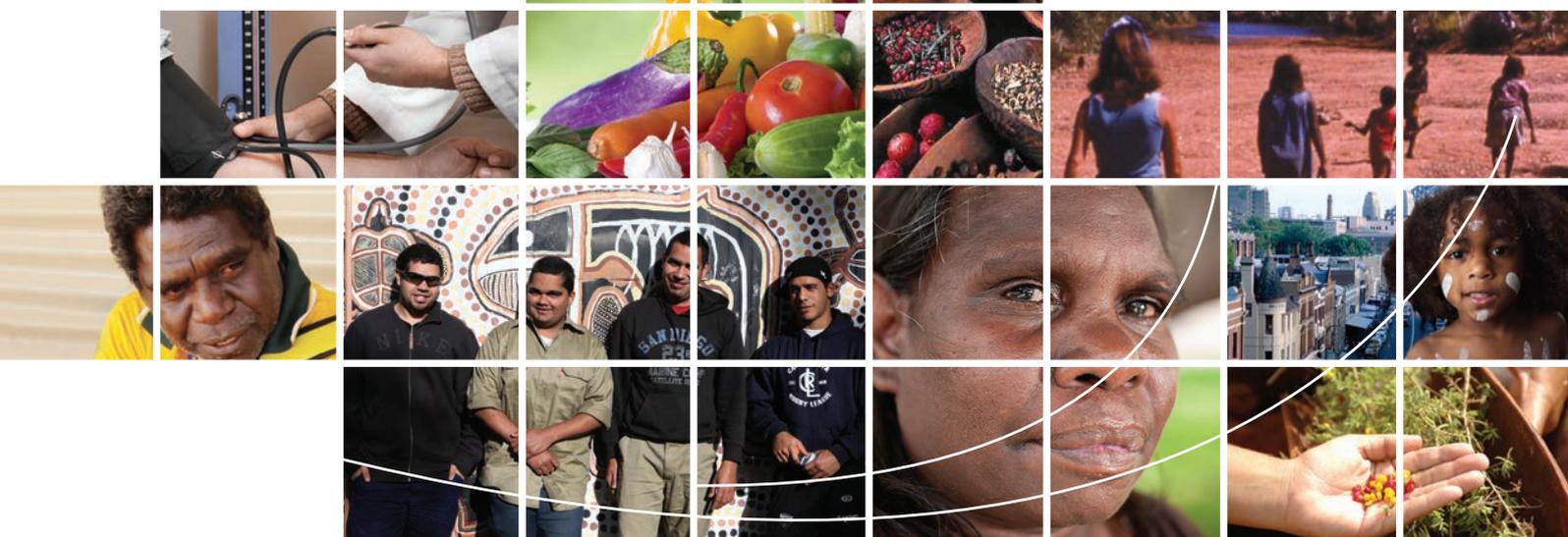
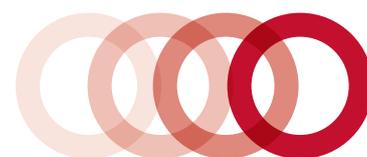
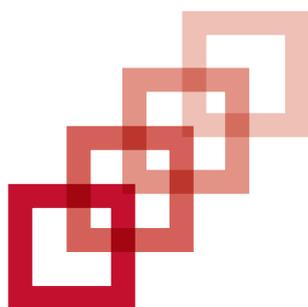
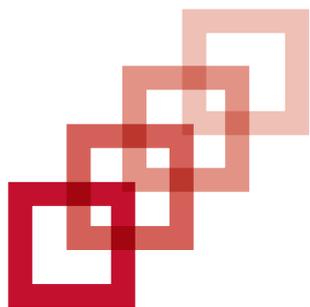


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Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results, 2012–13





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KEY FINDINGS

This publication presents information from the National Aboriginal and Torres Strait Islander Health Measures Survey. This survey is the largest biomedical survey ever conducted for Aboriginal and Torres Strait Islander Australians. Around 3,300 Aboriginal and Torres Strait Islander adults (aged 18 years and over) across Australia took part and voluntarily provided blood and/or urine samples, which were tested for a range of chronic disease and nutrient biomarkers.

At the national level, the results showed that:

- One in ten (11.1%) Aboriginal and Torres Strait Islander adults had diabetes. This comprised 9.6% with diagnosed diabetes and 1.5% with diabetes newly diagnosed from their test results.
- A further 4.7% were at high risk of diabetes according to their blood test results.
- Two in three (65.3%) had at least one risk factor for cardiovascular disease, that is, they were taking cholesterol-lowering medication or had one or more of high total cholesterol, lower than normal levels of HDL (good) cholesterol, high LDL (bad) cholesterol or high triglycerides.
- Nearly one in five (17.9%) had signs of chronic kidney disease.

It was also revealed that for Aboriginal and Torres Strait Islander adults:

- Around half (53.1%) with diabetes also had signs of chronic kidney disease.
- Two in five (38.9%) with diagnosed diabetes were effectively managing their condition, that is, they had an HbA1c test result of 7.0% or less.
- A quarter (25.0%) had high cholesterol, but only around one in ten (9.1%) of this group were aware they had it.

The survey also found striking differences across remoteness areas. When compared with those in urban areas, Aboriginal and Torres Strait Islander adults in remote areas were:

- Two and a half times as likely to have signs of chronic kidney disease (33.6% compared with 13.1%).
- Around twice as likely to have diabetes (20.8% compared with 9.4%).
- Five times as likely to have newly diagnosed diabetes (4.8% compared with 0.9%).
- Less likely to be effectively managing their diabetes (25.1% compared with 43.5%).

Finally, when compared with the non-Indigenous population (and after adjusting for age differences), Aboriginal and Torres Strait Islander people were:

- More than three times as likely to have diabetes (rate ratio of 3.3).
- Twice as likely to have signs of chronic kidney disease (rate ratio of 2.1).
- Nearly twice as likely to have high triglycerides (rate ratio 1.9).
- More likely to have more than one chronic condition, for example having both diabetes and kidney disease at the same time (53.1% compared with 32.5%).

ABOUT THE NATIONAL ABORIGINAL AND TORRES STRAIT ISLANDER HEALTH MEASURES SURVEY

The ABS Australian Health Survey (AHS) is the largest and most comprehensive health survey ever conducted in Australia. The survey, conducted throughout Australia, collected a range of information about health related issues, including health status and conditions, health risk factors and health service usage.

The Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS) forms part of the broader AHS and is based on a nationally representative sample of around 12,900 Aboriginal and Torres Strait Islander people. The AATSIHS was conducted in non-remote areas and remote areas across Australia, including discrete communities.

In 2011–13, the AATSIHS incorporated the first ABS biomedical collection for Aboriginal and Torres Strait Islander people, the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS). The NATSIHMS involved the collection of blood and urine samples from around 3,300 Aboriginal and Torres Strait Islander adults across Australia, which were then tested for various chronic disease and nutrient biomarkers. It also provided a unique opportunity to compare results with the non-Indigenous population, as collected in the National Health Measures Survey.

The NATSIHMS has been made possible by additional funding from the Australian Government Department of Health as well as the National Heart Foundation of Australia, and the contributions of these two organisations to improving health information in Australia through quality statistics are greatly valued.

The AATSIHS was developed with the assistance of an advisory group comprised of experts on health issues, many of whom were Aboriginal and Torres Strait Islander people. The biomedical component in particular was also developed with the assistance of several advisory groups and expert panels. Members of these groups were drawn from Commonwealth and state/territory government agencies, non-government organisations, relevant academic institutions and clinicians. The valuable contributions made by members of these groups are greatly appreciated.

Finally, the success of the NATSIHMS was dependent on the very high level of cooperation received from Aboriginal and Torres Strait Islander Australians. Their continued cooperation is very much appreciated; without it, the range of statistics published by the ABS would not be possible. Information received by the ABS is treated in strict confidence as required by the *Census and Statistics Act, 1905*.

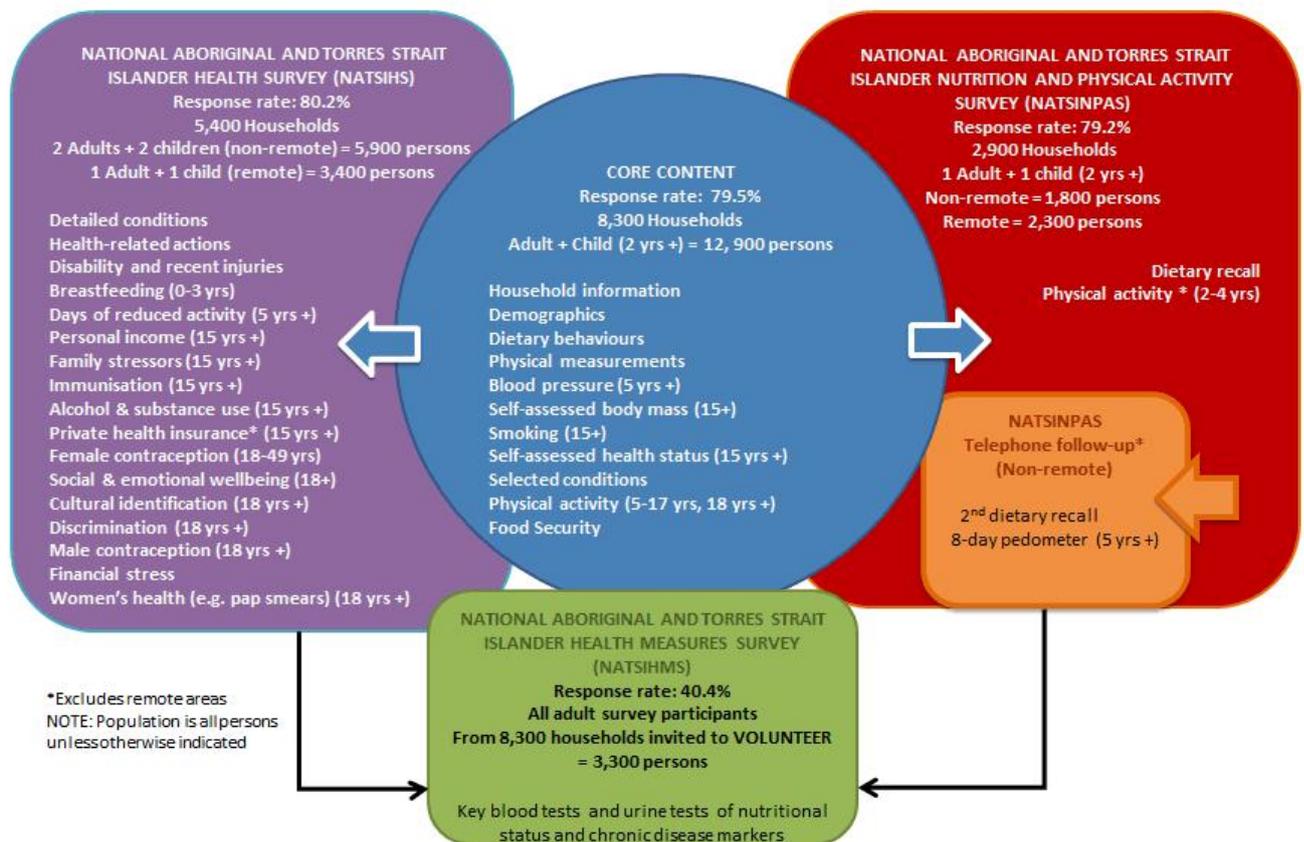
THE STRUCTURE OF THE AUSTRALIAN ABORIGINAL AND TORRES STRAIT ISLANDER HEALTH SURVEY

This publication is one of several ABS releases from the 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS) and is the first publication of biomedical results.

The AATSIHS combines the existing ABS National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) with two new elements - a National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (NATSINPAS) and a National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS).

The following diagram shows how the various elements combine to provide comprehensive health information for the Aboriginal and Torres Strait Islander population. The content for each component of the survey is listed along with the ages of respondents for which topics were collected.

Structure of the Australian Aboriginal and Torres Strait Islander Health Survey



As shown in the above diagram, the AATSIHS is made up of 3 components:

- the National Aboriginal and Torres Strait Islander Health Survey (NATSIHS);
- the National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (NATSINPAS); and
- the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)

All people selected in the AATSIHS were selected in either the NATSIHS or the NATSINPAS, however data items in the 'Core' were common to both surveys and therefore information for these data items is available for all Aboriginal and Torres Strait Islander persons in the AATSIHS. All adults aged 18 years and over were then invited to participate in the voluntary NATSIHMS. This sample design allows comparisons across a wide range of information about

people's health, as well as use of this information in the estimation process.

The NATSIHMS had approximately 3,300 Aboriginal and Torres Strait Islander participants aged 18 years and over from across Australia, including discrete communities. Respondents voluntarily provided blood and urine samples, which were then analysed for specific chronic disease and nutrition biomarkers. See Appendix A for the full list of tests conducted.

DIABETES

Diabetes is a chronic condition where insulin, a hormone that controls blood glucose levels, is no longer produced or not produced in sufficient amounts by the body.¹ If left undiagnosed or poorly managed, diabetes can lead to coronary heart disease, stroke, kidney failure, limb amputations or blindness.² In 2012, diabetes was the second leading cause of death for Aboriginal and Torres Strait Islander people. The age standardised death rate for diabetes was seven times higher for Aboriginal and Torres Strait Islander Australians compared with non-Indigenous Australians.³

The National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) provides an objective measurement of the number of Aboriginal and Torres Strait Islander people with diabetes in Australia. It included two tests to measure diabetes: a fasting plasma glucose test and a glycated haemoglobin test (commonly referred to as HbA1c).

Fasting plasma glucose measures the level of sugar in the person's blood at the time of testing. Participants were required to fast for 8 hours prior to the test in order to get an accurate reading. HbA1c, on the other hand, measures what the person's average blood glucose level has been in the previous three months. Participants were not required to fast for this test. A set of cut-offs are used for each test to determine whether a person has diabetes or is at high risk of diabetes. The cut-offs used in the NATSIHMS are shown below.

Cut-offs for Diabetes in the NATSIHMS

	Fasting plasma glucose (mmol/L)(a)	HbA1c (%) (b)
Has diabetes	7.0	6.5
At high risk of diabetes	6.1 to <7.0	6.0 to <6.5
No diabetes	<6.1	<6.0

(a) Based on World Health Organization cut-offs for fasting plasma glucose.⁴

(b) An HbA1c level of greater than or equal to 6.5% is the WHO recommended cut-off point for diabetes.⁵

ENDNOTES

1. Diabetes Australia, Sept 2011, *What is Diabetes?*, <<http://www.diabetesaustralia.com.au/en/Understanding-Diabetes/What-is-Diabetes/>>, Last accessed 25/06/2014.
2. The Royal Australian College of General Practitioners and Diabetes Australia, 2014, *General practice management of type 2 diabetes - 2014–15*, Last accessed 12/08/2014 <<http://www.diabetesaustralia.com.au/PageFiles/763/Updated%20GP%20guidelines.pdf>>
3. Australian Bureau of Statistics 2014, *Causes of Death, Australia 2012* <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3303.0/>>, Last accessed 25/06/2014.
4. World Health Organization 2006, *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia*, <http://www.who.int/diabetes/publications/Definition%20and%20diagnosis%20of%20diabetes_new.pdf>, Last accessed 25/06/2014.
5. World Health Organization 2011, *Use of Glycated Haemoglobin (HbA1c) in the Diagnosis of Diabetes Mellitus*, <http://www.who.int/diabetes/publications/report-hba1c_2011.pdf>, Last accessed 25/06/2014.

MEASURING DIABETES - DEFINITIONS

In the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS), two blood tests for diabetes were performed: fasting plasma glucose and glycated haemoglobin (commonly referred to as HbA1c). The tables available on the Downloads page of this publication present diabetes prevalence rates for both tests, including a comparison of the two tests in Table 6. However, at the time of publication, fasting plasma glucose is still the current standard test for diabetes in Australia, therefore the results presented in the publication commentary focus on fasting plasma glucose only.

Diabetes prevalence was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use.

A person was considered to have **known diabetes** if:

- they had ever been told by a doctor or nurse that they have diabetes and they were taking diabetes medication (either insulin or tablets); OR
- they had ever been told by a doctor or nurse that they have diabetes and their blood test result for fasting plasma glucose was greater than or equal to the cut off point for diabetes (that is, 7.0 mmol/L).

Note: people who had been told by a doctor or nurse that they have diabetes, but who were not taking medication for diabetes and did not have a fasting plasma glucose level 7.0 mmol/L, were classified as not having diabetes.

People with known diabetes were further classified as having Type I, Type II or Type unknown, based on the type of diabetes that a doctor or nurse told them they had. Women with gestational diabetes were excluded.

- A person was considered to have **newly diagnosed diabetes** if they reported no prior diagnosis of diabetes but had a fasting plasma glucose value 7.0 mmol/L.

Total persons with diabetes was defined as the total of known diabetes and newly diagnosed diabetes.

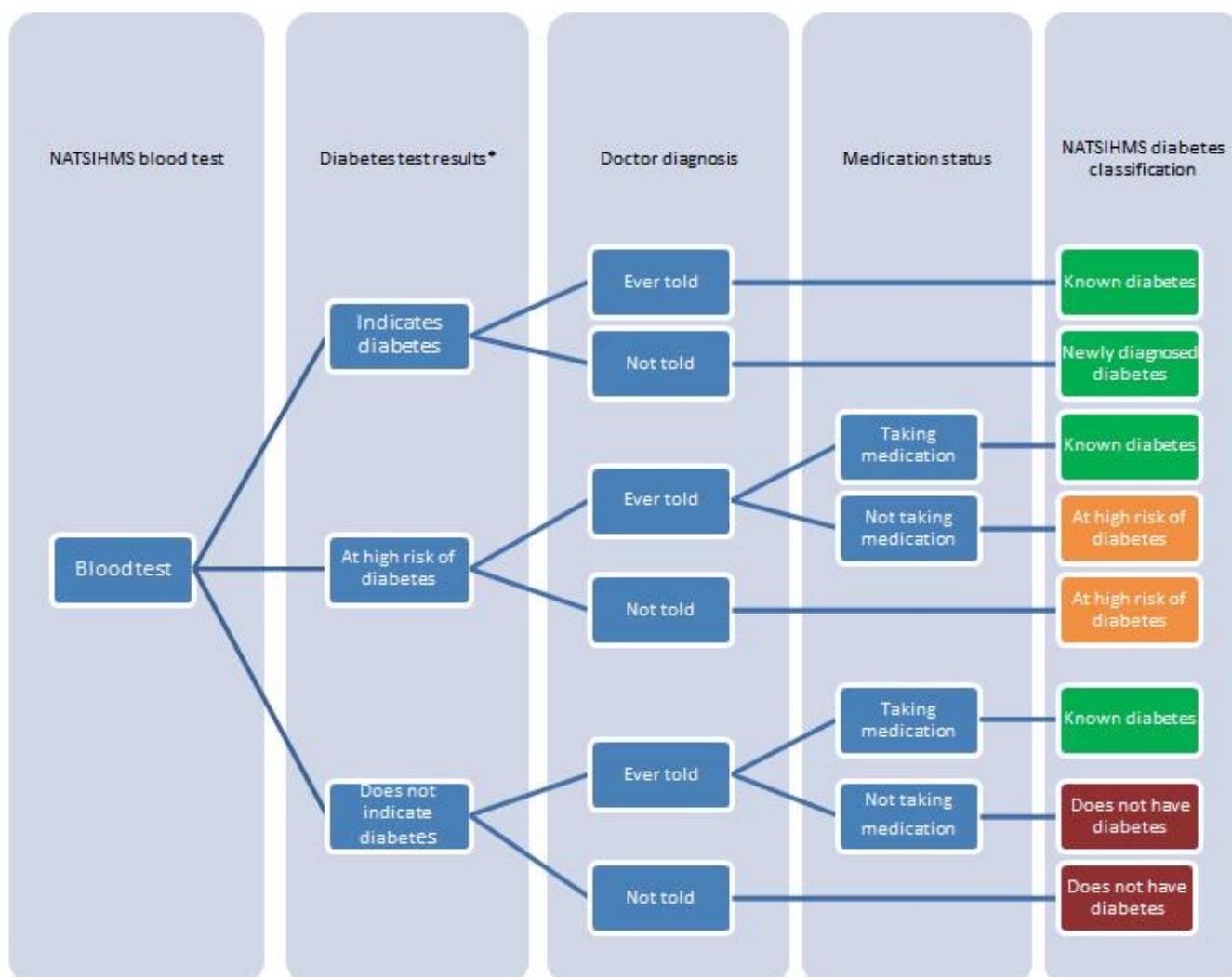
- A person was considered to be **at high risk of diabetes** if they did not currently have diabetes, but had an impaired fasting plasma glucose result, that is, a fasting plasma glucose level ranging from 6.1 mmol/L to less than 7.0 mmol/L.¹

The NATSIHMS diabetes classification is outlined in Figure 1 (this is also the same classification used for the general population). More information on diabetes prevalence is presented in Tables 1, 3, 4, 5, 6, 7 and 17 on the Downloads page of this publication.

Information on diabetes prevalence using this same definition but based on HbA1c test results are also shown in Tables 1, 3, 4, 5, 6, 7 and 17. The relevant cut-offs for HbA1c are as follows:

- Indicates diabetes: 6.5%
- At high risk of diabetes: 6.0% to <6.5%
- Does not indicate diabetes: <6.0%.

Figure 1: 2012–13 NATSIHMS diabetes classification



* Cut-offs for FPG: Indicates diabetes 7.0 mmol/L; At high risk of diabetes 6.1 to <7.0 mmol/L; Does not indicate diabetes <6.1 mmol/L.

*Cut-offs for HbA1c: Indicates diabetes 6.5%; At high risk of diabetes 6.0% to <6.5%; Does not indicate diabetes <6.0%.

ENDNOTES

1 World Health Organization 2006, *Definition and diagnosis of diabetes mellitus and intermediate hyperglycemia*, <http://www.who.int/diabetes/publications/Definition%20and%20diagnosis%20of%20diabetes_new.pdf>, Last accessed 25/06/2014.

DIABETES PREVALENCE

Diabetes prevalence was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use. See the Measuring diabetes - definitions section for a detailed description.

Data source and definitions

Fasting plasma glucose is the current standard test for diabetes diagnosis in Australia. The information on diabetes in the following sections is based on fasting plasma glucose results only. Information on diabetes prevalence using glycated haemoglobin (commonly referred to as HbA1c) test results, which is a non-fasting test, is shown in Tables 1, 3, 4, 5, 6, 7 and 17 on the Downloads page of this publication.

In order to get an accurate reading for the fasting plasma glucose test, participants were required to fast for 8 hours or more beforehand. The results presented here refer only to those who did fast (approximately 78% of adults who participated in the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)).

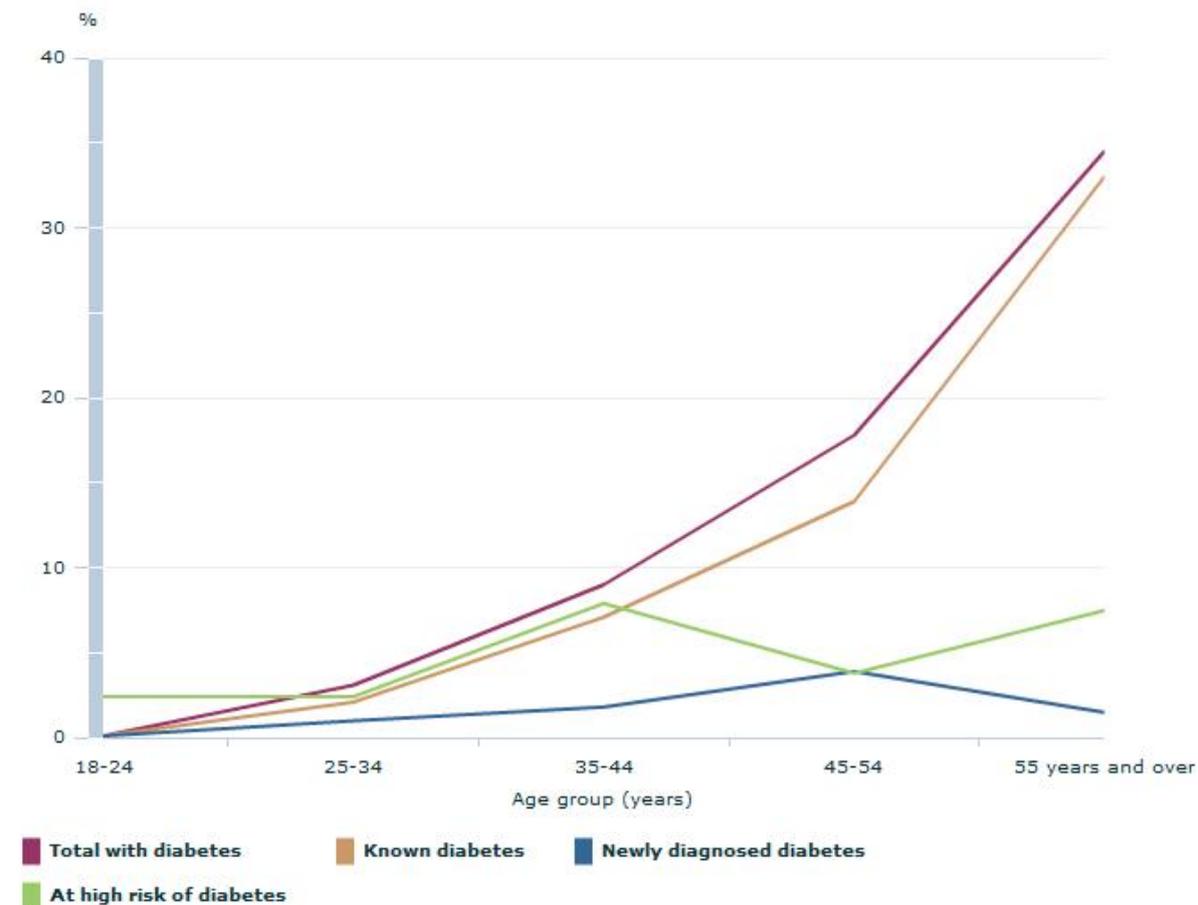
In 2012–13, just over one in ten (11.1%) Aboriginal and Torres Strait Islander adults had diabetes. This comprised 9.6% with known diabetes and 1.5% with diabetes newly diagnosed from their test results. This indicates that there was approximately one newly diagnosed case for every six diagnosed cases. A further one in twenty (4.7%) Aboriginal and Torres Strait Islander people had an impaired fasting plasma glucose result, which indicates that they were at high risk of diabetes. This means that there was an extra two people at high risk of diabetes for every six people who had been diagnosed.

Diabetes was twice as common among Aboriginal and Torres Strait Islander people living in remote areas in 2012–13. Around one in five (20.8%) Aboriginal and Torres Strait Islander people in remote areas had diabetes compared with around one in ten people in non-remote areas (9.4%). This difference was particularly pronounced for newly diagnosed diabetes, which was five times as high in remote areas than in non-remote areas (4.8% compared with 0.9%).

After taking age differences into account, Aboriginal and Torres Strait Islander people were more than three times as likely as non-Indigenous people to have diabetes. They were 3.6 times as likely to have known diabetes and twice as likely to have newly diagnosed diabetes. They were also nearly twice as likely to be at high risk of diabetes.

Diabetes prevalence among Aboriginal and Torres Strait Islander people steadily increased with age. Rates were especially high among those aged 55 years and over, with around one in every three people in this age group having diabetes (34.5%). A further 7.5% of those aged 55 and over were at high risk of diabetes.

