

Plain language review of diabetes among Aboriginal and Torres Strait Islander people

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Preface

This plain language review of diabetes among Aboriginal and Torres Strait Islander people is based on the *Review of diabetes among Aboriginal and Torres Strait Islander people (2017)* by Samantha Burrow and Kathy Ride.

Introduction

Diabetes is the world's fastest growing chronic disease [1]. Type 2 diabetes, in particular, is widespread both internationally and in Australia, and governments everywhere are struggling to manage the problem [2-4]. Socially disadvantaged groups and Indigenous peoples are more likely to develop type 2 diabetes [2]. Aboriginal and Torres Strait Islander Australians experience high levels of diabetes compared with the general population. They are three times more likely to have diabetes¹ than non-Indigenous Australians [5, 6] and Aboriginal and Torres Strait Islander women are almost twice as likely to develop gestational diabetes (diabetes during pregnancy) as non-Indigenous women [7]. There is also evidence that Aboriginal and Torres Strait Islander children² are eight times more likely than non-Indigenous children [8] to develop type 2 diabetes, even though it is traditionally considered to be an adult disorder [2]. Death rates from type 2 diabetes are also high: Aboriginal and Torres Strait Islander people are six times more likely than non-Indigenous Australians to die from diabetes [9].

1 Based on self-reported and biomedical data from a 2012-2013 national survey measuring type 1 diabetes, type 2 diabetes, and/or high sugar levels [5, 6].

2 Aged 10-14 years [8].

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There are many factors that contribute to the high levels of diabetes among Aboriginal and Torres Strait Islander people [13, 14]. Prevention and management programs that meet the needs of the community should be holistic and culturally appropriate, and also include services outside the health service sector [13, 15, 16].

Why do a review?

This review provides an overview of key information on diabetes among Aboriginal and Torres Strait Islander people in Australia. The review focuses mostly on type 2 diabetes among Aboriginal and Torres Strait Islander people because type 2 diabetes is responsible for the majority of cases of diabetes in this population. However, the review also refers to type 1 diabetes and gestational diabetes where information is available. It provides a historical, social and cultural background to the development of diabetes, and the behavioural and medical factors that contribute to diabetes among Aboriginal and Torres Strait Islander people. This review provides information on the levels of diabetes among Aboriginal and Torres Strait Islander people and other diseases and conditions that are caused or triggered by diabetes. This information includes data on: incidence (the number of new cases) and prevalence (the number of existing cases); and how many people are hospitalised, die or are disabled because of diabetes³. Comparisons between Aboriginal and Torres Strait Islander people and non-Indigenous people are adjusted to take into account age differences between the two populations (age adjusted). This review discusses the issues of prevention and management of diabetes, and provides information on programs, services, policies and strategies relating to diabetes among Aboriginal and Torres Strait Islander people. This review concludes by discussing possible future directions for managing the growing epidemic of diabetes in Australia.

This review draws mostly on journal publications, government reports, national data collections and national surveys. Most of these can be accessed through the HealthInfoNet's Australian Indigenous HealthBibliography.

When referring to Australia's Indigenous people, the HealthInfoNet prefers to use the terms Aboriginal, Torres Strait Islander, or Aboriginal and Torres Strait Islander. However, if we are quoting from a publication that uses the word 'Indigenous' we will use that term. If you have any concerns you are advised to contact the HealthInfoNet for further information.

³ For a discussion on the data limitations of the statistical sources used in this review please refer to Appendix 1 of *Review of diabetes among Aboriginal and Torres Strait Islander people* (2017) by Samantha Burrow and Kathy Ride

Key facts

The context of Aboriginal and Torres Strait Islander health and diabetes

- The high level of diabetes among Aboriginal and Torres Strait Islander people is a result of a combination of historical, social and cultural factors as well as health risk factors.
- In 2012-2013:
 - Aboriginal and Torres Strait Islander people had higher rates than non-Indigenous people of many of the risk factors for diabetes including: overweight and obesity; high blood pressure; abnormal cholesterol levels; smoking; and low daily consumption of fruit and vegetables
 - obese Aboriginal and Torres Strait Islander people were nearly five times as likely to have diabetes as those who were of normal weight or underweight (19% compared with 4%)
 - Aboriginal and Torres Strait Islander people with high blood pressure were nearly three times as likely to have diabetes as those without high blood pressure (24% compared with 9%).

The extent of diabetes among Aboriginal and Torres Strait Islander people

- Prevalence:
 - estimates from research studies among Aboriginal and Torres Strait Islander communities range from 4% to 33%
 - estimates from the AATSIHS national survey ranged from 9% (based on self-reported data) to 11% (based on medical data); Aboriginal and Torres Strait Islander people were more than 3 times as likely as non-Indigenous people to have diabetes.

Box 1: Diabetes

Diabetes (diabetes mellitus) is a disease that leads to high levels of glucose in the blood [10]. It occurs when a person is no longer able to produce their own insulin or when key organs in the body become resistant to insulin. It is a complex, chronic condition that can lead to illness, disability, reduced quality of life and early death [3, 10, 11]. Once diagnosed, diabetes requires lifelong management [3, 11]. There is currently no cure [3].

Type 2 diabetes is the most common form of diabetes, affecting mostly older people but becoming more common in young people and children [2, 3]. If undiagnosed or poorly managed, diabetes can lead to complications and death [6]. Complications include diseases of the large blood vessels (macrovascular disease), such as heart disease and stroke, and diseases of the small blood vessels (microvascular disease), such as kidney disease, eye disease and nerve disease [12]. Type 1 diabetes and gestational diabetes are the other main types of diabetes [10].

- Between 2006 and 2011:
 - Aboriginal and Torres Strait Islander people aged 10-14 years of age were more than eight times more likely to develop type 2 diabetes than non-Indigenous people of the same age
 - Aboriginal and Torres Strait Islander people aged 15-19 years of age were more than four times more likely to develop type 2 diabetes than non-Indigenous people of the same age.
- Between 2005 and 2007, 1.5% of Aboriginal and Torres Strait Islander women who gave birth had pre-existing diabetes and 5.1% had gestational diabetes mellitus (GDM).
- In 2012-13, Aboriginal and Torres Strait Islander people were four times more likely to be hospitalised for diabetes than non-Indigenous people.
- In 2013 the number of deaths from diabetes for Aboriginal and Torres Strait Islander people was six times higher than that for non-Indigenous people.

Complications and other diseases associated with diabetes

- In 2012-13:
 - Aboriginal and Torres Strait Islander people were six times more likely than non-Indigenous people to be hospitalised for 'complications of type 2 diabetes'
 - Aboriginal and Torres Strait Islander people with diabetes, cardiovascular disease and chronic kidney disease (i.e. all three conditions at the same time) were seven times more likely to be hospitalised than non-Indigenous people with the same three conditions.
- In 2005-2007, Aboriginal and Torres Strait Islander mothers who had diabetes during pregnancy were more likely than non-Indigenous mothers to have complications and require a long hospital stay. This was also true for their babies.

Prevention and management of diabetes

- Short-term healthy lifestyle programs which are designed to prevent type 2 diabetes among Aboriginal and Torres Strait Islander people can have positive health effects for up to two years, and are more likely to be effective if they are started by the community.

Diabetes programs and services

- Culturally appropriate, well managed primary health care services can be effective in improving diabetes care and health for Aboriginal and Torres Strait Islander people.

Diabetes policies and strategies

- The Diabetes Australia *Action plan* and the *Australian national diabetes strategy 2016-2020* both stress the need for a national approach to addressing diabetes. They recommend holistic, culturally appropriate diabetes programs that target Aboriginal and Torres Strait Islander people of all ages.

What factors contribute to diabetes among Aboriginal and Torres Strait Islander people?

The risk of developing diabetes is influenced not only by a person's behavior, but also by the following factors:

- historical
- social
- cultural
- geographical
- economic
- community
- government health policies and services [16].

Each of these will be discussed in more detail below.

Historical, social and cultural factors

Aboriginal and Torres Strait Islander people followed a hunter-gatherer lifestyle up until the late 18th century, but the arrival of Europeans in 1788 led to major changes in lifestyle [20, 21]. Traditional activities - finding renewable food and resources, following ancestral and cultural practices, and sustaining the spiritual connection to country - changed over time [17, 20-23].

A reduced amount of physical activity and poorer nutrition (which are key risk factors for diabetes) played an important role in the development of diabetes in Aboriginal and Torres Strait Islander people, particularly in the second half of the 20th century [20, 23]. The first case of diabetes among Aboriginal and Torres Strait Islander people was recorded in Adelaide in 1923 [24]. Records prior to this time showed that Aboriginal and Torres Strait Islander people were fit and lean, and did not suffer from the same health conditions seen in European populations [25 cited in 26]. The earliest detailed studies investigating the development of diabetes in Aboriginal and Torres Strait Islander populations were not undertaken until the early 1960s [26]. Both these studies and later ones found a relationship between the development of a 'westernised' lifestyle and increased levels of diabetes in the Aboriginal and Torres Strait Islander population [26, 27].

Social and cultural factors that also contribute to diabetes include:

- low levels of education
- unemployment
- low income
- poor or no housing
- poor access to services
- loss of connection with land
- racism
- imprisonment [18, 28, 29].

In general, Aboriginal and Torres Strait Islander people experience higher levels of disadvantage against all these measures, compared with non-Indigenous people.

Box 2: Health risk factors for diabetes

Health risk factors refer to the behaviours, characteristics, or dangers that increase the chances of a person developing a disease [31]. When people have multiple risk factors, the chances of developing the disease are increased. Risk factors can also increase the severity of the disease; increase the chances of developing complications or other related diseases; and reduce the chances that treatment or care will be successful. The risk factors for diabetes can be divided into two main categories: non-modifiable (cannot be changed) and modifiable (can be changed) [31, 38]. Non-modifiable risk factors include family history and age. Modifiable risk factors fall into two groups: behavioural or biomedical. These can be improved by changing behaviour and lifestyle, or with the use of medicines and treatment. Behavioural risk factors include tobacco smoking, low levels of physical activity and poor nutrition. Biomedical risk factors are present in the body and include high blood sugar levels, high blood pressure (hypertension), high blood cholesterol (dyslipidaemia) and obesity. When these risk factors occur together (known as the metabolic syndrome) they greatly increase the risk of type 2 diabetes. Having more than one risk factor increases the risk of a person getting diabetes. Having diabetes increases the risk of getting some other diseases, including cardiovascular disease, kidney disease and diabetic retinopathy [31, 39]. Cardiovascular disease is also a risk factor for diabetes.

