 08607B, 08884N, 09435N.

(b) By date of supply.

(c) % column may not add to 100 due to rounding.

Source: Analysis based on PBS and RPBS Section 85 supply data, Department of Health, <www.pbs.gov.au>.

Glucose lowering treatment regimens: sensitivity analysis

Additional sensitivity analysis was performed to determine the impact of using different methods to define glucose lowering treatment regimens in the study cohort.

The methodology employed here is different from that used in other studies in two main respects:

1. It used the most intensive regimen to capture most of the medicines supplied in 2012 and to ensure consistency with year prevalence estimates used in other sections of this report. Other studies examining medicine supply have used time point estimates or last treatment regimen during the study period, which provides more conservative estimations.
2. It used a median interval (50%) between prescriptions dispensed as the SCD to reduce overestimation of dual therapy and triple therapy. Some studies have used a 75% interval between prescriptions as the SCD, providing less conservative estimations.

The results from the current approach were compared with methods using:

- the most intensive regimen, with 75% interval between prescriptions as the SCD
- the last treatment regimen in 2012,with both median and 75% intervals between prescriptions as the SCD
- the treatment regimen in mid-2012 (as at 30 June 2012), with both median and 75% intervals between prescriptions as the SCD.

Table A10 presents the results using these methods:

- Using the most intensive regimen, with 75% intervals between prescriptions as the SCD, produced the highest proportions of dual and triple therapy.
- The mid-year point estimation, with median intervals between prescriptions as the SCD, resulted in a high proportion in the 'not-treated' category (28% compared with 15%–20% for the other methods).
- The last treatment regimen method, with median intervals between prescriptions as the SCD, produced a higher proportion of monotherapy (8 percentage points higher) and slightly lower proportions of dual and triple therapy (3–4 percentage points lower), compared with the current method.
- The last treatment regimen and mid-year point estimations, with 75% intervals between prescriptions as the SCD, produced relatively similar results to the current method, particularly for dual and triple therapy.

Each of these methods outlined have some limitations. Using the most intensive treatment regimen with a less conservative SCD interval (75%) might bias the estimations towards dual and triple therapy. When using the median (50%) interval between prescriptions as the SCD, the time-point estimation might bias the results towards no treatment, and the last treatment regimen might underestimate dual and triple therapy.

The method used in this report may provide a better proxy for the most intensive treatment regimen that was prescribed to a patient during the study period.

Table A10: Sensitivity analysis of the methods to define glucose lowering treatment regimens

Treatment regimen	Most intensive regimen (current method)		Last treatment regimen		Mid-year treatment regimen (at 30 June 2012)	
	Number	%	Number	%	Number	%
	Median (50%) interval between prescriptions as the SCD					
Mono	130,638	40	156,451	48	122,341	38
Dual	108,638	33	97,408	30	90,341	28
Triple	34,819	11	24,215	7	20,828	6
Triple+	2,479	1	876	0	861	0
Not treated	49,005	15	46,629	15	91,779	28
	A period that 75% of prescriptions refilled as the SCD					
Mono	121,004	37	140,410	43	125,549	39
Dual	110,027	34	106,312	33	102,836	32
Triple	40,207	12	30,502	9	28,208	9
Triple+	5,429	2	2119	1	1955	1
Not treated	48,912	15	46,236	15	67,031	20

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. The mid-year population cohort was used as the denominator.

Source: AIHW analysis of PBS–NDSS linked data.

Appendix B: Detailed statistical tables

Table B1: Numbers of concessional NDSS registrants compared with all NDSS registrants, by diabetes type and age group

Age group (years)	Type 1 diabetes			Type 2 diabetes		
	Concessional	NDSS registrants	% concessional	Concessional	NDSS registrants	% concessional
0–9	1,551	2,182	71	6	15	46
10–14	2,907	3,967	73	66	129	51
15–19	2,241	5,545	40	226	613	37
20–24	1,160	6,013	19	517	1,418	36
25–29	989	6,351	16	1,119	3,251	34
30–34	1,074	6,446	17	2,254	7,372	31
35–39	1,353	7,210	19	4,636	16,180	29
40–44	1,602	8,200	20	8,564	31,738	27
45–49	1,879	8,769	21	13,251	50,963	26
50–54	2,084	8,683	24	19,535	73,688	27
55–59	2,554	7,895	32	29,931	97,067	31
60–64	3,977	8,335	48	51,654	121,168	43
65–69	5,991	8,118	74	84,939	120,742	70
70–74	6,524	7,679	85	86,831	106,287	82
75–79	5,920	6,978	85	71,907	86,139	83
80–84	4,166	5,399	77	50,681	62,617	81
85+	2,405	5,064	47	29,613	43,878	67

Sources: AIHW analysis of the NDSS–PBS linked data set; NDSS registrant data set.

Table B2: Characteristics of the population cohort, 2012

	January 2012		December 2012		Mid-year 2012	
Characteristics	**Number**	**%**	**Number**	**%**	**Number**	**%**
Sex						
Male	162,513	50.2	163,596	50.0	163,055	50.1
Female	161,458	49.8	163,591	50.0	162,525	49.9
Age group (years)						
65–69	84,939	26.2	70,662	21.6	77,801	23.9
70–74	86,831	26.8	91,367	27.9	89,099	27.4
75–79	71,907	22.2	76,625	23.4	74,266	22.8
80–84	50,681	15.6	54,386	16.6	52,534	16.1
85+	29,613	9.1	34,147	10.4	31,880	9.8
Time since diabetes diagnosis (years)						
0–1	35,749	11.0	32,659	10.0	34,204	10.5
2–4	58,535	18.1	55,835	17.1	57,185	17.6
5–9	85,577	26.4	85,142	26.0	85,360	26.2
10+	144,084	44.5	153,527	46.9	148,806	45.7
Died during 2012						
No	309,677	95.6	. .	. .	. .	. .
Yes	14,294	4.4	. .	. .	. .	. .
Registered during 2012			. .	. .	. .	. .
No	. .	. .	309,677	94.6	. .	. .
Yes	. .	. .	17,510	5.4	. .	. .
Total	**323,971**		**327,187**		**325,579**	

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. Per cent column may not add to 100 due to rounding.