Aboriginal & Torres Strait Islander adults - Proportion with diabetes by age, 2012-13



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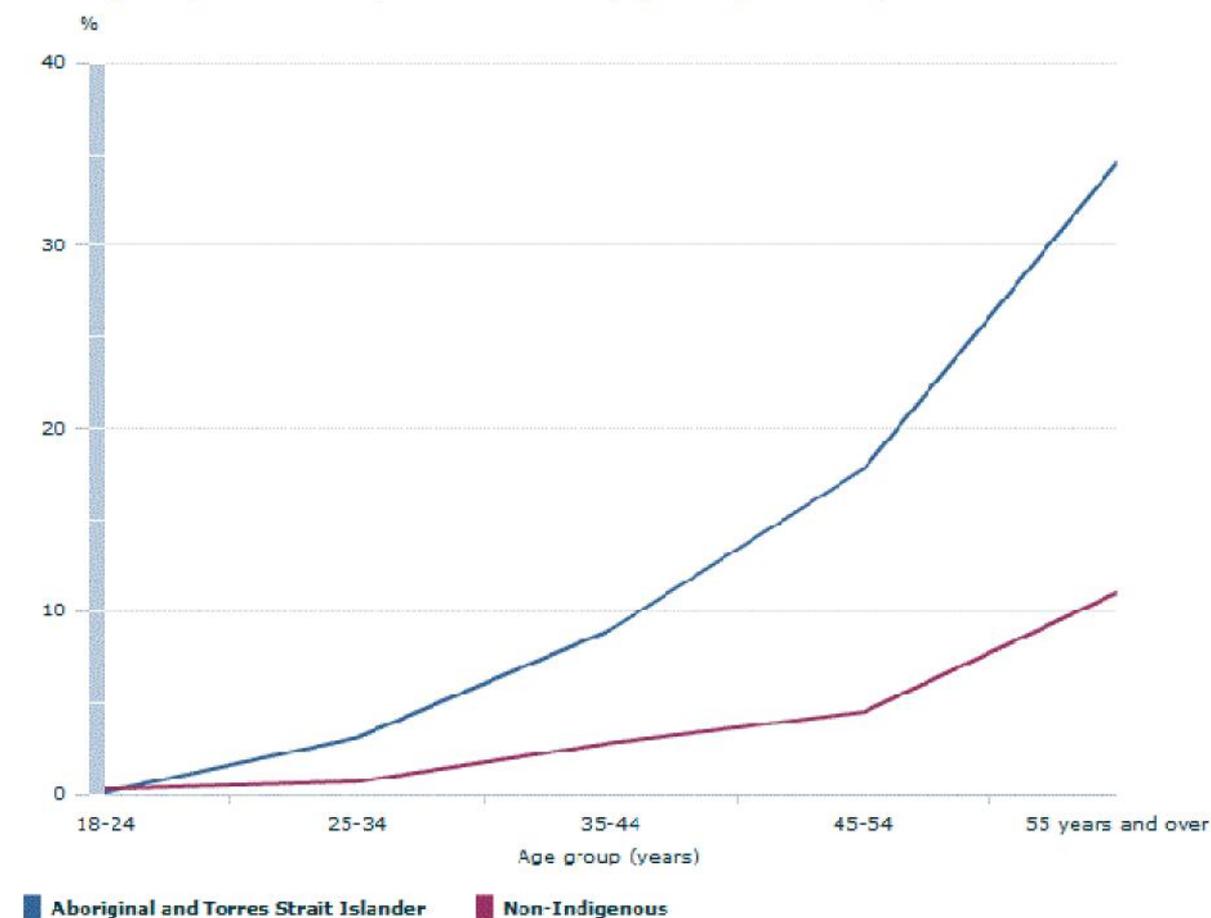
Australian Bureau of Statistics

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Although this overall age pattern was similar to non-Indigenous Australians, diabetes tended to occur at earlier ages for Aboriginal and Torres Strait Islander people. For example, the rate of diabetes for Aboriginal and Torres Strait Islander people aged 35–44 years (9.0%) was on par with that for non-Indigenous people aged 55–64 years (8.2%). Likewise, the rate for those aged 45–54 years (17.8%) was similar to that for those aged 65–74 in the non-Indigenous population (15.0%). This pattern was apparent for both known diabetes and newly diagnosed diabetes.

Persons aged 18 years & over - Proportion with diabetes by age & Indigenous status, 2011-13



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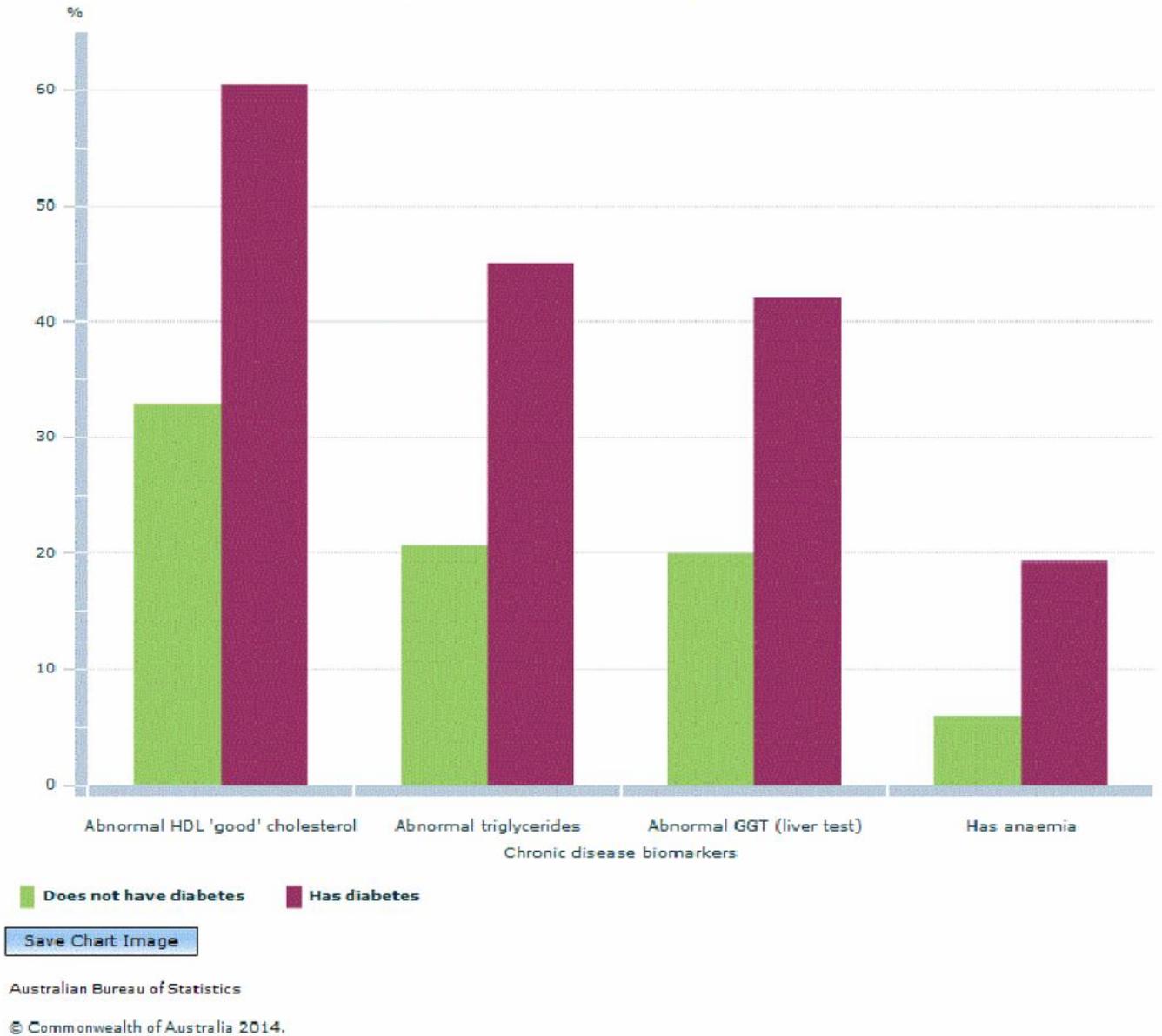
Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

One of the major risk factors for developing diabetes is obesity, as excess body weight can interfere with the body's production of, and resistance to, insulin.¹ The Australian Aboriginal and Torres Strait Islander Health Survey showed that four in every ten (39.8%) Aboriginal and Torres Strait Islander people were obese. In 2012–13, Aboriginal and Torres Strait Islander people who were obese were around seven times as likely as those of normal weight or underweight to have diabetes (17.2% compared with 2.4%).

Many Aboriginal and Torres Strait Islander people with diabetes also had signs of other chronic conditions. For example, diabetes had very high co-morbidity with kidney disease, of which diabetes is the major cause.² Around half (53.1%) of all Aboriginal and Torres Strait Islander people with diabetes had signs of chronic kidney disease in 2012–13. This was significantly higher than the corresponding rate in the non-Indigenous population (32.5%).

Diabetes was also associated with higher rates of cardiovascular disease. Six in ten (60.5%) Aboriginal and Torres Strait Islander people with diabetes had lower than normal levels of HDL (good) cholesterol compared with 32.9% of those without diabetes. They were also around twice as likely to have high triglycerides (45.1% compared with 20.7%). Rates of liver disease as measured by GGT were also much higher among those with diabetes (42.0% compared with 20.0%), as were rates of anaemia (19.3% compared with 5.9%).

Aboriginal & Torres Strait Islander adults - Proportion with & without diabetes by selected biomarkers, 2012-13



Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For more information on diabetes prevalence, see Tables 1, 3, 4, 5, 6, 7 and 17 on the Downloads page of this publication.

ENDNOTES

- 1 Kahn, B.B & Flier, J.S., 2000, 'Obesity and insulin resistance'. The Journal of Clinical Investigation, <<http://www.jci.org/articles/view/10842>>, Last accessed 1/08/2014.
- 2 Kidney Health Australia, July 2014, Diabetes and Chronic Kidney Disease (CKD), <<http://www.kidney.org.au/ForPatients/Management/DiabetesandCKD/tabid/704/Default.aspx>>, Last accessed 24/07/2014.

DIABETES MANAGEMENT

Glycated haemoglobin (HbA1c) is used to measure how well a person is managing their diabetes. This test gives an indication of the person's average blood glucose levels over the previous three months. The optimum management target for HbA1c for people with diabetes is a level of 7.0% or less. Maintaining this level decreases a person's risk of developing a range of complications from their diabetes, including problems with their circulation, kidneys, eyes and feet, and lowers the risk of heart attack and stroke. There is also a range of other optimum targets for Type 2 diabetes management, including those for cholesterol levels, Body Mass Index (BMI) and blood pressure.¹ These are listed in the Data source and definitions box below.

Data source and definitions

In the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS), information on diabetes management is presented for those with known diabetes. See the Measuring diabetes - definitions section for information on how this population is defined. The information in this section is based on fasting plasma glucose results only. Information on diabetes management using glycated haemoglobin (commonly referred to as HbA1c) test results is shown in Table 15 on the Downloads page of this publication.

Goals for optimum diabetes management, as defined by the 2014–15 General Practice Management of Type 2 Diabetes¹ are as follows:

- Fasting blood glucose levels between 6.0 and 8.0 mmol/L
- HbA1c levels less than or equal to 7.0%
- Total cholesterol less than 4.0 mmol/L
- HDL 'good' cholesterol greater than or equal to 1.0 mmol/L
- LDL 'bad' cholesterol less than 2.0 mmol/L
- Non-HDL cholesterol less than 2.5 mmol/L
- Triglycerides less than 2.0 mmol/L
- Albumin creatinine ratio (a kidney function test) less than 3.5 mg/mmol for women and less than 2.5 mg/mmol for men
- Urinary albumin excretion less than 20 mg/L
- Blood pressure less than or equal to 130/80 mmHg
- 'Normal' Body Mass Index (i.e. a BMI score of between 18.5 and 24.9)*
- Non-smoker
- Normal healthy eating**
- Alcohol intake less than or equal to 2 standard drinks per day**
- At least 30 minutes of physical activity per day, most days of the week (total greater than or equal to 150 minutes per week)**
- Immunisation against influenza, pneumococcal disease, diphtheria, tetanus, and pertussis**.

* The Guidelines do not specifically prescribe a normal BMI but rather a 'healthy' weight loss goal. Normal BMI is used for this data item as the survey only collected body mass at one time point. The previous guidelines (2012) also prescribed a normal BMI.

**Note information on normal eating habits, immunisation, alcohol and physical activity targets have not been included in this release, as data for these variables are not available for all persons in the NATSIHMS. However, some of this information can be sourced from the National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) component.

In 2012–13, around two in five (38.9%) Aboriginal and Torres Strait Islander adults with known diabetes were effectively managing their condition, that is, they had an HbA1c test result of 7.0% or less. Overall, Aboriginal and Torres Strait Islander women were more likely than men to be managing their diabetes (47.0% compared with 28.1%).

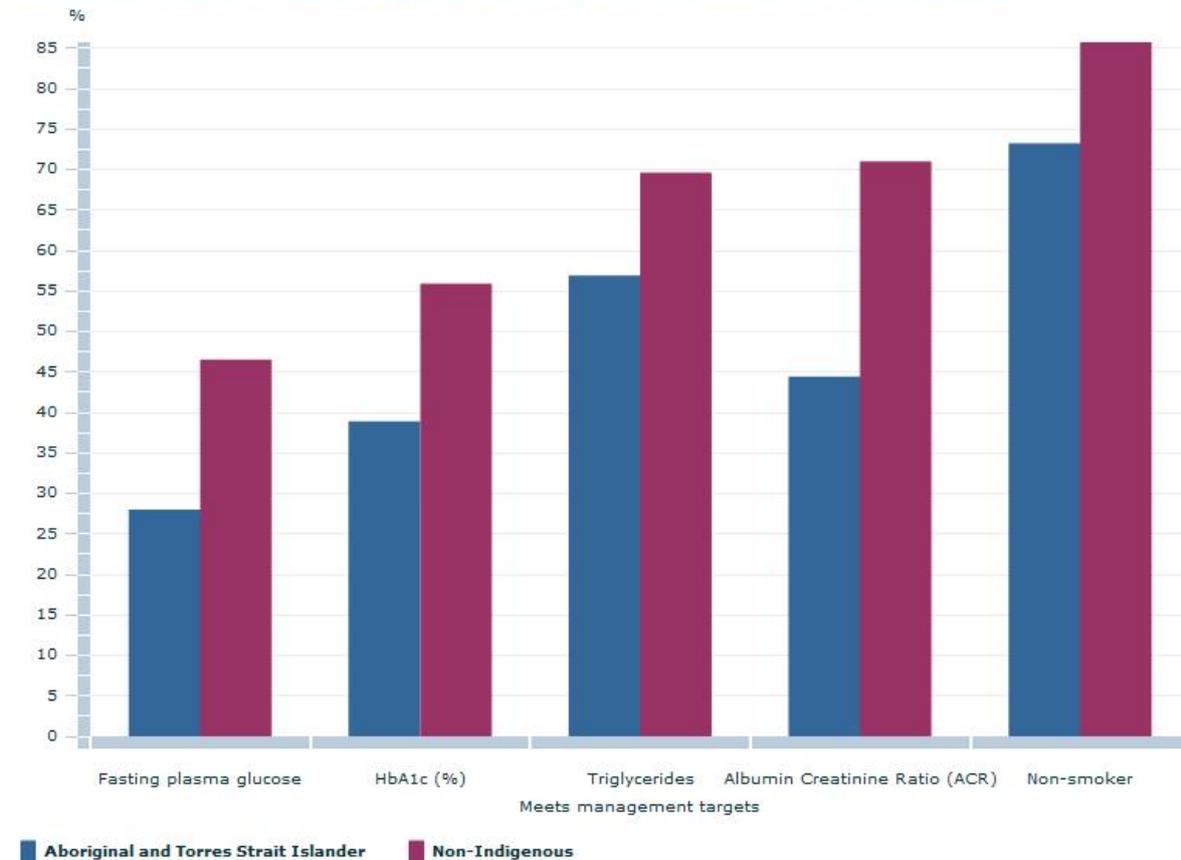
Based on the HbA1c target, Aboriginal and Torres Strait Islander people with known diabetes were less likely than their non-Indigenous counterparts to be managing their condition (38.9% compared with 55.9%).

As shown in the previous chapters, rates of known diabetes were particularly high for Aboriginal and

Torres Strait Islander people living in remote areas (16.0% compared with 8.5% in non-remote areas). Yet people in remote areas were far less likely than those in non-remote areas to be effectively managing their condition (25.1% compared with 43.5%).

Whilst HbA1c is a good indicator for monitoring diabetes, controlling other aspects of health such as blood lipids (fats) and kidney function levels also decreases the risk of diabetes related complications.² In 2012–13, just over half (56.9%) of all Aboriginal and Torres Strait Islander adults with known diabetes met the management target for triglycerides and almost half (44.4%) met the target for albumin creatinine ratio (ACR), which measures kidney function. However, Aboriginal and Torres Strait Islander people were still less likely than non-Indigenous people to meet these targets, particularly for ACR (44.4% compared with 71.0%).

Persons aged 18 years & over - Proportion with known diabetes meeting diabetes management guidelines, 2011-13



Save Chart Image

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For more information on diabetes management see Table 14 on the Downloads page of this publication.

ENDNOTES

1 Diabetes Australia, 2014, General practice management of type 2 diabetes – 2014–15. <<http://www.diabetesaustralia.com.au/PageFiles/763/UPdated%20GP%20guidelines.pdf>>, Last accessed 14/07/2014.

2 Australian Diabetes Council, 2011, Reducing the risk of complications in type 2 diabetes, <<http://www.australiandiabetescouncil.com/ADCCorporateSite/files/f4/f4940c4e-c5eb-4430-b50f-6724d0f9472d.pdf>>, Last accessed 14/07/2014.

CARDIOVASCULAR DISEASE

Cardiovascular disease remains one of the leading causes of death worldwide. In 2012, ischaemic heart diseases, which include angina, blocked arteries of the heart and heart attacks, were the leading cause of death for both Aboriginal and Torres Strait Islander people and non-Indigenous Australians. However, the age-standardised death rate for ischaemic heart diseases was nearly twice as high for Aboriginal and Torres Strait Islander people as that for non-Indigenous Australians.¹

The main indicators of cardiovascular disease that were measured in the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) were cholesterol, including total, high density lipoprotein (HDL) and low density lipoprotein (LDL), and triglycerides.

Blood pressure and obesity are also important measures associated with cardiovascular risk and were measured in the Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS). Detailed information on the prevalence of high blood pressure and obesity can be found in Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results, 2012–13.

ENDNOTES

1 Australian Bureau of Statistics 2014, Causes of Death, Australia 2012
<<http://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/3303.0/>>, Last accessed 25/06/2014.

CHOLESTEROL

Cholesterol is a type of fat that circulates in the blood. It is essential for many metabolic processes, including the production of hormones and building cells. There are two main types of cholesterol: high density lipoprotein (HDL) and low density lipoprotein (LDL). HDL cholesterol is known as 'good' cholesterol, as it picks up excess cholesterol in the blood and takes it to the liver where it is broken down, helping to prevent blockages. Low levels of HDL may increase the risk of heart disease. LDL cholesterol, on the other hand, is known as 'bad' cholesterol, as high levels in the bloodstream can lead to fatty deposits developing in the arteries, increasing the risk of heart attack or stroke.^{1,2}

Data source and definitions

Cholesterol levels are measured using a blood test. Abnormal cholesterol levels are defined as follows:

- Total cholesterol greater than or equal to 5.5 mmol/L
- LDL cholesterol greater than or equal to 3.5 mmol/L
- HDL cholesterol less than 1.0 mmol/L for men and less than 1.3 mmol/L for women

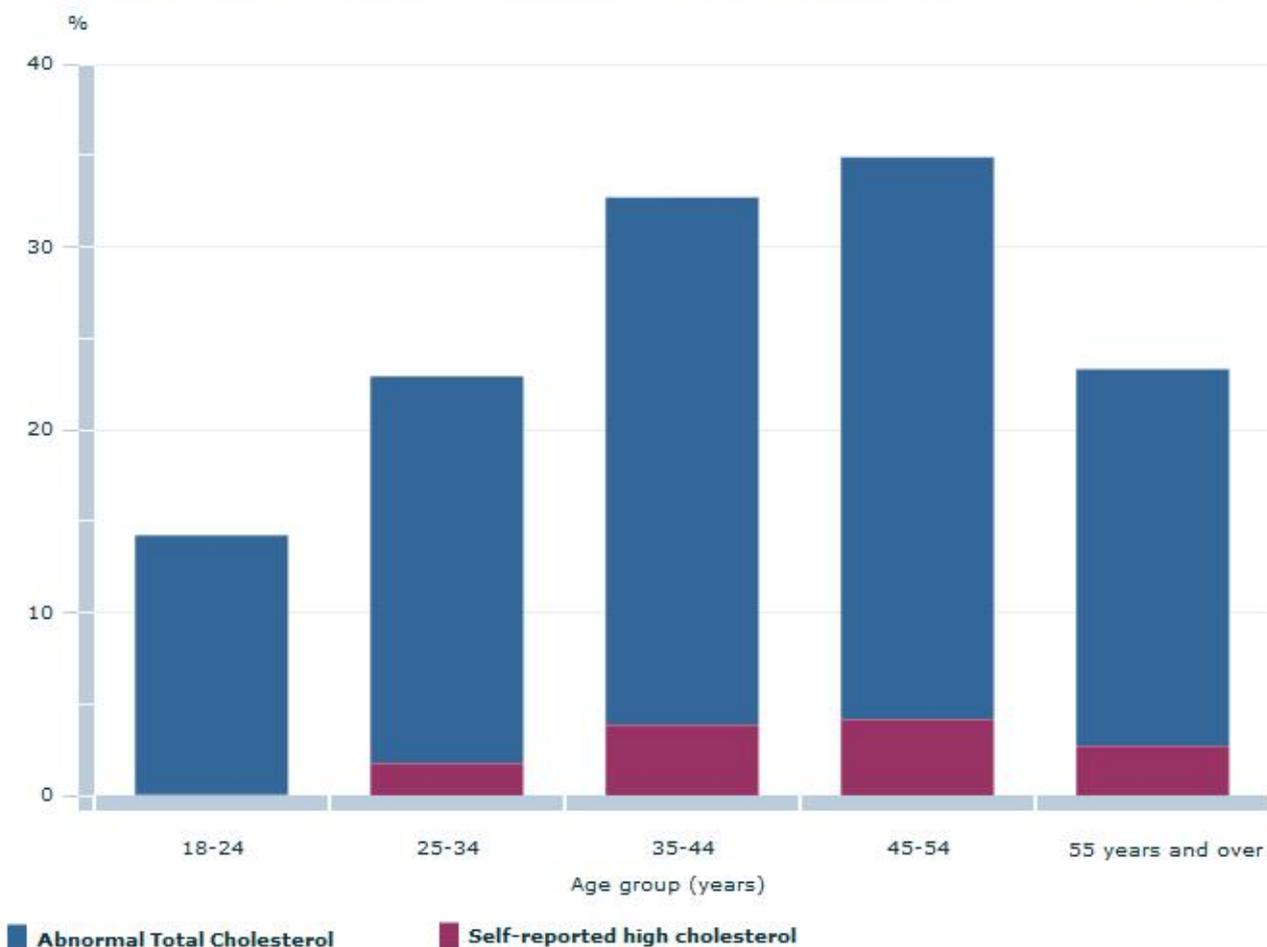
In order to get an accurate reading for the LDL cholesterol, people were required to fast for 8 hours or more beforehand. The LDL cholesterol results presented here refer only to those people who did fast (approximately 78% of adults who participated in the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)).

TOTAL CHOLESTEROL

Total cholesterol is a measure of all the different types of fats in the blood. Abnormal or high total cholesterol is a major risk factor for coronary heart disease and stroke.³

In 2012–13, one in four Aboriginal and Torres Strait Islander adults (25.0%) had abnormal or high total cholesterol levels according to their blood test results. Yet only one in ten people (9.1%) from this group self-reported having high cholesterol as a current long-term health condition. This was similar to the rate found in the non-Indigenous population (10.1%). This suggests that the majority of Aboriginal and Torres Strait Islander people with high total cholesterol results were either unaware that they had the condition or did not consider it to be a long-term or current problem.

Aboriginal & Torres Strait Islander adults - Proportion with abnormal & self reported cholesterol by age, 2012-13



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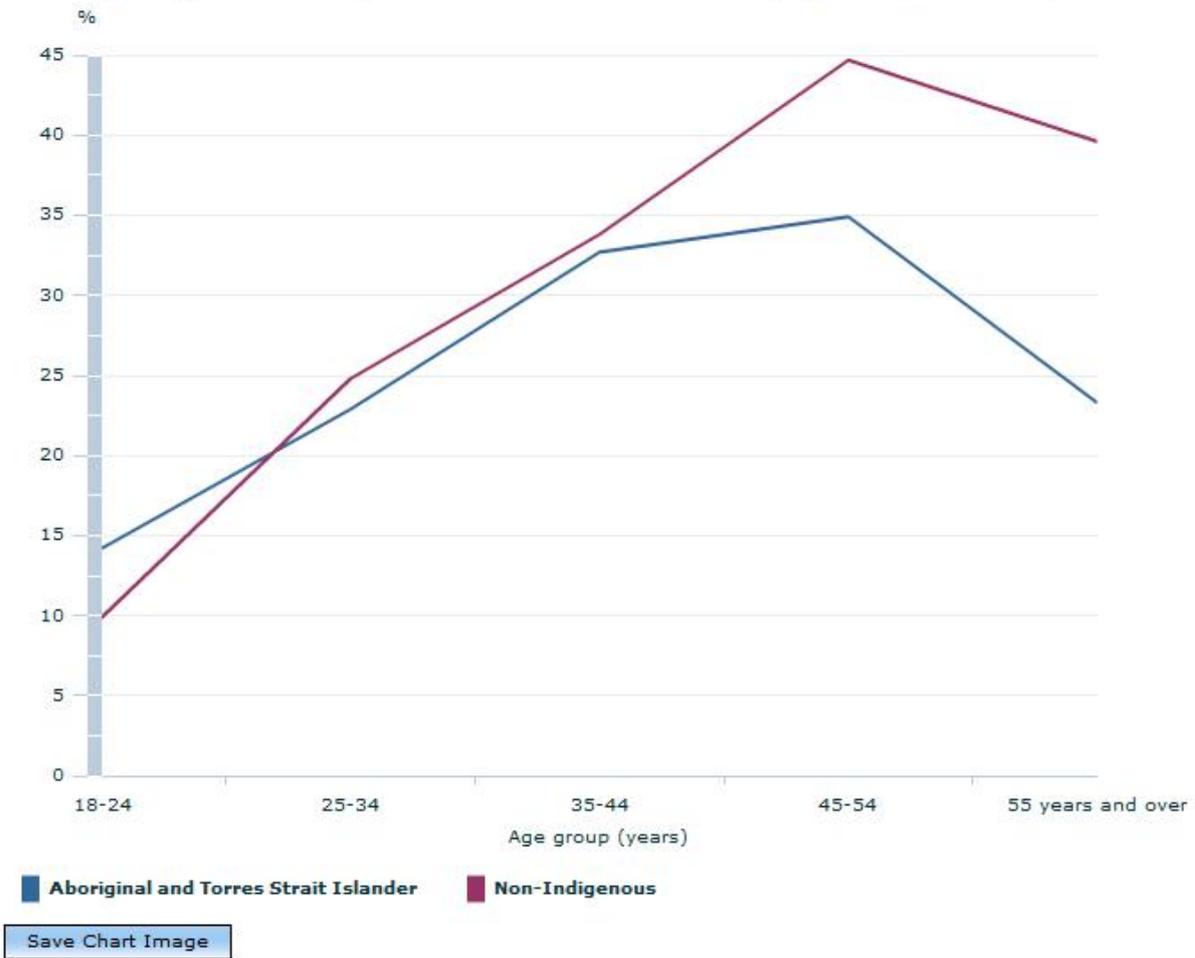
Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

After adjusting for differences in age structure, Aboriginal and Torres Strait Islander people were less likely than non-Indigenous people to have high total cholesterol (rate ratio of 0.8). However, this is likely due to more Aboriginal and Torres Strait Islander people taking cholesterol-lowering medication, particularly after the age of 55 (see the Dyslipidaemia section of this publication).