Health factors

Some behaviour and health factors can provide protection against developing diabetes (protective factors), while others can increase a person's risk of developing the condition (risk factors) [31].

Protective factors

There are several lifestyle factors that can help to reduce a person's risk of developing diabetes [16,31,32]:

- reduction in obesity
- increased physical activity
- improvements in diet
- breastfeeding.

Risk factors

Factors that increase the risk of developing diabetes, particularly type 2 diabetes, include:

- high blood pressure
- high blood cholesterol
- tobacco smoking
- low levels of physical activity
- poor diet
- being overweight or obese [31].

Aboriginal and Torres Strait Islander people are more likely to have these risk factors for diabetes than non-Indigenous Australians [5], and many who already have diabetes have multiple risk factors (more than one) and other related health problems [35-37].

Self-reported⁴ and biomedical⁵ data was collected for the 2012-13 *Australian Aboriginal and Torres Strait Islander health survey* (AATSIHS) [5, 6]. This can be used to calculate risk factors and levels of disease in the population. Although a population or group may have many of the risk factors and also have high levels of disease, it does not necessarily mean that the risk factors cause the disease [31]. However, in the case of Aboriginal and Torres Strait Islander people, the high prevalence of diabetes in this population (compared with the non-Indigenous population) suggests that there is a link between the risk factors and the disease [16].

4 Self-reported data is collected by asking people questions about their health and recording their answers

5 Biomedical data is collected by health professionals and includes height and weight, blood samples, urine samples etc

Survey data on diabetes risk factors

The 2012-13 AATSIHS collected data for several diabetes risk factors. These are discussed in more detail below [5, 6].

Overweight and obesity:

- Two thirds (66%) of Aboriginal and Torres Strait Islander people aged 15 years and over were either overweight (29%) or obese (37%) according to their body mass index (BMI) [40].
- The proportion of Torres Strait Islanders⁶ who were overweight (33%) or obese (40%) was slightly higher than the proportion of Aboriginal people (28% overweight and 37% obese).
- The percentage of Aboriginal and Torres Strait Islander children aged 2-4 years who were overweight or obese was less than the percentage of non-Indigenous children of the same age (17% compared with 23%).
- Around a quarter of both Aboriginal and Torres Strait Islander and non-Indigenous children aged 5-9 years were overweight (24%) or obese (23%) [41].
- The proportion of overweight or obese people in all other age groups was significantly higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people [41, 42]. Aboriginal and Torres Strait Islander people aged 15 years and over were 1.2 times more likely to be overweight or obese [42].
- Obese Aboriginal and Torres Strait Islander people aged 18 years and over were around five times more likely to have diabetes⁷ than those who were of normal weight or underweight (19% compared with 4%) [36].

High blood pressure

- One fifth (20%) of Aboriginal and Torres Strait Islander adults aged 18 years and over had high blood pressure ($\geq 140/90$ mmHg or higher) [43]. Aboriginal and Torres Strait Islander adults were 1.2 times more likely than non-Indigenous adults to have high blood pressure.
- Aboriginal and Torres Strait Islander people with high blood pressure were nearly three times more likely to have diabetes than those without high blood pressure (24% compared with 9%) [36].

Abnormal cholesterol and triglycerides

The proportion of Aboriginal and Torres Strait Islander adults aged 18 years and over with abnormal test results for cholesterol or triglycerides was as follows [44]:

- at least one quarter (25%) of Aboriginal and Torres Strait Islander adults aged 18 years and over had higher than normal levels of total cholesterol, low density lipoprotein (LDL) cholesterol, or triglycerides
- two fifths (40%) of Aboriginal and Torres Strait Islander adults aged 18 years and over had low levels of high density lipoprotein (HDL) cholesterol
- compared with non-Indigenous adults:
 - Aboriginal and Torres Strait Islander adults were more likely to have abnormal ratios of HDL cholesterol (1.8) and triglycerides (1.9)
 - Aboriginal and Torres Strait Islander adults were less likely to have abnormal total cholesterol and LDL cholesterol (ratios for both were 0.8) [45]
- compared with adults without diabetes:
 - Aboriginal and Torres Strait Islander adults with diabetes were around twice as likely to have abnormal HDL cholesterol (67% compared with 35%) and abnormal triglycerides (44% compared with 22%) [37].

Smoking

- Around two fifths of Aboriginal people (42%) and Torres Strait Islander people (38%) aged 15 years and over smoked on a daily basis [40].
- Aboriginal and Torres Strait Islander people aged 15 years and over were more likely to smoke on a daily basis than non-Indigenous people (2.6 times more likely) [46].
- More than two thirds (69%) of Aboriginal and Torres Strait Islander adults aged 18 years and over were either current or ex-smokers (47% Aboriginal people and 22% Torres Strait Islander people).

6 Includes people who are of Torres Strait Islander origin only, and those who are of both Aboriginal and Torres Strait Islander origin [40]

7 Diabetes was diagnosed based on glycated haemoglobin (HbA1c) test results [36].

Inadequate fruit and vegetable intake⁸

- Aboriginal and Torres Strait Islander children aged 2 years and over did not eat enough fruit (46%) or vegetables (92%) every day.
- Most (93%) Aboriginal and Torres Strait Islander people aged 2 years and over did not eat enough fruit and/or vegetables every day. This percentage increased to 97% for those aged 15 years or older.
- Torres Strait Islander people aged 15 years and over were more likely to eat enough fruit daily (48%) than Aboriginal people (41%).
- Aboriginal and Torres Strait Islander people aged 15 years and over were less likely than non-Indigenous people to eat enough fruit or vegetables each day (ratios were: fruit 0.9 and vegetables 0.8) [5].

How do chronic disease risk factors change over time?

A study to measure chronic disease risk factors was conducted in a remote Aboriginal community in the Northern Territory (NT) between 1992 and 2006 [48]. Data was collected during two health surveys. The first took place between 1992 and 1997 and the second between 2004 and 2006.

Results from the surveys showed that the prevalence of risk factors for diabetes increased over time (e.g. more people were outside the healthy range for weight, BMI, systolic blood pressure and triglycerides in the second survey) particularly the women, and the number of cases of diabetes remained the same or increased across all age groups except for males aged 45-54 years.

These results confirm that preventing or reducing the risk factors for diabetes is critical to the prevention and management of this condition among Aboriginal and Torres Strait Islander people [13].

Measuring diabetes in the Aboriginal and Torres Strait Islander population.

There are several types of diabetes, of which the most frequently occurring are type 1, type 2 and gestational diabetes (GDM) (see Box 3) [49, 50]. Type 1 diabetes is relatively uncommon among Aboriginal and Torres Strait Islander people, but Aboriginal and Torres Strait Islander people experience very high levels of type 2 diabetes compared with the general population [51]. Levels of GDM are also higher among Aboriginal and Torres Strait Islander women than among non-Indigenous women [7, 52].

Box 3: Types of diabetes

Type 1 diabetes (also known as *type 1 diabetes mellitus* or T1DM) is usually diagnosed in children and adolescents [7, 35, 53]. It is an auto-immune condition (a person's immune system starts to destroy its own cells) that causes damage to the pancreas, where insulin is produced. This causes hyperglycaemia (high blood sugar levels) because the body is no longer able to produce enough insulin. People with type 1 diabetes need insulin replacement for survival.

Type 2 diabetes (also known as *type 2 diabetes mellitus* or T2DM) usually develops in adulthood, although over recent years it is occurring more frequently among children and adolescents [7, 53]. It also causes hyperglycaemia but this is due either to not enough insulin being produced or to insulin resistance (where the cells in the body no longer respond to the insulin being produced). This form of diabetes often runs in families, and develops when a person has risk factors such as obesity, poor nutrition, and lack of physical activity. Type 2 diabetes can usually be controlled through changes in lifestyle, but may require insulin treatment over time.

Gestational diabetes (also known as *gestational diabetes mellitus* or GDM) is a form of diabetes that develops during pregnancy in some women who have not been diagnosed with diabetes before [7, 35, 53]. GDM occurs when the placenta produces certain hormones that block insulin activity. This can lead to insulin resistance and high blood sugar levels [7, 35, 53, 54]. This type of diabetes usually develops in the second or third trimester of pregnancy and disappears after the baby is born. GDM increases the risk of complications for both mother and baby at birth [7, 35] and puts the mother at increased risk of developing type 2 diabetes later in life. A woman who has had GDM is also more likely to have GDM in later pregnancies.

⁸ The Australian Dietary Guidelines [47] are used to calculate whether people are eating the recommended amounts of fruit and vegetables.

There are various ways to measure the extent of diabetes in a population (see Box 4). This review uses mostly national data, and most of this is type 2 diabetes data. Statistics for type 1 diabetes and GDM are reported if they are available. Separate data for Torres Strait Islanders is limited, but is also provided where available. The various measurements used in this review are defined below (see Box 4).

Box 4: Measuring diabetes⁹

Incidence is the number of new cases of diabetes that occur during a given period [55].

Prevalence is the number or proportion of cases of diabetes in a population at a given time [55].

Age-standardised rates enable comparisons of rates of diabetes between populations that have different age structures [56]. Age standardisation is used in this review when comparing Aboriginal and Torres Strait Islander people and non-Indigenous people because the Aboriginal and Torres Strait Islander population has a younger age structure than the non-Indigenous population.

Rate ratio (RR) is the rate of Aboriginal and Torres Strait Islander people affected by diabetes divided by the rate of non-Indigenous people affected by diabetes [56].

Ratio (R) is the proportion of Aboriginal and Torres Strait Islander people affected by diabetes divided by the proportion of non-Indigenous people affected by diabetes.

Potentially preventable hospitalisations are hospital admissions for conditions (including diabetes) that may have been avoided through prevention and/or management during the early stages [56].

Potentially avoidable deaths are deaths among people aged less than 75 years from conditions (including diabetes) which were considered possibly preventable and treatable [56]. Potentially avoidable deaths can be reduced through changes in lifestyle, prevention, early intervention and medical treatment.