. . not applicable.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B3: Age distribution of the population cohort by time since diabetes diagnosis, 2012

	Time since diagnosis (years)			
Age group (years)	**0–1**	**2–4**	**5–9**	**10+**
		Number		
65–69	9,981	15,887	21,564	30,364
70–74	9,735	16,479	23,942	38,935
75–79	7,248	12,209	19,060	35,744
80–84	4,519	7,928	13,132	26,953
85+	2,722	4,684	7,663	16,810
Total	**34,204**	**57,185**	**85,360**	**148,806**
		%		
65–69	29	28	25	20
70–74	28	29	28	26
75–79	21	21	22	24
80–84	13	14	15	18
85+	8	8	9	11

Note: Per cent column may not add to 100 due to rounding.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B4: Number of days between prescriptions for people with type 2 diabetes and aged 65 or over, by glucose lowering medicine class, between July 2011 and June 2013

	Days between prescriptions			
Medicines	**Mean**	**Median**	**Mode**	**75%**
Metformin	44	34	28	52
Sulfonylureas	42	31	28	49
Metformin + sulfonylureas	36	29	21	42
Acarbose	37	30	28	43
Glitazones	30	28	28	32
Metformin + glitazones	33	29	28	35
DPP4 inhibitor	31	28	28	33
Metformin + DPP4 inhibitor	32	28	28	34
Exenatide	32	30	28	35
Insulin	98	81	56	133

Note: Based on PBS claims of the study population that had 2 or more claims of each medicine class over a 12-month exposure period between July 2011 and June 2013.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B5: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, 2012

Glucose lowering medicine class	Number	%
Metformin	225,906	69
Sulfonylureas	131,507	40
Insulin	65,778	20
DPP4 inhibitor	41,057	13
Glitazones	14,930	5
Acarbose	2,983	1
Exenatide	2,782	1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. A person can be supplied with more than 1 type of medicine, and, as such, the proportions presented are not mutually exclusive and do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B6: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, by age group, 2012

	Age group (years)				
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
			Number		
Metformin	59,706	66,212	51,242	32,705	16,041
Sulfonylureas	29,339	35,502	30,588	22,563	13,515
Acarbose	733	877	701	470	202
Glitazones	4,044	4,632	3,455	1,972	827
DPP4 inhibitor	11,813	12,258	9,041	5,442	2,503
Exenatide	1,261	999	396	110	16
Insulin	16,860	18,527	14,884	9,951	5,556
			%		
Metformin	76.7	74.3	69.0	62.3	50.3
Sulfonylureas	37.7	39.8	41.2	42.9	42.4
Acarbose	0.9	1.0	0.9	0.9	0.6
Glitazones	5.2	5.2	4.7	3.8	2.6
DPP4 inhibitor	15.2	13.8	12.2	10.4	7.9
Exenatide	1.6	1.1	0.5	0.2	0.1
Insulin	21.7	20.8	20.0	18.9	17.4

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. A person can be supplied with more than 1 type of medicine, and, as such, the proportions presented are not mutually exclusive and do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B7: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised glucose lowering medicines, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)			
Medicines	**0–1**	**2–4**	**5–9**	**10+**
			Number	
Metformin	21,195	35,955	57,654	111,084
Sulfonylureas	8,055	15,445	31,126	76,866
Acarbose	158	252	545	2,026
Glitazones	573	1,202	2,896	10,257
DPP4 inhibitor	2,959	5,612	10,624	21,856
Exenatide	181	232	544	1,825
Insulin	2,851	5,321	10,662	46,937
			%	
Metformin	62.0	62.9	67.5	74.7
Sulfonylureas	23.5	27.0	36.5	51.7
Acarbose	0.5	0.4	0.6	1.4
Glitazones	1.7	2.1	3.4	6.9
DPP4 inhibitor	8.7	9.8	12.4	14.7
Exenatide	0.5	0.4	0.6	1.2
Insulin	8.3	9.3	12.5	31.5

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. A person can be supplied with more than 1 type of medicine, and, as such, the proportions presented are not mutually exclusive and do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B8: Characteristics of people aged 65 and over with type 2 diabetes who started treatment with PBS-subsidised blood glucose lowering medicines in 2012

Characteristics	Number	%
Age group		
65–69	4,528	31.0
70–74	4,082	27.9
75–79	3,037	20.8
80–84	1,887	12.9
85+	1,089	7.4
Time since diabetes diagnosis (years)		
0–1	6,777	46.4
2–4	2,322	15.9
5–9	3,002	20.5
10+	2,520	17.2
Initial medicines		
Metformin	11,542	78.9
Sulfonylureas	1,599	10.9
Insulin	561	3.8
Metformin + sulfonylureas	460	3.1
Metformin + DPP4 inhibitor	174	1.2
DPP4 inhibitor	117	0.8
Metformin + insulin	88	0.6

Note: Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013 and with no claim for diabetes medicines in the previous 12 months.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B9: People aged 65 and over with type 2 diabetes who started treatment with PBS-subsidised blood glucose lowering medicine, by medicine type and age group, 2012

	Age group (years)				
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
			Number		
Metformin	3,751	3,375	2,425	1,357	634
Sulfonylureas	329	353	329	315	273
Insulin	109	138	127	103	84
Metformin + sulfonylureas	174	107	83	57	39
Metformin + DPP4 inhibitor	73	40	36	15	10
DPP4 inhibitor	38	22	17	20	20
Metformin + insulin	36	27	9	8	8
Other	18	20	11	12	21
			%		
Metformin	82.8	82.7	79.8	71.9	58.2
Sulfonylureas	7.3	8.6	10.8	16.7	25.1
Insulin	2.4	3.4	4.2	5.5	7.7
Metformin + sulfonylureas	3.8	2.6	2.7	3.0	3.6
Metformin + DPP4 inhibitor	1.6	1.0	1.2	0.8	0.9
DPP4 inhibitor	0.8	0.5	0.6	1.1	1.8
Metformin + insulin	0.8	0.7	0.3	0.4	0.7
Other	0.4	0.5	0.4	0.6	1.9

Note: Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013 and with no claim for diabetes medicines in the previous 12 months.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B10: People aged 65 and over with type 2 diabetes who started treatment with PBS-subsidised blood glucose lowering medicine, by medicine type and time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)			
Medicines	**0–1**	**2–4**	**5–9**	**10+**
		Number		
Metformin	5,631	1,869	2,386	1,656
Sulfonylureas	491	258	358	492
Insulin	175	63	90	131
Metformin + sulfonylureas	280	66	82	132
Metformin + DPP4 inhibitor	33	20	28	36
DPP4 inhibitor	75	29	33	37
Metformin + insulin	65	6	9	8
Other	27	11	16	28
		%		
Metformin	83.1	80.5	79.5	65.7
Sulfonylureas	7.2	11.1	11.9	19.5
Insulin	4.1	2.8	2.7	5.2
Metformin + sulfonylureas	2.6	2.7	3.0	5.2
Metformin + DPP4 inhibitor	0.5	0.9	0.9	1.4
DPP4 inhibitor	1.1	1.2	1.1	1.5
Metformin + insulin	1.0	0.3	0.3	0.3
Other	0.4	0.5	0.5	1.1

Note: Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013 and with no claim for diabetes medicines in the previous 12 months.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B11: People aged 65 and over with type 2 diabetes, by glucose lowering treatment regimen, by age group and time since diabetes diagnosis, 2012

	Treatment regimen					
	Mono		Dual		Triple	
	Number	%	Number	%	Number	%
Age group (years)						
65–69	29,435	37.8	27,172	34.9	10,224	13.1
70–74	34,462	38.7	30,943	34.7	10,906	12.2
75–79	30,155	40.6	24,875	33.5	7,664	10.3
80–84	22,530	42.9	16,548	31.5	4,268	8.1
85+	14,056	44.1	8,310	26.1	1,739	5.5
Time since diabetes diagnosis (years)						
0–1	16,399	47.9	5,645	16.5	1,579	4.6
2–4	26,231	45.9	12,553	22.0	2,940	5.1
5–9	37,410	43.8	24,911	29.2	6,509	7.6
10+	50,590	34.0	64,729	43.5	23,768	16.0
Total	**130,638**	**40.1**	**107,848**	**33.1**	**34,801**	**10.7**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. Data for people who did not have any PBS claim for glucose lowering medication in 2012 are not presented in the table, and, as such, the proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B12: People aged 65 and over with type 2 diabetes in each glucose lowering treatment regimen, by medicine type, 2012

