



Position Statement 17

Aboriginal and Torres Strait Islander Ageing in Australia

Key points

1. The Australian and New Zealand Society for Geriatric Medicine (ANZSGM) recognises that Australian Aboriginal and Torres Strait Islander cultures, traditions and languages are diverse and dynamic. There is no single Australian Indigenous culture and cultural systems are ever-changing and evolving.
2. The ANZSGM recognises that Aboriginal and Torres Strait Islander populations of Australia face a burden of poor health that is far greater than that experienced by the general Australian population.
3. The ANZSGM recognises that older people represent a growing proportion of the overall Aboriginal and Torres Strait Islander population, and are a group with specific health care and social needs. There is evidence that Aboriginal and Torres Strait Islander Australians experience high rates of a number of age-related health conditions, and that conditions of ageing tend to affect people at a younger age than they do other Australians.
4. The ANZSGM recognises that the care needs of older Aboriginal and Torres Strait Islander Australians may differ from those of other Australians, and recognises the need for Aged Care services that are both accessible and culturally appropriate. Aboriginal and Torres Strait Islander people utilise dementia and aged care services at a younger age than other Australians. There is a need for service provision that allows older people to be cared for within their community.
5. The ANZSGM aims to improve access to specialist Geriatric medical services to aid in the delivery of health care to older Aboriginal and Torres Strait Islander Australians. For older people living in rural and remote areas, access to specialist health care services can be a challenge. This might be overcome, in part, by the provision of specialist outreach and telehealth services.
6. The ANZSGM supports appropriate cultural competency training for Geriatricians and trainees in Geriatric Medicine. Awareness of the special history of Australian Aboriginal and Torres Strait Islander peoples and how this impacts upon health issues is included as a learning objective within the core Professional Qualities Curriculum for Geriatrics Advanced Training.
7. The ANZSGM supports increasing the number of Aboriginal and Torres Strait Islander doctors training in Geriatric Medicine, and is committed to working with the RACP and the Australian Indigenous Doctor's Association (AIDA) in supporting and mentoring doctors through training.
8. The ANZSGM supports research into the health concerns of older Aboriginal and Torres Strait Islander Australians. Knowledge of factors that impact upon healthy ageing can inform health promotion strategies, guide the provision of health services, and make a difference to health outcomes.
9. The ANZSGM values the efforts of Government and Non-Government organisations that strive for health equality for Aboriginal and Torres Strait Islander Australians. We support the Royal Australian College of Physicians in its signing of the Statement of Intent for the 'Close the Gap' Campaign, aiming for equality in health status between Aboriginal and Torres Strait Islander Australians and non-Indigenous Australians by 2030.
10. The ANZSGM supports the self-determination of Aboriginal and Torres Strait Islander peoples, and advocates that all healthcare service provision, research efforts and policy development be conducted in collaboration

with the people to whom they apply, in order to ensure that processes are conducted in a culturally sensitive and useful way.

(The full document of this Position Statement can be found at: <http://www.anzsgm.org/posstate.asp>)

This Position Statement represents the views of the Australian and New Zealand Society for Geriatric Medicine. This Statement was approved by the Federal Council of the ANZSGM on 5th December 2016. The revision of this paper was coordinated by Dr Roselani Henry and Dr Eddy Strivens. The original paper was coordinated by Dr Eddy Strivens)

Introduction

Aboriginal and Torres Strait Islander people face a burden of poor health that is far greater than that experienced by other Australians. A high mortality rate in people aged 45-65 years contributes to a younger age profile in the Aboriginal and Torres Strait Islander population, with people aged 65 and over comprising only 3.4% of the population, compared to 14% of the non-Indigenous Australian population¹.

It is estimated that life expectancy at age 50 is 27.0 years for Aboriginal and Torres Strait Islander women, which is 6.9 years lower than the life expectancy of other Australian women. The life expectancy for Aboriginal and Torres Strait Islander men at age 50 is 23.8 years, 7.2 years lower than the life expectancy of other Australian men².

Addressing this inequity of life expectancy has been the aim of the Close the Gap Campaign³. The Campaign is a collaborative effort of health bodies, health professional bodies and human rights organisations that was initiated in 2006. In 2008, the Council of Australian Governments made a commitment to the target of Close the Gap, i.e. to achieve equality of life expectancy between Aboriginal and Torres Strait Islander peoples and non-Indigenous Australians within a generation. While recent years have seen the overall indigenous mortality rate decline, there is still much progress to be made to achieve this goal³.

Notwithstanding a high mid-life mortality, the Aboriginal and Torres Strait Islander population, like the Australian population overall, is ageing,

and the proportion of people aged 65 and over is predicted to more than double by 2026¹.

Aboriginal and Torres Strait Islander people utilise dementia and aged care services, including community services and residential care, at a younger age than other Australians². Presumably, this is due to higher rates of disability occurring at a comparatively younger age.

The term 'geriatric syndrome' has been used to describe a number of health conditions that occur in elderly people. These syndromes are often multifactorial in aetiology, resulting from accumulated impairments in multiple domains; they do not necessarily fit into a discrete disease category⁴.

There are many health conditions that are common among elderly people, but whether all of these fit the designation of a 'geriatric syndrome' is debatable. In a survey of Australia-Pacific geriatricians, Won et al (2013) listed 12 conditions that were identified by 90% of respondents as geriatric syndromes recognised by their country's geriatric society. These were: dementia, falls, delirium, frailty, incontinence, hearing impairment, visual impairment, sarcopaenia, malnutrition, immobility, gait disturbance, and pressure ulcers⁵. It could be argued that, while visual impairment is a common problem for the elderly, it does not necessarily fit the definition of a syndrome. Conversely, late-life depression and anxiety, which are considered by some to be geriatric syndromes, were not included in the list. Nevertheless, to provide a scope for this report, these 12 conditions/syndromes were selected to form the basis of literature searches for this position statement.