Burden of disease is measured in ‘disability-adjusted life years’ (DALYs). It provides a combined estimate of years of life lost due to premature mortality (early death) caused by diabetes, and years of life lost due to disability or ill health caused by diabetes [57].

Fatal burden is measured in ‘years of life lost’ (YLLs) and refers to the burden of disease that is caused by premature mortality from diabetes [57].

9 When considering the data presented in this review please note that: the availability and quality of data varies; there are data limitations associated with each of the measures of diabetes; statistics about diabetes for Aboriginal and Torres Strait Islander people are often underestimated.

Prevalence – how many people have diabetes?

Estimates of the prevalence of diabetes among Aboriginal and Torres Strait Islander people range from 4% to 33%, depending on the communities or groups surveyed [58]. According to the 2012-2013 AATSIHS, estimates of the prevalence of diabetes (type 1, type 2 or high sugar levels) among Aboriginal and Torres Strait Islander people throughout Australia range from 8.6% (based on self-reported data [5]) to 11.1% (based on biomedical data [6]).

Self-reported data the from the 2012-2013 AATSIHS

- Around 8.6% of Aboriginal and Torres Strait Islander people (8.8% of Aboriginal people and 7.0% of Torres Strait Islander people) aged 2 years and over reported that they had type 1 or type 2 diabetes and/or high sugar levels in their blood or urine [5, 40].
- Aboriginal and Torres Strait Islander people were more than three times more likely than non-Indigenous people to have diabetes and/or high sugar levels (3.2 times) [59].
- Diabetes and/or high sugar levels were reported by a higher percentage of Aboriginal and Torres Strait Islander females (9.6%) than males (7.7%) [60].
- Levels of diabetes and/or high sugar levels increased with age,¹⁰ [61] ranging from 1% for Aboriginal and Torres Strait Islander people aged 2-14 years to 40% for those aged 55 years and over (Table 1) [59].

Table 1. Proportions (%)¹ of people reporting diabetes/high sugar levels as a long-term health condition, by Indigenous status, and Indigenous:non-Indigenous ratios, Australia, 2012-2013

Age group (years)	Aboriginal and Torres Strait Islander (%)	Non-Indigenous (%)	Ratio ^{2,4}
2-14	0.5	NA ³	NA ³
15-24	1.4	NA ³	NA ³
25-34	5.3	1.1	4.8
35-44	11	2.8	4.0
45-54	23	5.6	4.2
55+	40	14	2.9

Notes:

1. Proportions are expressed as percentages
2. Ratio is the Indigenous proportion divided by the non-Indigenous proportion
3. Not available
4. Rounding may result in inconsistencies in calculated ratios

Source: ABS, 2014 (derived from Table 6.3) [59]

10 Data for age groups less than 25 should be used with caution due to the associated high standard error. Prevalence data for non-Indigenous people aged 2-14 and 15-24 was not reported [59].

- Aboriginal and Torres Strait Islander people living in non-remote areas (7.5%) had a lower prevalence of diabetes/high sugar levels than those living in remote areas (12.8%) [59].
- The prevalence among Aboriginal and Torres Strait Islander people was highest in the Northern Territory (NT) at 12%, followed by Western Australia (WA) (10%), South Australia (SA) (8.9%), Queensland (Qld) (8.3%), New South Wales (NSW) (8.1%), the Australian Capital Territory (ACT) (7.6%), Victoria (Vic) (7.1%) and Tasmania (Tas) (3.8%).

Biomedical data from the 2012-2013 AATSIHS

- Biomedical results generally agreed with the self-reported results obtained from the AATSIHS.
- Biomedical data was obtained for a smaller group of Aboriginal and Torres Strait Islander adults (18 years and over) who provided blood and urine samples [6].
- Results for fasting plasma glucose levels (a blood test) showed that 11% of Aboriginal and Torres Strait Islander adults had diabetes (9.6% had known diabetes and 1.5% were newly diagnosed from their test results) [62].
- A further 4.7% of Aboriginal and Torres Strait Islander adults were at high risk of diabetes.
- Aboriginal and Torres Strait Islander adults were 3.3 times as likely as non-Indigenous adults to have diabetes [63].
- Diabetes prevalence among Aboriginal and Torres Strait Islander adults increased with age, with particularly high rates among those aged 55 years and over (35%) [63].
- Diabetes tended to occur at earlier ages among Aboriginal and Torres Strait Islander adults than among non-Indigenous adults, with Aboriginal and Torres Strait Islander people having diabetes at rates similar to those of non-Indigenous people who were 20 years older [63].
- Aboriginal and Torres Strait Islander adults in remote areas were twice as likely to have diabetes as those living in non-remote areas (20.8% compared with 9.4%) [64].
- Around half of Aboriginal and Torres Strait Islander adults with diabetes also had signs of chronic kidney disease (53% compared with 11% without diabetes) [37].

How many people have gestational diabetes?

The Australian Institute of Health and Welfare (AIHW) has analysed data from the *National perinatal data collection* (NPDC) and calculated the prevalence of GDM for the period 2005-2007 [7].

During those years:

- 6.6% of Aboriginal and Torres Strait Islander women who gave birth in Australia had diabetes during pregnancy; 1.5% had pre-existing diabetes and 5.1% had GDM
- Aboriginal and Torres Strait Islander women who gave birth were 3.2 times more likely than non-Indigenous women to have pre-existing diabetes and 1.6 times more likely to have GDM.

A more recent estimate put the GDM prevalence among Aboriginal and Torres Strait Islander women in 2015 at 5.7%. This rate was calculated by analysing several studies conducted between 1980 and 2013 [52]. Although the prevalence was different among the groups studied (1.3% to 18.5%), the overall prevalence is similar to that calculated from the national collection. Although the prevalence of GDM increased from 3% to 12% between 1985-1987 and 1989, the study authors suggest that the introduction of a screening program for all pregnant Aboriginal women in Central Australia for GDM may partly explain this increase. They concluded that the prevalence is most likely the higher rate.

Incidence – how many new cases of diabetes are there?

Insulin-treated diabetes¹¹

- In 2013, there were 70 new cases of type 1 diabetes among Aboriginal and Torres Strait Islander people (3% of all new diabetes cases) [65].
- Between 2005 and 2013, 489 Aboriginal and Torres Strait Islander people were diagnosed with type 1 diabetes. The incidence rate for Aboriginal and Torres Strait Islander people in this period was lower than the rate for non-Indigenous people (7 per 100,000 population compared with 10 per 100,000 population).
- In 2011, 62 Aboriginal and Torres Strait Islander people were diagnosed with type 1 diabetes¹² (2.6% of all cases), 656 people began using insulin to treat type 2 diabetes (1.8% of all cases) and 118 females began using insulin to treat GDM¹³ (1.9% of all cases) [10].
- Type 1 diabetes occurred more frequently among Aboriginal and Torres Strait Islander males (60%) than females, and type 2 diabetes (insulin-treated cases only) occurred more frequently among Aboriginal and Torres Strait Islander females (54%) than males.

11 National incidence data for diabetes is based on estimates for insulin-treated diabetes (type 1, type 2 and GDM) and obtained from the *National (insulin-treated) diabetes register (NDR)* [10]

12 Year of first insulin use is used to estimate year of diagnosis as diabetes can remain undiagnosed for many years [10].

13 Results should be interpreted with caution as status (Indigenous/non-Indigenous) was not recorded for: 24% of cases of type 1 diabetes; 54% of cases of type 2 diabetes; and 26% of cases of GDM [10].

Combined data for the years between 2006 and 2011 revealed that [10]:

- incidence rates of insulin-treated type 2 diabetes were almost four times higher for Aboriginal and Torres Strait Islander people (134 per 100,000) than non-Indigenous people (36 per 100,000)
- incidence rates of type 1 diabetes were lower for Aboriginal and Torres Strait Islander people (7 per 100,000) than for non-Indigenous people (10 per 100,000)
- incidence rates of insulin-treated GDM were similar for Aboriginal and Torres Strait Islander females (60 per 100,000) and non-Indigenous females (59 per 100,000).

Type 2 diabetes in Aboriginal and Torres Strait Islander children and adolescents

- Type 2 diabetes, which was previously uncommon among children and adolescents, is being identified more frequently and makes up most of the new cases among this age group of Aboriginal and Torres Strait Islanders [8].
- Type 2 diabetes occurs more frequently among Aboriginal and Torres Strait Islander adolescents than non-Indigenous children and adolescents [66]
- Between 2006 and 2011, 252 new cases of diabetes were reported among Aboriginal and Torres Strait Islander youth aged 10-19 years¹⁴ [8] – more than half (55%) were type 2 and 43% were type 1 diabetes.
- The rates of type 2 diabetes for certain age groups were much higher for young Aboriginal and Torres Strait Islander people than for non-Indigenous children and adolescents of the same age (8.3 times as high among 10-14 year olds; 3.6 times as high for 15-19 year olds).
- A study conducted in NSW between 2001 and 2008 found that young Aboriginal and Torres Strait Islander people (aged 10-18 years) had an incidence of type 2 diabetes that was 6.9 times higher than non-Indigenous youth of the same age [68].
- Young Aboriginal and Torres Strait Islander females were more likely to be diagnosed with type 2 diabetes than young males (55% compared with 45%).
- On average, Aboriginal and Torres Strait Islander youth were younger than non-Indigenous youth when they were diagnosed with type 2 diabetes (13.5 years compared with 14.8 years).
- Aboriginal and Torres Strait Islander youth who were diagnosed with diabetes were more likely to live in rural areas than urban areas (71% compared with 26%).

What health services do Aboriginal and Torres Strait Islander people use?

General practitioners (GPs)

General practitioners (GPs) are usually the first point of contact for people with diabetes and often play a key role in coordinating the other specialised services and health professionals who are needed to help sufferers manage their condition [38].

The Bettering the evaluation and care of health (BEACH) survey [70] collects information on the clinical activity of GPs, and provides information on how often they manage diabetes for their Aboriginal and Torres Strait Islander patients. According to this survey:

- from April 2008 to March 2013, Aboriginal and Torres Strait Islander patients were twice as likely to require management for type 2 diabetes than other patients during GP visits (8.2 per 100 appointments compared with 4.0 per 100 appointments) [71].
- from April 2006 to March 2011, type 2 diabetes was the most common individual problem managed by GPs during appointments with Aboriginal and Torres Strait Islander patients (7.2 per 100 appointments) [72]. This was almost three times the rate for non-Indigenous patients.

