



# **BURDEN OF DIABETES IN AUSTRALIA: IT'S TIME FOR MORE ACTION**

Preliminary Report

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The report, appendix and the complete reference list can be found at:  
[www.sydney.edu.au/medicine/research/units/boden/recently-published.php](http://www.sydney.edu.au/medicine/research/units/boden/recently-published.php)

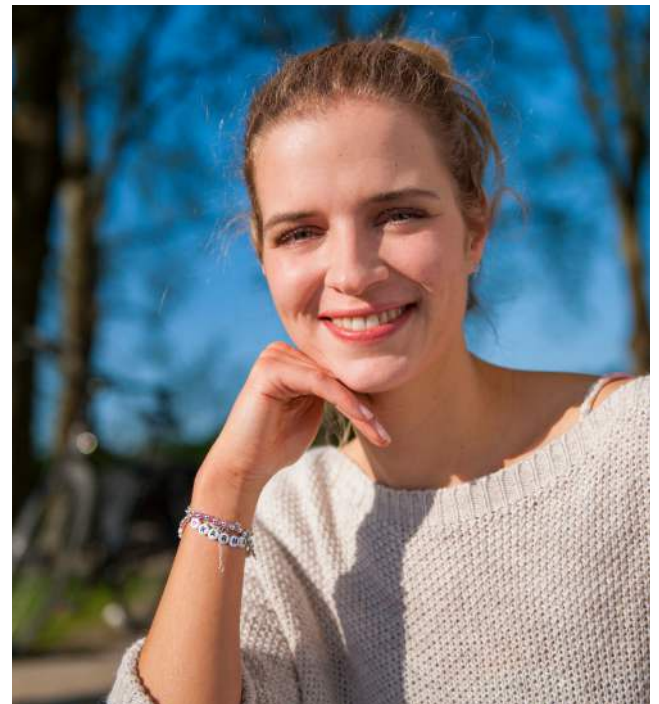
## 1. Background

Diabetes is a serious, chronic and progressive disease, characterised by elevated blood glucose levels. It is difficult to estimate the exact number of people with diabetes in Australia. The best estimate based on the National Diabetes Services Scheme (NDSS),<sup>1</sup> the Australian Health Survey (National Health Survey, 2014–15),<sup>2</sup> and the AusDiab study (1999–2000)<sup>3</sup> is that there are more than 1.2 million Australians with known diabetes. This accords with the International Diabetes Federation (IDF) estimate that in 2017 there were 1.1 million people aged between 20 and 79 years with diabetes in Australia.<sup>4</sup> Prevalence of diabetes in Australia has more than tripled over the past 25 years and there is no sign that this is slowing.<sup>5</sup> It is also estimated that over 2 million people are at high risk of developing diabetes.<sup>3</sup>

**1.2 million**   
Australians with known diabetes.

Over  
**2 million**  
people are at high risk of  
developing diabetes.

Diabetes is associated with significant premature mortality and morbidity, which impacts not only the individual with diabetes but also their family and the whole of society. Diabetes contributes to 10% of all deaths in Australia.<sup>5</sup> Age-adjusted death rates for people with diabetes were almost double those for the general Australian population and highest in people aged under 45 years (4.5 times higher in people with type 1 diabetes and 5.8 times higher in people with type 2 diabetes). Between 2009 and 2014, the mortality gap increased by 10% for people with type 2 diabetes, against a backdrop of death rates declining in the general population.<sup>5</sup> Compared with adults without diabetes, end-stage renal disease is up to 10 times higher and rates of amputation are typically 10 to 20 times higher.



*YASMIN FIEDLER Yasmin has type 1 diabetes*

Retinopathy affects an estimated 35% of people with diabetes and may result in severe visual loss and blindness. Adults with diabetes have two to three-fold increased rates of cardiovascular disease.<sup>6</sup> Rates of complications are even higher in Australia's Indigenous population. The total economic cost of diabetes has been estimated at \$14 billion, including direct health care costs and indirect costs such as reduced productivity, absence from work, early retirement and premature death. Annual costs are more than twice as high for people with diabetes complications as for people without complications.<sup>7</sup>