	Treatment regimen					
Medicines	Mono		Dual		Triple	
	Number	%	Number	%	Number	%
Metformin	90,549	27.8	100,074	30.7	34,882	10.7
Sulfonylureas	25,757	7.9	69,635	21.4	32,660	10.0
Insulin	17,320	5.3	26,980	8.3	15,650	4.8
DPP4 inhibitor	1,149	0.4	22,935	7.0	13,830	4.2
Glitazones	311	0.1	3,898	1.2	9,390	2.9

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common glucose lowering medicine types. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B13: People aged 65 and over with type 2 diabetes, by medicine type for each treatment regimen, 2012

Treatment regimen	Number	%
Mono		
Metformin	90,549	27.8
Sulfonylureas	25,757	7.9
Insulin	17,320	5.3
Dual		
Metformin + sulfonylureas	57,207	17.6
Metformin + insulin	22,295	6.8
Metformin + DPP4 inhibitor	17,913	5.5
Sulfonylureas + insulin	5,404	1.7
Sulfonylureas + DPP4 inhibitor	5,022	1.5
Triple		
Metformin + sulfonylureas + insulin	11,220	3.4
Metformin + sulfonylureas + DPP4 inhibitor	9,784	3.0
Metformin + sulfonylureas + glitazones	7,627	2.3
Metformin + DPP4 inhibitor + insulin	2,118	0.7
Metformin + sulfonylureas + exenatide	1,160	0.4

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common treatment regimens. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B14: People aged 65 and over with type 2 diabetes with common medicine types for monotherapy, by age group, 2012

	Age group (years)					
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Metformin	22,960	25,802	20,687	13,772	7,328	**90,549**
Sulfonylureas	3,649	5,248	6,021	5,920	4,919	**25,757**
Insulin	3,371	4,147	4,148	3,400	2,254	**17,320**
DPP4 inhibitor	237	300	251	213	148	**1,149**
Glitazones	79	78	74	51	29	**311**
			%			
Metformin	29.5	29.0	27.9	26.2	23.0	**27.8**
Sulfonylureas	4.7	5.9	8.1	11.3	15.4	**7.9**
Insulin	4.3	4.7	5.6	6.5	7.1	**5.3**
DPP4 inhibitor	0.3	0.3	0.3	0.4	0.5	**0.4**
Glitazones	0.1	0.1	0.1	0.1	0.1	**0.1**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for monotherapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B15: People aged 65 and over with type 2 diabetes with common medicine types for monotherapy, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)			
Medicines	**0–1**	**2–4**	**5–9**	**10+**
		Number		
Metformin	13,778	21,170	27,823	27,772
Sulfonylureas	2,377	4,068	7,434	11,877
Insulin	612	1,438	2,935	12,334
DPP4 inhibitor	174	224	321	430
Glitazones	12	45	74	180
		%		
Metformin	40.3	37.0	32.6	18.7
Sulfonylureas	6.9	7.1	8.7	8.0
Insulin	1.8	2.5	3.4	8.3
DPP4 inhibitor	0.5	0.4	0.4	0.3
Glitazones	0.0	0.1	0.1	0.1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for monotherapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B16: People aged 65 and over with type 2 diabetes with common medicine types for dual therapy, by age group, 2012

	Age group (years)				
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
			Number		
Metformin + sulfonylureas	13,134	16,075	13,489	9,558	4,951
Metformin + insulin	6,685	6,850	4,973	2,714	1,073
Metformin + DPP4 inhibitor	5,635	5,565	3,782	2,125	806
Sulfonylureas + insulin	893	1,235	1296	1151	829
Sulfonylureas + DPP4 inhibitor	899	1,218	1,282	1,002	621
Metformin + glitazones	608	681	498	272	102
Sulfonylureas + glitazones	321	430	457	336	193
Metformin + exenatide	205	120	47	13	3
			%		
Metformin + sulfonylureas	16.9	18.0	18.2	18.2	15.5
Metformin + insulin	8.6	7.7	6.7	5.2	3.4
Metformin + DPP4 inhibitor	7.2	6.2	5.1	4.0	2.5
Sulfonylureas + insulin	1.1	1.4	1.7	2.2	2.6
Sulfonylureas + DPP4 inhibitor	1.2	1.4	1.7	1.9	1.9
Metformin + glitazones	0.8	0.8	0.7	0.5	0.3
Sulfonylureas + glitazones	0.4	0.5	0.6	0.6	0.6
Metformin + exenatide	0.3	0.1	0.1	0.0	0.0

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for dual therapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B17: People aged 65 and over with type 2 diabetes with common medicine types for dual therapy, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)			
Medicines	**0–1**	**2–4**	**5–9**	**10+**
		Number		
Metformin + sulfonylureas	3,100	6,770	14,010	33,323
Metformin + insulin	561	1,623	3,216	16,894
Metformin + DPP4 inhibitor	1,492	3,055	5,417	7,948
Sulfonylureas + insulin	276	506	966	3,655
Sulfonylureas + DPP4 inhibitor	317	654	1,273	2,775
Metformin + glitazones	81	220	576	1,284
Sulfonylureas + glitazones	63	134	379	1,161
Metformin + exenatide	33	46	87	222
		%		
Metformin + sulfonylureas	9.1	11.8	16.4	22.4
Metformin + insulin	1.6	2.8	3.8	11.4
Metformin + DPP4 inhibitor	4.4	5.3	6.3	5.3
Sulfonylureas + insulin	0.8	0.9	1.1	2.5
Sulfonylureas + DPP4 inhibitor	0.9	1.1	1.5	1.9
Metformin + glitazones	0.2	0.4	0.7	0.9
Sulfonylureas + glitazones	0.2	0.2	0.4	0.8
Metformin + exenatide	0.1	0.1	0.1	0.1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for dual therapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B18: People aged 65 and over with type 2 diabetes with common medicine types for triple therapy, by age group, 2012