Hospitals

Hospitalisation data usually provides information on the more serious features of diabetes because hospitals are mostly used for treating the later stages of complications from diabetes or urgent cases of poor glycaemic control (high or low blood sugar levels that can lead to coma) [35][38].

Hospitalisation data for diabetes is presented in three ways:

- 1. separations** - where a person is admitted to hospital and then released after treatment or death
- 2. hospitalisations for diabetes as the principal diagnosis** - a principal diagnosis is the diagnosis considered to be the main reason for the patient's hospitalisation
- 3. hospitalisations for diabetes as an additional diagnosis** - where diabetes has affected the condition of the patient who has been admitted for another cause.

14 Based on combined data from the *National diabetes services scheme (NDSS)* and the *Australasian Paediatric Endocrine Group (APEG)* [8].

Hospital separations in 2012-13 [56]:

- Aboriginal and Torres Strait Islander people were four times more likely to be hospitalised for diabetes than non-Indigenous people.
- There were similar numbers of hospitalisations for Aboriginal and Torres Strait Islander males (1,379) and females (1,370).
- Males were 3.5 times more likely and females 4.7 times more likely to be hospitalised than non-Indigenous males and females [56].
- Hospitalisation rates for Aboriginal and Torres Strait Islander people were highest in remote and very remote areas (11 per 1,000), followed by inner and outer regional areas (6.0 per 1,000), and major cities (4.3 per 1,000) [56].
- Aboriginal and Torres Strait Islander people were 5.3 times more likely than their non-Indigenous counterparts to be hospitalised for diabetes in remote and very remote areas, 3.4 times more likely in inner and outer regional areas, and 2.8 times more likely in major cities.
- Aboriginal and Torres Strait Islander people were four times more likely than non-Indigenous people to be hospitalised for diabetes (all types¹⁵) as the principal and/or an additional diagnosis [35]. Aboriginal and Torres Strait Islander males and females were

both more likely than their non-Indigenous counterparts to be hospitalised (males: three times more likely and females: five times more likely).

- Hospitalisation rates for Aboriginal and Torres Strait Islander people with a principal (5.5 per 1,000) or additional diagnosis of type 2 diabetes (115 per 1,000) were higher than those with a principal (0.8 per 1,000) or additional diagnosis of type 1 diabetes (3.4 per 1,000) [35].
- Aboriginal and Torres Strait Islander people were four times more likely than non-Indigenous people to be hospitalised for type 2 diabetes, and 1.7 times more likely to be hospitalised for type 1 diabetes.
- Aboriginal and Torres Strait Islander females were 1.9 times more likely than non-Indigenous females to be hospitalised for GDM.
- Aboriginal and Torres Strait Islander males and females were more likely than their non-Indigenous counterparts to be hospitalised for each type of diabetes.
- When principal and additional diagnoses were analysed separately, the biggest difference seen was for Aboriginal and Torres Strait Islander females with a principal diagnosis of type 2 diabetes, who were 8.1 times more likely than non-Indigenous females to be hospitalised (Tables 2 and 3).

Table 2. Diabetes hospitalisation rates, as the principal diagnosis, by Indigenous status and sex, 2012-13 (rate per 100,000 population)

Diabetes type	Males			Females		
	Indigenous	Non-Indigenous	RR	Indigenous	Non-Indigenous	RR
Type 1	88	61	1.4	78	63	1.2
Type 2	563	129	4.4	529	65	8.1
GDM				150	19	7.9

Notes:

1. 'Non-Indigenous' includes hospitalisations of those whose Indigenous status was not stated.
2. Directly age-standardised to the 2001 Australian standard population.

Source: AIHW, 2014 (derived from Tables A6, A7 and A8) [35]

Table 3. Diabetes hospitalisation rates, as an additional diagnosis, by Indigenous status and sex, 2012-13 (rate per 100,000 population)

Diabetes type	Males			Females		
	Indigenous	Non-Indigenous	RR	Indigenous	Non-Indigenous	RR
Type 1	328	181	1.8	344	177	1.9
Type 2	10,126	3,258	3.1	12,821	2,200	5.8
GDM				390	266	1.5

Notes:

1. 'Non-Indigenous' includes hospitalisations of those whose Indigenous status was not stated.
2. Directly age-standardised to the 2001 Australian standard population.

Source: AIHW, 2014 (derived from Tables A6, A7 and A8) [35]

¹⁵ ICD-10-AM codes E10-E14 (type 1, type 2, other and unspecified diabetes) and O24.4 (GDM) [35].

From July 2008 to June 2010 for Aboriginal and Torres Strait Islander people with a principal diagnosis of diabetes (all types excluding GDM) living in NSW, Vic, Qld, WA, SA and the NT¹⁶ [72]:

- Aboriginal and Torres Strait Islander males and females had much higher hospitalisation rates for diabetes than their non-Indigenous counterparts in all age groups from 15–24 years onwards (Table 4).
- The biggest difference between Aboriginal and Torres Strait Islander and non-Indigenous hospitalisation rates occurred among males in the 35-44 year age group (9.1 times greater) and females in the 45-54 year age group (11.8 times greater).
- Age-standardised hospitalisation rates for Aboriginal and Torres Strait Islander people with diabetes were greatest in WA (21 per 1,000), followed by SA (18 per 1,000), the NT (17 per 1,000), Qld (17 per 1,000), NSW (8.7 per 1,000), and Vic (8.1 per 1,000) [72].
- The greatest differences between Aboriginal and Torres Strait Islander and non-Indigenous hospitalisation rates were for females in WA (6.2 times higher) and the NT (7.2 times higher).

Potentially preventable hospitalisations¹⁷

Hospitalisations for various chronic conditions, including complications of diabetes, are considered potentially preventable [56].

In 2012-13:

- two thirds (67%) of the potentially preventable chronic conditions that Aboriginal and Torres Strait Islander people were hospitalised for were diabetes complications. This is 6.1 times more than for non-Indigenous people
- Aboriginal and Torres Strait Islander people had higher rates of hospitalisation for diabetes complications than non-Indigenous people in all locations: 10.5 times higher in remote and very remote areas combined, 5.7 times higher in major cities and 4.5 times higher in inner and outer regional areas combined [56].

Table 4. Age-specific hospitalisation rates for a principal diagnosis of diabetes¹, by Indigenous status and sex, NSW, Vic, Qld, WA, SA, and NT², July 2008 to June 2010 (age-standardised rate per 1,000 population)

Age group	Males			Females		
	Indigenous	Non-Indigenous	RR ^{3,5}	Indigenous	Non-Indigenous	RR ^{3,5}
0-4	0.1	0.3	0.4	0.2	0.3	0.5
5-14	1.1	0.9	1.2	1.0	1.0	1.0
15-24	1.6	0.9	1.7	1.9	1.2	1.6
25-34	3.0	0.8	4.0	4.8	0.9	5.5
35-44	11	1.2	9.1	9.8	1.1	9.2
45-54	21	2.5	8.6	20	1.7	11.8
55-64	34	6.6	5.2	36	3.9	9.1
65+	42	20	2.1	44	14	3.1
All ages ⁴	14	4.1	3.4	14	3.0	4.8

- Notes:
1. Based on the ICD-10-AM sixth edition codes E10-E14 (this excludes GDM). Indigenous rates are calculated using population estimates based on the 2006 Census.
 2. Data excludes private hospitals in the NT
 3. RR is the rate ratio Indigenous: non-Indigenous people
 4. Directly age-standardised using the Australian 2001 standard population
 5. Rounding may result in inconsistencies in calculated ratios

Source: AIHW, 2013 (derived from Table 1.09.6) [72]

¹⁶ Data from the NT is for public hospitals only [72].

¹⁷ Data is from public and private hospitals in all jurisdictions [56].

How many people die from diabetes?

- In 2013¹⁸, diabetes¹⁹ was the second leading underlying cause of death for Aboriginal and Torres Strait Islander people.
- The rate was six times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people [9, 73].
- Diabetes was responsible for a greater proportion of deaths among Aboriginal and Torres Strait Islander people than among non-Indigenous people living in NSW, Qld, SA, WA and the NT (7.6% compared with 2.7%).
- Diabetes was the leading cause of death among Aboriginal and Torres Strait Islander females in 2013, responsible for 121 deaths (10%) [73].
- Aboriginal and Torres Strait Islander females and males were both more likely than non-Indigenous people to die from diabetes (females 8.1 times more and males 4.2 times more).
- Between 2009 and 2013, the number of Aboriginal and Torres Strait Islander females dying from diabetes increased by 15.2%, compared with a 2.1% increase in deaths among non-Indigenous females [9].
- In the 45-54 year age group Aboriginal and Torres Strait Islander people were 17 times more likely than non-Indigenous people to die from diabetes (rate ratios were 26.5 for females and 12.9 for males).
- Death rates for diabetes for Aboriginal and Torres Strait Islander people were greatest in the NT (180 per 100,000), followed by WA (139 per 100,000), Qld (87 per 100,000), SA (60 per 100,000) and NSW (50 per 100,000). The greatest difference in Indigenous: non-Indigenous death rates was observed in WA (9.0 times higher among Aboriginal and Torres Strait Islander people), followed by the NT (7.9), Qld (5.6), NSW (3.5) and SA (3.3) [73].
- From 2010-2012, diabetes was the underlying cause of death for 564 Aboriginal and Torres Strait Islander people (8% of all Indigenous deaths) in NSW, Qld, SA, WA and the NT [14]. Of these deaths, the underlying cause of death was recorded as: type 1 diabetes (5.0% of deaths); type 2 diabetes (46% of deaths); or the type of diabetes was unspecified (49% of deaths).
- For the period 2008-2012, diabetes was ranked the third highest cause of avoidable mortality among Aboriginal and Torres Strait Islander people after ischaemic heart disease and cancer.

What complications and comorbidities are associated with diabetes?

Diabetes can cause many serious health complications [74] and is frequently accompanied by comorbidities (other diseases a person has at the same time), particularly cardiovascular disease (CVD) and chronic kidney disease (CKD) [35].

Complications

Some complications of diabetes may occur soon after diagnosis while others may develop over several years [74].

Short-term health complications include:

- diabetic ketoacidosis²⁰
- hypoglycaemia (low blood glucose level)
- being more prone to getting infections and being less able to heal [10].