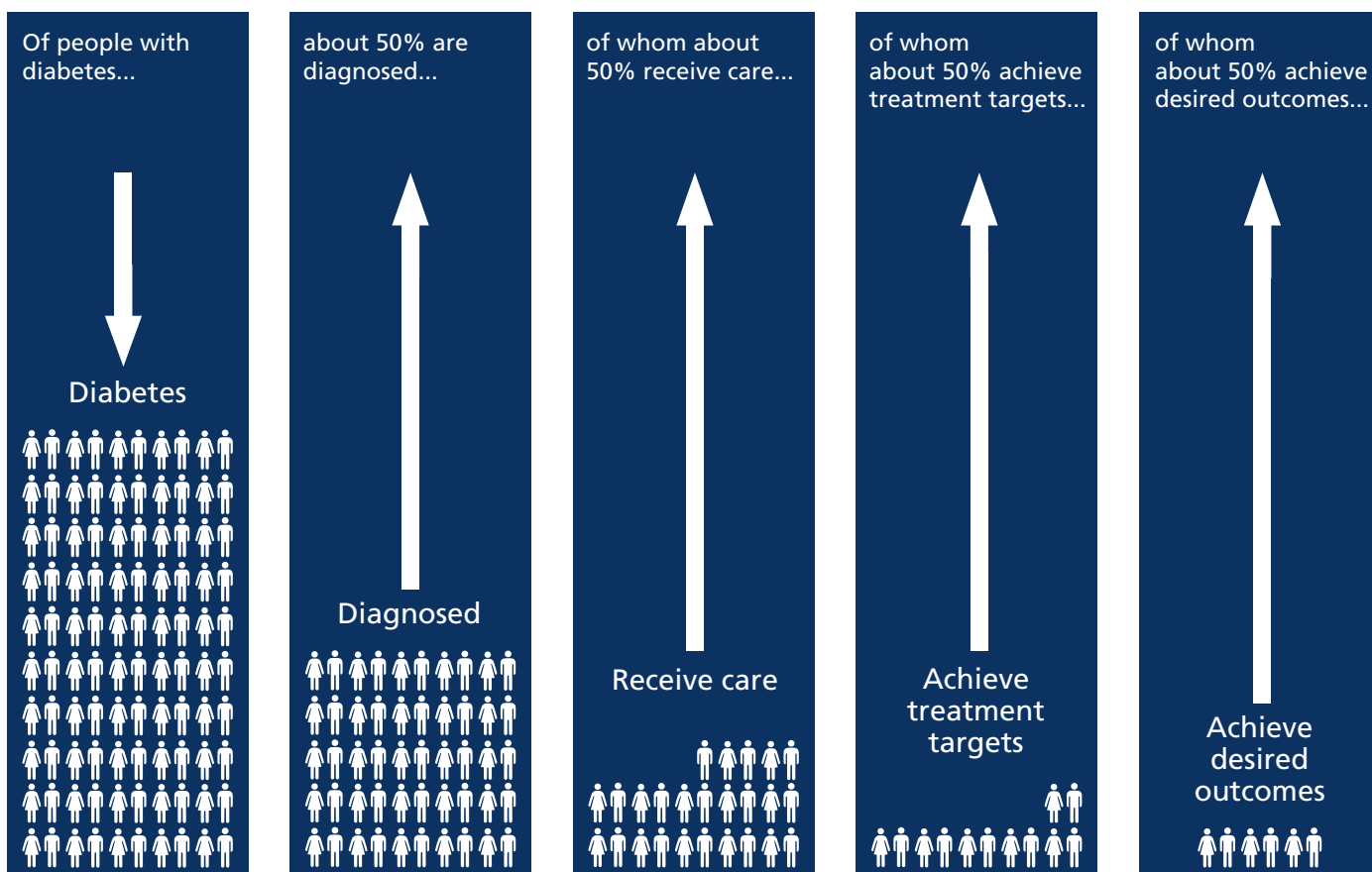
There is strong evidence that diabetes, especially when detected early, can be successfully managed, and complications prevented, but there is an appreciable evidence-practice gap in implementing proven clinical care programs. Multifactorial intervention including control of blood glucose, blood pressure and lipids can reduce the broad range of diabetes-related microvascular and macrovascular complications and premature mortality.<sup>8</sup> The beneficial effects of relatively short term improved glycaemic control on reducing microvascular complications was clearly demonstrated in the UKPDS in newly diagnosed people with type 2 diabetes [UK Prospective Diabetes Study (UKPDS) Group]. Intensive blood-glucose control with sulfonylureas or insulin significantly reduced the risk of microvascular complications compared with conventional treatment in patients with type 2 diabetes<sup>9</sup> whereas the beneficial effect on macrovascular complications takes longer.<sup>10</sup>

### The Rule of Halves

The Rule of Halves is a theoretical framework that has been applied to chronic diseases which states that roughly half of all people with diabetes are not diagnosed; half of those diagnosed do not receive care; half of those who receive care do not achieve their treatment targets; and half of those who reach their targets do not achieve the desired outcomes.<sup>11</sup>

### The Rule of Halves framework

The Rule of Halves framework illustrates the diabetes burden and indicates where the largest unmet clinical needs are:



This review examined the applicability of the Rule of Halves concept to diabetes in Australia as a first step to identifying gaps and developing strategies for earlier diagnosis, better access to diabetes care, and improving outcomes for people living with diabetes as outlined within the key action areas of the Australian National Diabetes Strategy 2016-2020.<sup>12</sup>

## 2. Methodology

The analysis was conducted based on existing quantitative data from published peer-reviewed literature, population health surveys and government reports on diabetes in Australia. Electronic databases including Medline, Embase, Cumulative Index to Nursing and Allied Health (CINAHL), PubMed and Cochrane Central Register of Controlled Trials (CENTRAL) were searched in April 2018 for articles relating to four research questions:

- 1) What is the prevalence of diagnosed and undiagnosed diabetes in Australia?
- 2) What is the proportion of people with diabetes in Australia receiving standard care?
- 3) What is the proportion of people with diabetes in Australia meeting management targets?
- 4) What is the proportion of people with diabetes-related complications in Australia?

A total of 6,111 records were retrieved from the database search (after removal of duplicates) and titles and abstracts were reviewed. Full-text articles of potentially eligible studies were then reviewed by two independent researchers. Studies of gestational diabetes or other diabetes were excluded, as were studies published before the year 2000 and with sample size < 150 (< 100 for studies conducted in the Indigenous population).