	Age group (years)				
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
			Number		
Metformin + sulfonylureas + insulin	3,301	3,537	2,433	1,381	568
Metformin + sulfonylureas + DPP4 inhibitor	2,931	2,987	2,200	1,181	485
Metformin + sulfonylureas + glitazones	2,132	2,421	1,757	966	351
Metformin + DPP4 inhibitor + insulin	726	664	428	211	89
Metformin + sulfonylureas + exenatide	524	437	153	43	3
Metformin + sulfonylureas + acarbose	247	338	277	210	81
Metformin + glitazones + insulin	242	230	144	65	18
Sulfonylureas + DPP4 inhibitor + insulin	158	218	201	147	106
Metformin + glitazones + DPP4 inhibitor	140	150	79	34	13
Sulfonylureas + glitazones + insulin	57	93	62	55	26
			%		
Metformin + sulfonylureas + insulin	4.2	4.0	3.3	2.6	1.8
Metformin + sulfonylureas + DPP4 inhibitor	3.8	3.4	3.0	2.2	1.5
Metformin + sulfonylureas + glitazones	2.7	2.7	2.4	1.8	1.1
Metformin + DPP4 inhibitor + insulin	0.9	0.7	0.6	0.4	0.3
Metformin + sulfonylureas + exenatide	0.7	0.5	0.2	0.1	0.0
Metformin + sulfonylureas + acarbose	0.3	0.4	0.4	0.4	0.3
Metformin + glitazones + insulin	0.3	0.3	0.2	0.1	0.1
Sulfonylureas + DPP4 inhibitor + insulin	0.2	0.2	0.3	0.3	0.3
Metformin + glitazones + DPP4 inhibitor	0.2	0.2	0.1	0.1	0.0
Sulfonylureas + glitazones + insulin	0.1	0.1	0.1	0.1	0.1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for triple therapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B19: People aged 65 and over with type 2 diabetes with common medicine types for triple therapy, by time since diabetes diagnosis, 2012

	Time since diagnosis (years)			
Medicines	**0–1**	**2–4**	**5–9**	**10+**
		Number		
Metformin + sulfonylureas + insulin	474	926	1,832	7,988
Metformin + sulfonylureas + DPP4 inhibitor	510	948	2,193	6,133
Metformin + sulfonylureas + glitazones	305	578	1,335	5,407
Metformin + DPP4 inhibitor + insulin	103	181	374	1,460
Metformin + sulfonylureas + exenatide	81	85	236	758
Metformin + sulfonylureas + acarbose	60	78	184	830
Metformin + glitazones + insulin	15	32	89	562
Sulfonylureas + DPP4 inhibitor + insulin	75	78	165	511
Metformin + glitazones + DPP4 inhibitor	18	45	110	243
Sulfonylureas + glitazones+ insulin	11	25	53	204
		%		
Metformin + sulfonylureas + insulin	1.4	1.6	2.1	5.4
Metformin + sulfonylureas + DPP4 inhibitor	1.5	1.7	2.6	4.1
Metformin + sulfonylureas + glitazones	0.9	1.0	1.6	3.6
Metformin + DPP4 inhibitor + insulin	0.3	0.3	0.4	1.0
Metformin + sulfonylureas + exenatide	0.2	0.1	0.3	0.5
Metformin + sulfonylureas + acarbose	0.2	0.1	0.2	0.6
Metformin + glitazones + insulin	0.0	0.1	0.1	0.4
Sulfonylureas + DPP4 inhibitor + insulin	0.2	0.1	0.2	0.3
Metformin + glitazones + DPP4 inhibitor	0.1	0.1	0.1	0.2
Sulfonylureas + glitazones + insulin	0.0	0.0	0.1	0.1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common medicine types for triple therapy. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B20: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised medicines for conditions associated with diabetes, by medicine and prescription number, 2012

	People					
Other medicine types	1 prescription	2 or more prescriptions	Total	1 prescription	2 or more prescriptions	Total
	Number			%		
Blood pressure lowering medicines						
Diuretics	12,032	134,240	**146,272**	8.2	91.8	**100.0**
Thiazides and thiazide-like	5,218	87,713	**92,931**	5.6	94.4	**100.0**
Other diuretics	12,810	58,872	**71,682**	17.9	82.1	**100.0**
Calcium channel blockers	4,636	114,654	**119,290**	3.9	96.1	**100.0**
ACE inhibitors	4,523	99,121	**103,644**	4.4	95.6	**100.0**
Beta blockers	6,609	96,236	**102,845**	6.4	93.6	**100.0**
ARBs	4,199	80,630	**84,829**	4.9	95.1	**100.0**
Other (anti-hypertensives)	3,449	26,568	**30,017**	11.5	88.5	**100.0**
Lipid modifying medicines						
Statins	5,265	227,867	**233,132**	2.3	97.7	**100.0**
Fibrates	870	13,608	**14,478**	6.0	94.0	**100.0**
Ezetimibe	677	11,275	**11,952**	5.7	94.3	**100.0**
Other	326	405	**731**	44.6	55.4	**100.0**
Anti-depressants	8,331	69,102	**77,433**	10.8	89.2	**100.0**
SSRIs	2,977	31,468	**34,445**	8.6	91.4	**100.0**
TCAs	5,428	21,402	**26,830**	20.2	79.8	**100.0**
Anti-psychotics	2,268	11,178	**13,446**	16.9	83.1	**100.0**
Atypical anti-psychotics	1,276	9,381	**10,657**	12.0	88.0	**100.0**
Anti-dementia	286	3,761	**4,047**	7.1	92.9	**100.0**
Medicines for eye disease	1,575	29,283	**30,858**	5.1	94.9	**100.0**

Note: Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B21: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised cardiovascular medicines, by medicine class and age group, 2012