Long-term health complications include:

- diseases of the small blood vessels (microvascular diseases) including damage to:
 - kidneys (nephropathy)
 - nerves (neuropathy)
 - eyes (retinopathy) [53, 74]
- diseases of the large blood vessels (macrovascular diseases) [74] including:
 - coronary heart disease
 - stroke
 - peripheral vascular disease
- feelings of distress, anxiety and depression [8].

Microvascular (small) and macrovascular (large blood vessel) complications are the major causes of sickness and death in people with diabetes [38].

Common complications of diabetes can be broadly grouped into circulatory, renal, ophthalmic and other complications²¹ [56]. These are described briefly in Box 5. Complications in pregnancy are discussed separately in the following section [10].

18 At the time of writing, cause of death data for 2013 was preliminary and subject to a revision process [73].

19 Based on the ICD-10-AM sixth edition codes E10-E14 (this excludes GDM) [73].

20 Diabetic ketoacidosis occurs when the breakdown of fat in the body results in an accumulation of ketones, and an increased acidity in the blood. This condition can be life-threatening if not treated [10].

21 Categories are based on ICD-10-AM classification of diseases [56].

Box 5: Common complications of diabetes

Circulatory complications

Circulatory complications of diabetes affect the heart and blood vessels and include coronary heart disease (angina and heart attacks), stroke, and peripheral vascular disease [35, 38].

Angina - temporary pain or discomfort in the chest due to inadequate blood supply in the heart at times of extra need, such as during exercise [35].

Heart attack - a life-threatening emergency that occurs when a blood clot suddenly blocks a vessel that supplies blood to the heart muscle [35].

Stroke - a sudden blockage or bleed in an artery supplying blood to the brain. This may cause paralysis of parts of the body, speech problems, or other disabilities [35].

Peripheral vascular disease (PVD) - poor blood supply to the arms and legs, causing pain [35]. PVD, in association with nerve damage in these areas, increases the risk of developing foot complications, such as foot ulcers and infections, which can lead to foot or lower leg amputations [38].

Renal complications

Renal complications of diabetes affect the kidneys and include *diabetic nephropathy* and *chronic kidney failure* [38]. These occur when high blood sugar levels damage the small blood vessels in the kidneys, making them less efficient at filtering waste. Diabetic nephropathy often develops without any symptoms so it is not detected until it has reached the later stages when treatments are less effective. Severe cases of diabetic nephropathy may lead to a type of chronic kidney failure called *end-stage kidney disease (ESKD)*. ESKD is fatal if it is not treated.

Ophthalmic complications

Ophthalmic complications of diabetes affect the eyes and include diabetic retinopathy, cataracts and glaucoma [38]. If they are not identified and treated in the early stages of the disease they can lead to reduced vision and blindness.

Diabetic retinopathy (DR) - damage to the blood vessels of the light-sensitive tissue at the back of the eye (retina).

Cataract - the lens, which is normally clear, becomes covered by a cloudy film meaning less light can enter the eye.

Glaucoma - damage to the optic nerve causes a gradual loss of vision. This is the result of an increase in pressure in the fluids in the eye.

Neuropathy

Other complications of diabetes include damage to structure and function of the nerves (neuropathy) which is caused by reduced blood flow [38].

Peripheral neuropathy occurs most frequently in the nerves of the toes, feet and legs. However, the hands and arms can also be affected. Some sufferers will require amputation of the affected limbs.

Autonomic neuropathy affects the nerves that control the heart and blood vessels, digestive system, urinary tract, sex organs, sweat glands and eyes. This can result in damage and poor functioning of the major organs, such as the heart and kidneys.

Hospitalisation figures for some of the complications of diabetes in 2012-13 [56]:

- Hospitalisation rates for complications of type 2 diabetes (as the main diagnosis) were 5.6 times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people.
- The biggest difference in hospitalisation rates between Aboriginal and Torres Strait Islander people and non-Indigenous people was for renal complications of type 2 diabetes (10 times higher).
- Hospitalisation rates for circulatory and ophthalmic complications were 2.8 times higher for Aboriginal people and 2.7 times higher Torres Strait Islander people compared with rates for other Australians.
- The hospitalisation rate for multiple complications of diabetes was 6.5 times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people.
- Differences in the rates of renal and circulatory complications were greatest in regional areas, with renal complications 10.7 times higher and circulatory complications 3.5 times higher.
- Differences in hospitalisation rates for ophthalmic complications were greatest in remote areas (3.1 times higher for Aboriginal and Torres Strait Islander people than for other Australians) (See Table 5).
- Hospitalisations for multiple complications of type 2 diabetes were 9.7 times more likely to occur among Aboriginal and Torres Strait Islander people than non-Indigenous people in remote areas.
- Hospitalisation rates for Aboriginal and Torres Strait Islander people with multiple complications were 5.2 times greater in regional areas and 3.3 times greater major cities compared with rates for other Australians.

Table 5. Hospitalisations for type 2 diabetes as a principal diagnosis among Aboriginal and Torres Strait Islander people, by complication, by remoteness, 2012-13 (age standardised rate per 100,000 population and rate ratio)

Complication ¹	Major cities ²		Inner and outer regional combined ²		Remote and very remote combined ²		Total	
	Rate ³	Rate ratio ⁴	Rate ³	Rate ratio ⁴	Rate ³	Rate ratio ⁴	Rate ³	Rate ratio ⁴
Circulatory	34	2.8	37	3.5	23	1.3	33	2.8
Renal	15	5.3	31	10.7	52	7.7	30	10.4
Ophthalmic	26	2.8	16	3.0	29	3.1	23	2.7
Other specified	143	3.8	251	6.0	413	8.3	252	6.5
Multiple	94	3.3	153	5.2	412	9.7	192	6.7
No complications	21	4.5	13	3.3	22	4.6	18	4.1
Total⁵	334	3.5	502	5.3	951	7.3	549	5.8

Notes:

- Categories are based on ICD-10-AM classification of diseases (International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification).
- Disaggregation by remoteness area is based on the ABS' 2011 Australian Statistical Geography Standard (ASGS) and relates to the patient's usual residence, not the location of the hospital.
- The age standardised rates per 100,000 population are calculated using the ABS Estimated 2012 Resident population by remoteness classification from the 2011 Census. Rates were directly age-standardised to the 2001 Australian population. Results for individual complications may be affected by small numbers and should be interpreted with caution.
- Rate ratio is the age standardised Aboriginal and Torres Strait Islander hospitalisation rate divided by the non-Indigenous hospitalisation rate.
- The total is not the sum of the individual conditions because diabetes complications overlap other categories.

Source: Derived from Steering Committee for the Review of Government Service Provision, 2014 (based on unpublished data from the National Hospital Morbidity Database (NHMD))

What diabetic complications occur in pregnancy?

Diabetes in pregnancy (both GDM and pre-existing type 1 or type 2 diabetes) can lead to a range of complications for the mother and child (see Box 6) [7]. Aboriginal and Torres Strait Islander mothers and babies are more likely to experience problems during pregnancy, labour and delivery than non-Indigenous mothers and babies.

Box 6: Complications associated with diabetes in pregnancy

Risks for the child include: miscarriage, stillbirth, hereditary deformities and respiratory distress. There is also increased risk of problems in early adulthood such as obesity, impaired glucose tolerance and type 2 diabetes [7].

Risks for the mother include: miscarriage, pre-eclampsia (high blood pressure), a need for induced labour, pre-term birth, caesarean section, and the first appearance or the progression of diabetic complications (including those associated with kidney, eye and cardiovascular diseases) [7]. For mothers with GDM, there is a risk of GDM occurring in later pregnancies and of a progression from GDM to type 2 diabetes.

Among Australian women who have diabetes during pregnancy:

- Aboriginal and Torres Strait Islander mothers have higher rates than non-Indigenous mothers of:
 - pre-term delivery
 - pre-term induction
 - hypertension
 - long hospital stays
- Aboriginal and Torres Strait Islander babies have higher rates than non-Indigenous babies of:
 - pre-term birth
 - low Apgar score²²
 - high level resuscitation²³
 - long hospital stays.

National figures regarding complications of diabetes in pregnancy for Aboriginal and Torres Strait Islander mothers and babies are available for the period 2005-07 (Table 6).

22 The Apgar score is an assessment tool to test a baby's condition after delivery [7]. A score of 0-6 at 5 minutes after birth indicates the presence of complications and poor outcomes for the baby. A score of 7-10 is normal.

23 The level of resuscitation applied to a baby immediately after birth to promote normal breathing is an indication of a baby's health and expected outcome [7]. Resuscitation measures vary from none, to suction and oxygen (low level), to ventilation and external cardiac massage (high level).

Table 6. Selected maternal and infant complications of diabetes among Aboriginal and Torres Strait Islander women who gave birth, by diabetes in pregnancy status, Australia, 2005-07 (percentage¹ and standardised incidence ratio²)

Complication	Pre-existing diabetes		GDM		No diabetes	
	% ¹	Ratio ³	% ¹	Ratio ³	% ¹	Ratio ³
Maternal						
Pre-term delivery ⁴	34	7.8	14	17.7	13	7.3
Pre-term induction ⁵	NA ⁶	NA ⁶	10 ⁷	2 ⁸	10 ⁷	2 ⁸
Long antenatal hospital stay ⁹	13	2.9	5.2	3.4	1.2	1.8
Long postnatal hospital stay ¹⁰	19	1.9	9.2	2.5	5.0	2.0
Infant¹¹						
Pre-term birth ¹³	34	1.4	15	1.4	13	1.7
Low Apgar score ¹⁴	4.2	1.4*	2.3	1.7	2.2	1.5
High level resuscitation ¹⁵	21	1.4	12	1.4	9.3	1.2
Long hospital stay ¹⁶	33	1.6	15	1.7	11	1.7

Notes:

1. Not age-standardised.
2. The standardised incidence ratio of actual cases divided by the expected number of cases among the Indigenous population based on the age-specific rate of the non-Indigenous population.
3. Indirectly age-standardised to the 2005-07 non-Indigenous maternal population, by diabetes in pregnancy status.
4. Duration of pregnancies from 20-36 weeks (5 pregnancies of less than 20 weeks duration also included).
5. Labour induced at less than 37 weeks.
6. Not available due to the small number of inductions among Indigenous women with pre-existing diabetes.
7. Approximate figure only. Directly age-standardised to the 2005-07 population of Indigenous women with induced labour and without diabetes in pregnancy.
8. Approximate figure only.
9. Includes Indigenous women who gave birth in hospital (only) and were in hospital for seven or more days prior to giving birth.
10. Includes Indigenous women who gave birth in hospital and were discharged home (only) and were in hospital for seven or more days after giving birth.
11. Includes live born babies only.
12. Indirectly age-standardised to the 2005-07 population of live born babies of non-Indigenous women, by maternal diabetes in pregnancy status.
13. Gestational age of live born babies from 20-36 weeks (5 babies of less than 20 weeks gestational age were also included).
14. Apgar score (at five minutes) of 0-6.
15. High level resuscitation includes intermittent positive pressure respiration through bag and mask, endotracheal intubation and intermittent positive pressure respiration, and external cardiac massage and ventilation.
16. Includes live born babies discharged home (only) seven or more days following birth.