Data were extracted in the following areas from included studies:

- 1) Study Information (first author, country of origin, study name, year);
- 2) Number of participants;
- 3) Type of diabetes;
- 4) Region of Australia;
- 5) Number (%) of people with diagnosed and undiagnosed diabetes;
- 6) Criteria for diagnosing diabetes;
- 7) Number (%) of people receiving standard diabetes care;
- 8) Number (%) of people meeting treatment/management targets;
- 9) Number (%) of people with diabetes complications;
- 10) Methods of data collection/data sources.

For studies of randomised controlled trials (RCT), only the baseline data were included. Mean proportions were calculated for each question, and separate results presented for people with type 1 diabetes and Indigenous people where there were sufficient data.



MARIA LUISA DE ARAUJA  
Maria has type 2 diabetes

### 3. Findings

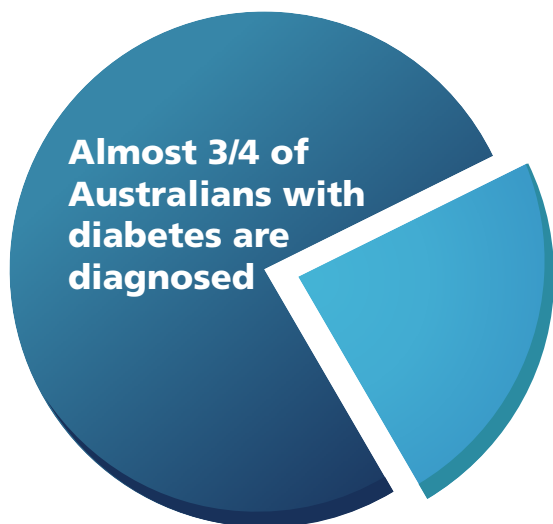
#### Question 1.

#### What is the prevalence of diagnosed and undiagnosed diabetes in Australia?

##### The proportion of people with diagnosed diabetes in Australia

	Proportion of people with diagnosed diabetes in Australia (%)	Sample size (n)
Total population	71	40,494
Indigenous population	81	5,570

Ten sources of data were included of which five reported diagnosed diabetes in the Aboriginal and Torres Strait Islander community (Appendix; Tables 1-2). All were population-based studies in adults (>18 years) of national or community samples. The majority reported total diabetes prevalence while two studies included individuals with a diagnosis of type 2 diabetes only.<sup>13,14</sup> The methods used to establish a diagnosis of diabetes varied between studies and included: people on diabetes treatment (insulin and/or blood glucose lowering medication) at the time of the study, having ever been told by a doctor or nurse that they had diabetes, blood testing including fasting blood glucose alone, oral glucose tolerance test with measurement of fasting blood glucose and two-hour post load blood glucose, or measurement of HbA1c. People with previously undiagnosed diabetes were determined as those who were not on diabetes treatment, had not previously been told by a doctor or nurse that they had diabetes and had a fasting blood glucose and/or two-hour post load blood glucose values and/or HbA1c above the diabetes threshold. The mean prevalence of diagnosed diabetes was 71% (range 50 – 80%) across included studies. Within the Indigenous population, 81% (range 71 - 86%) of people with diabetes were diagnosed.



#### Interpretation of the data

Overall, the data indicate that only 7 of 10 people in Australia with diabetes are diagnosed, with slightly higher rates of diagnosis in the Indigenous population. The results of this analysis are dependent on the representativeness of the population, the accuracy of self-reported diabetes and especially on the diagnostic procedure used to diagnose diabetes. The proportion of people who were found to have previously undiagnosed diabetes was highest when an oral glucose tolerance test was used. The AusDiab study showed that 40% of newly diagnosed diabetes was only detected by the 2hPG following an oral glucose tolerance test. The available studies had several limitations. Most were not nationally representative and focused on particular geographic areas and age groups; others had a low recruitment rate of the eligible population and in others a high proportion of participants had been recently screened for undiagnosed diabetes.



## Implications

At least three in ten adults with diabetes in Australia are undiagnosed. As a significant proportion of people have established complications at the time of diagnosis of diabetes, systematic efforts to screen for undiagnosed diabetes have the potential to reduce the burden of diabetes.

# 3 in 10

adults with diabetes in Australia are undiagnosed



## Question 2.

### What is the proportion of people with diabetes in Australia receiving standard care?

The diabetes annual cycle of care (ACC) is a checklist for use by general practitioners (GPs) to review the diabetes management and general health of people with diagnosed diabetes. It is considered the minimum level of care that a person with diabetes should receive in Australia. The ACC includes ongoing provision of education about diabetes at every visit; medication review, annual measurement of HbA1c, cholesterol and microalbuminuria; biannual assessment of BMI and blood pressure; and a biennial foot and eye examination. A Medicare claim for completion of an ACC may be made by the GP. Four studies assessed the proportion of people completing an ACC based on Medicare claims data or medical records (Appendix; Table 3a). The ACC completion rates ranged from 0.9% in an Indigenous population to 37% over a 12 to 18-month period in non-Indigenous people.<sup>15-18</sup>