	Age groups (years)					
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Blood pressure lowering medicines	61,952	68,278	58,167	41,991	24,437	**254,825**
Diuretics	30,875	38,649	34,489	26,050	16,209	**146,272**
Thiazides and thiazide-like	23,063	27,556	21,955	14,001	6,356	**92,931**
Other diuretics	11,399	15,926	17,056	15,531	11,770	**71,682**
Calcium channel blockers	26,250	32,990	28,920	20,229	10,901	**119,290**
ACE inhibitors	24,276	28,512	23,839	17,121	9,896	**103,644**
Beta blockers	21,341	27,336	24,984	18,583	10,601	**102,845**
ARBs	19,683	23,378	20,197	13,997	7,574	**84,829**
Other (anti-hypertensives)	6,643	8,718	7,586	4,913	2,157	**30,017**
Lipid modifying medicines	63,998	68,741	56,550	38,369	18,852	**246,510**
Statins	56,606	66,323	54,648	37,223	18,332	**233,132**
Fibrates	4,570	4,652	3,106	1,580	570	**14,478**
Ezetimibe	3,267	3,809	2,828	1,558	490	**11,952**
Other	162	209	186	118	56	**731**
			%			
Blood pressure lowering medicines	79.6	76.6	78.3	79.9	76.7	**78.3**
Diuretics	39.7	43.4	46.4	49.6	50.8	**44.9**
Thiazides and thiazide-like	29.6	30.9	29.6	26.7	19.9	**28.5**
Other diuretics	14.7	17.9	23.0	29.6	36.9	**22.0**
Calcium channel blockers	33.7	37.0	38.9	38.5	34.2	**36.6**
ACE inhibitors	31.2	32.0	32.1	32.6	31.0	**31.8**
Beta blockers	27.4	30.7	33.6	35.4	33.3	**31.6**
ARBs	25.3	26.2	27.2	26.6	23.8	**26.1**
Other (anti-hypertensives)	8.5	9.8	10.2	9.4	6.8	**9.2**
Lipid modifying medicines	82.3	77.2	76.1	73.0	59.1	**75.7**
Statins	72.8	74.4	73.6	70.9	57.5	**71.6**
Fibrates	5.9	5.2	4.2	3.0	1.8	**4.4**
Ezetimibe	4.2	4.3	3.8	3.0	1.5	**3.7**
Other	0.2	0.2	0.3	0.2	0.2	**0.2**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. A person can be supplied with more than 1 type of medicine, and, as such, the proportions presented are not mutually exclusive and do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B22: People aged 65 and over with type 2 diabetes supplied with PBS-subsidised blood pressure lowering and lipid modifying medicines, by medicine class and time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)				
Medicine classes	**0–1**	**2–4**	**5–9**	**10+**	**Total**
			Number		
Blood pressure lowering medicines					
Diuretics	12,842	22,416	35,905	75,096	**146,259**
Thiazides and thiazide-like	8,459	14,703	23,579	46,184	**92,925**
Other diuretics	5,918	10,283	16,529	38,944	**71,674**
Calcium channel blockers	10,030	17,926	28,911	62,415	**119,282**
ACE inhibitors	8,352	15,179	25,138	54,964	**103,633**
Beta blockers	9,002	15,836	25,321	52,678	**102,837**
ARBs	7,261	13,090	21,215	43,256	**84,822**
Other (anti-hypertensives)	2,356	4,168	6,832	16,660	**30,016**
Lipid modifying medicines					
Statins	19,935	36,780	59,121	117,276	**233,112**
Fibrates	1,047	2,174	3,720	7,536	**14,477**
Ezetimibe	938	1,837	3,090	6,087	**11,952**
Other	53	113	157	408	**731**
			%		
Blood pressure lowering medicines					
Diuretics	37.5	39.2	42.1	50.5	**44.9**
Thiazides and thiazide-like	24.7	25.7	27.6	31.0	**28.5**
Other diuretics	17.3	18.0	19.4	26.2	**22.0**
Calcium channel blockers	29.3	31.3	33.9	41.9	**36.6**
ACE inhibitors	24.4	26.5	29.4	36.9	**31.8**
Beta blockers	26.3	27.7	29.7	35.4	**31.6**
ARBs	21.2	22.9	24.9	29.1	**26.1**
Other (anti-hypertensives)	6.9	7.3	8.0	11.2	**9.2**
Lipid modifying medicines					
Statins	58.3	64.3	69.3	78.8	**71.6**
Fibrates	3.1	3.8	4.4	5.1	**4.4**
Ezetimibe	2.7	3.2	3.6	4.1	**3.7**
Other	0.2	0.2	0.2	0.3	**0.2**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. A person can be supplied with more than one type of medicine, and, as such, the proportions presented are not mutually exclusive and do not add up to 100%.
3. Records with missing diagnosis date were excluded therefore the total column does not match the total column in Table B21.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B23: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, 2012

Pairs of any 2 medicines	People supplied with 2 or more prescriptions			
	At least 2	Only 2	At least 2	Only 2
	Number		%	
Calcium channel blockers + thiazide/thiazide-like diuretics	50,192	14,457	15.4	4.4
Calcium channel blockers + beta blockers	44,291	9,674	13.6	3.0
ACE inhibitors + beta blockers	41,714	9,663	12.8	3.0
ACE inhibitors + calcium channel blockers	41,046	10,932	12.6	3.4
Beta blockers + other diuretics	37,360	3,882	11.5	1.2
ARBs + calcium channel blockers	35,567	9,503	10.9	2.9
Beta blockers + thiazide/thiazide-like diuretics	34,031	6,065	10.5	1.9
ARBs + beta blockers	30,001	6,219	9.2	1.9
ACE inhibitors + other diuretics	29,159	4,879	9.0	1.5
Calcium channel blockers + other diuretics	28,753	2,153	8.8	0.7
ARBs + other diuretics	22,369	3,705	6.9	1.1
ARBs + other blood pressure lowering	22,369	905	6.9	0.3
ACE inhibitors + thiazide/thiazide-like diuretics	20,771	3,627	6.4	1.1
Calcium channel blockers + other blood pressure lowering	18,879	919	5.8	0.3
ARBs + thiazide/thiazide-like diuretics	18,197	3,402	5.6	1.0
Other diuretics + thiazide/thiazide-like diuretics	16,027	1,495	4.9	0.5
Beta blockers + other blood pressure lowering	13,973	6,491	4.3	2.0
Other blood pressure lowering + thiazide/thiazide-like diuretics	12,646	1,094	3.9	0.3
ACE inhibitors + ARBs	11,401	1,791	3.5	0.6
ACE inhibitors + other blood pressure lowering	10,658	1,048	3.3	0.3
Other diuretics + other blood pressure lowering	9,992	281	3.1	0.1

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common pairs of blood pressure lowering medicines. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B24: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, by age group, 2012

	Age groups (years)					
Pairs of any 2 medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Calcium channel blockers + thiazide/thiazide-like diuretics	11,682	14,853	12,352	7,784	3,521	**50,192**
Calcium channel blockers + beta blockers	8,963	12,039	11,183	7,899	4,207	**44,291**
ACE inhibitors + beta blockers	8,821	11,126	10,005	7,512	4,250	**41,714**
ACE inhibitors + calcium channel blockers	9,079	11,250	9,915	7,018	3,784	**41,046**
Beta blockers + other diuretics	6,067	8,706	9,495	8,428	5,749	**38,445**
ARBs + calcium channel blockers	7,317	9,553	8,983	6,357	3,357	**35,567**
Beta blockers + thiazide/thiazide-like diuretics	7,676	9,913	8,484	5,452	2,506	**34,031**
ARBs + beta blockers	5,979	7,913	7,640	5,545	2,924	**30,001**
			%			
Calcium channel blockers + thiazide/thiazide-like diuretics	13.8	16.7	16.6	14.8	11.0	**15.4**
Calcium channel blockers + beta blockers	10.6	13.5	15.1	15.0	13.2	**13.6**
ACE inhibitors + beta blockers	10.4	12.5	13.5	14.3	13.3	**12.8**
ACE inhibitors + calcium channel blockers	10.7	12.6	13.4	13.4	11.9	**12.6**
Beta blockers + other diuretics	7.1	9.8	12.8	16.0	18.0	**11.8**
ARBs + calcium channel blockers	8.6	10.7	12.1	12.1	10.5	**10.9**
Beta blockers + thiazide/thiazide-like diuretics	9.0	11.1	11.4	10.4	7.9	**10.5**
ARBs + beta blockers	7.0	8.9	10.3	10.6	9.2	**9.2**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common pairs of blood pressure lowering medicines. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B25: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood pressure lowering medicines, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)				
Pairs of any 2 medicines	**0–1**	**2–4**	**5–9**	**10+**	**Total**
			Number		
Calcium channel blockers + thiazide/thiazide-like diuretics	4,125	7,307	12,262	26,497	**50,191**
Calcium channel blockers + beta blockers	3,574	6,306	10,506	23,903	**44,289**
ACE inhibitors + beta blockers	3,442	6,085	9,906	22,278	**41,711**
ACE inhibitors + calcium channel blockers	3,127	5,520	9,535	22,861	**41,043**
Beta blockers + other diuretics	3,102	5,448	8,734	21,159	**38,443**
ARBs + calcium channel blockers	2,783	4,980	8,504	19,299	**35,566**
Beta blockers + thiazide/thiazide-like diuretics	2,919	5,159	8,509	17,443	**34,030**
ARBs + beta blockers	2,479	4,299	7,243	15,977	**29,998**
			%		
Calcium channel blockers + thiazide/thiazide-like diuretics	12.1	12.8	14.4	17.8	**15.4**
Calcium channel blockers + beta blockers	10.4	11.0	12.3	16.1	**13.6**
ACE inhibitors + beta blockers	10.1	10.6	11.6	15.0	**12.8**
ACE inhibitors + calcium channel blockers	9.1	9.7	11.2	15.4	**12.6**
Beta blockers + other diuretics	9.1	9.5	10.2	14.2	**11.8**
ARBs + calcium channel blockers	8.1	8.7	10.0	13.0	**10.9**
Beta blockers + thiazide/thiazide-like diuretics	8.5	9.0	10.0	11.7	**10.5**
ARBs + beta blockers	7.2	7.5	8.5	10.7	**9.2**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common pairs of blood pressure lowering medicines. The proportions presented do not add up to 100%.
3. Records with missing diagnosis date were excluded therefore the total column does not match the total column in Table B24.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B26: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood lipid modifying medicines, by age group, 2012