Interestingly, there was no difference in the proportion of Aboriginal and Torres Strait Islander people with high total cholesterol between non-remote and remote areas in 2012–13. Rates were also similar for both men and women.

Similar to non-Indigenous Australians, the prevalence of high total cholesterol for Aboriginal and Torres Strait Islander people generally increased with age, peaking at 34.9% among those aged 45–54 years before dropping to 23.3% among those aged 55 years and over. However, this is likely the result of older people being more likely than younger people to take cholesterol-lowering medication.

Persons aged 18 years & over - Proportion with abnormal total cholesterol by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Obesity, smoking and high blood pressure are all known risk factors for high cholesterol.⁴ The NATSIHMS showed that Aboriginal and Torres Strait Islander people who were obese were twice as likely to have high total cholesterol as those who were normal weight or underweight (30.3% compared with 16.3%). Likewise, around two in five people with very high or severe blood pressure (42.7%) had high total cholesterol compared with 23.3% of those with normal blood pressure levels.

Yet, surprisingly, cholesterol was not associated with smoking in 2012–13. In fact, rates of high total cholesterol for Aboriginal and Torres Strait Islander people who were current smokers (25.6%) were very similar to those for ex-smokers (25.9%) and people who had never smoked (23.6%). This was different to the pattern seen in the non-Indigenous population, where smokers were more likely to have high total cholesterol than non-smokers.⁵

The NATSIHMS also showed that Aboriginal and Torres Strait Islander people with high cholesterol were more likely to have other signs of cardiovascular disease. For example, around four in five people with high total cholesterol levels also had abnormal levels of LDL cholesterol (82.6%). People with high total cholesterol were also more than twice as likely as those with normal total cholesterol levels to have high triglycerides (45.7% compared with 17.6%).

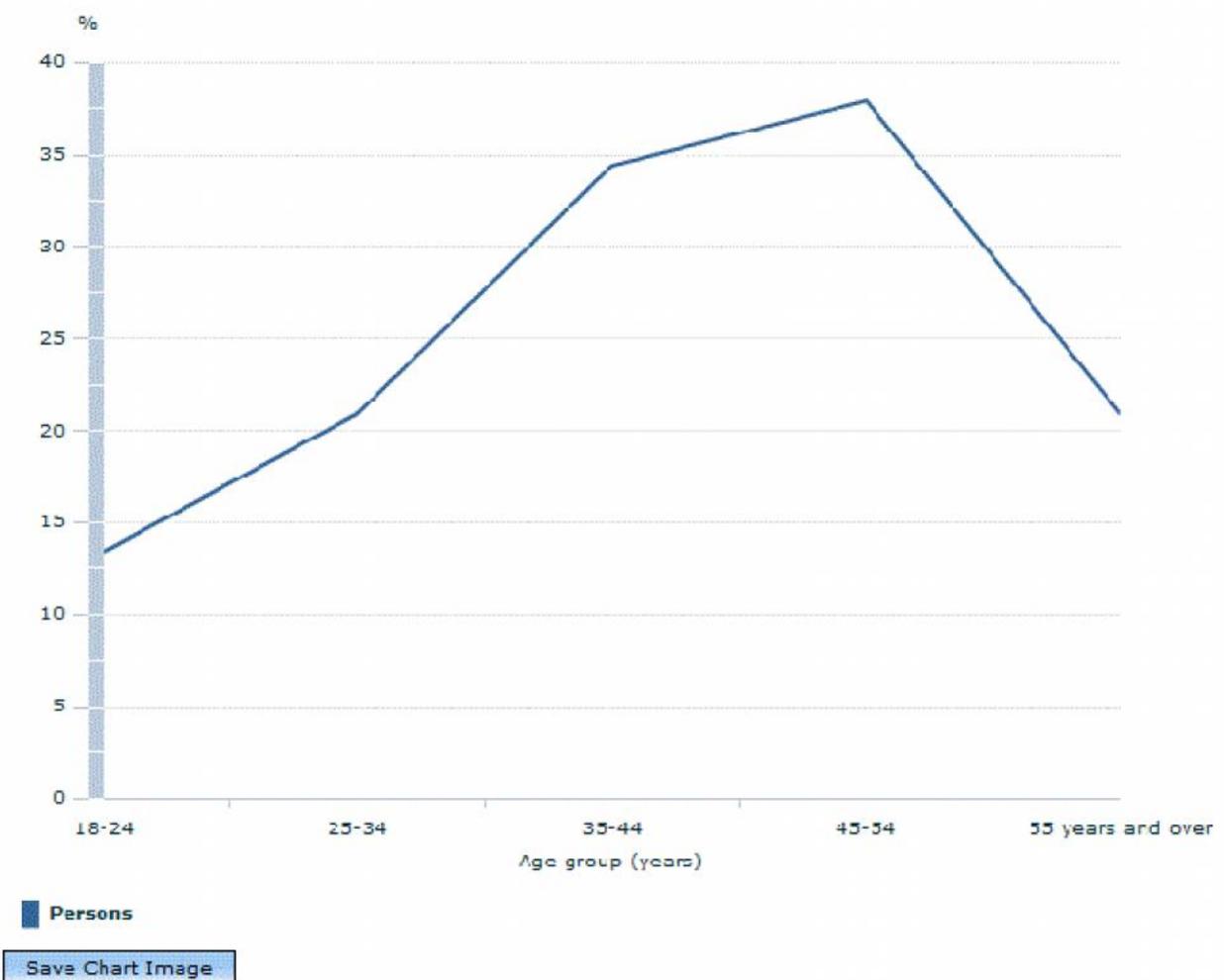
LDL CHOLESTEROL

LDL cholesterol is a measure of 'bad' cholesterol in the blood. Over time, LDL cholesterol can build up in the blood vessels and arteries, blocking the passage of blood flow.⁶

Overall, the results for LDL cholesterol were very similar to those for total cholesterol. In 2012–13, 25.0% of Aboriginal and Torres Strait Islander adults had abnormal or high levels of LDL cholesterol. After accounting for age differences, Aboriginal and Torres Strait Islander people were less likely than non-Indigenous people to have high LDL cholesterol levels (rate ratio 0.8).

Similar to the age pattern observed for high total cholesterol, the prevalence of high LDL cholesterol increased with age until middle adulthood, before decreasing among those aged 55 years and over. Again, this could be due to older people being more likely than younger people to take cholesterol-lowering medication.

Aboriginal & Torres Strait Islander adults - Proportion with abnormal LDL cholesterol by age, 2012-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

The associations between LDL cholesterol and health risk factors were also very similar to those for total cholesterol, with higher rates of LDL cholesterol among those who were overweight or obese, and those who had high blood pressure. Aboriginal and Torres Strait Islander people with abnormal LDL cholesterol were also more likely than those with normal LDL cholesterol to have high total cholesterol (84.9% compared with 3.8%) and high triglyceride levels (35.5% compared with 18.6%).

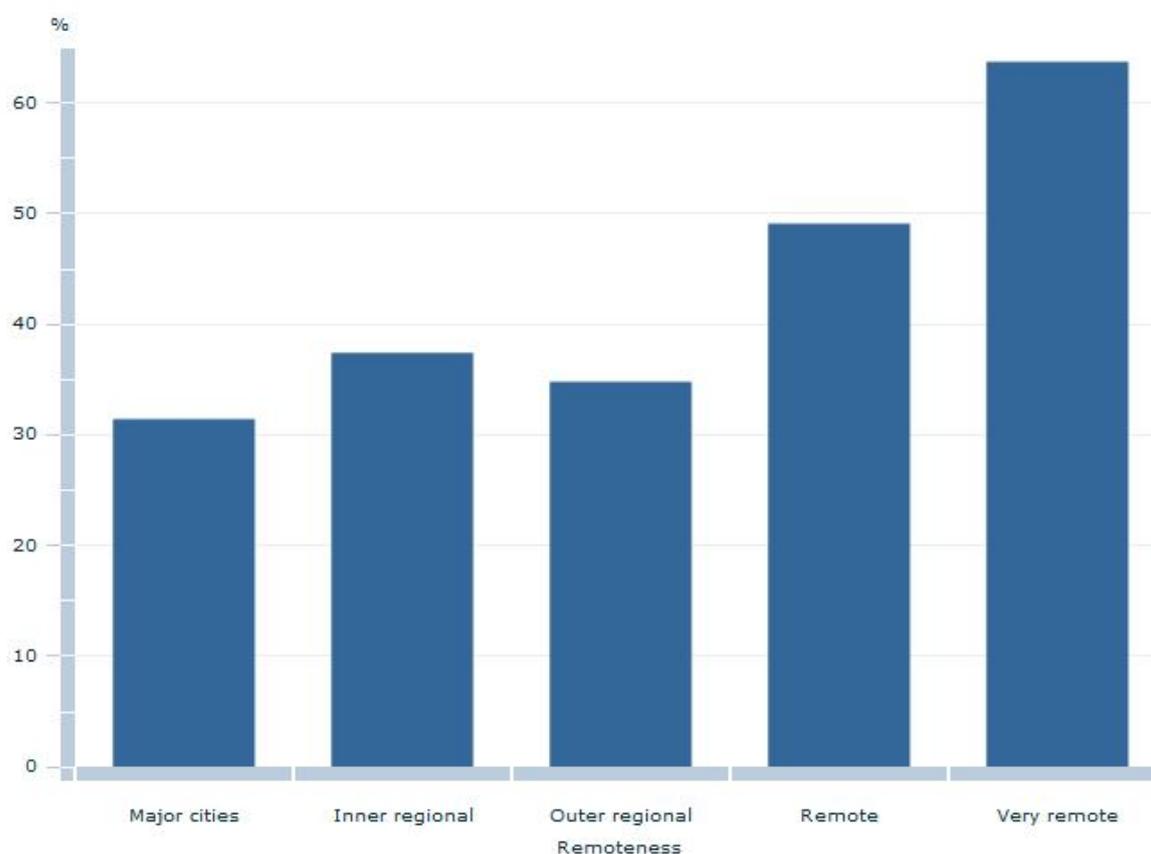
HDL CHOLESTEROL

HDL cholesterol, on the other hand, is the measure of 'good' cholesterol. HDL picks up excess cholesterol in the blood and takes it to the liver where it is broken down.⁶

In 2012–13, almost two in five Aboriginal and Torres Strait Islander adults (39.5%) had abnormal or low levels of HDL cholesterol, with higher rates among women (51.4%) than men (27.0%).

Unlike the other cholesterol biomarkers, abnormal HDL cholesterol was more common among Aboriginal and Torres Strait Islander people in remote areas than in non-remote areas (58.6% compared with 34.0%). Rates were especially high in very remote areas, where nearly two in three people (63.7%) had lower than normal levels of good cholesterol compared with one in three people (31.4%) in major cities.

Aboriginal & Torres Strait Islander adults - Proportion with abnormal HDL cholesterol by remoteness, 2012-13



■ Abnormal HDL cholesterol

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

After adjusting for age differences, Aboriginal and Torres Strait Islander people were nearly twice as likely as non-Indigenous people to have abnormal HDL cholesterol (rate ratio 1.8). For Aboriginal and Torres Strait Islander people, abnormal HDL cholesterol increased markedly during early adulthood, rising from 29.5% among those aged 18–24 years to 46.8% among those aged 35–44 years. This was noticeably different to the age pattern for non-Indigenous people, where rates remained fairly steady across all age groups (between 20.7% and 24.5%).

Persons aged 18 years & over - Proportion with abnormal HDL cholesterol by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Low levels of HDL cholesterol were also associated with a range of lifestyle risk factors. For example, nearly half of those who were obese (49.1%) or who were current smokers (46.1%) had lower than normal levels of HDL cholesterol, compared with 29.3% who were normal weight or underweight and 35.0% who had never smoked.

Although people with low levels of HDL cholesterol were less likely to have abnormal total cholesterol (20.5% compared with 28.5%), they were more likely than those with normal levels of HDL cholesterol to have abnormal triglycerides (34.2% compared with 19.3%). Furthermore, people with low levels of HDL cholesterol were around twice as likely to have diabetes (18.2% compared with 7.0%) and chronic kidney disease (24.4% compared with 13.6%).

For more information on cholesterol, see Tables 1, 3, 4, 5, 6, 7, 8 and 17 on the Downloads page of this publication.

ENDNOTES

1 CSIRO, Cholesterol facts, <<http://www.csiro.au/Outcomes/Health-and-Wellbeing/Prevention/CholesterolFacts.aspx>>, Last accessed 31/07/2014.

2 American Heart Association, 2014, Good vs. Bad Cholesterol,

<http://www.heart.org/HEARTORG/Conditions/Cholesterol/AboutCholesterol/Good-vs-Bad-Cholesterol_UCM_305561_Article.jsp>, Last accessed 31/07/2014.

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4 Heart Foundation, Cardiovascular Condition, <<http://www.heartfoundation.org.au/your-heart/cardiovascular-conditions/Pages/high-cholesterol.aspx>>, Last accessed 25/07/2014.

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<<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4364.0.55.005Main%20Features12011-12?opendocument&tabname=Summary&prodno=4364.0.55.005&issue=2011-12&num=&view=>>>, Last accessed 25/07/2014.

6 National Heart Foundation of Australia, 2013, Cholesterol, <<http://www.heartfoundation.org.au/SiteCollectionDocuments/NAHU-Cholesterol.pdf>>, Last accessed 25/07/2014.

TRIGLYCERIDES

Like cholesterol, triglycerides are a fatty substance in the blood. However, triglycerides work more like a type of fuel, circulating in the bloodstream to be used as energy by the cells. Research shows that high blood triglycerides are an independent risk factor for heart disease as they contribute to the development of atherosclerosis, which is the build-up of fatty deposits in the blood vessels.¹ High triglycerides are typically caused by a diet high in fat or kilojoules, but can also become elevated as a result of having other conditions, such as diabetes and kidney disease.

Data source and definitions

Triglycerides are measured using a blood test. Abnormal triglyceride levels were defined as greater than or equal to 2.0 mmol/L.

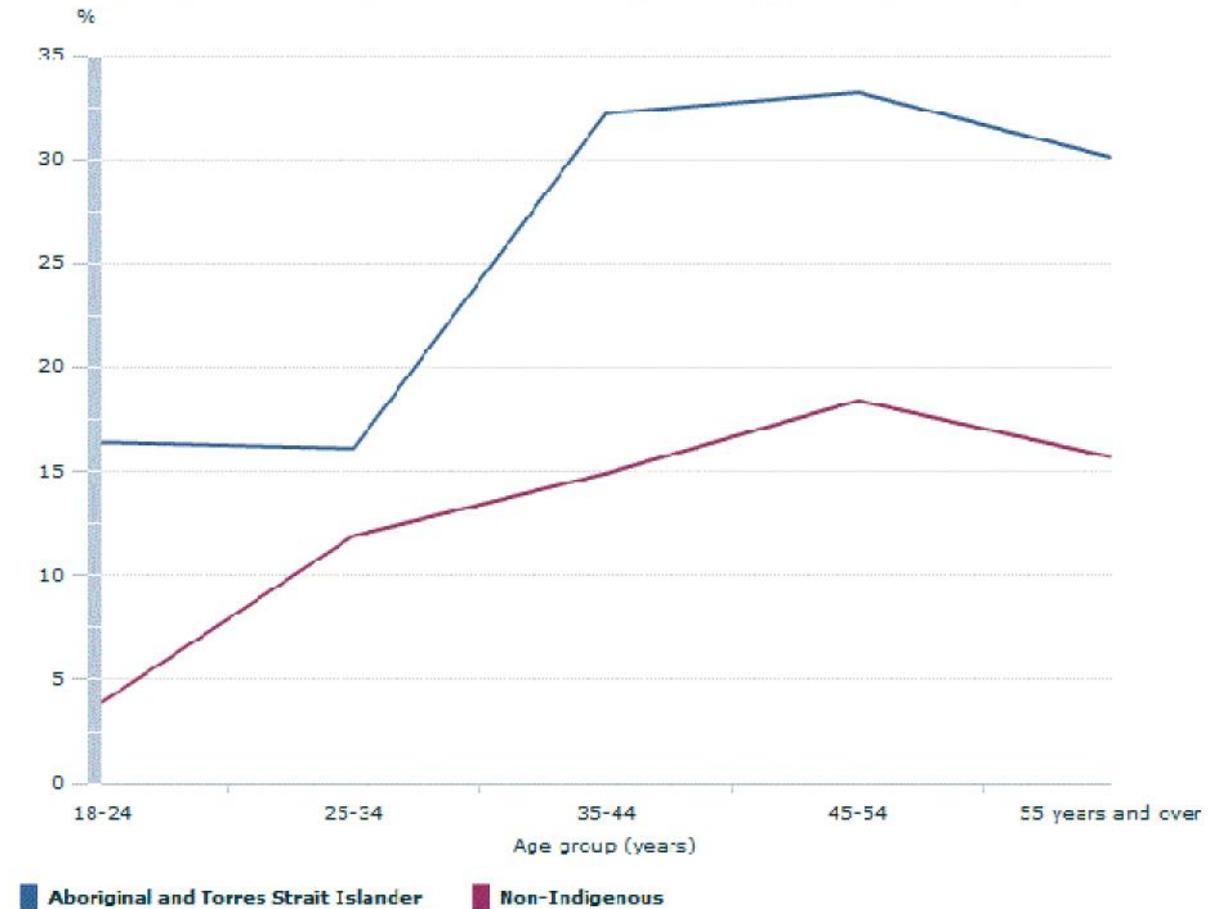
In order to get an accurate reading for triglycerides, people were required to fast for 8 hours or more beforehand. The results presented here refer only to those people who did fast (approximately 78% of adults who participated in the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)).

In 2012–13, almost one in four Aboriginal and Torres Strait Islander adults (24.8%) had high triglyceride levels according to their blood test results, with higher rates among men (32.2%) than women (17.6%). A similar pattern was also seen between non-Indigenous men and women. After adjusting for differences in age structure, Aboriginal and Torres Strait Islander people were twice as likely as non-Indigenous people to have high triglycerides (rate ratio of 1.9).

Regionally, high triglyceride levels were more common among Aboriginal and Torres Strait Islander people living in remote areas, where one in three people (33.5%) had high triglyceride levels compared with around one in four people in non-remote areas (23.3%).

The NATSIHMS showed that there was a sharp increase in the proportion of Aboriginal and Torres Strait Islander people with high triglyceride levels after the age of 35 years, with rates peaking at 33.2% among those aged 45–54 years. The gap between the Aboriginal and Torres Strait Islander population and non-Indigenous population also began to noticeably widen from 35 years, with Aboriginal and Torres Strait Islander people aged 35–44 years being around twice as likely as their non-Indigenous counterparts to have high triglycerides.

Persons aged 10 years & over Proportion with abnormal triglycerides by age & Indigenous status, 2011-13



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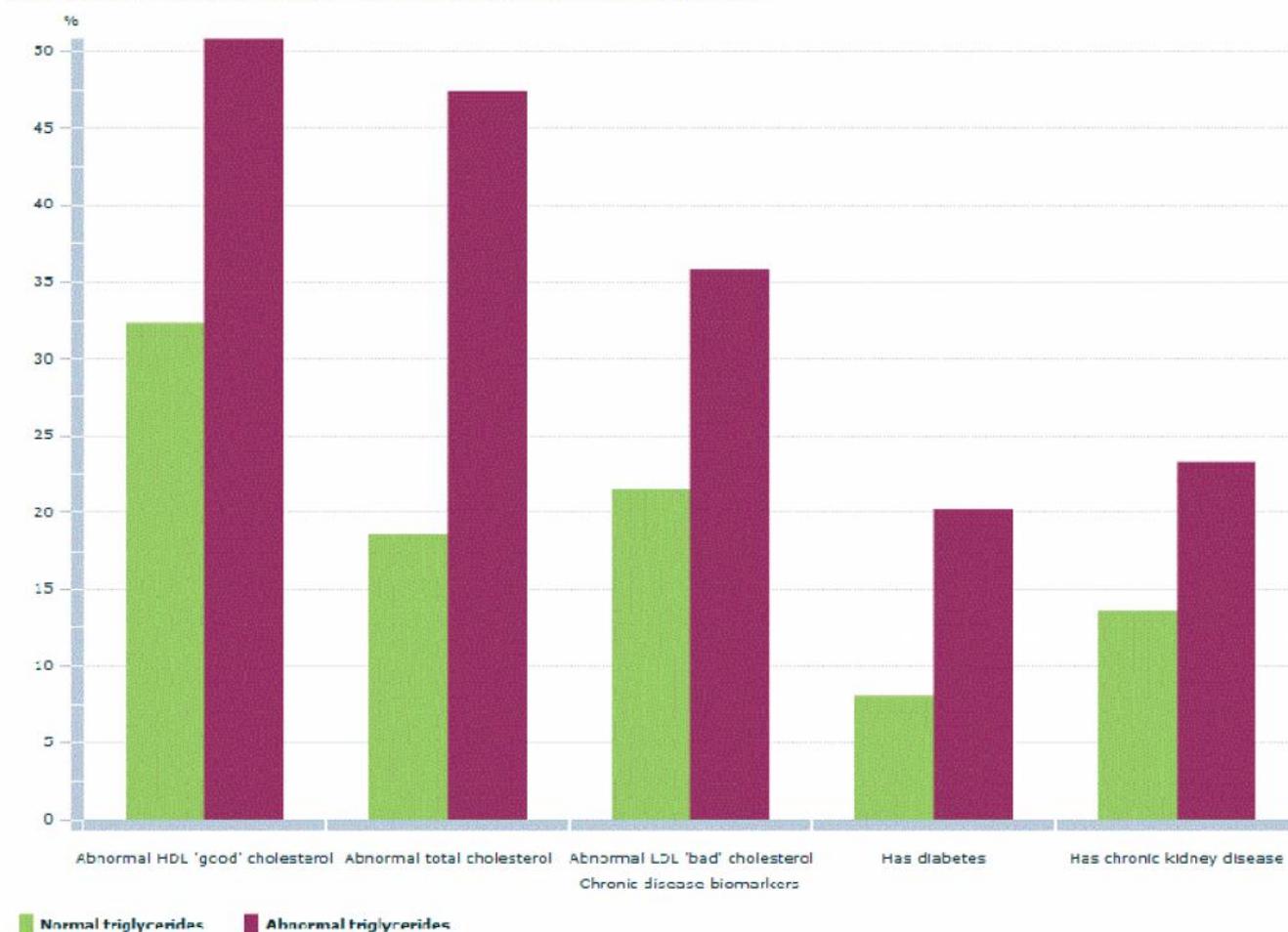
Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Risk factors such as excess body weight contribute to the development of abnormal triglyceride levels.² In 2012–13, overweight or obese Aboriginal and Torres Strait Islander adults were four times as likely to have high triglyceride levels compared with adults who were of normal weight or underweight (31.4% compared with 7.8%). However, there was no clear relationship between triglycerides and smoking.

Interestingly, Aboriginal and Torres Strait Islander people with high triglycerides were more likely than those with normal triglycerides to have abnormal levels for nearly every other chronic disease tested for in the NATSIHMS. This was particularly the case for the other cardiovascular biomarkers, such as high total cholesterol (47.4% compared with 18.6%), lower than normal HDL cholesterol (50.8% compared with 32.3%) and high LDL cholesterol (35.8% compared with 21.5%).

High triglycerides were also related to diabetes, as insulin resistance or poorly controlled diabetes can increase triglyceride levels.^{2,3} In 2012–13, Aboriginal and Torres Strait Islander people with high triglyceride levels were more than twice as likely as those with normal triglyceride levels to have diabetes (20.2% compared with 8.1%). They were also more likely to have signs of chronic kidney disease and liver disease.

Aboriginal & Torres Strait Islander adults - Triglyceride levels by selected biomarkers, 2012-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For more information on triglycerides, see Tables 1, 3, 4, 5, 6, 7, 8 and 17 on the Downloads page of this publication.

ENDNOTES

- 1 Talayero, BG and Sacks, FM, 2011, 'The Role of Triglycerides in Atherosclerosis', *Current Cardiology Reports*, <<http://link.springer.com/article/10.1007%2Fs11886-011-0220-3#page-1>>, Last accessed 23/07/2014.
- 2 Miller, M., Stone, N.J., Ballantyne, C., Bittner, V., Criqui, M.H., Ginsberg, H.N.,...Pennathur, S., 2011, Triglycerides and Cardiovascular Disease, *Circulation*, 123, 2292-2333, <<http://circ.ahajournals.org/content/123/20/2292.full>>, Last accessed 01/08/2014.
- 3 American Heart Association, 2014, Cholesterol Abnormalities & Diabetes, <http://www.heart.org/HEARTORG/Conditions/Diabetes/WhyDiabetesMatters/CholesterolAbnormalities-Diabetes_UCM_313868_Article.jsp>, Last accessed 31/07/2014.

DYSLIPIDAEMIA

Dyslipidaemia refers to a number of different lipid disorders (that is, conditions where there are too many fats in the blood). Estimates of dyslipidaemia from the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) can be used to determine how many Aboriginal and Torres Strait Islander people have at least one lipid disorder and therefore have an increased risk of heart disease.

Data source and definitions

In the NATSIHMS, a person was classified as having dyslipidaemia if they had one or more of the following:

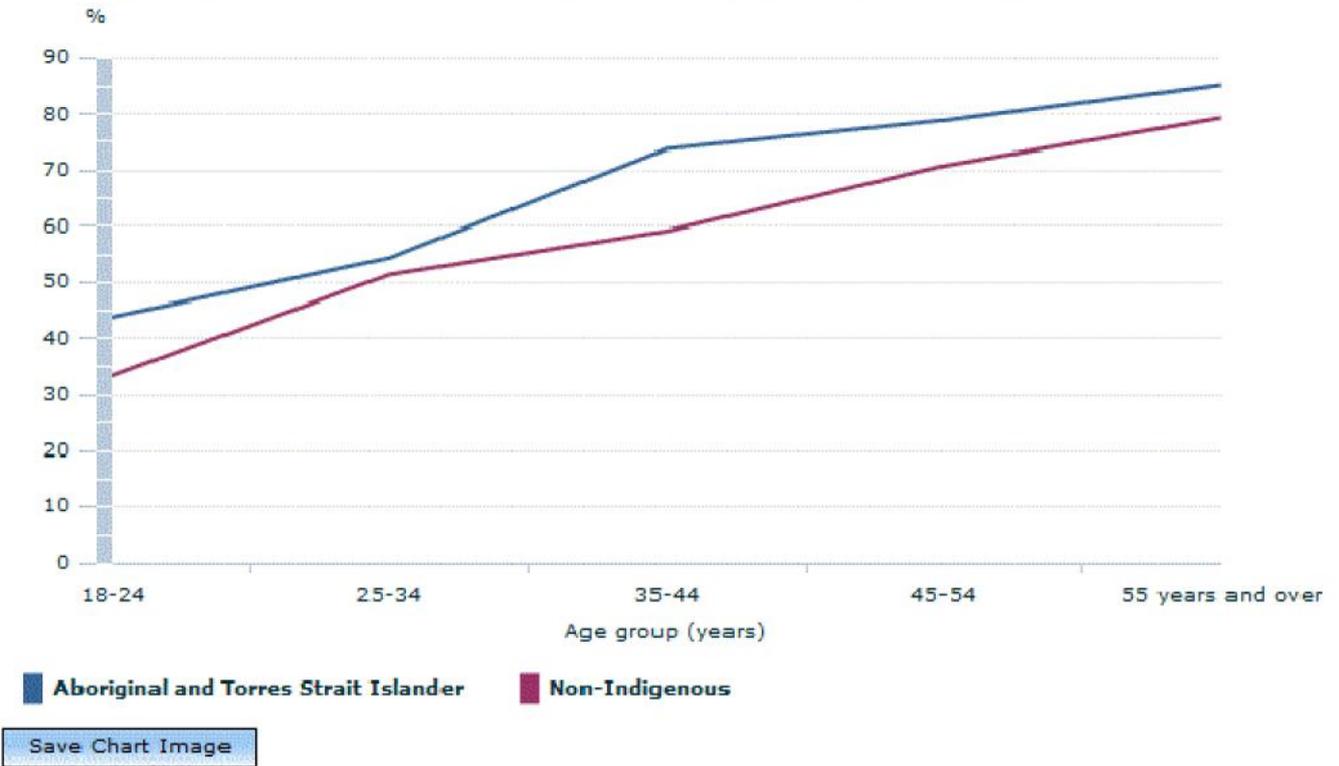
- Taking cholesterol-lowering medication
- Total cholesterol greater than or equal to 5.5 mmol/L
- HDL cholesterol less than 1.0 mmol/L for men and less than 1.3 mmol/L for women
- LDL cholesterol greater than or equal to 3.5 mmol/L
- Triglycerides greater than or equal to 2.0 mmol/L.