### The proportion of people with diabetes in Australia receiving standard care

	Population	Proportion of people with diagnosed diabetes completing health checks (%)	Sample size (n)
HbA1c check in the past 6 – 12 months	Total population	51	781,424
	Indigenous population	64	3,856
BP check in the past 6 – 12 months	Total population	71	6,000
	Indigenous population	79	3,856
Lipids check in the past 12 months	Total population	49	269,518
	Indigenous population	69	3,856
Kidney health check ( <i>urinary test</i> ) in the past 12 months	Total population	27	765,194
	Indigenous population	62	3,856
Eye examination in the past 12 – 24 months	Total population	71	53,053
	Indigenous population	45	4,643
Foot assessment in the past 6 – 12 months	Total population	42	50,061
	Indigenous population	46	3,991
Weight check in the past 6 – 12 months	Total population	59	5,245
	Indigenous population	63	3,856

Twenty-four studies investigated the proportion of people with diagnosed diabetes meeting annual care requirements for specific health checks, spanning a time-period of 1992 to 2016 (Appendix; Tables 3b – 3h). Studies which focused on people attending specialised diabetes services for regular care were excluded. Based on review of Medicare claims data and medical records, 51% of people with diabetes received an HbA1c check in the past 6-12 months (range 32 – 71%).

Two studies which assessed results over multiple time-points reported an increase in the proportion of people completing HbA1c checks over time.<sup>13,14</sup> Studies conducted in the Indigenous population reported 64% (range 61 - 68%) had an annual HbA1c check.<sup>11,14-16</sup> The mean proportion of people with diabetes receiving a lipid check in the past 12 months was similar to that for HbA1c (49% for the total population, 69% for the Indigenous population), while the mean proportion of people having a BP check in the past 6-12 months was higher at 71% (79% for the Indigenous population).

The proportion of people having an eye examination in the past 12-24 months varied significantly across the 16 included studies (range 11% - 96%). Studies where the results were based on participant self-report had significantly higher proportions of eye checks compared with studies that reviewed Medicare claims data and medical records. There was also wide variability in the proportion of people reported to be receiving eye examinations depending on the health professional conducting the check. While some studies assessed eye screenings conducted by an optometrist, others reported the proportion of people receiving eye examinations by other health professionals such as an ophthalmologist or a GP.

## Implications

The review highlighted significant deficiencies in important routine checks for many people with diabetes. Better systems would contribute to ensuring that routine health checks are performed and recorded. The process would be assisted by specific education of people with diabetes on the routine checks required as an integral component of expected diabetes care.

Although approximately 50% of individuals had an assessment of HbA1c, lipids, weight and feet, less than a third had the minimum required kidney health examinations (27%; range 10 - 67%). Studies that reported results for the time period 1990 – 2000 reported lower proportions of people receiving checks than studies conducted after the year 2000. Further, three studies where results were based on a large, random sample of community-based people rather than general practice attenders reported fewer people receiving kidney health checks; these results may be more generalisable to the population.<sup>13,14,17</sup>

The results for this question indicate that ethnicity may contribute to disparities in health care. Tran et al. analysed Medicare Benefits Scheme and Pharmaceutical Benefits Scheme claims data for 13,284 people living in New South Wales to determine the proportion of people with diabetes using primary care service over a 15-month period.<sup>15</sup> The study reported that 12.3% of Vietnamese and 25.5% of Chinese-born participants had a claim for allied health services compared with 49.7% of Australian-born participants, while those born in the Philippines had fewer claims for specialist services and Italian-born participants had fewer claims for completing an ACC checklist. Keel et al. reported that only 53% of Indigenous Australians received scheduled eye examinations compared with 78% of non-Indigenous Australians.<sup>18</sup>



THOMAS MCKEON *Thomas has type 2 diabetes*

## Interpretation of the data

Overall the data indicate that many people with diagnosed diabetes in Australia are not receiving expected standards of diabetes care, in particular with monitoring of HbA1c and lipids and kidney and foot checks. The majority of studies utilised Medicare claims data, however 'episode coning' for diagnostic testing may have underestimated biological testing. There were also ethnic disparities in access to diabetes care, with people not born in Australia demonstrating lower rates of received services compared with Anglo-Celts in studies that directly compared the two groups. Although the overall mean results suggest a higher proportion of Indigenous Australians receive diabetes health checks compared with the non-Indigenous population, these studies recruited people from Aboriginal and Torres Strait Islander health centres and may not be generalizable to the broader Indigenous community.

### Question 3.

#### What is the proportion of people with diabetes in Australia meeting management targets?

Thirty-five studies investigated the proportion of people with diabetes meeting management targets, spanning a time-period of 1993 to 2015 (Appendix; Tables 4a-4d). The analysis was not restricted to studies of people who had received only standard care and included some studies which provided more intensive care.

#### The proportion of people with diabetes in Australia meeting management targets

	Population	Proportion of people with diabetes meeting target (%)	Sample size (n)
HbA1c $\leq$ 7.0%	Total population	53	1,786,983
	Indigenous population	24	5,295
	Type 1 diabetes	25	2,215
BP $\leq$ 130/80mmHg	Total population	38	18,826
	Indigenous population	38	1,993
	Type 1 diabetes	67	1,565
Total cholesterol $\leq$ 4.0mmol/L	Total population	17	10,138
LDL cholesterol $<$ 2.5 mmol/L	Total population	38	20,125
HDL cholesterol $\geq$ 1.0 mmol/L	Total population	79	14,485
Triglycerides $<$ 2.0 mmol/L	Total population	65	15,677
BMI $\leq$ 25kg/m <sup>2</sup>	Total population	21	14,021