	Age groups (years)					
Pairs of any 2 medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Statins + fibrates	3,353	3,327	2,132	1,026	286	**10,124**
Statins + ezetimibe	2,244	2,548	1,787	928	261	**7,768**
Ezetimibe + fibrates	393	448	273	146	35	**1,295**
Statins + other anti-lipids	92	141	122	67	21	**443**
			%			
Statins + fibrates	4.3	3.7	2.9	2.0	0.9	**3.1**
Statins + ezetimibe	2.9	2.9	2.4	1.8	0.8	**2.4**
Ezetimibe + fibrates	0.5	0.5	0.4	0.3	0.1	**0.4**
Statins + other anti-lipids	0.1	0.2	0.2	0.1	0.1	**0.1**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common pairs of blood lipid modifying medicines. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B27: People aged 65 and over with type 2 diabetes supplied with the most common pairs of any 2 PBS-subsidised blood lipid modifying medicines, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)				
Pairs of any 2 medicines	**0–1**	**2–4**	**5–9**	**10+**	**Total**
			Number		
Statins + fibrates	739	1,517	2,609	5,258	**10,123**
Statins + ezetimibe	670	1,247	2,015	3,836	**7,768**
Ezetimibe + fibrates	393	448	273	146	**1,260**
Statins + other anti-lipids	33	62	92	256	**443**
			%		
Statins + fibrates	2.2	2.7	3.1	3.5	**3.1**
Statins + ezetimibe	2.0	2.2	2.4	2.6	**2.4**
Ezetimibe + fibrates	1.1	0.8	0.3	0.1	**0.4**
Statins + other anti-lipids	0.1	0.1	0.1	0.2	**0.1**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the most common pairs of blood lipid modifying medicines. The proportions presented do not add up to 100%.
3. Records with missing diagnosis date were excluded therefore the total column does not match the total column in Table B26.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B28: People aged 65 and over with type 2 diabetes supplied with selected PBS-subsidised blood pressure lowering agents and blood lipid modifying agents, by age group, 2012

	Age groups (years)					
Supply of any 2 or 3 medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Blood pressure lowering + lipid modifying medicines	52,557	62,946	52,413	35,926	17,557	**221,399**
Statins + calcium channel blockers	21,811	27,705	24,156	16,445	7,867	**97,984**
Statins + beta blockers	18,268	23,434	21,184	15,341	7,621	**85,848**
Statins + ACE inhibitors	20,215	24,009	19,838	13,736	6,852	**84,650**
Statins + thiazide/thiazide-like diuretics	18,670	22,625	18,108	11,114	4,605	**75,122**
Statins + ARBs	15,838	19,075	16,531	11,150	5,276	**67,870**
Statins + other diuretics	9,263	13,026	13,817	12,142	7,587	**55,835**
Statins + calcium channel blockers + thiazide/thiazide-like diuretics	9,813	12,593	10,479	6,382	2,687	**41,954**
Statins + calcium channel blockers + beta blockers	7,813	10,486	9,715	6,726	3,279	**38,019**
Statins + calcium channel blockers + ACE inhibitors	7,784	9,733	8,509	5,846	2,833	**34,705**
Statins + beta blockers + other diuretics	5,215	7,477	8,087	6,969	4,068	**31,816**
Statins + calcium channel blockers + ARBs	6,157	8,080	7,644	5,238	2,510	**29,629**
Statins + beta blockers + thiazide/thiazide-like diuretics	6,565	8,537	7,285	4,543	1,955	**28,885**
Statins + beta blockers + ARBs	5,153	6,839	6,598	4,651	2,182	**25,423**
			%			
Blood pressure lowering + lipid modifying medicines	24.0	25.4	24.4	21.2	14.4	**68.0**
Statins + calcium channel blockers	28.0	31.1	32.5	31.3	24.7	**30.1**
Statins + beta blockers	23.5	26.3	28.5	29.2	23.9	**26.4**
Statins + ACE inhibitors	26.0	26.9	26.7	26.1	21.5	**26.0**
Statins + thiazide/thiazide-like diuretics	24.0	25.4	24.4	21.2	14.4	**23.1**
Statins + ARBs	20.4	21.4	22.3	21.2	16.5	**20.8**
Statins + other diuretics	11.9	14.6	18.6	23.1	23.8	**17.1**
Statins + calcium channel blockers + thiazide/thiazide-like diuretics	12.6	14.1	14.1	12.1	8.4	**12.9**
Statins + calcium channel blockers + beta blockers	10.0	11.8	13.1	12.8	10.3	**11.7**
Statins + calcium channel blockers + ACE inhibitors	10.0	10.9	11.5	11.1	8.9	**10.7**
Statins + beta blockers + other diuretics	6.7	8.4	10.9	13.3	12.8	**9.8**
Statins + calcium channel blockers + ARBs	7.9	9.1	10.3	10.0	7.9	**9.1**
Statins + beta blockers + thiazide/thiazide-like diuretics	8.4	9.6	9.8	8.6	6.1	**8.9**
Statins + beta blockers + ARBs	6.6	7.7	8.9	8.9	6.8	**7.8**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents selected blood pressure lowering medicines and blood lipid modifying medicines. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B29: People aged 65 and over with type 2 diabetes supplied with selected PBS-subsidised blood pressure lowering agents and blood lipid modifying agents, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)				
Supply of any 2 or 3 medicines	**0–1**	**2–4**	**5–9**	**10+**	**Total**
			Number		
Blood pressure lowering + lipid modifying medicines	18,354	34,027	55,636	113,364	**221,381**
Statins + calcium channel blockers	7,755	14,320	23,787	52,116	**97,978**
Statins + beta blockers	7,206	12,924	21,081	44,631	**85,842**
Statins + ACE inhibitors	6,500	12,178	20,553	45,411	**84,642**
Statins + thiazide/thiazide-like diuretics	6,372	11,476	19,133	38,136	**75,117**
Statins + ARBs	5,404	10,155	16,979	35,328	**67,866**
Statins + other diuretics	4,320	7,757	12,792	30,961	**55,830**
Statins + calcium channel blockers + thiazide/thiazide-like diuretics	3,262	5,902	10,275	22,514	**41,953**
Statins + calcium channel blockers + beta blockers	2,935	5,268	8,989	20,825	**38,017**
Statins + calcium channel blockers + ACE inhibitors	2,517	4,618	8,077	19,491	**34,703**
Statins + beta blockers + other diuretics	2,462	4,439	7,148	17,766	**31,815**
Statins + calcium channel blockers + ARBs	2,171	4,019	7,060	16,378	**29,628**
Statins + beta blockers + thiazide/thiazide-like diuretics	2,370	4,240	7,220	15,054	**28,884**
Statins + beta blockers + ARBs	2,013	3,568	6,087	13,752	**25,420**
			%		
Blood pressure lowering + lipid modifying medicines	53.7	59.5	65.2	76.2	**68.0**
Statins + calcium channel blockers	22.7	25.0	27.9	35.0	**30.1**
Statins + beta blockers	21.1	22.6	24.7	30.0	**26.4**
Statins + ACE inhibitors	19.0	21.3	24.1	30.5	**26.0**
Statins + thiazide/thiazide-like diuretics	18.6	20.1	22.4	25.6	**23.1**
Statins + ARBs	15.8	17.8	19.9	23.7	**20.8**
Statins + other diuretics	12.6	13.6	15.0	20.8	**17.1**
Statins + calcium channel blockers + thiazide/thiazide-like diuretics	9.5	10.3	12.0	15.1	**12.9**
Statins + calcium channel blockers + beta blockers	8.6	9.2	10.5	14.0	**11.7**
Statins + calcium channel blockers + ACE inhibitors	7.4	8.1	9.5	13.1	**10.7**
Statins + beta blockers + other diuretics	7.2	7.8	8.4	11.9	**9.8**
Statins + calcium channel blockers + ARBs	6.3	7.0	8.3	11.0	**9.1**
Statins + beta blockers + thiazide/thiazide-like diuretics	6.9	7.4	8.5	10.1	**8.9**
Statins + beta blockers + ARBs	5.9	6.2	7.1	9.2	**7.8**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents selected blood pressure lowering medicines and blood lipid modifying medicines. The proportions presented do not add up to 100%.
3. Records with missing diagnosis date were excluded therefore the total column does not match the total column in Table B28.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B30: People aged 65 and over with type 2 diabetes supplied with common supply of selected PBS-subsidised mental health and ophthalmological medicines, by age group, 2012