In order to get an accurate reading for dyslipidaemia, people were required to fast for 8 hours or more beforehand. The results presented here refer only to those people who did fast (approximately 78% of adults who participated in the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS)).

In 2012–13, around two in three (65.3%) Aboriginal and Torres Strait Islander adults had dyslipidaemia. This comprised 13.9% who took some form of cholesterol-lowering medication and 51.4% who took no medication but had either high total cholesterol, low HDL cholesterol, high LDL cholesterol or high triglyceride levels based on their test results. Overall, rates of dyslipidaemia were similar for both men and women.

After adjusting for age difference between the two populations, Aboriginal and Torres Strait Islander people were more likely than non-Indigenous people to have dyslipidaemia (rate ratio of 1.1). Although the overall age pattern was similar to that for non-Indigenous Australians, rates of dyslipidaemia were significantly higher for middle aged Aboriginal and Torres Strait Islander people compared with their non-Indigenous counterparts. For example, 73.8% of Aboriginal and Torres Strait Islander people aged 35–44 years had dyslipidaemia compared with 59.2% of non-Indigenous people in this age group.

Persons aged 18 years & over - Proportion with dyslipidaemia by age & Indigenous status, 2011-13



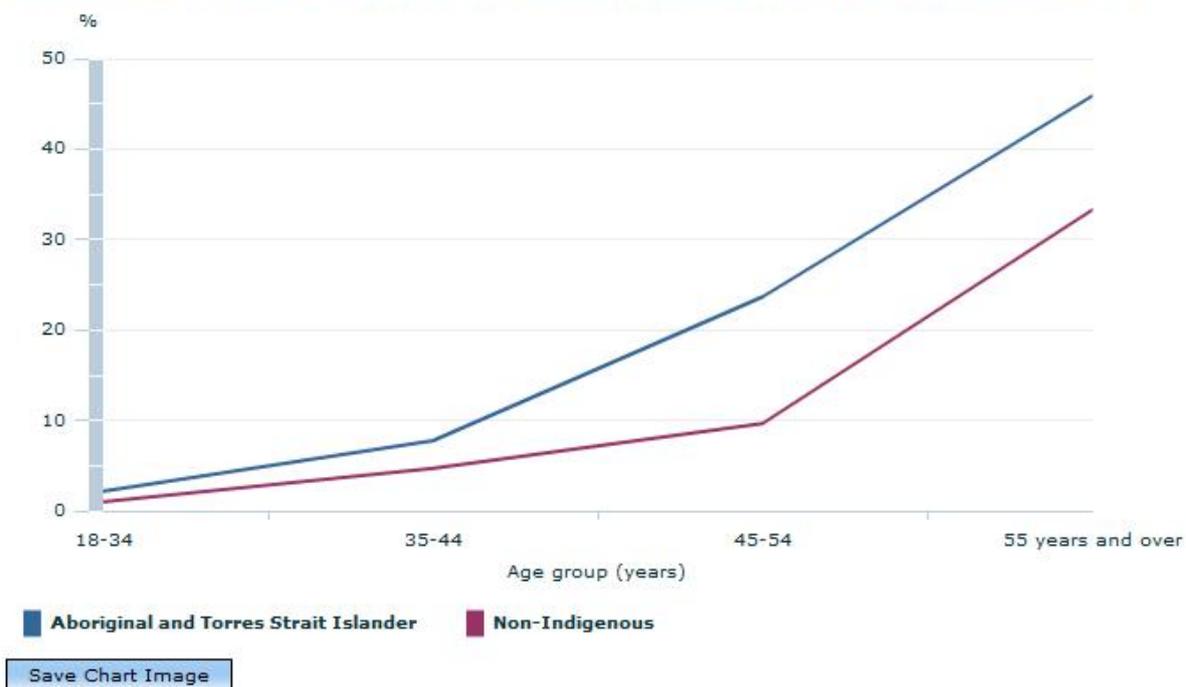
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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

The results showed that Aboriginal and Torres Strait Islander people were no more likely than their non-Indigenous counterparts to have dyslipidaemia based on their test results alone. In fact, the difference between the two populations was entirely driven by Aboriginal and Torres Strait Islander people being more likely than non-Indigenous people to take some form of cholesterol-lowering medication (rate ratio of 1.6), particularly at younger ages. For example, cholesterol medication use in the Aboriginal and Torres Strait Islander population noticeably increased from 7.8% among those aged 35–44 years to 23.7% of those aged 45–54 years. This was about 10 years earlier than the corresponding increase in the non-Indigenous population, which occurred between 45–54 years and 55 years over.

Persons aged 18 years & over - Proportion taking lipid lowering medication by age & Indigenous status, 2011-13



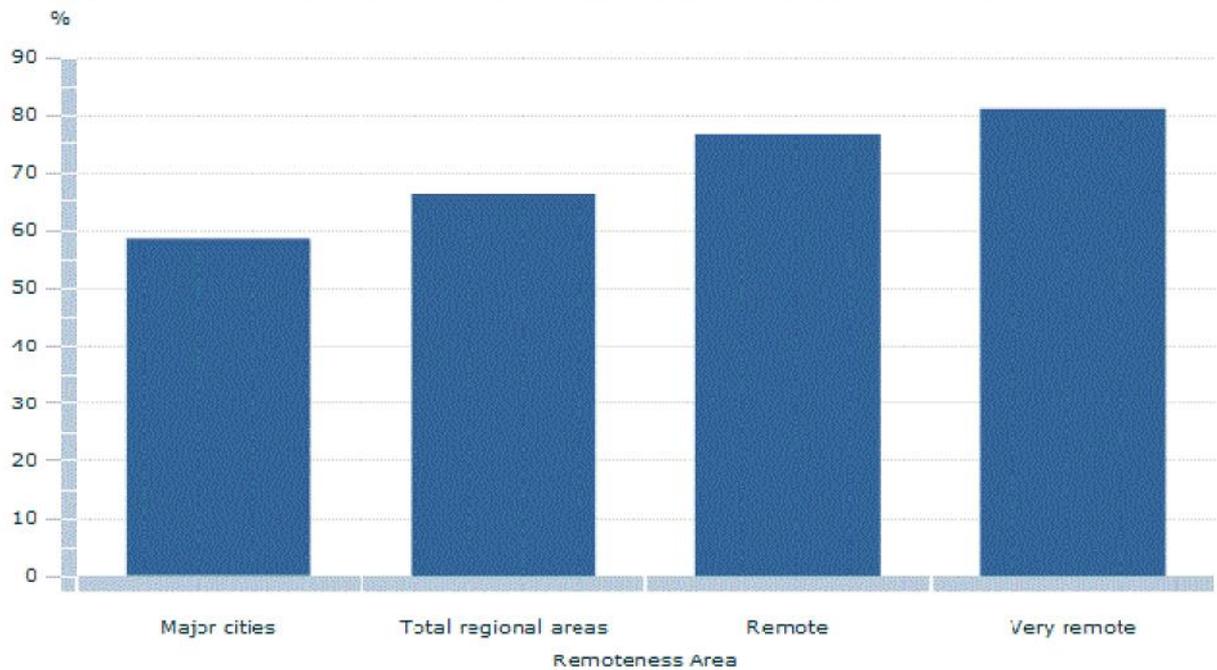
Australian Bureau of Statistics

© Commonwealth of Australia 2014.

Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

In 2012–13, Aboriginal and Torres Strait Islander people living in remote areas were more likely than those living in non-remote areas to have dyslipidaemia (79.4% compared with 62.8%). Rates were particularly high among those in very remote areas, where around eight in ten (81.1%) people had dyslipidaemia compared with around six in ten (58.7%) people living in major cities. Interestingly, this was not due to differences in the proportions of adults taking cholesterol-lowering medication. Instead, it was due to Aboriginal and Torres Islander people in remote areas being more likely than those in non-remote areas to have dyslipidaemia based on their test results alone.

Aboriginal & Torres Strait Islander adults - Proportion with dyslipidaemia by remoteness, 2012-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

As with all the cardiovascular disease biomarkers, dyslipidaemia was strongly associated with obesity. In fact in 2012–13, Aboriginal and Torres Strait Islander people who were obese were almost twice as likely to have dyslipidaemia compared with those of normal weight or underweight (79.9% compared with 42.5%). Interestingly though, there was no association found between dyslipidaemia and smoking.

For more information on dyslipidaemia, see Tables 3, 4, 13 and 17 on the Downloads page of this publication.

CHRONIC KIDNEY DISEASE

Kidney disease is a chronic disease in which a person's kidney function is reduced or damaged. This affects the kidney's ability to filter blood and therefore control the body's water and other hormone levels, leading to increased fluid and waste within the body.¹ Kidney disease is also associated with several other chronic diseases such as diabetes and cardiovascular disease.

Diseases of the urinary system were the 10th leading cause of death for Aboriginal and Torres Strait Islander people in 2012. The age-standardised death rate for urinary diseases was two and a half times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people.²

Chronic kidney disease has a number of stages, ranging in severity from Stage 1 to Stage 5, with the early stages often showing no symptoms. An individual's kidney function can improve or regress during the early stages of the disease but once Stages 4 and 5 are reached, kidney function is severely reduced and unlikely to improve. A person with end stage kidney disease is generally reliant on kidney replacement therapy in the form of dialysis or kidney transplant.^{1,3}

Data source and definitions

The National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) measured two aspects of kidney function: estimated glomerular filtration rate (eGFR) and the presence of albuminuria.

Chronic kidney disease stages were then determined by combining the participants' eGFR results with their albumin creatinine ratio (ACR) results. The different stages were defined as follows:

- No indicators of chronic kidney disease - eGFR ≥ 60 mL/min/1.73 m² and no presence of albuminuria
- Stage 1 - eGFR ≥ 90 mL/min/1.73 m² & albuminuria
- Stage 2 - eGFR 60–89 mL/min/1.73 m² & albuminuria
- Stage 3a - eGFR 45–59 mL/min/1.73 m²
- Stage 3b - eGFR 30–44 mL/min/1.73 m²
- Stage 4–5 - eGFR <30 mL/min/1.73 m²

The NATSIHMS test results only indicate a stage of chronic kidney disease as further testing would be required for a diagnosis.

Note that people who live in non-private dwellings, such as hostels, hospitals or nursing homes were not in the scope of the survey. This may affect estimates of the number of people with some conditions; for example, conditions which may require periods of hospitalisation, such as kidney disease.

In 2012–13, almost one in five (17.9%) Aboriginal and Torres Strait Islander people aged 18 years and over had indicators of chronic kidney disease, with the majority being in Stage 1 (11.8%) and very few in Stages 4–5 (1.1%). Overall, the rates of chronic kidney disease were similar for Aboriginal and Torres Strait Islander men (18.9%) and women (16.9%).

After taking age differences into account, Aboriginal and Torres Strait Islander people were more than twice as likely as non-Indigenous people to have indicators of chronic kidney disease (rate ratio of 2.1). They were three times as likely as their non-Indigenous counterparts to have indicators of Stage 1 chronic kidney disease and more than four times as likely to have Stages 4–5 (rate ratio of 4.6).

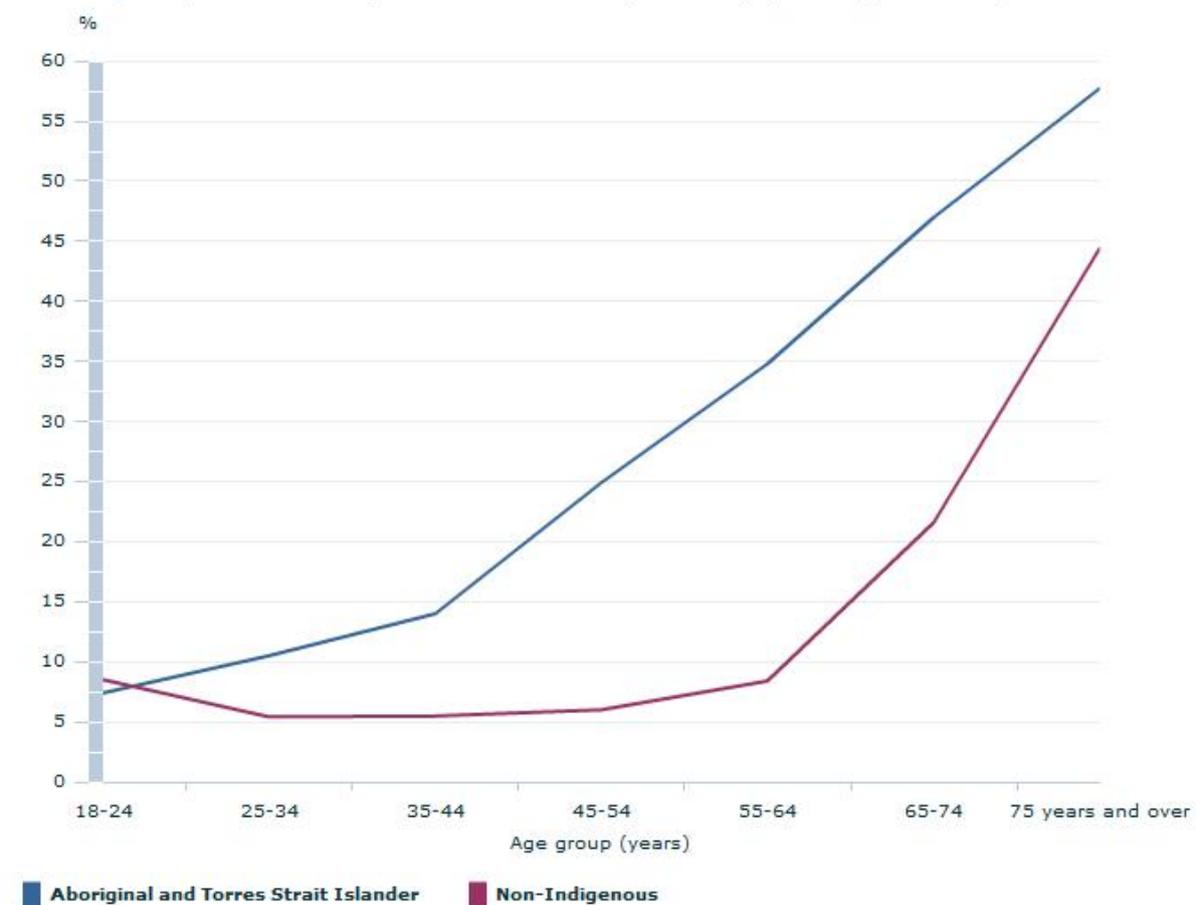
Among those Aboriginal and Torres Strait Islander people who had indicators of chronic kidney disease in the NATSIHMS, 11.2% self-reported having the condition. Although this rate is significantly higher than that for the non-Indigenous population (where 6.0% with indicators of chronic kidney disease self-reported having the condition), these results still indicate that around nine in ten Aboriginal and Torres Strait Islander people with signs of kidney disease were not aware they had it.

However, this is not unexpected as unlike other tests for chronic disease, results for albuminuria or abnormal eGFR alone cannot provide a diagnosis for kidney disease and could instead indicate the presence of an acute kidney condition or infection. Kidney disease can only be confirmed if albuminuria or eGFR of less than 60 mL/min/1.73 m² are persistent for at least three months.⁴ The majority (69.8%) of people with indicators of chronic kidney disease who self-reported the condition had test results that indicated they were in the later stages of the disease (Stages 3 to 5).

Rates of chronic kidney disease were particularly high for Aboriginal and Torres Strait Islander people living in remote areas in 2012–13, where around three in every ten (33.6%) people had indicators of the disease. This compared with just over one in ten (13.1%) living in non-remote areas.

Overall, the prevalence of chronic kidney disease in the Aboriginal and Torres Strait Islander population steadily increased with age from early adulthood, whereas in the non-Indigenous population, levels of kidney disease remained very flat until late adulthood and only began to increase from the age of 65.

Persons aged 18 years & over - Proportion with chronic kidney disease by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

The higher prevalence of chronic kidney disease in the Aboriginal and Torres Strait Islander population may be due to the high prevalence of traditional chronic kidney disease risk factors, including diabetes and high blood pressure.¹ Diabetes is the most common cause of chronic kidney disease as, over time, high blood glucose levels can damage the filtering units within the kidneys.⁵ In the NATSIHMS, almost four in ten (37.7%) Aboriginal and Torres Strait Islander people with chronic kidney disease also had diabetes. This compared with less than one in ten (6.4%) people without

chronic kidney disease.

High blood pressure is another important risk factor for chronic kidney disease as high blood pressure can damage the blood vessels supplying the kidneys.⁶ In 2012–13, Aboriginal and Torres Strait Islander people with high blood pressure were more than twice as likely to have indicators of chronic kidney disease compared with those who had normal blood pressure (29.4% compared with 14.9%).

Obesity was also associated with higher rates of chronic kidney disease in 2012–13. Around two in ten (20.1%) Aboriginal and Torres Strait Islander people who were obese had indicators of chronic kidney disease compared with just over one in ten (12.7%) people who were normal weight or underweight. Interestingly, however, this relationship between obesity and chronic kidney disease was not evident in the non-Indigenous population.⁷

For more information on chronic kidney disease, see Tables 1, 3, 4, 5, 6, 7, 10 and 17 on the Downloads page of this publication.

ENDNOTES

- 1 Kidney Health Australia, July 2014, Risk factors and symptoms of Kidney Disease?, <<http://www.kidney.org.au/KidneyDisease/RiskFactorsandSymptoms/tabid/819/Default.aspx>>, Last accessed 24/07/2014.
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LIVER FUNCTION

The liver works as the body's filter, removing toxins from the blood, processing nutrients and regulating its metabolism. A range of factors, including fatty liver disease, infections and excessive alcohol consumption can prevent the liver from performing these functions and if left untreated, can lead to liver damage.¹ When the liver is inflamed or damaged, enzymes including alanine aminotransferase (ALT) and gamma glutamyl transferase (GGT) leak from the liver cells into the bloodstream. As a result, elevated levels of ALT and GGT in the bloodstream can indicate the presence of liver disease.

Cirrhosis and other diseases of liver were the 9th leading cause of death for Aboriginal and Torres Strait Islander people in 2012 and were the 23rd leading cause for non-Indigenous people. The age standardised death rate for these diseases were four times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people overall.²

Data source and definitions

The National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) measured the levels of two blood enzymes related to liver function: alanine aminotransferase (ALT) and gamma glutamyl transferase (GGT). While elevated levels for either test may indicate liver damage, they cannot diagnose the presence of liver disease.

Abnormal liver function as measured by ALT is defined as:

- an ALT reading of greater than 40 U/L for males.
- an ALT reading of greater than 30 U/L for females.

Abnormal liver function as measured by GGT is defined as:

- a GGT reading of greater than 50 U/L for males.
- a GGT reading of greater than 35 U/L for females.

ALANINE AMINOTRANSFERASE (ALT)

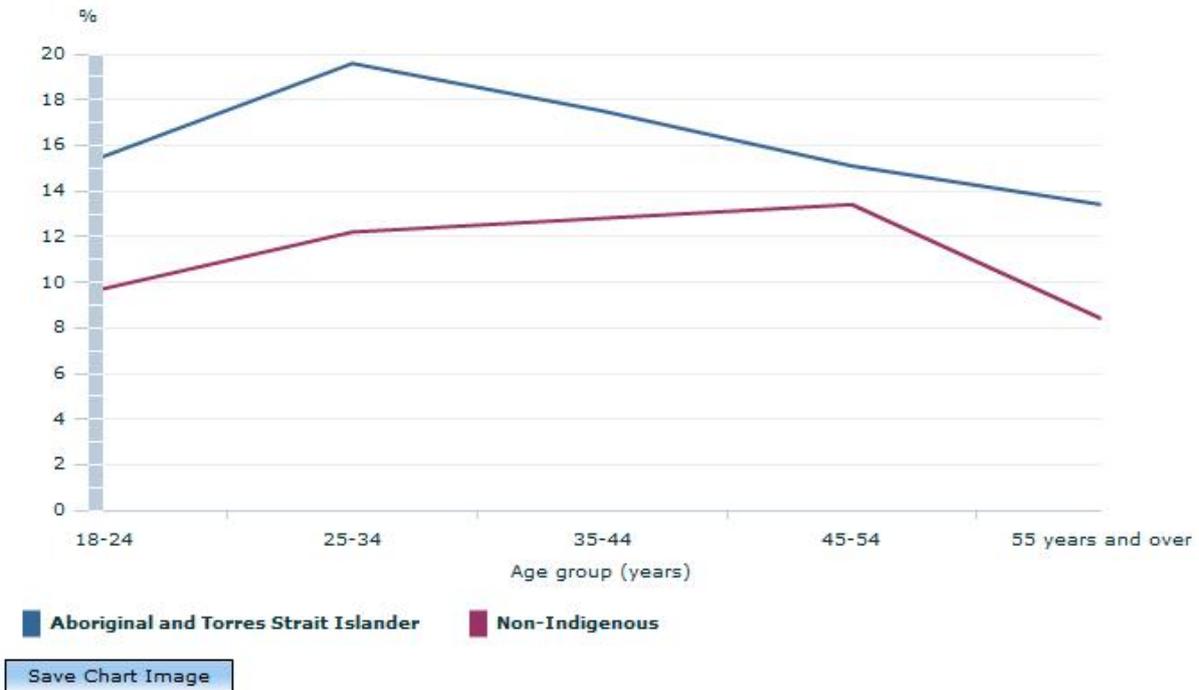
ALT is an enzyme found mainly in the liver that helps the liver metabolise food into energy. Elevated levels of ALT in the blood can occur when the liver is damaged or diseased.³

In 2012–13, 16.5% of Aboriginal and Torres Strait Islander adults had abnormal or elevated levels of ALT in their blood, with higher rates among men than women (19.9% compared with 13.3%). After taking age differences into account, Aboriginal and Torres Strait Islander people were around one and a half times as likely as non-Indigenous Australians to have high ALT levels (rate ratio of 1.4).

Elevated ALT was more common among Aboriginal and Torres Strait Islander people living in remote areas in 2012–13. Around one in five (21.8%) Aboriginal and Torres Strait Islander people in remote areas had abnormal ALT levels compared with around one in seven (15.0%) of those who lived in non-remote areas.

Aboriginal and Torres Strait Islander people were at a higher risk of liver disease than their non-Indigenous counterparts in some age groups, with the biggest difference for those aged 25–34 years (19.6% compared with 12.2%).

Persons aged 18 years & over - Proportion with abnormal ALT levels by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Excess body fat is recognised as a risk factor for liver disease.⁴ As was the case for non-Indigenous Australians, Aboriginal and Torres Strait Islander people who were obese were around three times as likely to have elevated ALT compared with those of normal weight or underweight (25.5% compared with 8.6%).⁵

High blood pressure was also associated with elevated ALT in 2012–13. Aboriginal and Torres Strait Islander people with high blood pressure were twice as likely to have abnormal ALT compared to those with normal blood pressure (26.1% and 13.7% respectively). The same pattern was apparent for non-Indigenous adults; however the relationship was less pronounced (13.1% who had high blood pressure also experienced elevated ALT compared with 10.3% who had normal blood pressure).

Overall, almost three in five Aboriginal and Torres Strait Islander people (58.9%) who had elevated ALT also had high levels of GGT. While Aboriginal and Torres Strait Islander people with abnormal ALT were almost twice as likely to have high triglycerides (40.3% compared with 21.7%), there was no clear association with any of the other chronic disease biomarkers except for anaemia.

GAMMA GLUTAMYL TRANSFERASE (GGT)

The enzyme GGT is found in many tissues in the body. It exists in a relatively high concentration in the liver but is also found in the tissues of the kidneys, bile duct, pancreas, gallbladder, spleen, heart and brain. When any of these tissues are damaged or diseased, GGT leaks from the tissue into the bloodstream. High GGT levels may therefore be indicative of a broader range of conditions and not just liver disease.^{6,7}

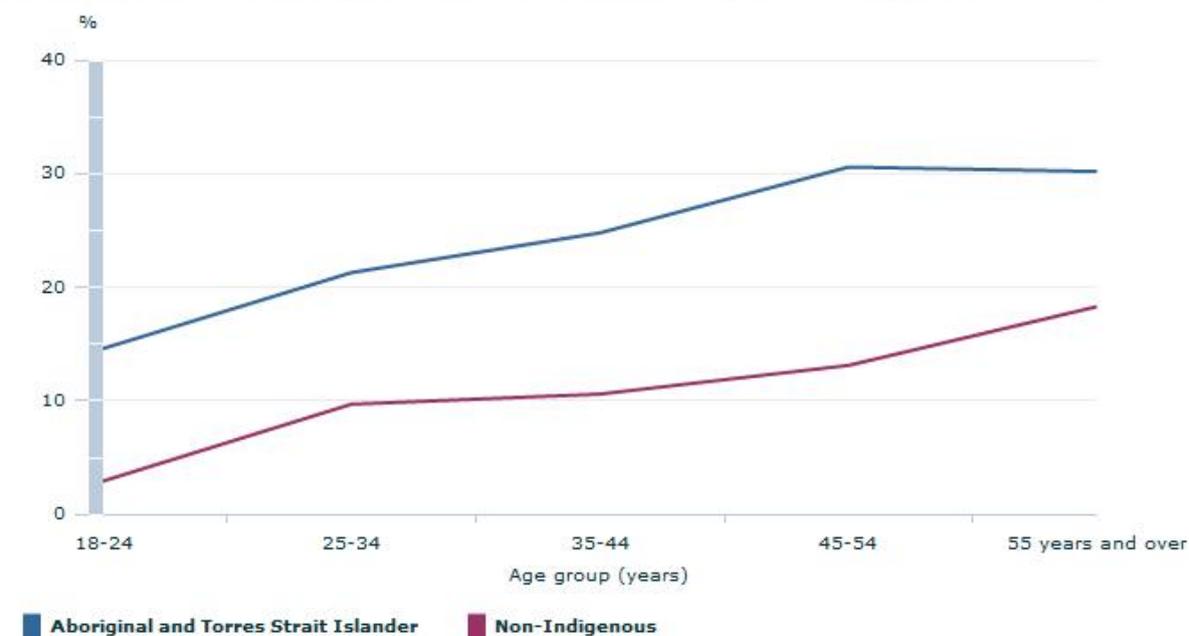
In 2012–13, around one in four (23.4%) Aboriginal and Torres Strait Islander people had abnormal or elevated levels of GGT in their blood. After taking age differences of the populations into account, Aboriginal and Torres Strait Islander people were twice as likely as non-Indigenous Australians to have abnormal levels of GGT (rate ratio 2.1).