Thirty-one studies investigated the proportion of people meeting the HbA1c target of  $\leq 7.0\%$ , with an overall mean of 53% (range 13-79%). In the majority of studies, the HbA1c result was obtained either from blood tests or review of medical records. Two studies obtained HbA1c results from participant self-report.<sup>19,20</sup>

Five studies reported results for people with type 1 diabetes specifically, indicating 28% achieved an HbA1c  $\leq 7.0\%$ .<sup>19,21-24</sup> Three of these studies directly compared results for people with type 1 and type 2 diabetes, however the results must be interpreted with caution as the groups were not matched for diabetes duration.<sup>19,22,23</sup> Chittleborough et al. compared people with incident (newly diagnosed) diabetes to people with long-term diagnosed diabetes and found better glycaemic control for the newly diagnosed (74% vs. 45.8% achieving HbA1c  $\leq 7\%$ ).<sup>25</sup> Eight studies reported results for the Indigenous population, with a mean of 24% of people achieving the HbA1c target of  $\leq 7.0\%$ .<sup>17,26-32</sup>

## Interpretation of the data

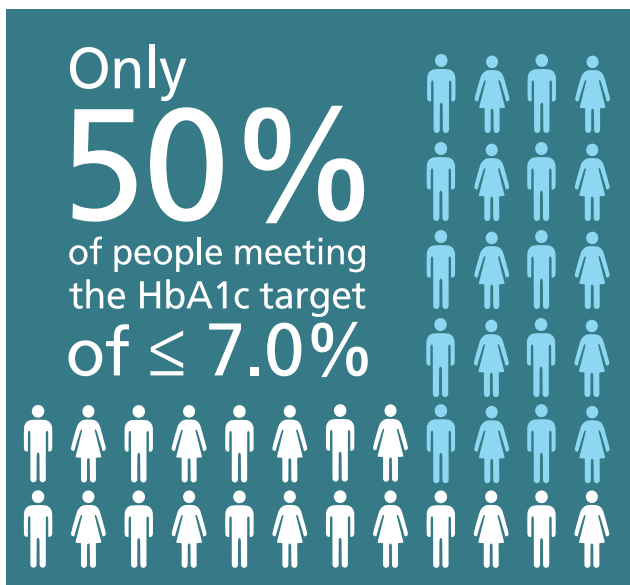
Overall the data indicate that management of diabetes in Australia is suboptimal, with only 50% of people meeting the HbA1c target of  $\leq 7.0\%$  and less than 50% meeting management targets for blood pressure, lipids and body weight. The results are dependent on the method of data collection, with studies based on participant self-report indicating significantly higher proportions of people meeting targets compared with data sourced from medical records. Indigenous Australians, people with type 1 diabetes and those with longer diabetes duration are less likely to achieve HbA1c targets.

Nineteen studies investigated the proportion of people meeting the blood pressure target of  $\leq 130/80$ , with an overall mean of 38% (range 15 - 73%). All results were based on measured blood pressure. Four studies reported results for people with type 1 diabetes, indicating 67% met the blood pressure target.<sup>21-23,33</sup> The higher proportion of people with type 1 diabetes meeting the target may be due to this population group being younger in age. Six studies conducted within an Indigenous population reported 38% of participants achieved blood pressure  $\leq 130/80$ ,<sup>28-32</sup> a similar result to the total cohort of non-Indigenous and Indigenous combined. Comparing the achievement of targets between those with newly diagnosed and long-term diabetes also revealed similar results between the groups (23.7% vs. 26.8%).<sup>25</sup>

## Implications

There is a well established relationship between better glycaemic control and a reduced risk of microvascular complications. Multifactorial intervention that improves glycaemic, blood pressure and lipid control significantly reduces the risk of premature mortality and cardiovascular disease. Improvement in the proportion of people with diabetes meeting targets would translate into improved outcomes.