	Age groups (years)					
Medicines	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
			Number			
Anti-depressants	18,550	19,967	17,278	13,130	8,508	**77,433**
SSRIs	8,463	8,621	7,533	5,843	3,985	**34,445**
TCAs	6,301	7,362	6,268	4,450	2,449	**26,830**
Anti-psychotics	2,510	2,671	2,725	2,754	2,786	**13,446**
Atypical anti-psychotics	1,972	2,053	2,116	2,203	2,313	**10,657**
Anti-dementia	207	573	1,088	1,285	894	**4,047**
Medicines for eye disease	4,381	7,007	7,833	6,845	4,792	**30,858**
			%			
Anti-depressants	23.8	22.4	23.3	25.0	26.7	**23.8**
SSRIs	10.9	9.7	10.1	11.1	12.5	**10.6**
TCAs	8.1	8.3	8.4	8.5	7.7	**8.2**
Anti-psychotics	3.2	3.0	3.7	5.2	8.7	**4.1**
Atypical anti-psychotics	2.5	2.3	2.8	4.2	7.3	**3.3**
Anti-dementia	0.3	0.6	1.5	2.4	2.8	**1.2**
Medicines for eye disease	5.6	7.9	10.5	13.0	15.0	**9.5**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the common supply of selected mental health and ophthalmological medicines. The proportions presented do not add up to 100%.

Source: AIHW analysis of the NDSS–PBS linked data set.

Table B31: People aged 65 and over with type 2 diabetes supplied with selected PBS-subsidised mental health and ophthalmological medicines, by time since diabetes diagnosis, 2012

	Time since diabetes diagnosis (years)				
Medicines	**0–1**	**2–4**	**5–9**	**10+**	**Total**
			Number		
Anti-depressants	7,053	12,215	19,111	39,042	**77,421**
SSRIs	3,112	5,341	8,497	17,491	**34,441**
TCAs	2,296	4,237	6,561	13,733	**26,827**
Anti-psychotics	1,418	2,189	3,201	6,635	**13,443**
Atypical anti-psychotics	1,100	1,758	2,530	5,268	**10,656**
Anti-dementia	312	551	846	2,338	**4,047**
Medicines for eye disease	2,420	4,400	7,240	16,794	**30,854**
			%		
Anti-depressants	20.6	21.4	22.4	26.2	**23.8**
SSRIs	9.1	9.3	10.0	11.8	**10.6**
TCAs	6.7	7.4	7.7	9.2	**8.2**
Anti-psychotics	4.1	3.8	3.8	4.5	**4.1**
Atypical anti-psychotics	3.2	3.1	3.0	3.5	**3.3**
Anti-dementia	0.9	1.0	1.0	1.6	**1.2**
Medicines for eye disease	7.1	7.7	8.5	11.3	**9.5**

Notes

1. Includes all people who were supplied with all their PBS medicines at a concessional rate between January 2009 and June 2013.
2. This table presents the common supply of selected mental health and ophthalmological medicines. The proportions presented do not add up to 100%.
3. Records with missing diagnosis date were excluded therefore the total column does not match the total column in Table B30.

Source: AIHW analysis of the NDSS-PBS linked data set.

Glossary

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

blood cholesterol: Fatty substance produced by the liver and carried by the blood to supply the rest of the body. Its natural function is to supply material for cell walls and for steroid hormones, but if levels in the blood become too high this can lead to atherosclerosis and heart disease.

cardiovascular disease: Any disease of the circulatory system, namely the heart (cardio) or blood vessels (vascular). Includes heart attack, angina, stroke, heart failure and peripheral vascular disease. Cardiovascular disease is also known as circulatory disease.

cholesterol: See **blood cholesterol**.

chronic: Persistent and long lasting.

chronic kidney disease: Refers to all conditions of the kidney lasting at least 3 months, where a person has had evidence of kidney damage and/or reduced kidney function, regardless of the specific diagnosis of disease or condition causing the disease.

co-administration: Assumed use (determined from prescriptions supplied) of 2 or more medicines at the same time.

comorbidity: When a person has 2 or more health problems at the same time.

concessional patients: People who receive a greater subsidy and pay less for medicines than general patients. Concessional beneficiaries typically include the aged, people with disabilities, single parents, pensioners, Health Care Card holders, and Commonwealth Seniors Health Card holders and Veterans card holders.

contraindication: A specific situation in which a drug, procedure, or surgery should not be used or undertaken because it may be harmful to the person.

co-payment: A payment made by the Pharmaceutical Benefits Scheme user at the time of service as part of the total payment for a pharmaceutical or associated product.