* Not significant

Source: Derived from AIHW, 2010 (based on data from the NHMD and NPDC)

What effect do other health problems have on diabetes hospitalisation rates?

When a person has two or more health problems at the same time, it is known as comorbidity [35]. The effects of comorbidity may lead to each of the health problems being more severe and also to poorer long-term results.

Diabetes, CVD and CKD often occur together in the same person. The big differences in hospitalisation rates seen between Aboriginal and Torres Strait Islander people with diabetes and non-Indigenous people with diabetes increase when the individuals have more diseases contributing to the comorbidity (i.e. three diseases compared to two or one) [35]. In 2012-13, Aboriginal and Torres Strait Islander people with diabetes, CVD and CKD were 7.3 times more likely than non-Indigenous people to be hospitalised. Aboriginal and Torres Strait Islanders aged 25 years and over who had all three diseases were more likely than non-Indigenous people to be hospitalised - 5.0 times more likely for males and 10.7 times more likely for females.

How can we prevent and manage diabetes?

It is generally accepted that, for diabetes prevention and management programs to be effective, they require a combination of health promotion programs, interventions that target the whole population and medical services. In addition, it is important that programs for Aboriginal and Torres Strait Islander people are culturally sensitive, meet the needs of each community, and are not seen as being forced on communities [13]. It is also recommended that these programs be supported by actions that deal with the social causes of Aboriginal and Torres Strait Islander health such as poverty, culture, racism, employment and education [13, 15].

Evidence from published materials suggests that the current high levels of diabetes among Aboriginal and Torres Strait Islander people are potentially preventable [75].

How can we prevent diabetes?

There is currently no known way to prevent type 1 diabetes²⁴ [76] or GDM²⁵ [77], but the prevention of type 2 diabetes in those people who have many risk factors is possible and important [78]. To help prevent or delay the onset of type 2 diabetes in high-risk individuals, we can:

24 Type 1 diabetes is an autoimmune condition that cannot currently be prevented or cured [76].

25 Although losing excess weight before pregnancy, and adopting healthy eating and exercise habits before and during pregnancy, may reduce the risk of developing GDM and subsequent type 2 diabetes [77].

1. identify those at high risk through the use of risk assessment tools (medical assessments, online tools)
2. provide education programs
3. promote lifestyle changes that focus on increased physical activity, better nutrition and weight loss.

The *Aboriginal and Torres Strait Islanders and diabetes action plan* [13], released by Diabetes Australia in 2013, recommends prevention programs that focus on all life stages of Aboriginal and Torres Strait Islander people. The risk of developing diabetes begins even before birth, so prevention programs should focus on: women, both before and during pregnancy; pre-school and school-aged children; adolescents; and high-risk people of all ages. It is also important to prevent complications in people who already suffer from diabetes.

A. Risk assessment – identifying those at high risk

In order to make sure that high-risk people are identified, it is important that assessment tools or methods are culturally appropriate. Risk assessments should be carried out even before an individual shows signs of diabetes [13].

The *Australian type 2 diabetes risk assessment tool* (AUSDRISK) identifies people at high risk of diabetes through a questionnaire. It uses anthropometric measurements (e.g. height, weight, waist circumference), family history, ethnic background, age and gender, to calculate the risk of developing diabetes over a 5-year period [78-80]. The main benefits of AUSDRISK are that it can be used by anyone to assess their own risk and it is practical for use in community settings. All Australian governments have recognised its usefulness.

Although AUSDRISK is generally used for people over the age of 40 years, it is recommended that Aboriginal and Torres Strait Islander people be screened using the AUSDRISK tool from the age of 18 years [78]. It must be noted, however, that AUSDRISK may not be as accurate for Aboriginal and Torres Strait Islander people (and some other racial groups) because it was created using data from non-Indigenous populations [81-83].

B. Educating people about the risks

Educating the population about diabetes is an important prevention strategy. Education should:

- include information on:
 - diabetes risks
 - how to lower risks
- stress that diabetes is not 'normal' (even if lots of people have it)
- be culturally appropriate for Aboriginal and Torres Strait Islander communities, families and individuals
- begin in childhood or adolescence [13].

Education programs for children and adolescents, including school-based education programs, can help to prevent people from developing diabetes later in life by giving them the knowledge to make healthy lifestyle choices. Intervention programs that help to improve the nutrition of infants and children can also help by providing them with a healthy start to life [15].

Box 7: The Deadly choices program

The *Deadly choices program* provides school-based chronic disease education for young Aboriginal and Torres Strait Islander students (Years 7 to 12) in Brisbane, Qld [84]. The program includes health education, physical activity sessions, and health checks. A recent evaluation of the program showed improvements in knowledge, attitudes and confidence relating to types of chronic disease, chronic disease risk factors, prevention and health checks. The evaluation also found that students who participated in the program had significant increases in:

- number of breakfasts eaten per week
- amount of physical activity done per week
- amount of fruit and vegetables eaten per day
- the number of health checks done.

C. Lifestyle changes for prevention

Although there have not been any studies done to measure how effective lifestyle changes are in preventing diabetes among Aboriginal and Torres Strait Islander people, there have been studies looking at the effects of lifestyle changes on general health, weight control and other chronic diseases.

A recent review of healthy lifestyle programs that focussed on improving physical activity and nutrition among Aboriginal and Torres Strait Islander people found that programs can have positive health effects for up to two years [16]. Unfortunately, very few healthy lifestyle programs have lasted more than five years, due to lack of funding. Continuing programs without external funding is almost impossible, especially in communities where people experience social and financial problems [13, 16].

Choosing a program to help prevent diabetes needs to be done by using programs that have been shown to work elsewhere, or programs that are based on research that shows positive results.

One common factor among all the most successful programs is that they are more likely to be effective if the idea comes from the community or it is requested by the community [16].

Some examples of programs that have focussed on healthy weight, good nutrition and physical activity are described below.

Healthy weight program

The *Healthy weight program*—later renamed the *Living strong program*—started in Queensland in 1997 in response to high levels of type 2 diabetes and other chronic diseases among Aboriginal and Torres Strait Islander adults [85-87]. The program offered health screenings and conducted workshops promoting healthy weight, good nutrition and physical activity. An evaluation of the program in 2005 showed participants had achieved weight loss, increased fruit and vegetable intake, and small gains in physical activity. The program is no longer running.

Looma healthy lifestyle project

The *Looma healthy lifestyle project* began in a remote WA community in 1993 and is one of the few examples of a program that has continued long-term (it was still in operation 18 years after it began) [16]. The project was strongly supported and guided by the community with the main aims being to decrease the number of new cases of obesity, diabetes and coronary heart disease. The program promoted an increase in physical activity and an improved diet, through activities such as promotion of traditional cooking methods, changes to how the community store was run, and nutrition education. The first evaluation of the program found no significant changes in the levels of obesity or diabetes in the community [88]. However, a follow-up health assessment in 2009 found that, although there was no drop in the levels of diabetes in the community, there had been no increase since 2003 [16].

Life! Program and the Road to good health

The *Life! program* is funded by the Victorian Government and managed by Diabetes Australia — Victoria [89]. It offers a course specifically for Aboriginal people and their families called the *Road to good health* [90] which has been guided by a working group that includes some Aboriginal and/or Torres Strait Islander members and organisations. The program supports participants to make long-term lifestyle changes around healthier eating and becoming more physically active [13]. It is run by Aboriginal Health Workers and other health professionals, and Indigenous values and health promotion practices are embedded in the course. Evaluations to date suggest the course is culturally relevant and valuable to users, but other published results are not yet available.

Sport as part of a healthy lifestyle

This men's program was conducted in a regional NSW community. Results from the program showed that for the inactive, clinically obese Indigenous men who did the program, their medical risk factors for type 2 diabetes decreased [91]: reduced waist circumference, BMI and waist to hip ratio (WHR); and a decrease in insulin resistance. These results suggest there is potential for sports-based training programs to reduce the risk of developing type 2 diabetes in high-risk Indigenous men.

Other possible prevention measures

Diabetes prevention will benefit from combining health measures with other measures that are not directly health-related. Possible strategies include [13]:

- increasing the availability of healthy foods and making access to healthy foods easier (e.g. in stores and through community gardens and traditional food projects)
- reducing advertising of unhealthy foods and making healthy foods cheaper
- providing clearer food labelling and nutrition education about the nutritional value of foods
- introducing a tax on sugary drinks (e.g. soft drinks)
- encouraging local councils to provide more opportunities for physical activity
- improving housing.

Diabetes management

For those people who already suffer from diabetes, it is important for them to know how to manage their condition to prevent it from getting worse. To be effective for Aboriginal and Torres Strait Islander people, there must be access to a broad range of health services in a broad range of settings [13] and coordinated interaction between patients, healthcare providers and the healthcare system [78]. Recent recommendations for improving diabetes management for Aboriginal and Torres Strait Islander people include:

- earlier detection of undiagnosed diabetes
- good quality primary health care (e.g. GPs and Aboriginal Health Workers)
- access to medications
- education on diabetes self-management
- specialist treatment in hospitals when complications develop.

The following sections refer mainly to the management of type 2 diabetes for Aboriginal and Torres Strait Islander people. Some information about managing diabetes in pregnancy is also provided.

The importance of early detection

Most primary health care services in Australia play an important role in the early detection of diabetes [93]. The ability to detect diabetes more easily would lead to an improvement in early intervention and diabetes management for Aboriginal and Torres Strait Islander people [13].