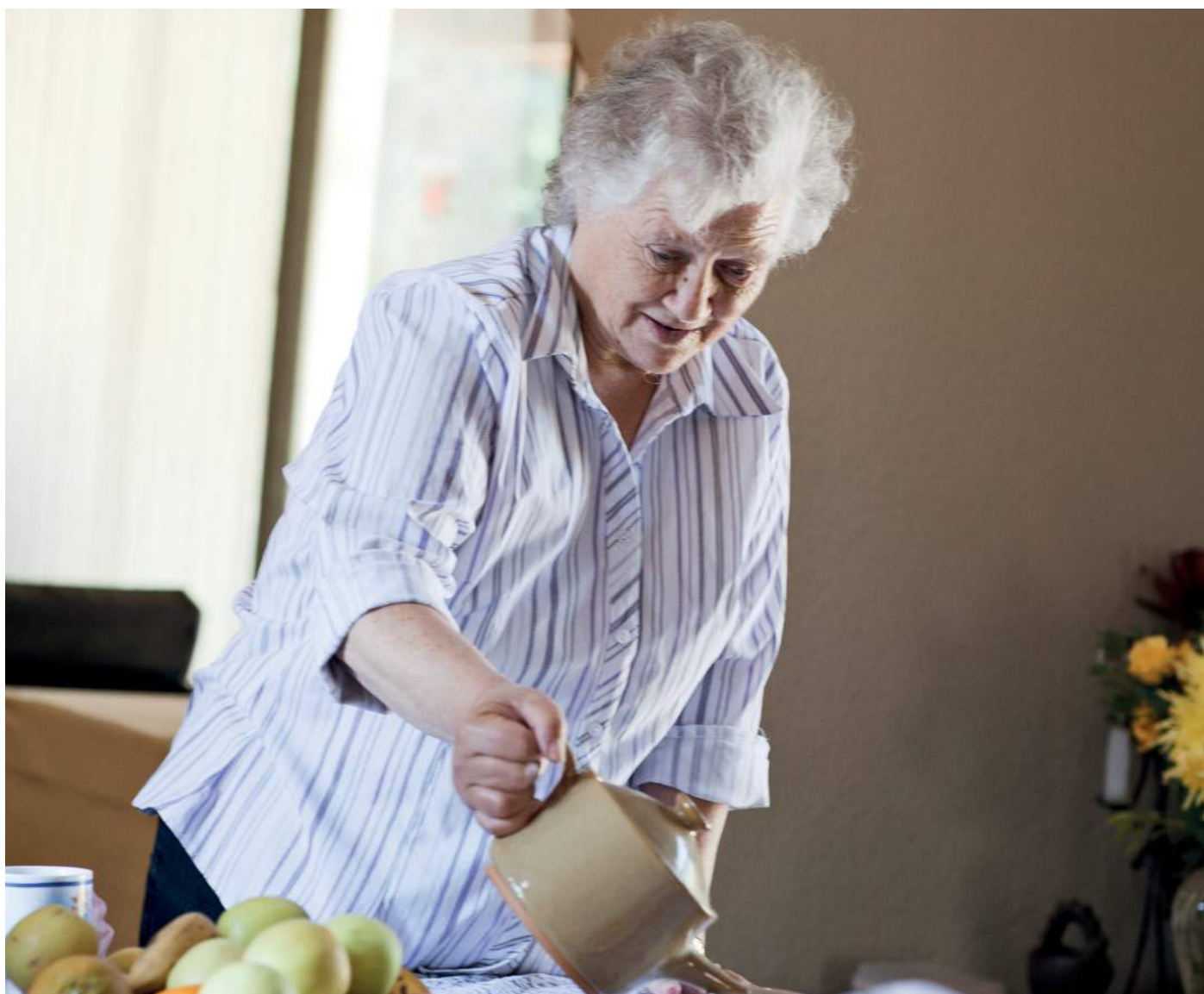
Nine studies reported the proportion of people meeting a total cholesterol target of  $\leq 4.0$  mmol/L, with an overall result of 17% (range 12 - 40%) for the total cohort of Indigenous and non-Indigenous participants. An additional five studies examined the proportion of people meeting a cholesterol target of 5.5mmol/L with target achievement ranging from 52 - 80%. Two studies in children and adolescents reported  $> 60\%$  achieved cholesterol targets.<sup>33,34</sup> Although Australian national guidelines recommend an LDL cholesterol target  $< 2.0$ mmol/L, all studies included in this review reported on the achievement of LDL cholesterol  $< 2.5$ mmol/L.



Thirty-eight percent of people with diabetes met the LDL cholesterol target, 79% of people with diabetes met the HDL cholesterol target of  $\geq 1.0$  mmol/L and 65% the triglycerides target of  $< 2.0$  mmol/L. The proportion of people meeting the LDL cholesterol target was higher among those with long-term diabetes compared with newly diagnosed (45.6% vs. 26.3%).<sup>25</sup>

Four studies conducted within an Indigenous population reported similar results to those for the non-Indigenous population.<sup>28-30,32</sup> Mean proportions were not calculated for the Indigenous population and for people with type 1 diabetes due to limited data for each individual target.

Seven studies investigated the proportion of people with BMI  $\leq 25$  kg/m<sup>2</sup>, with a mean of 21% (range 17 - 59%). One study of type 1 diabetes patients (mean age 23 years) was included which reported over 50% of participants were within the target BMI range.<sup>21</sup>



MARIA BIRD Maria has type 2 diabetes



*DANIELLA BESWICK*  
*Daniella has type 1 diabetes*

#### Question 4.

#### What is the proportion of people with diabetes-related complications in Australia?

Forty-two studies investigated the prevalence of complications among people with diabetes in Australia, spanning a 26-year time-period (1990-2016) (Appendix; Tables 5a-5f). The main complications assessed were microvascular complications (eye disease, neuropathy, nephropathy and foot disease, amputation) and macrovascular disease (coronary artery disease, peripheral vascular disease, myocardial infarction, stroke). This analysis was unable to look at the prevalence of complications specifically for people within treatment targets due to limited data.

#### The proportion of people with diabetes-related complications in Australia

	Population	Proportion of people with diabetes-related complications (%)	Sample size (n)
Diabetic retinopathy	Total population	19	36,311
	Indigenous population	27	5,367
	Type 1 diabetes	24	6,162
Foot ulcer	Total population	5	45,274
Peripheral sensory neuropathy	Total population	25	51,031
	Type 1 diabetes	11	1,822
Kidney disease (microalbuminuria or worse)	Total population	33	947,767
	Indigenous population	55	46,460
	Type 1 diabetes	12	6,960
Stroke	Total population	4	40,916
Ischaemic heart disease	Total population	13	46,835
Peripheral arterial disease	Total population	13	49,062

Diabetic eye disease was the most commonly investigated diabetes complication with 36 studies reporting on the prevalence of some form of eye disease including diabetic retinopathy (proliferative and non-proliferative), diabetic macular edema and blindness. Overall, there was a mean prevalence of diabetic retinopathy of 19% (range 7 - 61%) for the total population and 27% (range 16 - 33%) for Indigenous people with diabetes. In three studies where the prevalence of diabetic retinopathy was reported separately for people with type 1 and type 2 diabetes, there was a higher proportion of diagnosed diabetic retinopathy within the type 1 diabetes population; however, the type 1 diabetes group had a significantly longer diabetes duration.<sup>23,34,45</sup> The prevalence of diabetic retinopathy was higher for studies where the diagnosis was based on ocular examination or retinal photography (both diagnostic tests produced similar results) compared with self-report.