data linkage: The bringing together (linking) of information from two or more different data sources that are believed to relate to the same entity; for example, the same individual or the same institution. Data linkage can provide more information about the entity and, in certain cases, provide a time sequence, helping to 'tell a story', show 'pathways' and perhaps unravel cause and effect. The term is used synonymously with 'record linkage' and 'data integration'.

dementia: A general and worsening loss of higher brain power, such as memory, understanding and reasoning.

depression: A mood disorder with prolonged feelings of being sad, hopeless, low and inadequate, with a loss of interest or pleasure in activities and often with suicidal thoughts or self-blame.

diabetes (diabetes mellitus): A chronic condition in which the body cannot properly use its main energy source, the sugar glucose. This is due to either the pancreas not producing enough of the hormone insulin or the body being unable to effectively use the insulin produced. Insulin helps glucose enter the body's cells from the bloodstream and then be

processed by them. Diabetes is marked by an abnormal build-up of glucose in the blood and it can have serious short-term and long-term effects on any of the body's systems, especially the blood vessels and nerves. Different types of diabetes are type 1 diabetes (see **type 1 diabetes**), type 2 diabetes (see **type 2 diabetes**), gestational diabetes (see **gestational diabetes**) and other types of diabetes.

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

dual therapy: The use of recommended first-line medicines, either metformin or a sulfonylurea, in combination with another anti-diabetic therapy to manage type 2 diabetes.

gestational diabetes: A form of diabetes that is defined as glucose intolerance in pregnant women not previously diagnosed with diabetes. Gestational diabetes mellitus is a temporary form of diabetes that usually disappears after the baby is born. Women who have had gestational diabetes are at increased risk of developing type 2 diabetes; gestational diabetes also increases the risk of perinatal morbidity and mortality. Compare with type 1 diabetes (see **type 1 diabetes**), and type 2 diabetes (see **type 2 diabetes**).

glucose: The main sugar that the body uses for energy. Glucose is a simple sugar that comes from the breakdown of carbohydrates in the diet as well as from the breakdown of glycogen (the storage form of glucose) in the liver. The body requires the hormone insulin to use glucose properly.

high blood pressure/hypertension: Definitions of high blood pressure (or hypertension) vary but the World Health Organization definition is well accepted: a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more, or [the person is] receiving medication for high blood pressure.

highly specialised drugs: Under Section 100 of the *National Health Act 1953* (Cwlth), certain drugs (for example, cyclosporin) can be supplied to patients only through hospitals because only hospitals can provide the facilities or staff necessary for the appropriate use of the drugs. These drugs are funded by the Australian Government separately from the Pharmaceutical Benefits Scheme (see **Pharmaceutical Benefits Scheme**).

hyperglycaemia: High blood sugar level.

hypoglycaemia: Low blood sugar level.

incidence: The number of new cases (of an illness or event, and so on) occurring during a given period. Compare with prevalence (see **prevalence**).

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

insulin: A hormone produced in the pancreas that helps glucose to enter body cells for energy metabolism.

insulin-treated diabetes: All types of diabetes treated with insulin; includes type 1, type 2, gestational and other types of diabetes. It is a term used to describe those on the National (insulin-treated) Diabetes Register and is not a standard classification used in clinical practice.

mental illness: Disturbances of mood or thought that can affect behaviour and distress the person or those around them, so the person has trouble functioning normally. They include anxiety disorders, depression (see **depression**) and schizophrenia.

mono therapy: Use of a single drug at any given time to manage type 2 diabetes.

oedema: A condition characterised by an excess of watery fluid collecting in the cavities or tissues of the body.

ophthalmology: A medical specialty dealing with eye diseases.

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

prevalence: The number or proportion (of cases, instances, and so forth) present in a population at a given time. Compare with incidence (see **incidence**).

prevalent medicine supply: A measure of the number of people from the study who had at least 1 claim of a specific medicine in 2012 divided by the mid-year population cohort.

regimen: A drug or combination of drugs deemed to be taken at the same time by a patient at a point in time.

risk factor: Any factor that represents a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease, others are not necessarily so.

Section 100 drugs: See **highly specialised drugs**.

standard coverage days (SCD): The estimated medication coverage days for each class of medication.

stockpiling: A phenomenon that often occurs towards the end of the calendar year when a Safety Net Card holder 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.

switch: Changing from one subsidised therapy to another.

triple therapy: Use of metformin or a sulfonylurea in combination with 2 other anti-diabetic therapies to manage type 2 diabetes.

type 1 diabetes: A form of diabetes marked by a complete lack of insulin and needing insulin replacement for survival. This form of diabetes mostly arises in childhood or in young adults, though it can occur at any age. Adults may develop a slowly progressive form of type 1 diabetes called Latent Autoimmune Diabetes in Adults, which can be treated initially without insulin injections (see **type 2 diabetes** and **gestational diabetes**).

type 2 diabetes: The most common form of diabetes, which is marked by reduced or less effective insulin. Some cases may be managed with changes to diet along with increased exercise and weight loss. Many require drugs as well—namely oral glucose lowering drugs that work on the pancreas. Many others require insulin in addition to other treatments (see **type 1 diabetes** and **gestational diabetes**).

under co-payment: A PBS medicine that costs less than the general PBS user's co-payment (see **co-payment**). Under co-payment data were not collected by the PBS before April 2012.

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Related publications

The following AIHW publications relating to diabetes might also be of interest:

- AIHW 2015. Cardiovascular disease, diabetes and chronic kidney disease—Australian facts: risk factors. Cardiovascular, diabetes and chronic kidney disease series no. 4. Cat. no. CDK 4. Canberra: AIHW.
- AIHW 2014. Cardiovascular disease, diabetes and chronic kidney disease: Australian facts: morbidity—hospital care. Cardiovascular, diabetes and chronic kidney disease series no. 3. Cat. no. CDK 3. Canberra: AIHW.
- AIHW 2014. Cardiovascular disease, diabetes and chronic kidney disease: Australian facts: prevalence and incidence. Cardiovascular, diabetes and chronic kidney disease series no. 2. Cat. no. CDK 2. Canberra: AIHW.
- AIHW 2014. Cardiovascular disease, diabetes and chronic kidney disease: Australian facts mortality. Cardiovascular, diabetes and chronic kidney disease series no. 1. Cat. no. CDK 1. Canberra: AIHW.
- Senes S & Penm E 2007. Medicines for cardiovascular health: are they used appropriately? Cat. no. CVD 36. Canberra: AIHW.
- AIHW: Webbie K & O'Brien K 2006. Use of medicines by Australians with diabetes. Cat. no. AUS 82. Canberra: AIHW.

This report describes dispensing patterns of glucose lowering medicines and medicines for other conditions associated with diabetes in a concessional population cohort of Australians aged 65 and over diagnosed with type 2 diabetes. It uses linked data from the National Diabetes Services Scheme and the Pharmaceutical Benefits Scheme to explore medicine supply patterns in 2012 by age and time since diabetes diagnosis. It shows that, in general, the longer the time since diagnosis, the more likely it is that an individual would be supplied with all medicine types and the more intense their glucose lowering treatment regimens would be. This report highlights the complexity of pharmacological management in older people with type 2 diabetes and the diversity of medicine supply patterns in relation to age and time since diabetes diagnosis.