As was the case with ALT, the proportion of Aboriginal and Torres Strait Islander people with elevated

GGT was higher in remote Australia than in non-remote Australia. Over one in three (35.0%) Aboriginal and Torres Strait Islander people in remote areas had elevated GGT compared to one in five (20.0%) in non-remote areas. However, unlike ALT, abnormal GGT rates were similar for both men and women (23.9% compared with 22.9%).

Overall, abnormal levels of GGT increased with age for both Aboriginal and Torres Strait Islander people and non-Indigenous people. However, the rate of one in every seven (14.6%) Aboriginal and Torres Strait Islander aged 18–24 years with abnormal GGT was not reached by non-Indigenous people until the age of 45–54 years (13.1%).

Persons aged 18 years & over - Proportion with abnormal GGT levels by age & Indigenous status, 2011-13



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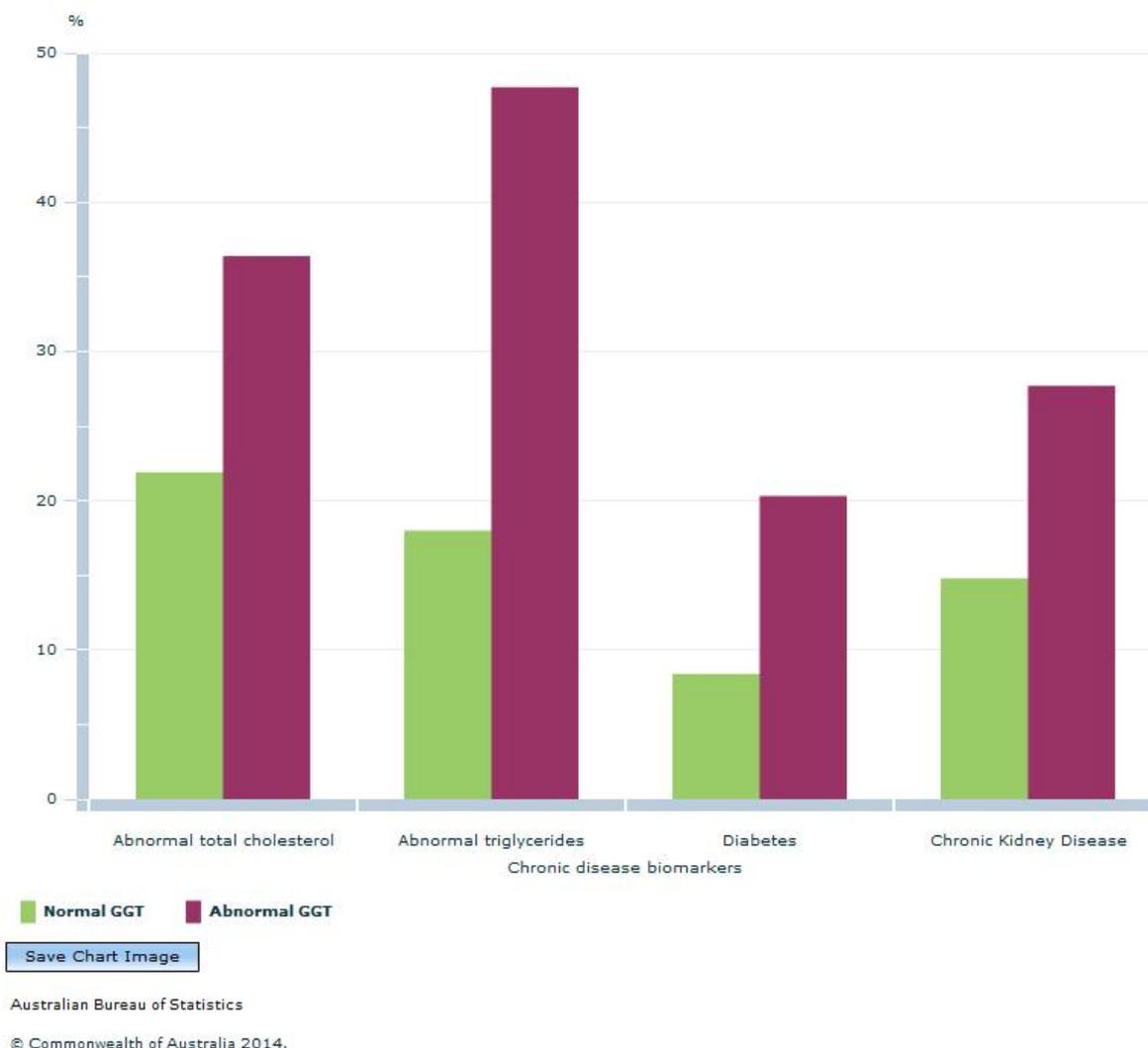
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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

As was the case with ALT, rates of abnormal GGT were higher among those who were obese or who had high blood pressure. For example, around one in three (32.0%) people who were obese had abnormal GGT compared with around one in seven (13.5%) who were of normal weight or underweight. Likewise, one in three Aboriginal and Torres Strait Islander people with high blood pressure also had abnormal GGT (33.3%) compared to only one in five who did not have high blood pressure (20.6%). However, unlike ALT, GGT was also linked to smoking, with current smokers more likely to have abnormal GGT than those who had never smoked (27.8% and 19.7% respectively).

Aboriginal and Torres Strait Islander people with abnormal GGT were more likely to have indicators of other chronic conditions as well. This was particularly the case for triglycerides, where those with high GGT levels were more than twice as likely as those with normal GGT levels to have high triglycerides (47.7% compared with 18.0%). They were also more likely to have high total cholesterol (36.4% compared with 21.9%), diabetes (20.3% compared with 8.4%) and signs of kidney disease (27.7% compared with 14.8%).

Aboriginal & Torres Strait Islander adults - GGT levels by selected biomarkers, 2012-13



Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For more information on ALT and GGT, see Tables 1, 3, 4, 5, 6 and 11 on the Downloads page of this publication.

ENDNOTES

- 1 Angulo, P and Lindor, KD, 2002, 'Non-alcoholic fatty liver disease', *Journal of Gastroenterology and Hepatology*, <<http://www.gastrohep.com/conreports/bangkok/jghs2.pdf>>, Last accessed 01/08/2014.
- 2 Australian Bureau of Statistics, Mar 2014, 'Causes of Death, Australia, 2012', ABS cat. no. 3303.0, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3303.02012?OpenDocument>>, Last accessed 31/07/2014.
- 3 Schindhelm, RK, et al. 2006, 'Alanine aminotransferase as a marker of non-alcoholic fatty liver disease in relation to type 2 diabetes mellitus and cardiovascular disease', *Diabetes/Metabolism Research and Reviews*, <http://dare.uvu.nl/bitstream/handle/1871/13286/21810_Schindhelm_proefschrift_V3.pdf?sequence=1#page=95>, Last accessed 01/08/2014.
- 4 Farrell, GC et al. 2006, 'Nonalcoholic fatty liver disease: From steatosis to cirrhosis', *Hepatology*, <<http://onlinelibrary.wiley.com/doi/10.1002/hep.20973/full>>, Last accessed 01/08/2014.
- 5 Australian Bureau of Statistics, 2013, 4364.0.55.005 - Australian Health Survey: Biomedical Results for Chronic Diseases, 2011-12, <<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4364.0.55.005Main%20Features12011-12?opendocument&tabname=Summary&prodno=4364.0.55.005&issue=2011-12&num=&view=>>>, Last accessed 25/07/2014.

6 Lee, DS, et al. 2007, 'Gamma Glutamyl Transferase and Metabolic Syndrome, Cardiovascular Disease, and Mortality Risk: The Framingham Heart Study', *Arteriosclerosis, Thrombosis, and Vascular Biology*, <<http://atvb.ahajournals.org/content/27/1/127.full>>, Last accessed 01/08/2014. 7
Ruttman, E, et al. 2005, 'Gamma-Glutamyltransferase as a Risk Factor for Cardiovascular Disease Mortality: An Epidemiological Investigation in a Cohort of 163 944 Austrian Adults', *Circulation: Journal of the American Heart Association*, <<http://circ.ahajournals.org/content/112/14/2130.full>>, Last accessed 01/08/2014.

EXPOSURE TO TOBACCO SMOKE

The National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) included a test for cotinine as an objective measure of smoking status. The body produces cotinine in the process of breaking down, or metabolising, nicotine.¹ Given that most nicotine comes from exposure to tobacco smoke, cotinine levels are assumed to be generally proportionate to the amount of tobacco exposure a person receives through smoking, or in some cases, through exposure to second hand smoke. However, cotinine levels only remain elevated for around 20 hours after exposure to tobacco smoke, therefore it can only provide a measure of short-term exposure.

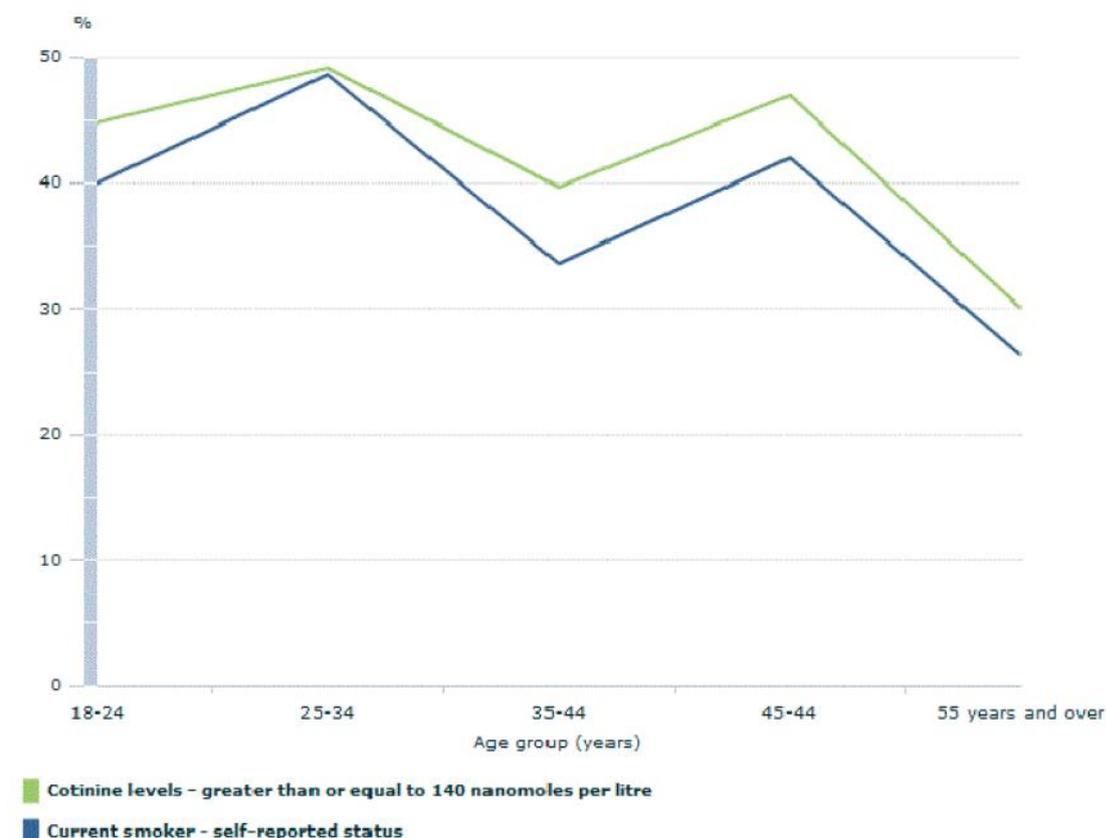
Data source and definitions

Levels of cotinine were measured via a blood test. In the NATSIHMS, cotinine levels of 140 nmol/L or greater indicate exposure to tobacco smoke.

The 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS) showed that 44.4% of Aboriginal and Torres Strait Islander adults self-reported being a current daily smoker.²

As for the non-Indigenous population, the pattern across age for Aboriginal and Torres Strait Islander people for cotinine levels of 140 nmol/L or more were very similar to that for the self-reported smoking data. Although small gaps were evident, none of these were significant.

Aboriginal & Torres Strait Islander adults - Cotinine levels & self-reported smoker status by age, 2012-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

As expected, the majority (95.4%) of Aboriginal and Torres Strait Islander adults who self-reported being current smokers had cotinine levels indicating exposure to tobacco smoke. Interestingly, however, 13.9% of those who self-reported being an ex-smoker had levels of cotinine indicating exposure to tobacco smoke, as did 6.0% of those who self-reported having never smoked. This pattern was the same for both men and women. Overall, these discrepancies were much higher than those found in the non-Indigenous population, where only 5.7% of ex-smokers and 0.3% of those who had never smoked had cotinine levels of 140nmol/L or more.

This difference was particularly noticeable for Aboriginal and Torres Strait Islander people living in remote areas, where 22.5% of non-smokers had levels of cotinine indicating exposure to tobacco smoke. One potential explanation for this could be the use of chewing tobacco. Chewing tobacco is not included in the self-reported smoking rates, yet according to the AATSIHS, around 2.2% of Aboriginal and Torres Strait Islander people living in remote areas chewed tobacco daily. The NATSIHMS showed that of those non-smokers in remote areas who had cotinine levels greater than or equal to 140nmol/L, around one in five (19%) reported chewing tobacco daily.

Other possible reasons for the discrepancy include the use of nicotine in some smoking cessation programs (e.g. nicotine patches), which would raise the level of cotinine in the blood, or high levels of exposure to second hand smoke. It is also possible that people's smoking behaviours changed between the time they self-reported their smoking status and the time they provided their biomedical sample.

For more information on cotinine, see Table 5 on the Downloads page of this publication.

ENDNOTES

1 Benowitz, NL, 1996, Cotinine as a Biomarker of Environmental Tobacco Smoke Exposure, *Epidemiologic Reviews* <<http://epirev.oxfordjournals.org/content/18/2/188.citation>>, Last accessed 02/07/2013.

2 Australian Bureau of Statistics, June 2014, Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results, 2012–13, ABS cat. no 4727.0.55.006 <<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4727.0.55.006~2012-13~Main%20Features~Tobacco%20smoking~13>>, Last accessed 06/06/2014.

ANAEMIA

Anaemia is caused by a decrease in either the number of red blood cells in the body or the quantity of haemoglobin within red blood cells. When a person is anaemic, their heart has to work harder to ensure that muscles and organs get the oxygen they need. Haemoglobin is a protein found in red blood cells. It contains a large amount of iron and helps transport oxygen from the lungs to the rest of the body. The National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) measured the concentration of haemoglobin in the blood, which can help diagnose anaemia.

Data source and definitions

Haemoglobin levels were measured using a blood test. Abnormal levels of haemoglobin indicating a risk of anaemia are defined differently for males and females, young people, and pregnant women, as based on World Health Organization guidelines¹:

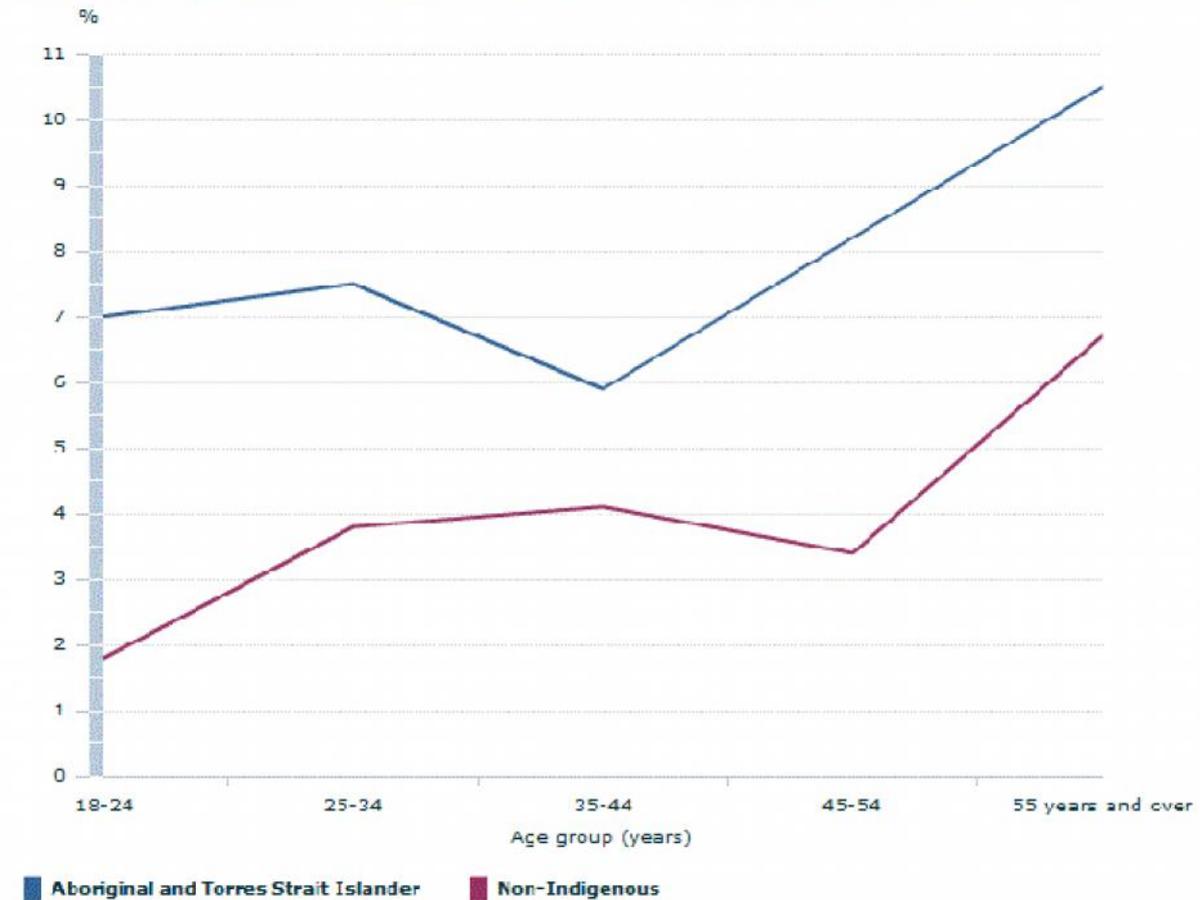
- Less than 120 g/L for females aged 15 years or older who are not pregnant
- Less than 130 g/L for males aged 15 years or older
- Less than 110 g/L for pregnant women

In 2012–13, 7.6% of Aboriginal and Torres Strait Islander adults were at risk of anaemia. After taking age differences into account, Aboriginal and Torres Strait Islander people were almost twice as likely as non-Indigenous people to be at risk (rate ratio of 1.9).

Overall, the risk of anaemia was higher for Aboriginal and Torres Strait Islander people living in remote areas compared with those living in non-remote areas (10.1% compared with 6.9%). Research suggests that poor nutrition and poor supply of healthy food contributes to chronic diseases such as anaemia, particularly in remote Australia.²

As was the case in the non-Indigenous population, Aboriginal and Torres Strait Islander women were more likely than men to be at risk of anaemia (10.3% compared with 4.8%). Although the overall age pattern for anaemia was similar for both the Aboriginal and Torres Strait Islander and non-Indigenous populations, Aboriginal and Torres Strait Islander people were at a higher risk of anaemia than their non-Indigenous counterparts in most age groups.

Persons aged 18 years & over - Proportion at risk of anaemia by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Research has shown that anaemia is associated with both diabetes and chronic kidney disease.³ This was reflected in the NATSIHMS results, where 29.6% of those at risk of anaemia had diabetes compared with 9.7% of those not at risk. Those at risk of anaemia were also more likely to have signs of chronic kidney disease (41.9% compared with 15.8%).

For more information on anaemia, see Tables 1, 3, 4, 5 and 6 on the Downloads page of this publication.

ENDNOTES

1 World Health Organization (WHO) 2011, *Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity*, Vitamin and Mineral Nutrition Information System, <<http://www.who.int/vmnis/indicators/haemoglobin/en/>>, Last accessed 17/07/2014.

2 Council of Australian Governments, 2009, National Strategy For Food Security In Remote Indigenous Communities, <https://www.coag.gov.au/sites/default/files/nat_strat_food_security.pdf>, Last accessed 17/07/2014.

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IODINE

Iodine is an essential nutrient required for the production of thyroid hormones. These hormones are important for normal growth and development, particularly of the brain. The major dietary sources of iodine include seafood, especially seaweed, baked bread and dairy milk. Inadequate amounts of iodine may lead to a range of conditions, including goiter, hypothyroidism, and in severe cases, intellectual disability.¹

Data source and definitions

Iodine levels are measured using a urine test.

According to the World Health Organization (WHO), a population is considered iodine deficient if the median urinary iodine concentration (MUIC) is less than 100 µg/L. The WHO recommends that no more than 20% and 50% of the population have an iodine concentration below 50 µg/L and 100 µg/L, respectively.¹

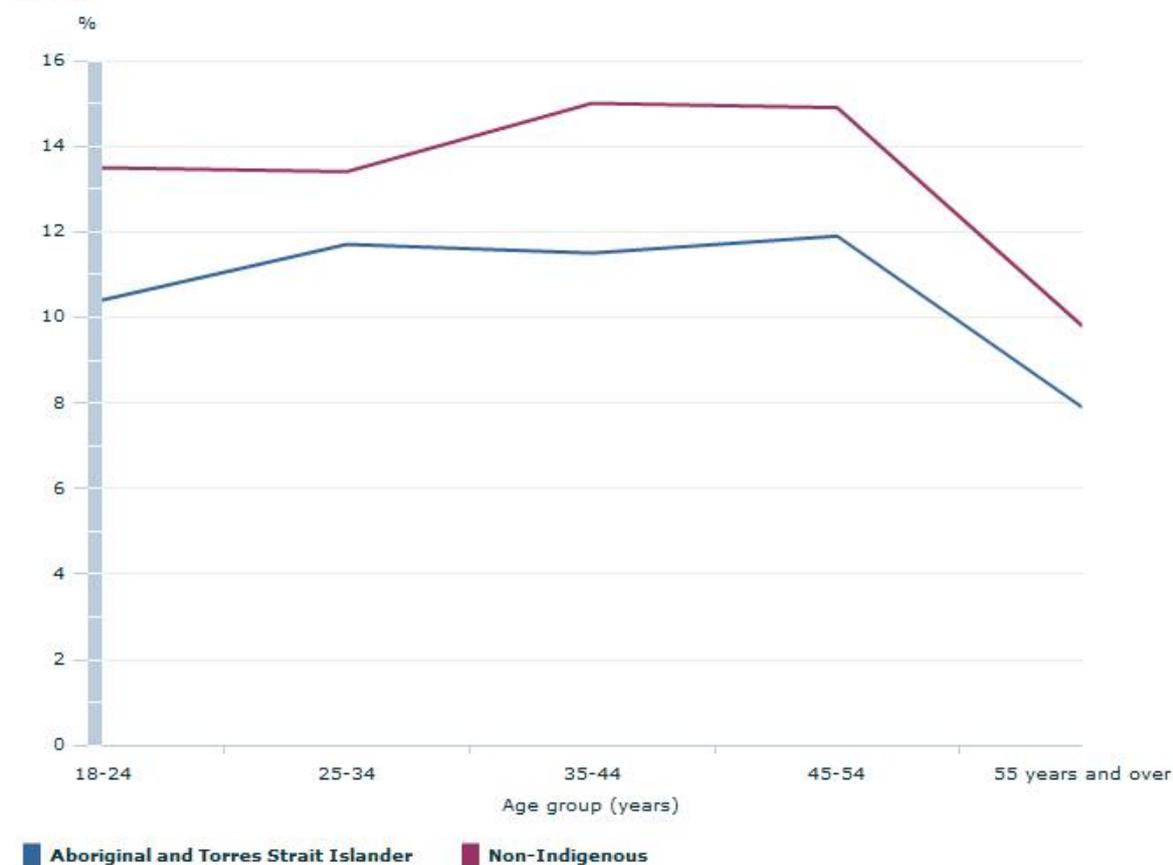
The National Aboriginal and Torres Strait Islander Health Measure Survey (NATSIHMS) showed that the Aboriginal and Torres Strait Islander adult population was iodine sufficient in 2012–13, with a population MUIC of 135.0 µg/L. Likewise, only around one in ten people (10.8%) had an iodine level of less than 50 µg/L.

Overall, Aboriginal and Torres Strait Islander adults had higher iodine levels than all non-Indigenous adults (a median of 135.0 µg/L compared with 124.0 µg/L).² Likewise, after adjusting for age differences, Aboriginal and Torres Strait Islander people were less likely than non-Indigenous people to have iodine levels under 50 µg/L (rate ratio 0.8).

Median iodine levels were generally higher among Aboriginal and Torres Strait Islander people living in remote areas than in non-remote areas in 2012–13. This may be due to the varying access to and affordability of certain foods, or the different diets typically consumed by people living in various parts of Australia. Interestingly, however, there was no difference in proportion of people with an iodine level of less than 50 µg/L between non-remote and remote areas (11.0% compared with 10.1%).

Looking at age, rates of urinary iodine concentration below 50 µg/L remained fairly stable among Aboriginal and Torres Strait Islander and non-Indigenous adults across all broad age groups. Although rates for both populations appeared to dip for those aged 55 years and over, this difference was not significant.

Persons aged 18 years & over - Proportion with Iodine levels less than 50 ug per L by age & Indigenous status, 2011-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

Sufficient iodine levels are particularly important for women of childbearing years as deficiency could impede the normal growth and development of the fetus if these women were to become pregnant.¹ In 2012–13, Aboriginal and Torres Strait Islander women aged 18–44 years had a MUIC of 135 µg/L, which was above the recommended population level of 100 µg/L.

For more information on iodine, see Tables 2, 3, 4 and 5 on the Downloads page of this publication.

ENDNOTES

1 World Health Organization, UNICEF, ICCIDD, 2007, Assessment of iodine deficiency disorders and monitoring their elimination, <http://www.who.int/nutrition/publications/micronutrients/iodine_deficiency/9789241595827/en/>, Last accessed 30/07/2014.

2 Australian Bureau of Statistics 2014, Australian Health Survey: Biomedical Results for Nutrients, 2011-12, ABS cat. no. 4364.0.55.006, <<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.006Chapter2002011-12>>, Last accessed 24/07/2014.

VITAMIN D

Vitamin D is essential for the body to absorb calcium effectively, which is important for bone health and muscle function, and for preventing conditions such as osteoporosis. The main source of Vitamin D is exposure to sunlight, although small amounts can be obtained through some foods, such as fatty fish and fortified margarine and milk.¹

The main consequence of severe Vitamin D deficiency is rickets in children and osteopenia (fragile bones) in older people.¹ There is some evidence to suggest that low Vitamin D levels could also be a risk factor for other chronic conditions, including heart disease, cancer and kidney disease, but more research is needed to better understand these links.^{2,3}

Measuring Vitamin D

In the National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS), Vitamin D levels were measured via a blood test, which measures Vitamin D obtained from both food and sunlight.¹

The NATSIHMS used the Liquid Chromatography Mass Spectrometry (LCMS) method to assess Vitamin D status. This method has the highest sensitivity and specificity for measurement of Vitamin D.⁴

Given the expensive equipment required for the LCMS method and the lack of standardisation in measurement across laboratories, the LCMS method is not yet widely used in Australia³ and standardised test cut-offs are yet to be developed.

In the NATSIHMS, the levels recommended in a recent Australian position statement on Vitamin D² have been applied to determine Vitamin D deficiency. These cut-offs are:

- Mild deficiency: 30 – 49 nmol/L
- Moderate deficiency: 13* – 29 nmol/L
- Severe deficiency: <13* nmol/L
- Total deficiency: <50 nmol/L
- Adequate levels: 50 nmol/L#

* Note that the cut-off recommended in the position statement is <12.5 nmol/L, but the AATSIHS is unable to output against this cut-off as the Vitamin D data is only available in whole numbers.