There is evidence that suggests that NHMRC guidelines may soon be changed regarding recommended testing for diagnosis of diabetes [83]. The new method would be more accurate than current tests.

Managing diabetes in the primary health care setting

The Royal Australian College of General Practitioners (RACGP) provides clear guidelines on how to manage type 2 diabetes [78], but there are often large gaps between the recommended care and the care patients actually receive [96]. To improve diabetes management for Aboriginal and Torres Strait Islander people, the recommendations include:

- providing access to a range of different models of culturally appropriate care [13]
- involving Aboriginal and Torres Strait Islander Health Workers, liaison officers, outreach workers or care coordinators [78]
- up-skilling for GPs to help them manage more complex patients
- providing access for patients to local services that offer specialised treatment (such as renal dialysis for those with diabetes-related complications) [13]. It is suggested that this would reduce travel, ensure patients remain close to their support networks, and facilitate self-management.

The RACGP recommends that health professionals use written plans to assist in the management of diabetes [78] (see Box 8).

Some management strategies that are used in the general population to help with chronic conditions have been successfully adapted to suit Aboriginal settings and patients [101]. Those that have been most successful include, among other things, structured and holistic care plans based on the patient's needs, as well as appropriate supports and training for staff.

For patients, the benefits of these programs have included [101]:

- an improved understanding of chronic diseases and their management
- a greater control over, and active involvement in, managing their own health
- the ability to set and achieve realistic personal goals
- building confidence in their ability to monitor their own progress
- improved overall health and wellbeing
- confidence to seek early intervention for possible complications.

Box 8: Written plans to manage diabetes

A *General practice management plan* (GPMP), which is usually developed by a GP together with the patient, lists the patient's needs and goals, as well as the management strategies and resources that will be used [78]. A *Team care arrangement* (TCA) builds on the GPMP and includes team-based care from at least two other healthcare professionals (e.g. allied health care workers such as dietitians and podiatrists).

Can primary care be effective in the long term?

Evidence from several studies in both Aboriginal and Torres Strait Islander communities shows that diabetes care can be improved and maintained in the medium to long term (up to ten years) [97, 98, 100-103].

A systematic review published in 2015 looked at primary health care interventions for chronic diseases in indigenous populations from several countries, namely Australia, New Zealand, Canada and the United States [104]. The authors identified a number of common factors, both positive and negative, that affected these interventions:

- intervention design – the level of community engagement, the policy and funding environment, leadership, staff attitudes to change, and adequate resources
- workforce issues - recruitment and retention of staff, adequate staff training, dedicated chronic disease positions with clear roles and responsibilities, employing Indigenous Health Workers and including them in decision making
- health care providers skills and expertise – showing understanding, supportive and empowering attitudes towards patients, having the ability to communicate sensitively, and the willingness to allow patients to be involved in their care
- clinical care pathways - effective electronic support systems and clear referral pathways
- access issues - the provision of culturally safe, consistent services and coordinated care.

Access to primary health care services

Many Aboriginal and Torres Strait Islander people find it difficult to access primary health care services, which contributes to their poor health [105]. Some of the factors that make access difficult include [106]:

- the financial costs associated with consultation fees, medicines, transport, lost wages and time taken to attend appointments
- lack of services in remote areas and long distances to travel to attend appointments
- poorer access to community controlled health organisations in metropolitan and regional areas compared to remote areas
- poor cooperation between different parts of the health system that are involved in managing different parts of a patient's treatment
- lack of cultural safety in mainstream services
- cultural misunderstandings, poor communication and experiences of discrimination with mainstream practitioners.

Evaluation of services in remote communities in the NT suggests that diabetes care would be improved and would be better value for money if patients in remote communities had better access to services [107].

Access to medicines

Many Aboriginal and Torres Strait Islanders have trouble getting the medicine they need, or find it difficult to stick to a plan for managing their diabetes medications [108]. Some of the reasons include:

- having no transport to get to diabetic services
- the high cost of medicines and services
- difficulty in understanding what their medication is, what it is for, and how to use it (from labels or information sheets)
- the opinions and behaviours of the patients around filling scripts, taking medication, sharing medication and side effects.

Some strategies that may help improve access to and use of medicines for Aboriginal and Torres Strait Islander people include:

- changes to the *Pharmaceutical benefits scheme* (PBS) to allow prescriptions to be filled and supplied in hospitals [13] – this would improve access and reduce costs
- use of *Webster packs* [109]
- allowing patients' medication to be reviewed during home visits by health staff [109]
- providing more positive information to patients about the *National diabetes services scheme* (NDSS) [110] (including the availability of cheaper products and support services)
- cultural awareness programs for pharmacists and their staff to improve relationships with Aboriginal and Torres Strait Islander customers [108, 109]
- education programs for Aboriginal and Torres Strait Islander Health Workers (provided by pharmacists) about the medicines used by diabetic people [108]
- increasing the number of Aboriginal and Torres Strait Islander pharmacy staff [108]
- improved information for consumers about their medicines [108].

Self-management

An important component of diabetes management is self-management – where patients (and their carers) manage their own health on a day-to-day basis (see Box 9). Providing support for people who are self-managing their diabetes is essential for it to be successful [78, 93]. There is evidence that culturally appropriate self-management support for Aboriginal and Torres Strait Islander people is most effective when led by Aboriginal and Torres Strait Islander Health Workers [93]. Examples of culturally appropriate self-management support programs include the *Aunty Jean's good health team program* [111] and the *Wurli-Wurlinjang diabetes day program* [112].

Aunty Jean's good health team

Aunty Jean's good health team was an experimental project built around the idea that better results could be achieved if the community could work together for better health outcomes [111]. With the Elders leading the way, it involved completing 12 education units, conducted once a week for 12 weeks, along with a home-based program of activity. Evaluation of the program showed improvements at both an individual level:

- improved self-management
- increased levels of physical activity

and at community level:

- creation of a supportive environment for good health through partnerships between the community and health professionals
- strengthening relationships within the community
- a commitment to developing culturally appropriate health promotion strategies and behaviours
- culturally appropriate information-sharing.

The Wurli-Wurlinjang diabetes day program

The *Wurli-Wurlinjang diabetes day program* is run by an Aboriginal community controlled health service in Katherine in the NT [113], and has been operating since 2008 [112]. The program is run once a week for people with type 2 diabetes, promoting self-management by providing a supportive environment and culturally appropriate care. Positive outcomes of the program include:

- improvement in social and emotional wellbeing
- an increase in the number of clients receiving medical checkups
- a small but significant improvement in medical results, including control of blood sugar, blood pressure, cholesterol levels and weight.

Tertiary care

Diabetes complications require treatment and management by specialist services (tertiary care). Many Aboriginal and Torres Strait Islander people access this level of diabetes care in hospitals [13] as this is the most affordable and accessible option for them. The *Aboriginal and Torres Strait Islanders and diabetes action plan* (2013), produced by Diabetes Australia, suggests that a number of strategies could improve access to tertiary care for Aboriginal and Torres Strait Islander people other than in hospitals, including:

- providing better opportunities for using telehealth services
- up-skilling GPs to help them manage more complex patients
- performing diabetes risk assessments in hospitals and primary care settings when patients attend for other reasons
- providing PBS prescriptions in hospitals.

Managing diabetes in pregnancy

Women who have diabetes during pregnancy (both pre-existing and GDM) and their babies are at greater risk of complications than women without diabetes. The risk of complications can be reduced if the diabetes is diagnosed early and is managed effectively [13]. Aboriginal and Torres Strait Islander women and their children, in general, have a high risk of developing diabetes, so programs are needed to manage diabetes during pregnancy.

Box 9: Self-management

Self-management involves the patient (and any carers they may have) working in partnership with health professionals to [78]:

- understand diabetes and its treatment options
- be actively involved in developing and following a plan of care
- participate in activities that protect and promote their own health
- monitor and manage the symptoms and signs of diabetes on a regular basis
- manage the impact of diabetes on the patient in a holistic way - physical, emotional and social wellbeing.

The RACGP recommends that patients (and their carers) are given structured, evidence-based diabetes education [78]. Diabetes education can be delivered in groups or individually, but should be culturally sensitive and tailored to the needs of each participant. Identifying barriers that may prevent a patient from being able to self-manage their diabetes is also important. These barriers include issues around a patient's levels of understanding, physical disability, mental health, background health knowledge, social and financial restrictions, where they live and whether they have good access to services.

They need to:

- increase women's access to health support before and during their pregnancy [13]
- help improve control of diabetes in pregnancy [15]
- help deliver healthy babies [13]
- encourage breastfeeding (to reduce the risk of obesity and diabetes) [15]
- help mothers and families to follow healthy lifestyles [13].

The *Northern Territory diabetes in pregnancy partnership* project aims to provide information to help develop policy and planning for the management of diabetes in pregnancy throughout Australia. By reviewing current models of care, and improving the medical care and results for women with diabetes in pregnancy (including high risk Aboriginal and Torres Strait Islander women) and their babies [116], this project will help to collect evidence relating to improved practices in screening, management and post-partum (after birth) follow-up [13, 115].

Programs and services

National programs

National programs and services that contribute to improved health outcomes for people with diabetes include [117, 118]:

- the *Medicare benefits schedule* (MBS) - provides subsidies for patient care and includes Medicare items for the planning and management of chronic conditions, including diabetes.
- the *Pharmaceutical benefits scheme* (PBS) - provides subsidies for medicines used in the treatment of diabetes (*PBS medicine co-payments*)
- the *National diabetes services scheme* (NDSS) - provides subsidised diabetes products and services to people who have been diagnosed with diabetes and who are registered with the scheme
- healthy lifestyle promotion programs including those that tackle smoking
- a support workforce based in Primary Health Networks and Aboriginal community controlled health organisations (ACCHOs)
- GP, specialist and allied health outreach services
- funding for research into diabetes conditions through the NHMRC
- funding for AIHW to support national monitoring of vascular diseases including diabetes.

Healthy for life program

The *Healthy for life program* (HfL) is a national program that includes a focus on early detection and management of chronic disease among Aboriginal and Torres Strait Islander people [131]. The program collects information from all over Australia on service activity (e.g. how many patients had a health assessment or a blood test) and health outcome data (including clinical outcomes for diabetes e.g. improvements in blood pressure or blood sugar levels). The Australian Government has recently committed funding to expand the program into an additional 32 Aboriginal and Torres Strait Islander community controlled health services [132].