Nine studies reported on the prevalence (current or previous history) of foot complications including foot lesions, ulcers, and lower limb amputations. One study that extracted data on 2,731 adults with type 2 diabetes from national GP registers between 2000-2002 reported that 13.8-16.5% of people with diabetes had a foot complication.<sup>36</sup> Within the studies that reported on specific foot complications, 5% (1 - 11%) of participants reported a history of foot ulcers and another 19.6% were at risk for foot ulcers.<sup>37</sup>

Three studies reported on the prevalence of amputations in people with diabetes. ANDIAB data from 1998-2011 indicated a slight increase in the national prevalence of amputations from 1.1% to 1.9%.<sup>38</sup> The average annual rate of extremity amputations in Western Australia from 2000-2010 was reported to be 724 and 564 per 100,000 person-years in type 1 and type 2 diabetes respectively.<sup>39</sup> Only one study investigated the prevalence of foot complications among Indigenous people with diabetes and reported 2% of those with previously diagnosed diabetes and 0% of those with newly diagnosed diabetes had a toe amputation.<sup>32</sup>



KEENAN HENDRICK Keenan has type 1 diabetes

Fourteen studies reported on peripheral sensory neuropathy which was detected in a mean of 25% of participants (range 12 - 63%). Three studies reported results of the Fremantle Diabetes Study, a longitudinal study conducted over two time periods; 1993-1996 and 2008-2011. These studies examined ethnic differences in the rate of complications, indicating both people of Asian background and Aboriginal Australians had higher rates of peripheral sensory neuropathy compared with Anglo-Celts across both time periods.<sup>28,40,41</sup> Two studies of children and adolescents (predominantly with type 1 diabetes) reported that the prevalence of peripheral sensory neuropathy was slightly lower than in the adult population (11%; range 7 - 27%).

Eighteen studies reported on the prevalence of kidney disease (microalbuminuria or worse). Overall there was a mean prevalence of 33% (range 3 - 62%) in the total population, and 55% (range 36 - 62%) in the Indigenous population. The majority of studies reported kidney disease as the presence of albuminuria (micro or macro) detected through a urinary albumin test. The prevalence of kidney disease was lower (12%) for people with type 1 diabetes (predominantly children and adolescents). Only one study audited the prevalence of end-stage kidney disease, reporting a national prevalence of 1.0 - 2.7% from 1998-2011.<sup>38</sup>

Five studies reported the overall prevalence of cardiovascular disease (CVD) among people with diabetes to be 25-50%, with similar rates of CVD between the Indigenous and non-Indigenous population.<sup>25,42-44</sup>

Chittleborough et al. reported a higher prevalence of CVD for people with HbA1c  $\geq 7.0\%$  (30.5% vs.19.9%).<sup>45</sup> Across the studies that reported on specific diseases 4% reported a diagnosis of stroke and 13% ischaemic heart disease (history of myocardial infarction, angina, coronary artery bypass grafting or angioplasty). Henze et al. also reported 12% prevalence of heart failure among 315 men in Western Australia.<sup>46</sup>





One study that investigated the difference in rates of complications between people with type 1 and type 2 diabetes reported a significantly higher prevalence of stroke and ischaemic heart disease among people with type 2 diabetes;<sup>35</sup> however, the study did not match the groups for diabetes duration and those with type 2 diabetes had a significantly longer duration of diabetes (14.7 years vs. 11.6 years,  $p=0.001$ ). No studies investigated the differences in CVD prevalence between Indigenous and non-Indigenous populations.

The mean prevalence of peripheral arterial disease (PAD) was 13%. The majority of included studies based the diagnosis on an ankle brachial index  $\leq 0.90$ , but one study was based on self-reported surgery for PAD.<sup>47</sup> Davis et al. compared disease prevalence between Aboriginal and Anglo-Celts and reported higher rates of PAD in the Anglo-Celt community between 1993-1996 (15.8% vs. 29.7%), but higher PAD in the Aboriginal community between 2008-2011 (30.7% vs. 21.5%).<sup>28</sup>

### Interpretation of the data

Overall the data indicate a significant burden from diabetes complications in people with diabetes. Indigenous people are more likely to experience adverse complications of diabetes, in particular kidney disease. The inclusion of people both within and outside treatment targets, together with the inclusion of data based on participant self-report may have influenced the results.



DAVID CREER David has type 2 diabetes

### Implications

The gaps in standards of care and the high proportion of people with diabetes not achieving targets is translating into significant morbidity. In addition to improving care of diabetes and associated risk factors for complications, surveillance, early detection and specific intervention programs are required to reduce the development and impact of diabetes complications.