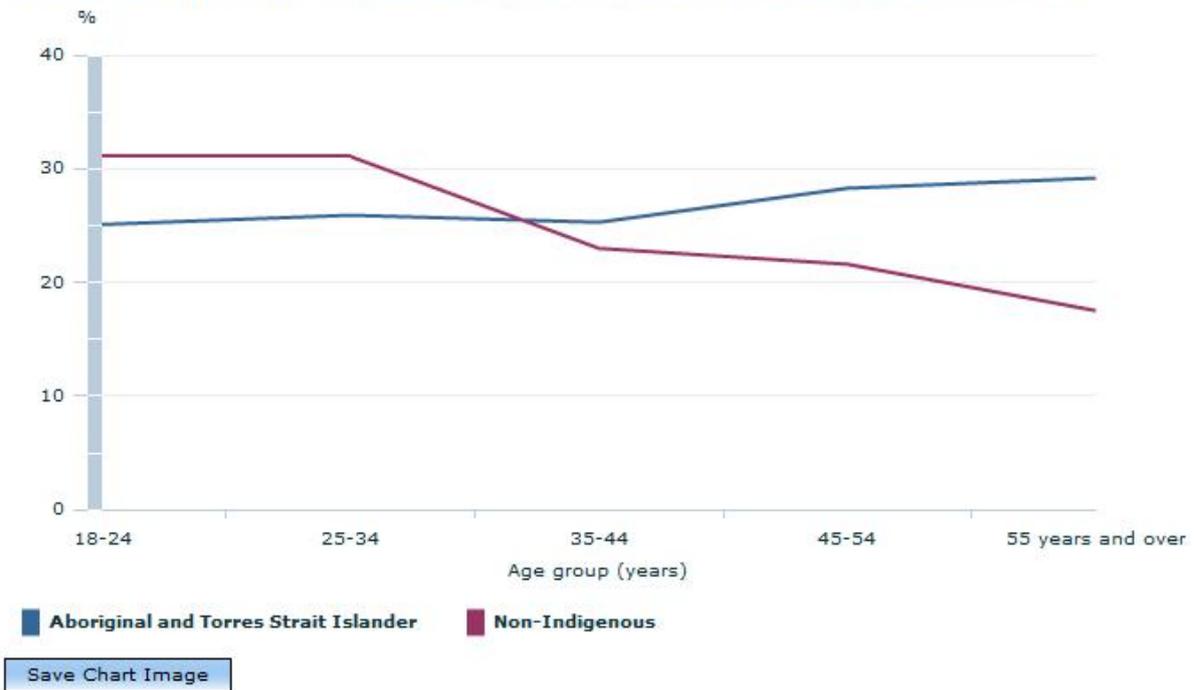
Note that the position statement states that levels may need to be 10 to 20 nmol/L higher at the end of summer, to allow for seasonal decrease.

In 2012–13, around one in four (26.5%) Aboriginal and Torres Strait Islander adults had a Vitamin D deficiency (<50 nmol/L), with the majority having a mild deficiency (21.9%) and the remainder a moderate or severe deficiency (4.6%). This pattern was similar for both men and women. After taking age differences into account, Aboriginal and Torres Strait Islander people were more likely to have a Vitamin D deficiency than their non-Indigenous counterparts (rate ratio of 1.1).

In 2012–13, Vitamin D deficiency was much more common among Aboriginal and Torres Strait Islander people living in remote areas, where almost four in ten (38.7%) Aboriginal and Torres Strait Islander people were Vitamin D deficient compared with just over two in ten people living in non-remote areas (23.0%).

Unlike many of the other biomarkers, Vitamin D levels did not vary by age, with similar deficiency rates for all broad age groups (between 25.1% and 29.2%). This was different to the pattern seen in the non-Indigenous population, where rates of Vitamin D deficiency decreased as people got older. This decrease in Vitamin D deficiency in the non-Indigenous population corresponded with an increase in the use of Vitamin D supplements, especially among older age groups.⁵ However information on supplement use was not collected in the AATSIHS, so this comparison is not available for the Aboriginal and Torres Strait Islander population.

Persons aged 18 years & over - Proportion with Vitamin D deficiency by age & Indigenous status, 2011-13



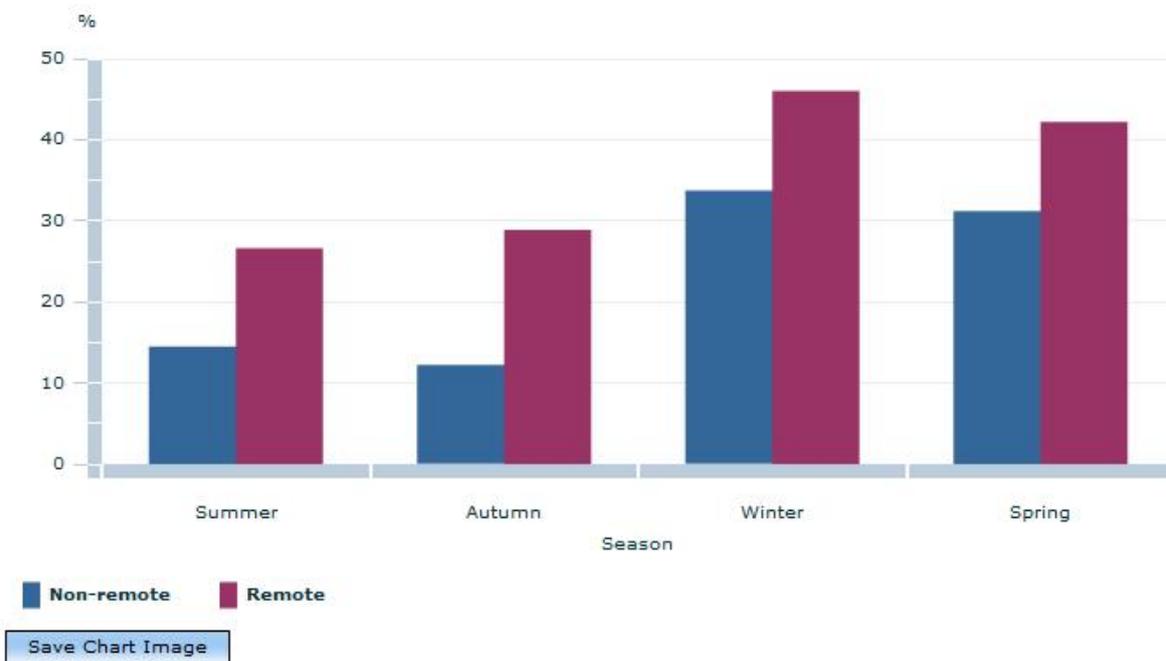
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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

As expected, Vitamin D levels varied considerably by season, with overall deficiency rates for Aboriginal and Torres Strait Islander people being much lower in summer (15.3%) and autumn (16.2%) than in winter (36.4%) and spring (34.8%). While this seasonal impact was seen across both non-remote and remote areas, rates of Vitamin D deficiency remained higher among Aboriginal and Torres Strait Islander people in remote areas than in non-remote areas regardless of the time of year.

Aboriginal & Torres Strait Islander adults - Proportion with Vitamin D deficiency by season & remoteness, 2012-13

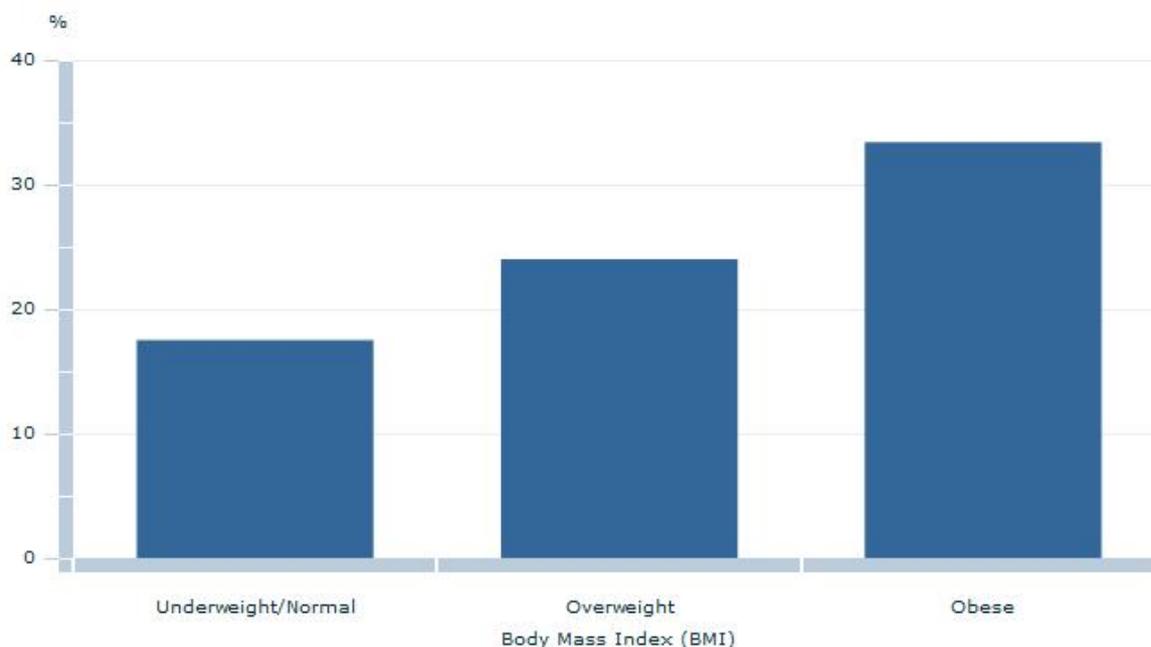


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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

The Australian position statement² on Vitamin D highlights that obese people may be at higher risk of Vitamin D deficiency because excess body fat can interfere with the absorption of Vitamin D. This was reflected in the NATSIHMS results, with Aboriginal and Torres Strait Islander people who were obese being almost twice as likely to have Vitamin D deficiency as those who were underweight or of normal weight (33.4% and 17.5% respectively). Interestingly though, this relationship was not evident in the non-Indigenous population.⁵

Aboriginal & Torres Strait Islander adults - Proportion with Vitamin D deficiency by BMI, 2012-13



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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

There is some evidence to suggest that low Vitamin D levels are associated with increased risk of certain chronic health conditions, including heart disease and diabetes, although these are yet to be clearly established.^{2,3} In 2012–13, Aboriginal and Torres Strait Islander people with a Vitamin D deficiency were almost twice as likely as those with adequate levels of Vitamin D to have diabetes (16.6% compared with 9.0%). They were also more likely to have chronic kidney disease (26.9% compared with 14.3%). It is important to note however, that the cause and effect of these relationships cannot be determined from this information.

For more information on Vitamin D see Tables 2, 3, 4, 5, 12 and 16 on the Downloads page of this publication.

ENDNOTES

1 Gibson RS, 2005, Principles of Nutritional Assessment, 2nd edition, Oxford University Press, New York.

2 Nowson CA, McGrath JJ, Ebeling PR, Haikerwal A, Daly RM, Sanders KM, Seibel MJ and Mason, RS, 2012, Vitamin D and health in adults in Australia and New Zealand a position statement, Medical Journal of Australia 196(11): 686-687, <https://www.mja.com.au/journal/2012/196/11/vitamin-d-and-health-adults-australia-and-new-zealand-position-statement?0=ip_login_no_cache%3Da474845072622903b6f5567f3a1d71d9>, Last accessed 17/03/2014.

3 The Royal College of Pathologists of Australasia, 2013, Position statement; Use and Interpretation of Vitamin D testing, <<http://www.aims.org.au/documents/item/347>>, Last accessed 1/04/2014.

4 Carter GD, Jones JC. 2009 Use of a common standard improves the performance of liquid chromatography-tandem mass spectrometry methods for serum 25-hydroxyvitamin-D. Ann Clin Biochem; 46: 79-81.

5 Australian Bureau of Statistics, July 2014, Australian Health Survey: Biomedical Results for Nutrients, 2011-12, ABS cat. no. 4364.0.55.006, <<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.0.55.006Chapter2002011-12>>.

FEATURE ARTICLE: CHRONIC DISEASE RESULTS FOR ABORIGINAL AND TORRES STRAIT ISLANDER AND NON-INDIGENOUS AUSTRALIANS

Introduction

Despite a small narrowing in the life expectancy gap in recent years, the life expectancy for Aboriginal and Torres Strait Islander people is still around 10 years lower than for other Australians.¹ A major contributor to this mortality gap is chronic disease, which is estimated to account for around two-thirds of all premature deaths among Aboriginal and Torres Strait Islander Australians.²

The 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS) results have highlighted the extent of poor health among Aboriginal and Torres Strait Islander people compared with other Australians. The biomedical test results from the groundbreaking National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS) also showed large disparities in chronic disease prevalence between the two populations.

This article looks more closely at how diabetes, cardiovascular disease and chronic kidney disease (as measured in the NATSIHMS) differ between Aboriginal and Torres Strait Islander people and non-Indigenous Australians.

How much more at risk of chronic disease are Aboriginal and Torres Strait Islander people compared to other Australians?

The NATSIHMS showed that Aboriginal and Torres Strait Islander adults were more likely than non-Indigenous adults to have abnormal results for nearly every chronic disease that was tested for.

After taking age differences between the two populations into account, Aboriginal and Torres Strait Islander people (compared with non-Indigenous people) were:

- More than four times as likely to be in the advanced stages of chronic kidney disease (Stages 4–5)
- More than three times as likely to have diabetes
- Twice as likely to have signs of chronic kidney disease
- Nearly twice as likely to have high triglycerides and lower than normal levels of HDL (good) cholesterol.

The gaps were even more striking in remote areas, where Aboriginal and Torres Strait Islander people were more than five times as likely as all non-Indigenous people to have diabetes and nearly four times as likely to have kidney disease.

Persons aged 18 years and over: Age standardised rate ratios for chronic disease biomarkers, 2011–13

	Remote(a)	Non-remote(b)	Total population(c)
	Rate ratio	Rate ratio	Rate ratio
Has diabetes (fasting plasma glucose)	5.4	2.9	3.3
Has indicators of chronic kidney disease	3.7	1.6	2.1
Abnormal triglycerides	2.6	1.8	1.9
Abnormal HDL (good) cholesterol	2.6	1.6	1.8
Abnormal total cholesterol	0.7	0.8	0.8

(a) The rate ratio is calculated by dividing the age standardised prevalence rate for Aboriginal and Torres Strait Islander people in remote areas by the age standardised prevalence rate for all non-Indigenous people.

(b) The rate ratio is calculated by dividing the age standardised prevalence rate for Aboriginal and Torres Strait Islander people in non-remote areas by the age standardised prevalence rate for all non-Indigenous people.

(c) The rate ratio is calculated by dividing the age standardised prevalence rate for all Aboriginal and Torres Strait Islander people by the age standardised prevalence rate for all non-Indigenous people.

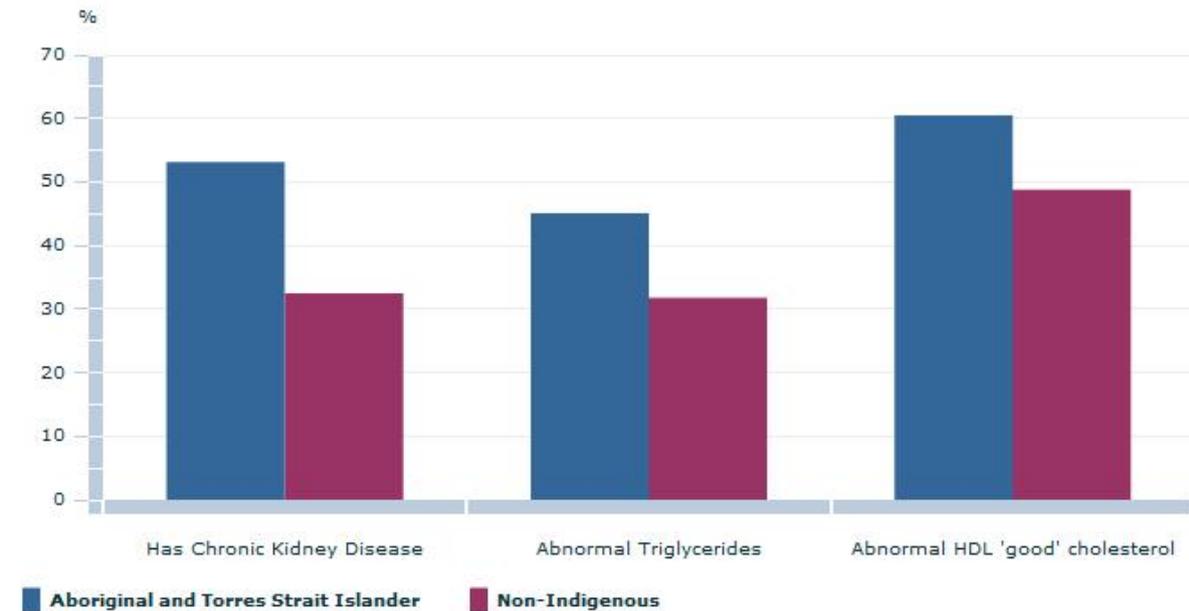
The only exception to this pattern was total cholesterol, where fewer Aboriginal and Torres Strait Islander people had high cholesterol compared with non-Indigenous people. However, this likely due to more Aboriginal and Torres Strait Islander people taking cholesterol-lowering medication (rate ratio 1.6).

Are Aboriginal and Torres Strait Islander people who have certain conditions, like diabetes, also more likely to have other conditions too?

Diabetes, cardiovascular disease and chronic kidney disease are all risk factors for each other and often occur together in the same individual.³

Co-morbidity between these conditions was more common for Aboriginal and Torres Strait Islander people than for non-Indigenous people in 2011–13. Diabetes in particular had very high co-morbidity with kidney disease, with around half (53.1%) of all Aboriginal and Torres Strait Islander people with diabetes also having signs of kidney disease. This was higher than the corresponding rate for non-Indigenous people with diabetes (32.5%). Aboriginal and Torres Strait Islander people with diabetes were also more likely than non-Indigenous people with diabetes to have indicators of cardiovascular disease, including high triglycerides (45.1% compared with 31.8%) and lower than normal levels of HDL (good) cholesterol (60.5% compared with 48.8%).

Persons aged 18 years & over with diabetes - Proportion with abnormal test results by Indigenous status, 2011-13



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Australian Bureau of Statistics

© Commonwealth of Australia 2014.

Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

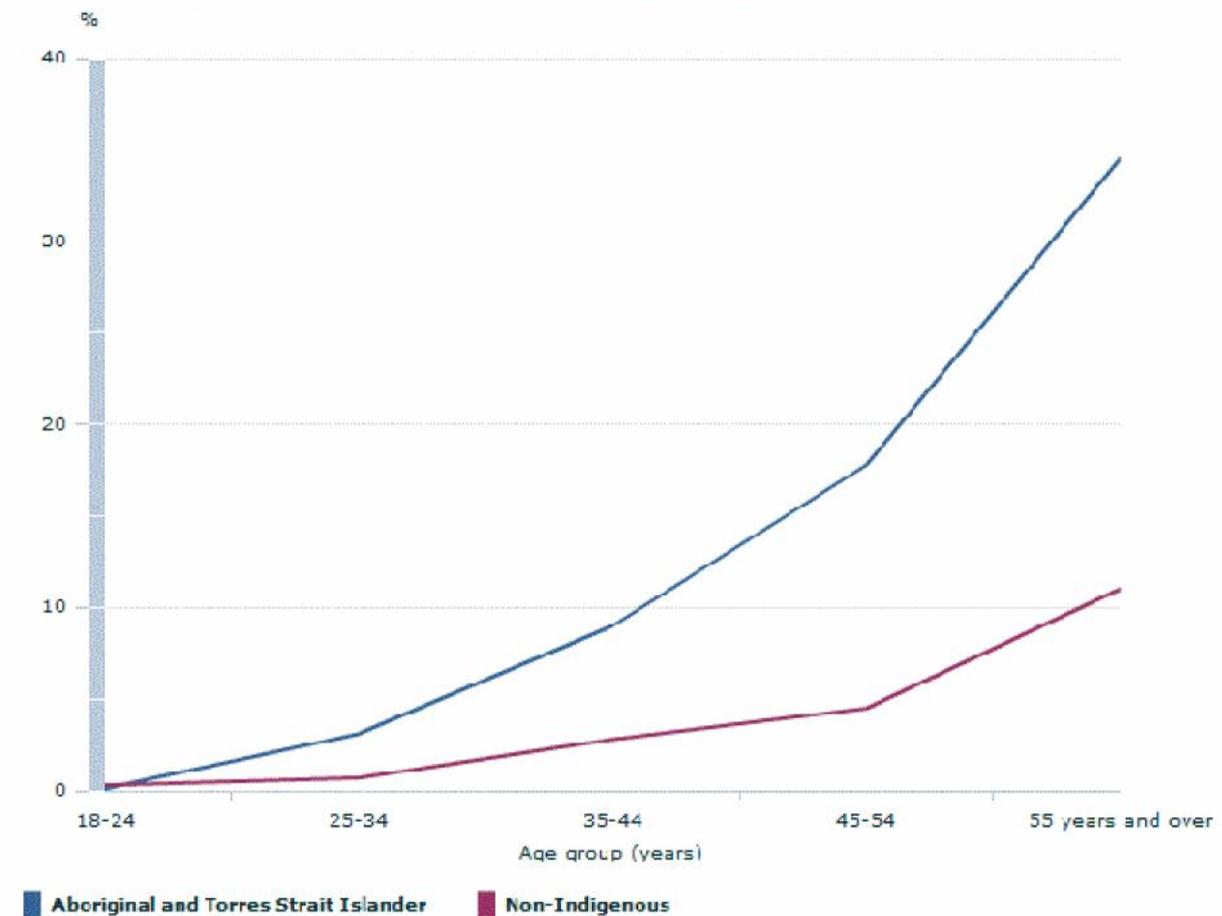
There was also a high level of co-morbidity between kidney disease and the cardiovascular risk factors, with more than half (54.1%) of Aboriginal and Torres Strait Islander people with chronic kidney disease having lower than normal levels of HDL cholesterol and 37.5% having high triglycerides. This, too, was higher than the corresponding rates for the non-Indigenous population (25.8% and 19.6% respectively).

How much earlier do Aboriginal and Torres Strait Islander people experience chronic disease?

The NATSIHMS confirmed that not only do Aboriginal and Torres Strait Islander people experience more chronic disease overall, they tend to develop it at younger ages as well.

For diabetes, the gap between the two populations began to significantly widen from 35 years onwards. In fact, the rate of diabetes for Aboriginal and Torres Strait Islander people aged 35–44 years (9.0%) was on par with that for non-Indigenous people aged 55–64 years (8.2%). Likewise, the proportion for those aged 45–54 years (17.8%) was similar to that for those aged 65–74 years in the non-Indigenous population (15.0%).

Persons aged 18 years & over - Proportion with diabetes by age & Indigenous status, 2011-13



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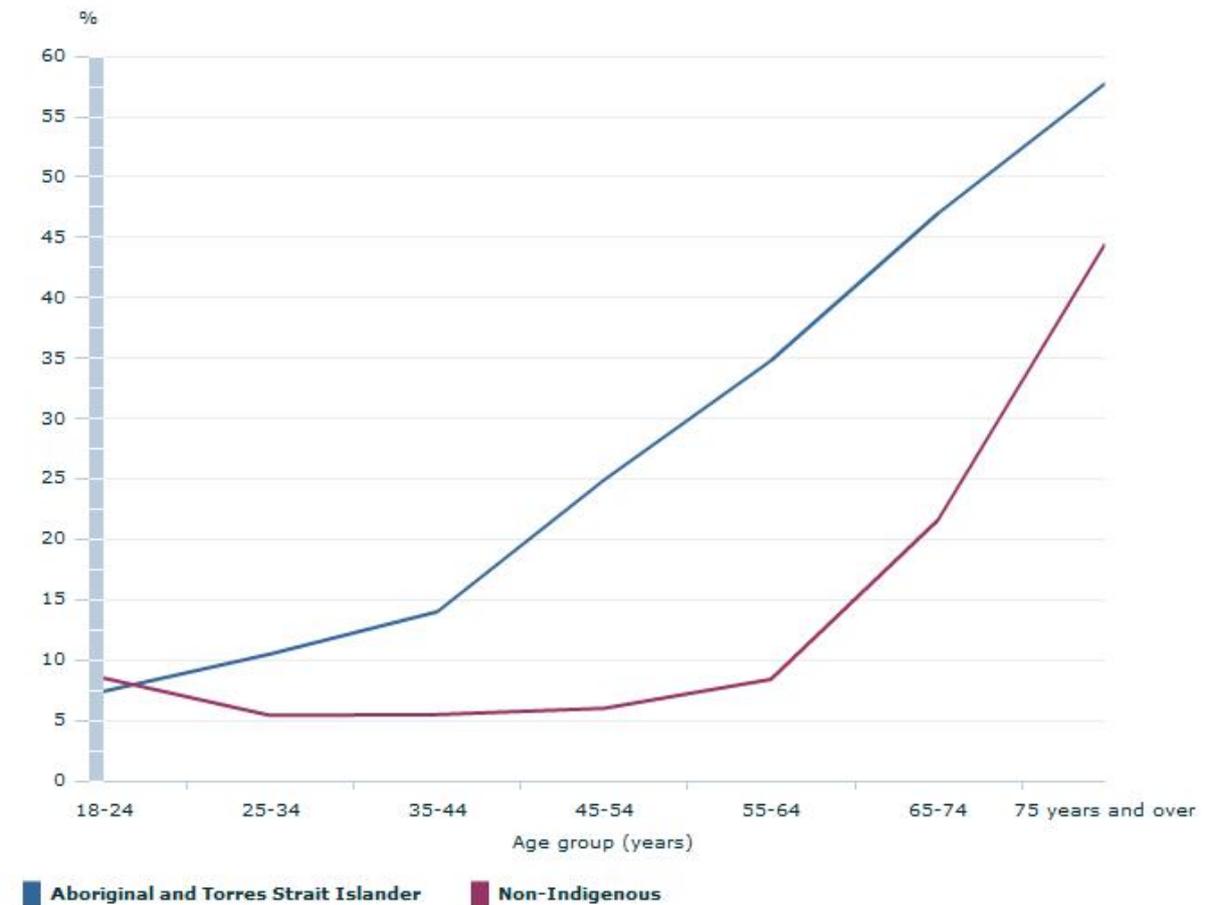
Australian Bureau of Statistics

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For kidney disease, rates began to increase from early adulthood in the Aboriginal and Torres Strait Islander population and then more noticeably from 45 years onwards, whereas in the non-Indigenous population, levels of kidney disease remained very flat until late adulthood and only began to increase from the age of 65.

Persons aged 18 years & over - Proportion with chronic kidney disease by age & Indigenous status, 2011-13



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Australian Bureau of Statistics

© Commonwealth of Australia 2014.

Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

For the cardiovascular biomarkers of HDL (good) cholesterol and triglycerides, the gap between the Aboriginal and Torres Strait Islander population and non-Indigenous population significantly increases from 35 years. For example, Aboriginal and Torres Strait Islander people aged 35–44 years were around twice as likely as their non-Indigenous counterparts to have high triglycerides (32.2% compared with 14.9%) and lower than normal levels of HDL cholesterol (46.8% compared with 24.5%).

What role does obesity play?