Primary health care services

Both mainstream and community controlled primary health care services in Australia need to provide skilled and culturally appropriate diabetes care to Aboriginal and Torres Strait Islander people living in the community [93] [120].

Culturally appropriate primary health care services

Culture and identity are central to Aboriginal and Torres Strait Islander views of health [120], so it is important that services that provide primary health care to Aboriginal and Torres Strait Islander people recognise the importance of community values such as connection to culture, family and land [107].

Culturally appropriate chronic disease services usually include [120]:

- a high level of Aboriginal and Torres Strait Islander community engagement and good communication at all levels
- local knowledge about what works and what is acceptable
- strong Aboriginal and Torres Strait Islander leadership
- partnerships and community involvement that promote shared responsibilities
- enough funding and good project management to enable the service to continue
- suitable evaluation methods for measuring the effects of the intervention.

Aboriginal and Torres Strait Islander Health Workers make an important contribution to good diabetes care for Aboriginal and Torres Strait Islander people [93, 121] by:

- helping patients feel comfortable
- helping break down communication and cultural barriers that may exist between patients and non-Indigenous health staff [93]
- providing culturally appropriate support for self-management patients [121].

A study in Far North Queensland (FNQ) between 2011 and 2013 showed that Indigenous Health Workers helped improve diabetes care and control in Aboriginal and Torres Strait Islander adults by helping patients [121]:

- make and keep appointments
- understand their medications
- learn about nutrition and the effects of smoking
- understand their self-management.

Primary health care services need more Aboriginal and Torres Strait Islander Health Workers (including males) [122] and more diabetes-trained Aboriginal and Torres Strait Islander staff at all levels (health and allied health professionals, and support workers) [13]. Barriers to the involvement of Aboriginal and Torres Strait Islander Health Workers in diabetes care that have been identified include:

- inadequate training
- lack of clear role divisions among health care professionals
- lack of stable relationships with non-Indigenous staff
- high demands for acute care (short term treatment for a severe condition such as hypoglycemia) [122].

Aboriginal and Torres Strait Islander community controlled primary health care services

Aboriginal and Torres Strait Islander community controlled primary health care services are located in all states and territories and are funded by the federal, state and territory governments and other sources [126]. They are planned and governed by local Aboriginal and Torres Strait Islander communities and aim to deliver holistic and culturally appropriate health and health-related services. Aboriginal and Torres Strait Islander community controlled primary health care services vary in the primary health care activities they offer. Possible activities include: diagnosis and treatment of illness or disease; management of chronic illness; transportation to medical appointments; outreach clinic services; immunisations; dental services; and dialysis services.

In 2011-12, 80% of Aboriginal and Torres Strait Islander primary health care services that received funding from the Federal Government provided early detection activities for diabetes [126].

Policies and strategies

The *Australian National Diabetes Strategy 2016-2020* is one of the few policies developed by the Federal Government that focusses specifically on diabetes [157]. It was released at the end of 2015 and includes a specific goal to reduce the impact of diabetes among Aboriginal and Torres Strait Islander people. The strategy identifies areas for action and ways to measure progress, but recognises that cooperation across all levels of government, the health sector and other relevant organisations will be needed to develop an implementation plan.

Before this, the *National diabetes strategy 2000-2004* [133] aimed to help reduce diabetes in Australia at both a personal and national level [138]. The *Strategy* identified five goals and a framework for action. Aboriginal and Torres Strait Islander people were identified as a high-risk population who would need specific attention.

In 2013, Diabetes Australia developed the first national policy document specific to diabetes in the Aboriginal and Torres Strait Islander population. It is titled the *Aboriginal and Torres Strait Islanders and diabetes action plan* [13].

Other than this, diabetes has generally been included in policies and strategies that are focussed on chronic disease more broadly. This is understandable because of the common risk factors and frequent comorbidity of many chronic diseases (particularly cardiovascular disease, kidney disease and diabetes). Likewise, there has been no specific policy or strategy for diabetes in Aboriginal and Torres Strait Islander people – this has been addressed in policies that focus more broadly on Aboriginal and Torres Strait Islander health. A recent example of this is the *National Aboriginal and Torres Strait Islander health plan 2013-2023* (the *Health plan*) which was released in 2013 [147]. The *Health plan* [155] makes specific reference to the impact of chronic diseases, including diabetes, on the health of Aboriginal and Torres Strait Islander adults.

Figure 1 shows a timeline of national policies that have been relevant to diabetes among Aboriginal and Torres Strait Islander people.

Figure 1. Selected national policy developments relevant to addressing diabetes among Aboriginal and Torres Strait Islander people

1987	<ul style="list-style-type: none"> • National diabetes service scheme (NDSS) is established
1996	<ul style="list-style-type: none"> • Diabetes becomes a National health priority area (NHPA) • Ministerial Advisory Committee on Diabetes is established
1998	<ul style="list-style-type: none"> • National diabetes strategy and implementation plan report is published
1999	<ul style="list-style-type: none"> • National (insulin-treated) diabetes register (NDR) is established
2000	<ul style="list-style-type: none"> • National diabetes strategy 2000-2004 is signed
2002	<ul style="list-style-type: none"> • Australian Health Ministers' Advisory Council (AHMAC) agreed to the development of a national policy approach to chronic disease prevention and care
2006	<ul style="list-style-type: none"> • National service improvement framework for diabetes is released • National chronic disease strategy is released • Australian better health initiative is announced
2007	<ul style="list-style-type: none"> • Diabetes is included in the National reform agenda • A national package to prevent type 2 diabetes is announced
2008	<ul style="list-style-type: none"> • Australian type 2 diabetes risk assessment tool (AUSDRISK) is introduced • New Medicare item introduced to develop a Diabetes risk plan for high risk individuals • Close the gap statement of intent is signed • National partnership agreement on closing the gap in Indigenous health outcomes is established • Indigenous chronic disease package is announced
2010	<ul style="list-style-type: none"> • Practice incentives program – Indigenous health incentive receives funding
2011	<ul style="list-style-type: none"> • NDSS introduces National development programs that include initiatives for Aboriginal and Torres Strait Islander people
2013	<ul style="list-style-type: none"> • Aboriginal and Torres Strait Islanders and diabetes action plan is released • National Aboriginal and Torres Strait Islander health plan 2013-2023 is released
2014	<ul style="list-style-type: none"> • Indigenous Australians' health programme is established
2015	<ul style="list-style-type: none"> • New National diabetes strategy 2016-2020 is released

Future directions

In 2013, Diabetes Australia talked with Aboriginal and Torres Strait Islander community groups, medical experts, top health organisations and researchers to develop the *Aboriginal and Torres Strait Islanders and diabetes action plan* for submission to the Federal Government [13]. The *Action plan* outlined a set of values to guide future diabetes policy and program development for Aboriginal and Torres Strait Islander people.

Many of the recommendations in the Action plan have been included in the recently released *Australian national diabetes strategy 2016-2020* [157]. This new strategy stresses the importance of providing a national plan of action and outlines seven high-level goals, one of which is to reduce the impact of diabetes among Aboriginal and Torres Strait Islander people.

To reduce the impact of diabetes among Aboriginal and Torres Strait Islander people, the strategy recommends:

- developing and implementing community-wide, culturally relevant awareness programs
- promoting pre-conception, pregnancy and early years programs
- providing early years education and intervention programs that address the social and environmental causes of Aboriginal and Torres Strait Islander health
- developing and implementing community-wide healthy eating measures
- promoting access to specialist support services
- encouraging better detection and management of diabetes in primary care settings
- supporting diabetes workforce development in primary care settings
- encouraging use of the *My health record* among rural and remote health care providers.

Both the *Action plan* and the *National diabetes strategy* have identified the need for holistic, culturally appropriate diabetes programs that target people of all ages and that take account of cultural values [13]. A new proposed structure for the care and management of chronic disease for Aboriginal and Torres Strait Islander people, the *Wellbeing framework*, aims to include the social, emotional, cultural and spiritual aspects of health and wellbeing with the physical aspects [158, 159].

It is hoped that primary health care services will be able to address the particular chronic care needs of their communities more effectively by using the *Wellbeing framework*, in consultation with the communities [158, 159].

Concluding comments

Aboriginal and Torres Strait Islander people experience higher rates of diabetes than non-Indigenous people. This is due to a combination of historical, social and cultural factors, as well as lifestyle and other health risk factors [13, 15, 16]. Programs that suit community needs and are culturally appropriate [13, 15], plus better access to high quality primary health care services and tertiary specialist services, will help improve the prevention and management of diabetes.

Successful programs for prevention and management of diabetes do exist at the local level [16, 101]. And the culturally appropriate care provided by Aboriginal and Torres Strait Islander community controlled health services [125] help to improve management and care, but experts agree that a coordinated national approach is also needed [75, 133]. The release of the new *Australian national diabetes strategy 2016-2020* [157] may be an important first step toward this goal.

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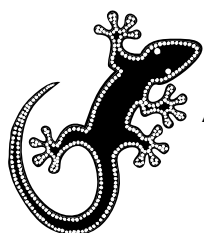
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Australian Indigenous HealthInfoNet

The Australian Indigenous HealthInfoNet's mission is to contribute to improvements in Aboriginal and Torres Strait Islander health by making relevant, high quality knowledge and information easily accessible to policy makers, health service providers, program managers, clinicians, researchers and the general community. We are helping to 'close the gap' by providing the evidence base to inform practice and policy in Aboriginal and Torres Strait Islander health.

The HealthInfoNet addresses this mission by undertaking research into various aspects of Aboriginal and Torres Strait Islander health and disseminates the results (and other relevant knowledge and information) mainly via its Internet site (www.healthinonet.ecu.edu.au). The HealthInfoNet's research mainly involves analysis and synthesis of data and other information obtained from academic, professional, government and other sources, but it also undertakes some primary data collection and analysis.

The HealthInfoNet is a leader in knowledge transfer, the area of research which aims at transferring the results of pure and applied research into practice. In this research, the HealthInfoNet addresses the knowledge needs of a wide range of potential users. These include policy makers, health service providers, program managers, clinicians and other health professionals (including Aboriginal and Torres Strait Islander health workers), and researchers. The HealthInfoNet also provides easy-to-read and summarised material for students and the general community.

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