## 4. Conclusion

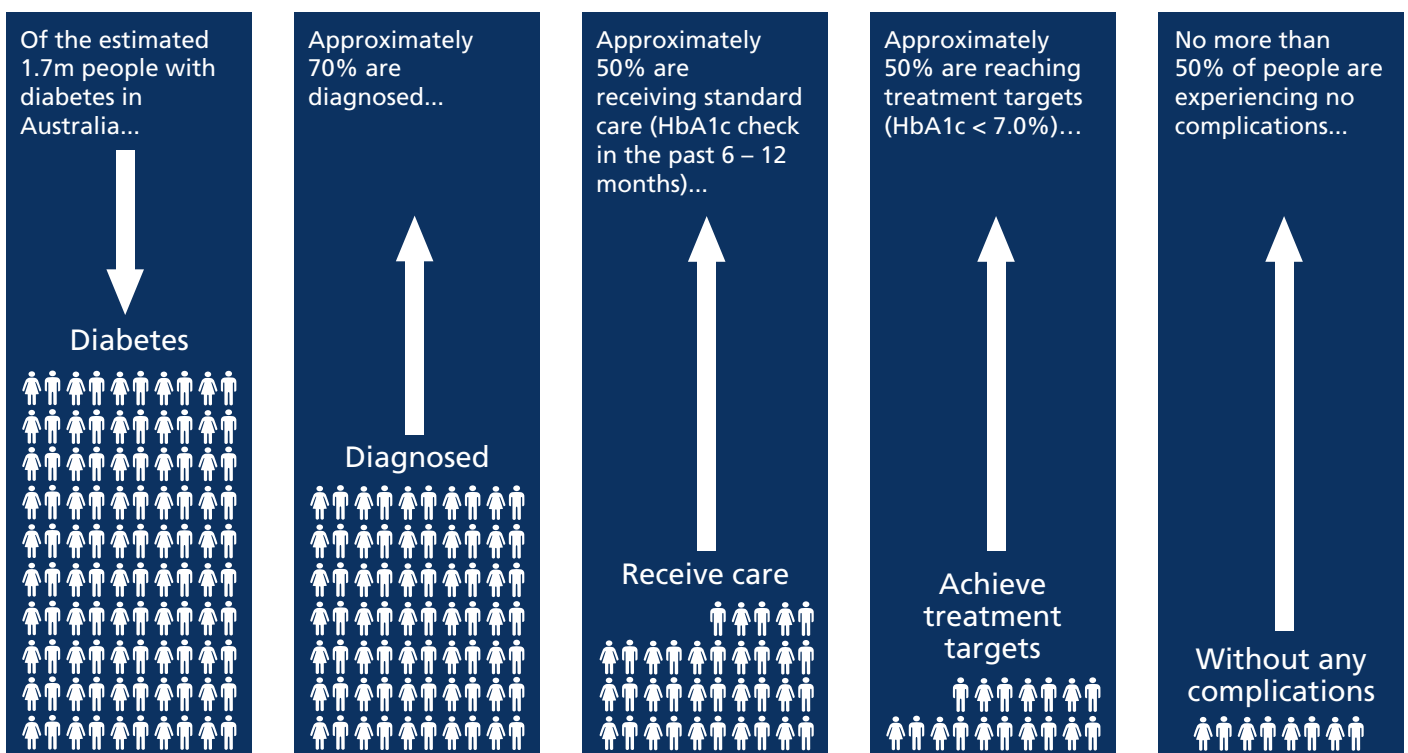
This review highlights the gaps in care, management and outcomes in people with diabetes in Australia. Based on an estimated 1.1 million people with diagnosed type 2 diabetes, another 350,000 have undiagnosed diabetes, which could be detected by fasting glucose or HbA1c, and a further 200,000 have undiagnosed diabetes which could be detected by the 2hPG following an oral glucose tolerance test. Efforts to find these people with undiagnosed diabetes could avert the development of diabetes related complications. In addition, the next national biomedical survey should be used to generate up-to-date accurate data on undiagnosed diabetes by including a sub-sample which has all three tests used to diagnose diabetes.

The review also highlights that a significant proportion of people with known diabetes are not receiving standard care in terms of not being monitored at regular intervals for glycaemic, blood pressure and lipid control or for early signs of the development of diabetes complications. In addition, over half are not achieving treatment targets, predisposing them to developing complications. Consequently, too many people with known diabetes have established micro and macrovascular complications resulting in a significant and potentially avoidable personal, costly and societal burden. Given the strong evidence that the development and progression of complications can be prevented, improved care and management of people with diabetes could substantially reduce this burden.

The results of the Rule of Halves analyses are summarised in the figure below. As can be seen from the figure, the 'Halves' rule does generally apply for Australia apart from diagnosis rates which average approximately 70%, indicating that there is still much that needs to be done to reduce the diabetes burden.

Australia has the basic infrastructure to deliver evidence-based diabetes best practice to address the significant evidence-practice gaps identified in this review. The challenge is to implement the actions identified in the Australian National Diabetes Strategy 2016-2020<sup>12</sup> to achieve earlier diagnosis, better access to diabetes care, and better outcomes for people with diabetes.

### Australia's Diabetes Burden



The report, appendix and the complete reference list can be found at:  
[www.sydney.edu.au/medicine/research/units/boden/recently-published.php](http://www.sydney.edu.au/medicine/research/units/boden/recently-published.php)

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Alex has type 1 diabetes