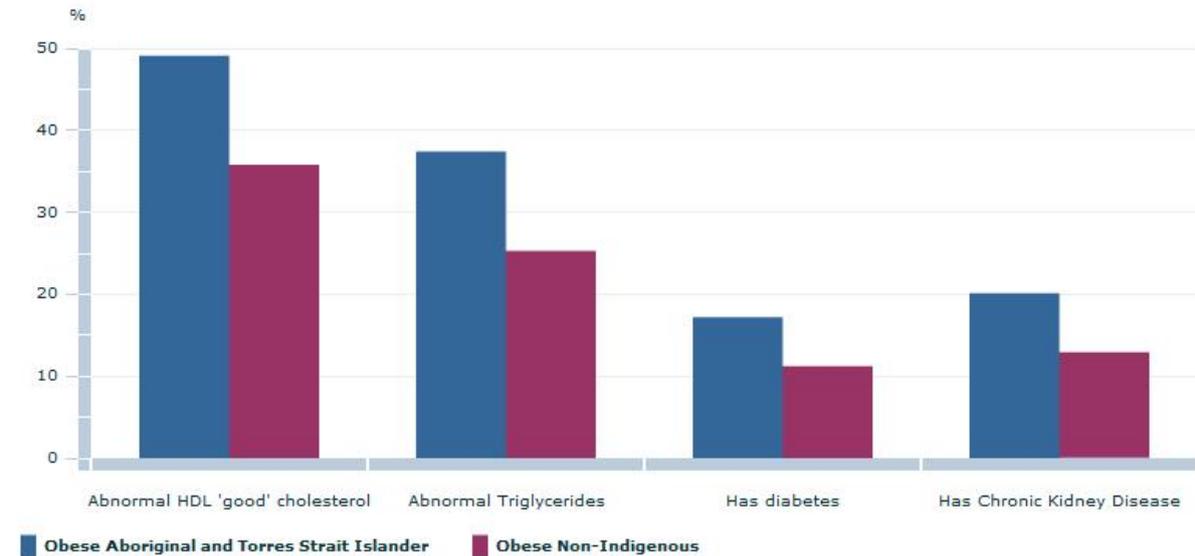
Obesity is known to increase the risk of many health conditions, including heart disease, diabetes, high blood pressure and some types of cancer.^{4,5} The AATSIHS showed that obesity rates remained high among Aboriginal and Torres Strait Islander adults in 2012–13, with four in every ten (39.8%) being obese.⁶ After taking age differences into account, Aboriginal and Torres Strait Islander adults were one and a half times as likely as non-Indigenous Australians to be obese (rate ratio 1.6).

Obesity, in turn, was strongly associated with the chronic disease biomarkers. In fact, being obese increased the risk of abnormal test results for nearly every chronic disease tested for in the survey. For example, Aboriginal and Torres Strait Islander adults who were obese were seven times as likely as those who were of normal weight or underweight to have diabetes and nearly five times as likely to have high triglycerides.

Interestingly, though, Aboriginal and Torres Strait Islander people who were obese were still more

likely than non-Indigenous people who were obese to experience chronic disease. They were more likely to have risk factors for cardiovascular disease, including lower than normal levels of HDL (good) cholesterol (49.1% compared with 35.8%) and high triglycerides (37.4% compared with 25.3%). They were also more likely to have diabetes (17.2% compared with 11.2%) and chronic kidney disease (20.1% compared with 12.9%).

Persons aged 18 years & over who are obese - Proportion with abnormal test results by Indigenous status, 2011-13



Save Chart Image

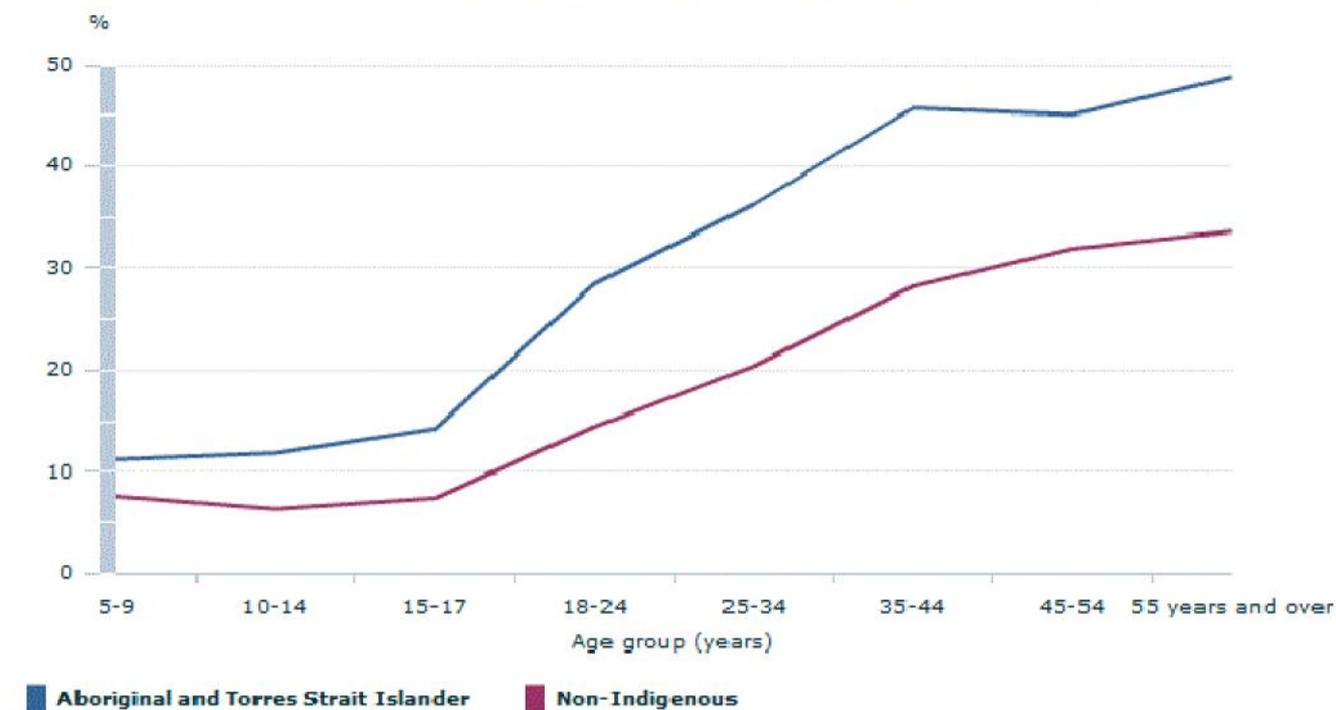
Australian Bureau of Statistics

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results

This may be partly explained by the earlier incidence of obesity in the Aboriginal and Torres Strait Islander population, particularly for children and young adults. The AATSIHS showed that by early adolescence, nearly one in eight (11.8%) Aboriginal and Torres Strait Islander children aged 10 to 14 were obese.⁶ This was nearly double the rate for non-Indigenous children of the same age (6.3%). In fact, the rate for 10 to 14 year olds was more on par with those aged 18–24 years in the non-Indigenous population (14.4%). Likewise, the rate of obesity among young Aboriginal and Torres Strait Islander people aged 18–24 was equivalent to that for non-Indigenous adults aged 35–44 years (both 28%).

Persons aged 5 years & over - Proportion who were obese by age & Indigenous status, 2011-13



Save Chart Image

Australian Bureau of Statistics

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Source(s): Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results

Does the risk of chronic disease increase even more if obesity is combined with smoking?

Surprisingly, the NATSIHMS showed that the risk of chronic disease did not significantly increase when obesity was combined with smoking. For example, rates of high cholesterol were no different for those Aboriginal and Torres Strait Islander people who both smoked and who were obese compared with all persons who were obese. This was also the case for diabetes and kidney disease.

Even independently, smoking was not associated with most of the NATSIHMS biomarkers in 2012–13. While Aboriginal and Torres Strait Islander smokers were more likely than non-smokers to have lower than normal levels of HDL (good) cholesterol, there was no clear relationship with any of the other cardiovascular biomarkers, nor with diabetes or kidney disease. This was different to the pattern seen for non-Indigenous adults, where smokers were more likely than non-smokers to have signs of cardiovascular disease and that the risk increased when obesity and smoking was combined, particularly for people under the age of 45.⁷

ENDNOTES

1 Australian Bureau of Statistics 2013, Life Tables for Aboriginal and Torres Strait Islander Australians, 2010-2012, ABS cat. no. 3302.0.55.003

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2 AHMAC (Australian Health Ministers' Advisory Council) 2012. Aboriginal and Torres Strait Islander Health Performance Framework 2012 report

<[http://www.health.gov.au/internet/main/Publishing.nsf/Content/F766FC3D8A697685CA257BF0001C96E8/\\$File/hpf-2012.pdf](http://www.health.gov.au/internet/main/Publishing.nsf/Content/F766FC3D8A697685CA257BF0001C96E8/$File/hpf-2012.pdf)> Last accessed 1/08/2014.

3 AIHW (Australian Institute of Health and Welfare) 2009, Prevention of cardiovascular disease, diabetes and chronic kidney disease <<http://www.aihw.gov.au/publication-detail/?id=6442468313>> Last accessed 1/08/2014.

4 World Health Organization 2003, *Obesity and Overweight*,

<<http://www.who.int/dietphysicalactivity/media/en/gsf Obesity.pdf>>, Last accessed 25/05/2014.

5 Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH 1999 *The Disease Burden Associated with Overweight and Obesity*, Journal of the American Medical Association, <<http://jama.jamanetwork.com/article.aspx?articleid=192030>>, Last accessed 25/08/2014.

6 Australian Bureau of Statistics 2013, Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results, 2012–13, ABS cat. no. 4727.0.55.006

<<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4727.0.55.006main+features12012-13>> Last accessed 1/08/2014.

7 Australian Bureau of Statistics 2013, Australian Health Survey: Biomedical Results for Chronic Disease 2011–12, ABS cat. no. 4364.0.55.005

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EXPLANATORY NOTES

INTRODUCTION

1 This publication is the first release of information from the 2012–13 National Aboriginal and Torres Strait Islander Health Measures Survey (NATSIHMS), which forms part of the 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS).

2 For more information on the structure of the AATSIHS, see the Structure of the Australian Aboriginal and Torres Strait Islander Health Survey section of this publication. The following information focusses on the NATSIHMS component of the survey only.

3 All adults aged 18 years and over who participated in either the National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) or the National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey (NATSINPAS) were invited to participate in the voluntary NATSIHMS. The surveys took place throughout Australia from April 2012 to July 2013. Participants in the NATSIHMS voluntarily provided blood and urine samples, which were then analysed for specific biomarkers.

4 The 2012–13 NATSIHMS collected information about:

- chronic disease biomarkers, including tests for diabetes, cholesterol, triglycerides, kidney disease and liver function
- nutrient biomarkers, including tests for iron, folate, iodine, Vitamin B12 and Vitamin D.

See Appendix A for the list of tests conducted in the NATSIHMS.

5 In addition, the broader survey collected a wide range of information about selected health conditions, risk factors (for example, obesity) and demographic and socioeconomic factors, which can be analysed in relation to the NATSIHMS results.

6 The list of data items from the survey, as well as detailed information on the different tests used in the NATSIHMS, is available in the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2012–13 (cat. no. 4727.0.55.002).

SCOPE OF THE SURVEY

7 The 2012–13 NATSIHS and NATSINPAS included a combined sample of 8,237 private dwellings across Australia. Remote and non-remote areas in all states and territories were included, as were discrete Aboriginal and Torres Strait Islander communities.

8 The scope was all Aboriginal and Torres Strait Islander people who were usual residents of private dwellings in Australia. Usual residents are those who usually live in a particular dwelling and regard it as their own or main home.

9 Private dwellings are houses, flats, home units and any other structures used as private places of residence at the time of the survey. People usually resident in non-private dwellings, such as hotels, motels, hostels, hospitals, nursing homes, and short-stay caravan parks were not in scope. This may affect estimates of the number of people with some conditions; for example, conditions which may require periods of hospitalisation, such as kidney disease.

10 Further scope exclusions for this survey were:

- Non-Indigenous persons
- Non-Australian diplomats; diplomatic staff and members of their household
- Members of non-Australian Defence forces stationed in Australia and their dependents
- Overseas visitors.

11 All selected persons aged 18 years and over in both the NATSIHS and the NATSINPAS were then invited to participate in the voluntary NATSIHMS.

DATA COLLECTION

12 The interview components of the NATSIHS and NATSINPAS were conducted under the *Census and Statistics Act (CSA) 1905*. The biomedical component was collected under the Privacy Act 1988 and were subject to ethics approval. Ethics approval for the NATSIHMS at the national level was sought and gained from Australian Government Department of Health and Ageing's Departmental Ethics Committee.

13 Ethics approval for the NATSIHMS component was also required at the jurisdictional level for New South Wales, Western Australia, Northern Territory and for Queensland Health Service Districts. Ethics approval was sought and gained from the following Ethics Committees:

- Aboriginal Health and Medical Research Council Ethics Committee in New South Wales
- Aboriginal Health Research Ethics Committee in South Australia
- Western Australian Aboriginal Health Ethics Committee in Western Australia
- Western Australia Country Health Service (WACHS) Research Ethics Committee in Western Australia
- Central Australian Human Research Ethics Committee in Northern Territory
- Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research in Northern Territory
- several Human Research Ethics Committees of Queensland Government Hospital and Health Services districts.

14 At the completion of NATSIHS and NATSINPAS questions, interviewers explained the voluntary NATSIHMS component and provided a written information sheet.

15 Informed consent was sought from adults through completion of a consent form. A copy of the consent form was left with the respondent. Those that agreed to take part were provided a referral form to complete (including whether specific medications or supplements were regularly taken) to provide to the collection clinic.

16 A follow-up reminder process was used for non-remote respondents who consented to the NATSIHMS but had not yet attended a collection clinic. This process took the form of phone calls or letters arranged ten days apart from the interview date. Home visits and temporary clinics were offered to participants in certain circumstances to maximise participation rates, particularly in remote areas and for those who were incapacitated. To reduce expenses for travel, child-care or time off work, all participants were able to claim a reimbursement of \$50.

17 Most blood and urine samples were collected at Sonic Healthcare collection clinics or alternatively, via a home visit or temporary clinic held at Aboriginal Medical Services (AMS) using standard operating procedures for phlebotomy collection. In some areas, other pathology service providers were used (including IMVS Pathology for regional areas in South Australia and Northern Territory), but the same standard collection procedures were still used.

18 All blood and urine samples, with the exception of urinary iodine analysis, which was conducted by Sullivan Nicolaides Pathology (SNP) in Queensland, were then analysed at a central laboratory at Douglass Hanly Moir (DHM) Pathology in Sydney, Australia on machines accredited by the National Association of Testing Authorities (NATA). DHM conducted Internal Quality Control (QC) analysis for all instruments used to conduct analysis on the samples. More information on NATSIHMS quality assurance methods and procedures is available in the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2011–13 (cat. no. 4727.0.55.002).

19 All participants were provided with a pathology report of their results either via post or through their local health service. Participants in non-remote areas could also nominate for their results to be sent to their regular doctor. In cases where the results were outside the normal range, participants were contacted by a qualified health professional and encouraged to discuss their results with their doctor. If the test results showed a significantly high or low result which was dangerous to the person's

health, they were contacted immediately and advised on the best course of action.

RESPONSE RATES

20 In the NATSIHS and NATSINPAS combined, there were a total of 8,237 households fully responding, giving a response rate of 79.5%. This resulted in a total of 12,947 persons in the sample aged 2 years and over.

21 Of the 8,157 respondents aged 18 years and over in the combined NATSIHS/NATSINPAS sample, 3,293 (40.4%) participated in the biomedical component. A higher level of response was achieved in remote areas (55.8%) than in non-remote areas (28.1%).

RESPONSE RATES, National Aboriginal and Torres Strait Islander Health Measures Survey, 2012-13

	Number of persons no.	Proportion of persons %
Fully responding interview (18+)	8 157	100.0
Did not proceed to Biomedical component		
Not offered(a)	115	1.4
Refused	1 947	23.9
Considering	56	0.7
Gave consent but did not participate	2 746	33.7
Biomedical Participants (18+)	3 293	40.4
Urine sample provided	3 105	38.1
Blood sample provided		
Fasting sample	2 200	27.0
Non-fasting sample	1 061	13.0

(a) Biomedical component was not offered in proxy interviews for adults where the respondent was not present and communities where collection could not be arranged.

NON- REMOTE/REMOTE RESPONSE RATES, National Aboriginal and Torres Strait Islander Health Measures Survey, 2012-13(a)

	NON-REMOTE Number of persons no.	NON-REMOTE Proportion of persons %	REMOTE Number of persons no.	REMOTE Proportion of persons %.
Fully responding interview	4549	100.0	3608	100.0
Did not proceed to Biomedical component	3270	71.9	1594	44.2
Biomedical Participants	1279	28.1	2014	55.8

(a) 18 years and over

22 In 2012–13, 77.6% of those who participated in the NATSIHMS had fasted. Data relating to fasting tests (for example, the fasting plasma glucose test) relate to the fasting population only. Analysis of the characteristics of people who fasted compared with those who did not fast showed no difference between fasters and non-fasters.

23 The following table compares characteristics of persons who participated in the NATSIHMS with those who participated in the NATSIHS and NATSINPAS combined.

COMPARISONS BETWEEN NATSIHMS AND NATSIHS/NATSINPAS SAMPLES, Persons aged 18 years and over, 2012–13

	NON-REMOTE		REMOTE		TOTAL	
	NATSIHMS (unweighted) %	NATSIHS/ NATSINPAS (unweighted) %	NATSIHMS (unweighted) %	NATSIHS/ NATSINPAS (unweighted) %	NATSIHMS (unweighted) %	NATSIHS/ NATSINPAS (unweighted) %
Married	54.1	47.8	45.1	44.8	48.6	46.5
Has a non-school qualification	53.9	48.7	32.4	33.1	40.8	41.8
In the Labour Force	57.0	56.9	53.4	54.3	54.8	55.8
Self-reported diabetes	15.2	13.7	23.6	21.3	20.3	17.0
Self-reported high cholesterol	6.3	4.1	10.4	9.0	8.8	6.3
Excellent or Very Good self-assessed health	32.1	34.4	32.7	33.5	32.5	34.0
Current daily smoker	29.7	41.1	52.2	50.7	43.5	45.4
Overweight/obese	77.8	71.7	67.4	67.6	71.4	69.8

(a) 18 years and over

24 More detailed information on response rates is available in the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2011–13 (cat. no. 4727.0.55.002)

WEIGHTING, BENCHMARKING AND ESTIMATION

25 Weighting is a process of adjusting results from a sample survey to infer results for the in-scope total population. To do this, a weight is allocated to each sample person. The weight is a value which indicates how many population units are represented by the sample unit.

26 The first step in calculating weights for each person was to assign an initial weight, which was equal to the inverse of the probability of being selected in the survey. For example, if the probability of a person being selected in the survey was 1 in 600, then the person would have an initial weight of 600 (that is, they represent 600 others). An adjustment was then incorporated into the weighting to account for Aboriginal and Torres Strait Islander persons not covered by the sample. For more information on undercoverage, see the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2012–13 (cat. no. 4727.0.55.002).

27 The weights are calibrated to align with independent estimates of the population of interest, referred to as 'benchmarks', in designated categories of sex by age by area of usual residence. Weights calibrated against population benchmarks compensate for over or under-enumeration of particular categories of persons and ensure that the survey estimates conform to the independently estimated distribution of the population by age, sex and area of usual residence, rather than to the distribution within the sample itself. The selection of benchmarks was chosen to maximise the accuracy of the estimates of biomedical characteristics, by reducing both random and systematic errors as much as possible.

28 The NATSIHMS results were benchmarked to the estimated Aboriginal and Torres Strait Islander resident population living in private dwellings at 30 June 2011. Excluded from these benchmarks were persons in non-private dwellings. The benchmarks, and hence the estimates from the survey, do not (and are not intended to) match estimates of the total Australian Aboriginal and Torres Strait Islander resident population obtained from other sources.

29 Survey estimates of counts of persons are obtained by summing the weights of persons with the characteristic of interest. Estimates of non-person counts (for example, number of conditions) are obtained by multiplying the characteristic of interest with the weight of the reporting person and aggregating.

30 The weights for the NATSIHMS are different to the weights for the combined NATSIHS/NATSINPAS due to the differing response patterns between the surveys.

31 An investigation was undertaken to determine whether the accuracy of NATSIHMS estimates could be improved by weighting with any other variables collected in the NATSIHS and NATSINPAS, including smoking status, Body Mass Index, self-assessed health, employment status, marital status and blood pressure. While the use of some of these variables would have improved the accuracy of some NATSIHMS estimates (e.g. the use of smoker status in the weighting process would have ensured that totals relating to current daily smokers were identical in the NATSIHMS to those in the combined NATSIHS and NATSINPAS), they made no difference to the main variables of interest in the NATSIHMS (i.e. estimates of diabetes, cholesterol) and even in some cases increased the measure of sampling error or Relative Standard Error (RSE).

32 The decision to maximise the accuracy of these main variables of interest in the NATSIHMS by not including those other variables in the calculation of weights for the NATSIHMS means that, while variables collected in the NATSIHMS can be analysed with variables collected in either the NATSIHS and NATSINPAS, the NATSIHS and NATSINPAS should be used when reporting on the prevalence of these variables. For example, for self-reported medical conditions and risk factors such as smoking, the most accurate prevalences should be calculated using the combined NATSIHS and NATSINPAS sample.

RELIABILITY OF ESTIMATES

Sampling and non-sampling error

33 All sample surveys are subject to sampling and non-sampling error.

34 Sampling error is the difference between estimates, derived from a sample of persons, and the value that would have been produced if all persons in scope of the survey had been included. For more information refer to the Technical Note. Indications of the level of sampling error are given by the Relative Standard Error (RSE) and Margin of Error (MoE).

35 In this publication, estimates with an RSE of 25% to 50% are preceded by an asterisk (e.g. *3.4) to indicate that the estimate has a high level of sampling error relative to the size of the estimate, and should be used with caution. Estimates with an RSE over 50% are indicated by a double asterisk (e.g. **0.6) and are generally considered too unreliable for most purposes. These estimates can be used to aggregate with other estimates to reduce the overall sampling error.

36 The MoEs are provided for all proportions to assist users in assessing their reliability. Users may find this measure is more convenient to use, rather than the RSE, in particular for small and large proportions. The proportion combined with the MoE defines a range which is expected to include the true population value with a given level of confidence. This is known as the confidence interval. This range should be considered by users to inform decisions based on the proportion.

37 Non-sampling error may occur in any data collection, whether it is based on a sample or a full count such as a census. Non-sampling errors occur when survey processes work less effectively than intended. Sources of non-sampling error include non-response or missing test results, errors in reporting by respondents or in recording of answers by interviewers, and occasional errors in coding and processing data.

38 Non-response can affect the reliability of results and can introduce a bias. The magnitude of any bias depends on the rate of non-response and the extent of the difference between the characteristics of those people who responded to the survey and those who did not.

39 Results for biomarkers may vary depending on the type of test and assay used, as well as the type of machine used to analyse the blood and urine samples. Details around the procedures followed for each of the biomarkers in the NATSIHMS are outlined in the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2012–13 (cat. no. 4727.0.55.002).

40 In the NATSIHMS, month of collection was used to analyse the seasonal effects of Vitamin D

deficiency. Although there were proportionally more people who had their blood samples taken in Spring than in Autumn, this only had a very small impact on the overall rate of Vitamin D deficiency at the population level.

DISTRIBUTION OF THE ADULT NATSIHMS SAMPLE BY SEASON

Season	% of sample
Summer	14.1
Autumn	26.1
Winter	21.9
Spring	37.9

CONFIDENTIALITY

41 The *Census and Statistics Act, 1905* provides the authority for the ABS to collect statistical information, and requires that statistical output shall not be published or disseminated in a manner that is likely to enable the identification of a particular person or organisation. This requirement means that the ABS must take care and make assurances that any statistical information about individual respondents cannot be derived from published data.

42 Some techniques used to guard against identification or disclosure of confidential information in statistical tables are suppression of sensitive cells, random adjustments to cells with very small values, and aggregation of data. To protect confidentiality within this publication, some cell values may have been suppressed and are not available for publication but included in totals where applicable. As a result, sums of components may not add exactly to totals due to the confidentialisation of individual cells.

ROUNDING

43 Estimates presented in this publication have been rounded. As a result, sums of components may not add exactly to totals.

44 Proportions presented in this publication are based on unrounded figures. Calculations using rounded figures may differ from those published.

ACKNOWLEDGEMENTS

45 The success of the 2012–13 AATSIHS was dependent on the very high level of cooperation received from Aboriginal and Torres Strait Islander Australians. Their continued cooperation is very much appreciated; without it, the range of statistics published by the ABS would not be possible. Information received by the ABS is treated in strict confidence as required by the *Census and Statistics Act, 1905*.

46 The 2012–13 AATSIHS was developed with the assistance of an advisory group comprised of experts on health issues, many of whom were Aboriginal and Torres Strait Islander people. The biomedical component was also developed with the assistance of several advisory groups and expert panels. Members of these groups were drawn from Commonwealth and state/territory government agencies, non-government organisations, relevant academic institutions and clinicians. The valuable contributions made by members of these groups are greatly appreciated.

PRODUCTS AND SERVICES

47 Summary results from the NATSIHMS are available in spreadsheet form from the Downloads tab in this release.

48 Special tabulations are available on request. Subject to confidentiality and sampling variability constraints, tabulations can be produced from the survey incorporating data items, populations and geographic areas selected to meet individual requirements. A list of data items is available from the Australian Aboriginal and Torres Strait Islander Health Survey: Users' Guide, 2011–13 (cat. no. 4727.0.55.002).

RELATED PUBLICATIONS

49 Other ABS publications which may be of interest are shown under the 'Related Information' tab of this release.

50 Current publications and other products released by the ABS are listed on the ABS website <www.abs.gov.au>. The ABS also issues a daily Release Advice on the website which details products to be released in the week ahead.

GLOSSARY

Aboriginal and Torres Strait Islander people

Refers to people who identified themselves, or were identified by another household member, as being of Aboriginal, Torres Strait Islander, or Aboriginal and Torres Strait Islander origin.

Age standardisation

Age standardisation is a way of allowing comparisons between two or more populations with different age structures, in order to remove age as a factor when examining relationships between variables. For example, the Aboriginal and Torres Strait Islander population has a larger proportion of young people and a smaller proportion of older people than the non-Indigenous population. For this reason, where appropriate, estimates for Aboriginal and Torres Strait Islander people and non-Indigenous people have both been age standardised to reflect the age structure of the same population — the total estimated resident population of Australia as at 30 June 2001. The age standardised rates are the rates that would have prevailed if both populations had this same age structure.

Albumin creatinine ratio (ACR)

The ratio of albumin (a protein) to creatinine (a waste product) in the urine can determine how well the kidneys are functioning. An elevated ACR result may indicate kidney disease or a reduction in kidney function. In this survey, abnormal ACR - also known as albuminuria - is defined as 2.5 mg/mmol or greater for males, and 3.5 mg/mmol or greater for females.

Albuminuria

Albuminuria is defined as the presence of albumin, a type of protein, in the urine. In this survey, the presence of albuminuria was defined as an ACR reading of greater than or equal to 2.5 mg/mmol for males and greater than or equal to 3.5 mg/mmol for females.

Also see Albumin creatinine ratio (ACR), Macroalbuminuria, Microalbuminuria and Normoalbuminuria.

Alanine aminotransferase (ALT)

ALT is an enzyme found mainly in the liver. When the liver is damaged or diseased, ALT leaks into the bloodstream. In this survey, abnormal ALT is defined as greater than 40 U/L for males and greater than 30 U/L for females.

Anaemia

Anaemia describes a decrease in either the number of red blood cells in the body or the quantity of haemoglobin within red blood cells.

Also see haemoglobin.

At high risk of diabetes

In this survey, a person was considered to be at high risk of diabetes if they did not currently have diabetes, but had an impaired fasting plasma glucose result, that is, a fasting plasma glucose level ranging from 6.1 mmol/L to less than 7.0 mmol/L. The equivalent cut-off for the glycated haemoglobin (HbA1c) test was a value of 6.0% to less than 6.5%.

Also see Diabetes, Known diabetes and Newly diagnosed diabetes.

Blood pressure

See High blood pressure.

Body Mass Index (BMI)

Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, normal weight, overweight and obesity. It is calculated from height and weight information, using the formula weight (kg) divided by the square of height (m). To produce a measure of the prevalence of underweight, normal weight, overweight or obesity in adults, BMI values are grouped according to the table below which allows categories to be reported against both the World Health Organization (WHO) and National Health and Medical Research Council (NHMRC) guidelines.

BODY MASS INDEX, Adults

Category	Range
Underweight	Less than 18.50
Normal range	18.50 — 24.99
Overweight	25.00 — 29.99
Obese	30.00 or more

C-reactive protein (CRP)

CRP is used for ferritin interpretations and measures general levels of inflammation in the body. High levels may mask iron deficiency and therefore people with CRP levels above 10mg/L were excluded from the ferritin results.

Also see Iron and Ferritin.

Cholesterol

Cholesterol is a type of fat that circulates in the blood. It is essential for many metabolic processes, including the production of hormones and in building cells. There are two main types of cholesterol: high density lipoprotein (HDL) and low density lipoprotein (LDL).

Also see Total cholesterol, HDL cholesterol and LDL cholesterol.

Chronic kidney disease stages

Chronic kidney disease stages were derived using a combination of participants' estimated glomerular filtration rate (eGFR) results with their albumin creatinine ratio (ACR) results. The different stages were defined as follows:

- No indicators of chronic kidney disease - eGFR greater than or equal to 60 mL/min/1.73 m² and no presence of albuminuria
- Stage 1 - eGFR greater than or equal to 90 mL/min/1.73 m² & albuminuria
- Stage 2 - eGFR 60 to 89 mL/min/1.73 m² & albuminuria
- Stage 3a - eGFR 45–59 mL/min/1.73 m²
- Stage 3b - eGFR 30–44 mL/min/1.73 m²
- Stage 4–5 - eGFR less than 30 mL/min/1.73 m²

Cotinine

Cotinine is produced in the process of breaking down, or metabolising, nicotine. Elevated levels of cotinine in the blood can be used to determine exposure to tobacco smoke. However, cotinine levels only remain elevated for around 20 hours after exposure to tobacco smoke, therefore it can only provide a measure of short-term exposure. In this survey, cotinine levels of 140 nmol/L or greater indicate exposure to tobacco smoke.

Current daily smoker

A current daily smoker is a respondent who reported at the time of interview that they regularly smoked one or more cigarettes, cigars or pipes per day. Also see Smoker status.

Diabetes

Diabetes is a chronic condition where insulin, a hormone that controls blood glucose levels, is no longer produced or is not produced in sufficient amounts by the body. In this survey, diabetes prevalence was derived using a combination of blood test results and self-reported information on diabetes diagnosis and medication use.

Also see Known diabetes, Newly diagnosed diabetes and At high risk of diabetes.

Dyslipidaemia

Refers to a number of different lipid disorders (that is, conditions where there are too many fats in the blood). In this survey, a person was considered to have dyslipidaemia if they had one or more of the following:

- Taking cholesterol-lowering medication
- Total cholesterol greater than or equal to 5.5 mmol/L
- HDL cholesterol less than 1.0 mmol/L for men and less than 1.3 mmol/L for women
- LDL cholesterol greater than or equal to 3.5 mmol/L
- Triglycerides greater than or equal to 2.0 mmol/L

Estimated glomerular filtration rate (eGFR)

eGFR measures the rate at which the kidneys filter wastes from the blood. In this survey, abnormal kidney function using eGFR is defined as a reading of less than 60 mL/min/1.73m².

Fasting plasma glucose

A blood test that measures the amount of glucose (a sugar) in the blood. In this survey, fasting plasma glucose levels of 7.0 mmol/L or greater indicates diabetes. A fasting plasma glucose level from 6.1 mmol/L to less than 7.0 mmol/L is known as impaired fasting plasma glucose and indicates that a person is at high risk of diabetes.

Ferritin

Ferritin measures the amount of iron stores in the body. Low ferritin in the blood reflects depleted iron stores. Levels of ferritin can be affected by infection or inflammation, therefore people with inflammation (defined as a C-reactive protein level of >10mg/L) were excluded from the NATSIHMS ferritin results.

Also see C-reactive protein, Iron and Serum transferrin receptor.

Folate

Folate is a B group vitamin that is essential for healthy growth and development. Folate is found naturally in food, such as green leafy vegetables, fruits and grains, while folic acid is the synthetic form of folate added to food or used in dietary supplements. Folate can help prevent neural tube defects in babies, including spina bifida, if it is taken before conception and early in pregnancy. Folate status can be assessed by measuring serum folate, which provides information on recent intake.

Also see Serum folate.

Gamma glutamyl transferase (GGT)

GGT is an enzyme that is found in high concentrations in the liver, and in lesser concentrations in the kidneys, bile duct, pancreas, gallbladder, spleen, heart, and brain. When these tissues are damaged by disease or inflammation, GGT leaks from the tissue into the bloodstream. Abnormal GGT is defined as greater than 50 U/L for males and greater than 35 U/L for females.

Haemoglobin

Haemoglobin is an iron-containing protein and is found in the red blood cells and helps transport oxygen from the lungs to the rest of the body. Low haemoglobin levels in the blood may indicate anaemia. In this survey, the risk of anaemia is defined using haemoglobin levels. For non-pregnant women, haemoglobin levels less than 120 g/L are defined as at risk of anaemia. For pregnant women, haemoglobin levels less than 110 g/L are defined as at risk of anaemia. For males, haemoglobin levels less than 130 g/L are defined as at risk of anaemia.

See also Anaemia.

HbA1c test

Glycated haemoglobin, commonly known as HbA1c, is a blood test that measures what the person's average blood glucose level has been in the previous three months. Results from the HbA1c test can be expressed either as a percentage (%) or as a measurement in mmol/mol. In this survey, normal HbA1c is defined as less than 6.0%; at high risk of diabetes is defined as 6.0% to less than 6.5% and levels greater than or equal to 6.5% indicate diabetes.

HDL cholesterol

High density lipoprotein (HDL) cholesterol is the measure of "good" cholesterol. HDL picks up excess cholesterol in the blood and takes it to the liver where it is broken down. High levels of HDL cholesterol reduce the risk of heart disease, while low levels increase the risk. In this survey, abnormal HDL cholesterol is defined as less than 1.0 mmol/L for males, and as less than 1.3 mmol/L for females.

High blood pressure

A measured blood pressure reading of 140/90 mm Hg (millimetres of mercury) or higher. Data on high blood pressure in this publication refer to measured blood pressure only, and do not take into account whether people who might otherwise have high blood pressure are managing their condition through the use of blood pressure medications.

Impaired fasting plasma glucose

A fasting plasma glucose level ranging from 6.1 mmol/L to less than 7.0 mmol/L. Also see At high risk of diabetes.

Iodine

Iodine is an important nutrient for the production of thyroid hormones. It is essential for brain development, particularly in young children and infants. Deficiency in iodine can cause goitres, hypothyroidism, fetal brain damage and developmental delays. The major dietary sources of iodine include seafood, especially seaweed, and baked bread and dairy milk.

The WHO considers a population iodine deficient if the median urinary iodine concentration is less than 100 µg/L. They also recommended that no more than 20% of the population have iodine concentrations below 50 µg/L.

Iron

Iron is an essential mineral for transporting oxygen around the body. Iron deficiency can lead to fatigue, tiredness and decreased immunity. Measures of iron intake in the NATSIHMS include Ferritin and Serum transferrin receptor.

Also see Ferritin and Serum transferrin receptor

Kidney disease stages

See Chronic kidney disease stages

Known diabetes

In this survey, a person was considered to have known diabetes if:

- they had ever been told by a doctor or nurse that they have diabetes and they were taking diabetes medication (either insulin or tablets); OR
- they had ever been told by a doctor or nurse that they have diabetes and their blood test result for fasting plasma glucose was greater than or equal to the cut off point for diabetes (that is, greater than or equal to 7.0 mmol/L).

People who had been told by a doctor or nurse that they have diabetes, but who were not taking medication for diabetes and did not have a fasting plasma glucose level of 7.0 mmol/L or greater, were classified as not having diabetes.

People with known diabetes were further classified as having Type I, Type II or Type unknown, based on the type of diabetes that a doctor or nurse told them they had. Women with gestational diabetes were excluded.

The corresponding diabetes cut-off for HbA1c is a value of 6.5% or greater.

LDL cholesterol

Low density lipoprotein (LDL) cholesterol is the measure of "bad" cholesterol in the blood. Over time, LDL cholesterol can build up in the blood vessels and arteries, blocking the passage of blood flow. In this survey, abnormal LDL cholesterol is defined as 3.5 mmol/L or greater.

Also see Total cholesterol and HDL cholesterol.

Macroalbuminuria

An increased amount of albumin, a protein, in the urine. Macroalbuminuria is defined as an albumin creatinine ratio (ACR) of more than 25 mg/mmol for males, or more than 35 mg/mmol for females. Also see Albumin creatinine ratio (ACR).

Margin of Error (MoE)

Describes the distance from the precision of the estimate at a given confidence level, and is specified at a given level of confidence (95% in this publication). In this publication, Margin of error has only been provided for proportions and rate ratios. For more information see the Technical Note of this publication.

Microalbuminuria

A slightly increased amount of albumin, a protein, in the urine. Microalbuminuria is defined as an albumin creatinine ratio (ACR) of 2.5 to 25 mg/mmol for males, or 3.5 to 35 mg/mmol for females. Also see Albumin creatinine ratio (ACR).

Newly diagnosed diabetes

In this survey, a person was considered to have newly diagnosed diabetes if they reported no prior diagnosis of diabetes but had a fasting plasma glucose value of 7.0 mmol/L or greater. The equivalent cut-off for the HbA1c test is a value of 6.5% or greater.

Also see Known diabetes and At high risk of diabetes.

Non-HDL Cholesterol

Calculated by subtracting the level of HDL cholesterol from the level of total cholesterol. Non-HDL cholesterol levels are monitored as part of diabetes management as a tool to assess cardiovascular risk.

Normoalbuminuria

Normal levels of protein in the urine. Normoalbuminuria is defined as an albumin creatinine ratio (ACR) of less than 2.5 mg/mmol for males, or less than 3.5 mg/mmol for females. See also Albumin creatinine ratio (ACR).

Normal weight

See Body Mass Index (BMI)

Obese

See Body Mass Index (BMI).

Overweight

See Body Mass Index (BMI).

Rate ratios

Aboriginal and Torres Strait Islander to non-Indigenous rate ratios are calculated by dividing the proportion of Aboriginal and Torres Strait Islander people with a particular characteristic by the proportion of non-Indigenous people with the same characteristic. If the characteristic of interest is highly correlated with age (e.g. diabetes), age standardised proportions are used to calculate Aboriginal and Torres Strait Islander to non-Indigenous rate ratios. A rate ratio of 1.0 indicates that the prevalence of the characteristic is the same in the Aboriginal and Torres Strait Islander and non-Indigenous populations. Rate ratios greater than 1.0 indicate higher prevalence in the Aboriginal and Torres Strait Islander population and rate ratios less than 1.0 indicate higher prevalence in the non-Indigenous population. Rate ratios produced for this publication were based on age standardised proportions to two decimal places.

Relative Standard Error (RSE)

The standard error expressed as a percentage of the estimate. For more information see the Technical Note in this publication.

Remoteness

The Remoteness Structure for the Australian Statistical Geography Standard (ASGS) 2011, has five categories based on an aggregation of geographical areas which share common characteristics of remoteness, determined in the context of Australia as a whole. These categories are:

- Major cities of Australia
- Inner regional Australia
- Outer regional Australia
- Remote Australia
- Very remote Australia

The five categories are generally aggregated in some way for use in output.

The 2011 Remoteness Structure has been built using the same principles as the 2006 Remoteness Structure. The primary difference is that it was built from ASGS Statistical Area Level 1 (SA1) regions rather than from 2006 Census Collection Districts (CCD).

Serum folate

A measure the level of folate in the body. It is sensitive to folate intake and can fluctuate due to short-term changes in diet.

Also see Folate.

Serum transferrin receptor

An indicator of iron levels in the body. It is not as affected by infection or inflammation as other measures, such as ferritin.

Smoker status

The extent to which a respondent was smoking at the time of interview, and refers to regular smoking of tobacco, including manufactured (packet) cigarettes, roll-your-own cigarettes, cigars and pipes, but excludes chewing tobacco and smoking of non-tobacco products. Categorised as:

- Current daily smoker - a respondent who reported at the time of interview that they regularly smoked one or more cigarettes, cigars or pipes per day;
- Current smoker - Other - a respondent who reported at the time of interview that they smoked cigarettes, cigars or pipes, less frequently than daily;
- Ex-smoker - a respondent who reported that they did not currently smoke, but had regularly smoked daily, or had smoked at least 100 cigarettes, or smoked pipes, cigars, etc at least 20 times in their lifetime; and
- Never smoked - a respondent who reported they had never regularly smoked daily, and had smoked less than 100 cigarettes in their lifetime and had smoked pipes, cigars, etc less than 20 times.

Total cholesterol

Total cholesterol is a measure of all the different types of fats in the blood. In this survey, abnormal total cholesterol is defined as 5.5 mmol/L or greater.

Also see Cholesterol, HDL cholesterol, and LDL cholesterol.

Triglycerides

Triglycerides are a fatty substance in the blood. They work as a type of fuel, circulating in the bloodstream to be used as energy by the cells. In this survey, abnormal triglycerides are defined as 2.0 mmol/L or greater.

Underweight

See Body Mass Index (BMI).

Vitamin B12

Vitamin B12 is a water-soluble vitamin with a key role in the normal functioning of the brain and nervous system, and for the formation of blood. Vitamin B12 is a nutrient that helps keep the body's nerve and blood cells healthy and helps make DNA. If left untreated, Vitamin B12 deficiency, also known as B12 deficiency, can lead to anemia, as well as nerve and brain damage.

Vitamin D

Vitamin D is essential for the body to absorb calcium effectively. The main source of Vitamin D is exposure to sunlight, although small amounts can be obtained through some foods, such as eggs, fatty fish and fortified margarine and milk. The main consequence of severe Vitamin D deficiency is rickets in children and osteopenia (fragile bones) in older people. In the NATSIHMS, the levels

recommended in a recent Australian position statement on Vitamin D have been applied to determine Vitamin D deficiency. These are:

- Mild deficiency: 30 – 49 nmol/L
- Moderate deficiency: 13* – 29 nmol/L
- Severe deficiency: <13* nmol/L
- Total deficiency: <50 nmol/L
- Adequate levels: 50 nmol/L#

* Note that the cut-off recommended in the position statement is <12.5 nmol/L, but the NATSIHMS is unable to output against this cut-off as the Vitamin D data is only available in whole numbers.

Note that the position statement states that levels may need to be 10 to 20 nmol/L higher at the end of summer, to allow for seasonal decrease.

Waist circumference

Waist circumference is associated with an increased risk of metabolic complications associated with obesity. The WHO and National Health and Medical Research Council (NHMRC) approved the following guidelines for Caucasian men and women:

WAIST MEASUREMENT GUIDELINES, Adults

	Men	Women
Not at risk	Waist circumference less than 94 cm	Waist circumference less than 80 cm
Increased risk	Waist circumference more than or equal to 94 cm	Waist circumference more than or equal to 80 cm
Greatly increased risk	Waist circumference more than or equal to 102 cm	Waist circumference more than or equal to 88 cm

TECHNICAL NOTE

RELIABILITY OF THE ESTIMATES

1 Two types of errors are possible in an estimate based on a sample survey: sampling error and non-sampling error. The sampling error is a measure of the variability that occurs by chance because a sample, rather than the entire population, is surveyed. Since the estimates in this publication are based on information obtained from a sample of persons they are subject to sampling variability; that is, they may differ from the figures that would have been produced if all persons had been included in the survey. One measure of the likely difference is given by the standard error (SE). There are about two chances in three that a sample estimate will differ by less than one SE from the figure that would have been obtained if all persons had been included, and about 19 chances in 20 that the difference will be less than two SEs.

2 Another measure of the likely difference is the relative standard error (RSE), which is obtained by expressing the SE as a percentage of the estimate. The RSE is a useful measure in that it provides an immediate indication of the percentage errors likely to have occurred due to sampling, and thus avoids the need to refer also to the size of the estimate.

$$\text{RSE}\% = \left(\frac{\text{SE}}{\text{estimate}} \right) \times 100$$

3 RSEs for the published estimates are supplied in the online version of this publication on the ABS website.

4 The smaller the estimate the higher the RSE. Very small estimates are subject to such high SEs (relative to the size of the estimate) as to detract seriously from their value for most reasonable uses. In the tables in this publication, only estimates with RSEs less than 25% are considered sufficiently reliable for most purposes. However, estimates with larger RSEs, between 25% and less than 50% have been included and are preceded by an asterisk (e.g. *3.4) to indicate they are subject to high SEs and should be used with caution. Estimates with RSEs of 50% or more are preceded with a double asterisk (e.g. **0.6). Such estimates are considered unreliable for most purposes.

5 The imprecision due to sampling variability, which is measured by the SE, should not be confused with inaccuracies that may occur because of imperfections in reporting by interviewers and respondents and errors made in coding and processing of data. Inaccuracies of this kind are referred to as the non-sampling error, and they may occur in any enumeration, whether it be in a full count or only a sample. In practice, the potential for non-sampling error adds to the uncertainty of the estimates caused by sampling variability. However, it is not possible to quantify the non-sampling error.

STANDARD ERRORS OF PROPORTIONS AND PERCENTAGES

6 Proportions and percentages formed from the ratio of two estimates are also subject to sampling errors. The size of the error depends on the accuracy of both the numerator and the denominator.

7. For proportions where the denominator is an estimate of the number of persons in a group and the numerator is the number of persons in a sub-group of the denominator group, the formula to approximate the RSE is given below. The formula is only valid when x is a subset of y.

$$\text{RSE} \left(\frac{X}{Y} \right) = \sqrt{\text{RSE}(X)^2 - \text{RSE}(Y)^2}$$

8. For proportions where the denominator and numerator are independent estimates, for example a ratio of rates relating to two separate populations such as Aboriginal and Torres Strait Islander people and non-Indigenous people, the formula to approximate the RSE is given below. The formula is only

valid when x and y are estimated from separate independent populations, and when the RSEs on x and y are small.

$$RSE\left(\frac{X}{Y}\right) = \sqrt{RSE(X)^2 + RSE(Y)^2}$$

COMPARISON OF ESTIMATES

9 Published estimates may also be used to calculate the difference between two survey estimates. Such an estimate is subject to sampling error. The sampling error of the difference between two estimates depends on their SEs and the relationship (correlation) between them. An approximate SE of the difference between two estimates (x-y) may be calculated by the following formula:

$$SE(x - y) = \sqrt{[SE(x)]^2 + [SE(y)]^2}$$

10 While the above formula will be exact only for differences between separate and uncorrelated (unrelated) characteristics of sub-populations, it is expected that it will provide a reasonable approximation for all differences likely to be of interest in this publication.

11 Another measure is the Margin of Error (MoE), which describes the distance from the population value of the estimate at a given confidence level, and is specified at a given level of confidence. Confidence levels typically used are 90%, 95% and 99%. For example, at the 95% confidence level the MoE indicates that there are about 19 chances in 20 that the estimate will differ by less than the specified MoE from the population value (the figure obtained if all dwellings had been enumerated). The 95% MoE is calculated as 1.96 multiplied by the SE.

12 The 95% MoE can also be calculated from the RSE by:

$$MoE(y) \approx \frac{RSE(y) \times y}{100} \times 1.96$$

13 The MoEs in this publication are calculated at the 95% confidence level. This can easily be converted to a 90% confidence level by multiplying the MoE by

$$\frac{1.645}{1.96}$$

or to a 99% confidence level by multiplying by a factor of

$$\frac{2.576}{1.96}$$

14 A confidence interval expresses the sampling error as a range in which the population value is expected to lie at a given level of confidence. The confidence interval can easily be constructed from the MoE of the same level of confidence by taking the estimate plus or minus the MoE of the estimate.

EXAMPLE OF INTERPRETATION OF SAMPLING ERROR

15 Standard errors can be calculated using the estimates and the corresponding RSEs. For example, in this publication, the estimated proportion of Aboriginal and Torres Strait Islander females aged 18 years and over who have abnormal total cholesterol is 22.7%. The RSE for this estimate is 7.5%, and the SE is calculated by:

$$\begin{aligned} \text{SE of estimate} &= \left(\frac{\text{RSE}}{100} \right) \times \text{estimate} \\ &= 0.075 \times 22.7 \\ &= 1.7 \end{aligned}$$

16 Standard errors can also be calculated using the MoE. For example, the MoE for the estimate of the proportion of Aboriginal and Torres Strait Islander females aged 18 years and over who have abnormal total cholesterol is +/- 3.3 percentage points. The SE is calculated by:

$$\begin{aligned} \text{SE of estimate} &= \left(\frac{\text{MoE}}{1.96} \right) \\ &= \left(\frac{3.3}{1.96} \right) \\ &= 1.7 \end{aligned}$$

17 Note due to rounding the SE calculated from the RSE may be slightly different to the SE calculated from the MoE for the same estimate.

18 There are about 19 chances in 20 that the estimate of the proportion of Aboriginal and Torres Strait Islander females aged 18 years and over who have abnormal total cholesterol is within +/- 3.3 percentage points from the population value.

19 Similarly, there are about 19 chances in 20 that the proportions of Aboriginal and Torres Strait Islander females aged 18 years and over who have abnormal total cholesterol is within the confidence interval of 19.4.% to 26.0%.

SIGNIFICANCE TESTING

20 For comparing estimates between surveys or between populations within a survey it is useful to determine whether apparent differences are 'real' differences between the corresponding population characteristics or simply the product of differences between the survey samples. One way to examine this is to determine whether the difference between the estimates is statistically significant. This is done by calculating the standard error of the difference between two estimates (x and y) and using that to calculate the test statistic using the formula below:

$$\frac{|x - y|}{\text{SE}(x - y)}$$

21 If the value of the statistic is greater than 1.96 then we may say there is good evidence of a statistically significant difference at 95% confidence levels between the two populations with respect to that characteristic. Otherwise, it cannot be stated with confidence that there is a real difference between the populations.

ABBREVIATIONS

..	not applicable
*	estimate has a relative standard error of 25% to 50% and should be used with caution
**	estimate has a relative standard error greater than 50% and is considered too unreliable for general use
#	the margin of error should be given particular consideration when using the proportion.
µg/L	Microgram per Litre
AATSIHS	Australian Aboriginal and Torres Strait Islander Health Survey
ABS	Australian Bureau of Statistics
ACR	Albumin Creatinine ratio
AHS	Australian Health Survey
ALT	Alanine aminotransferase
ASGC	Australian Standard Geographical Classification
BMI	Body Mass Index
CKD	Chronic kidney disease
CRP	C-reactive protein
CVD	Cardiovascular disease
DHM	Douglass Hanly Moir
eGFR	estimated glomerular filtration rate
FPG	fasting plasma glucose
g/L	grams per Litre
GGT	Gamma glutamyl transferase
HbA1c	Glycated haemoglobin test
HDL	High-density lipoprotein
kg	kilogram
LDL	Low-density lipoprotein
mL/min	millilitres per minute
mm Hg	millimetre of mercury
mmol/L	millimoles per Litre
MoE	Margin of Error
na	not available
NATSIHMS	National Aboriginal and Torres Strait Islander Health Measures Survey
NATSIHS	National Aboriginal and Torres Strait Islander Health Survey
NATSINPAS	National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey
nmol/L	nanomoles per Litre
RSE	relative standard error
SE	standard error
sTfR	Serum/soluble transferrin receptor
U/L	Units per Litre
WHO	World Health Organization

APPENDIX A

SUMMARY OF CHRONIC DISEASE BIOMARKERS

	Age	Test type	Fasting
Cardiovascular disease biomarkers			
Total cholesterol	18+	Blood	No
High Density Lipoprotein (HDL) cholesterol	18+	Blood	No
Low Density Lipoprotein (LDL) cholesterol	18+	Blood	Yes
Triglycerides	18+	Blood	Yes
Diabetes biomarkers			
Fasting plasma glucose	18+	Blood	Yes
Glycated Haemoglobin (HbA1c)	18+	Blood	No
Kidney disease biomarkers			
Albumin creatinine ratio (ACR)	18+	Urine	No
Estimated glomerular filtration rate (eGFR)	18+	Blood	No
Liver function biomarkers			
Alanine aminotransferase (ALT)	18+	Blood	No
Gamma glutamyl transferase (GGT)	18+	Blood	No
Tobacco use			
Cotinine	18+	Blood	No

SUMMARY OF NUTRIENT BIOMARKERS

	Age	Test type	Fasting
Folate & Vitamin B12			
Serum folate	18+	Blood	No
Serum Vitamin B12	18+	Blood	No
Iron			
Serum ferritin	18+	Blood	No
Inflammation marker (C-reactive Protein (CRP))	18+	Blood	No
Serum transferrin receptor (sTfR)	18+	Blood	No
Haemoglobin (Hb)	18+	Blood	No
Vitamin D			
Serum 25-hydroxyvitamin D [25(OH)D]	18+	Blood	No
Iodine			
Iodine concentration	18+	Urine	No

MEDIA RELEASE

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Aboriginal and Torres Strait Islander adults experience diabetes 20 years earlier than non-Indigenous adults

Aboriginal and Torres Strait Islander adults are more than three times as likely as non-Indigenous adults to have diabetes, and they experience it at much younger ages, according to new figures released by the Australian Bureau of Statistics today.

"Results from the largest ever biomedical collection for Aboriginal and Torres Strait Islander adults, which collected information on a wide range of chronic diseases and nutrition, reveal that diabetes is a major concern," said Dr Paul Jelfs from the ABS.

"The voluntary blood test results showed that in 2012–13, one in ten Aboriginal and Torres Strait Islander adults had diabetes. This means that, when age differences are taken into account, Aboriginal and Torres Strait Islander adults were more than three times as likely as non-Indigenous adults to have diabetes."

"What was even more striking was how much earlier in life Aboriginal and Torres Strait Islander adults experience diabetes. In fact, the equivalent rates of diabetes in the Aboriginal and Torres Strait Islander population were often not reached until 20 years later in the non-Indigenous population." said Dr Jelfs.

The survey revealed that diabetes was twice as common among Aboriginal and Torres Strait Islander adults living in remote areas. Around one in five in remote areas had diabetes compared with around one in ten in non-remote areas.

Also of interest was the fact that many Aboriginal and Torres Strait Islander adults with diabetes also had signs of other chronic conditions.

"More than half of all Aboriginal and Torres Strait Islander adults with diabetes also had signs of kidney disease. This compared with a third of non-Indigenous adults with diabetes", said Dr Jelfs.

"Given these findings, it is not surprising that the death rate for diabetes among Aboriginal and Torres Strait Islander people is seven times higher than for non-Indigenous people."

Other results released today suggest that many Aboriginal and Torres Strait Islander adults may not be aware they have high cholesterol, with one in four having high cholesterol levels, yet only one in ten being aware they had it.

Further information is available in Australian Aboriginal and Torres Strait Islander Health Survey: Biomedical Results, 2012–13 (cat. no. 4727.0.55.003) available for free download on the ABS website.

Media notes:

- When reporting ABS data you must attribute the Australian Bureau of Statistics (or the ABS) as the source.
- Media requests and interviews - contact the ABS Communications Section on 1300 175 070.

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