Falls and fractures

A number of studies relating to the incidence of falls or their consequences in Australian Aboriginal and Torres Strait Islander populations were identified. Seven of these met criteria for further review and are summarised in table 3.

With respect to estimating overall prevalence or incidence of falls, only one study was identified that specifically addressed an Aboriginal or Torres Strait Islander population group. This study, by LoGuidice et al (2012), surveyed 363 Aboriginal men and women aged ≥ 45 years living in the Kimberley region of Western Australia, and found a prevalence of self- or informant-reported falls of 31%⁶.

TABLE 3: Summary of studies on falls, or consequences of falls, addressing an Australian Aboriginal and/or Torres Strait Islander population				
	Study Type	Data set	Results	Strengths and limitations
LoGiudice DC et al. 2012. Preliminary evaluation of the prevalence of falls, pain and urinary incontinence in remote living Indigenous Australians over the age of 45. <i>Intern Med J.</i>	Cross sectional study	Interviews with 363 indigenous men and women (and family members) living in 6 remote communities and one town in the Kimberley region of WA. The sample represented 17% of those over 45 y/o living in the Kimberley.	<ul style="list-style-type: none"> - Prevalence of self- or informant-reported falls was 31% (95% CI 25.3-36.7) - After adjustment for sex, age and education, associations with falls included alcohol use, stroke, epilepsy, head injury and poor hearing. 	Based on self-reported data. Relies on participant recall and reporting.
Clapham KF, Stevenson MR, Lo SK. 2006. Injury Profiles of Indigenous and non-Indigenous people in New South Wales. <i>Med J Aust.</i>	An observational analysis of NSW hospitalisation data	All injury related deaths and hospitalisations for all age groups recorded in the NSW Health Outcomes Information and Statistical Toolkit database from 1999 to 2003. Data from the 2001 Census were used to calculate rates.	<ul style="list-style-type: none"> - Rate of falls-related hospitalisation for Indigenous people in NSW was 592.94/100,000 person years. - Rate of falls-related death for indigenous people in NSW was 1.67/100,000 person years. - Rates of falls-related hospitalisation and falls-related deaths were lower for the Indigenous population than the non-Indigenous population (rate ratios 0.79 (95% CI 0.76-0.82) and 0.44 (95% CI 0.22-0.88) respectively). 	The study did not include an age breakdown of the falls data, such that the presented falls rates represented all age groups combined, including children.
Gowing CJ et al. 2015. Ten years of trauma in the 'top end' of the Northern Territory, Australia: A retrospective analysis. <i>International Emergency Nursing.</i>	An observational analysis of data collected in the Royal Darwin Hospital Trauma Registry	All trauma presentations to RDH between 01/2003 and 12/2012 with an injury severity score >9 (i.e. minimal trauma excluded). Isolated neck of femur fractures resulting from mechanical falls were excluded.	<ul style="list-style-type: none"> - Falls accounted for 19% (<i>n</i> 538) of the trauma presentations. Indigenous ethnicity was associated with fewer falls presentations (odds ratio 0.4) but more assault presentations within the study group. 	Minimal trauma falls, including isolated neck of femur fractures resulting from mechanical fall, were excluded in the study. Data not broken down by age group. Falls rates were not estimated per population.
Macintosh DJ, Pearson B. 2001.	An observational	232 patients, of whom 15 identified as indigenous, who were admitted to the	<ul style="list-style-type: none"> - Age standardised rate of femoral neck fracture was 30/10000 for indigenous women 	Small sample size. Study relied on census

Fractures of the femoral neck in Australian Aboriginals and Torres Strait Islanders. <i>Aust J Rural Health.</i> Jun;9(3):127-33.	analysis of the number of admissions for hip fracture to the Cairns Base Hospital	Cairns Base Hospital with a diagnosis of femoral neck fracture between Nov 1997 and July 2000. Data from the 1996 census were used to calculate rates.	<ul style="list-style-type: none"> - and 30/10000 for non-indigenous women - Age standardised rate of femoral neck fracture was 13/10000 for indigenous men and 5/10000 for non-indigenous men 	data to calculate rates. As the 1999 census data amalgamated indigenous and non-indigenous people over the age of 75, the age-specific rates could only be approximated.
AIHW. 2010. The problem of osteoporotic hip fracture in Australia. Bulletin 76.	An observational analysis of national data on osteoporotic hip fracture in adults over 40 y/o.	Data was sourced from the AIHW National Hospital Morbidity Database, which covers almost all public and private hospitals in Australia. For the comparison of rates by indigenous status, a data set from 2 years (2005-2007), which included 31253 non-Indigenous, and 186 Indigenous cases was used.	<ul style="list-style-type: none"> - The overall incidence of hospitalisation for osteoporotic hip fracture was 175/100,000 population in 2006/7. - Over the 2 year period 2005/2007, Indigenous males were twice as likely to have a hip fracture as other Australian males (rate ratio 2.01 (95% CI 1.70-2.54)), and Indigenous females were 26% more likely to have a hip fracture than other Australian females (rate ratio 1.26 (95%CI 1.07-1.47)). 	A large study, Australia wide. No distinction was made between fracture rates for people who identified as TSI vs Aboriginal.
Wong YY et al. 2013. Hip fractures among Indigenous Western Australians from 1999 to 2009. <i>Intern Med J.</i>	An observational analysis of Western Australia (WA) data on hip fracture in adults over 40 y/o.	All documented hospital admissions for minimal trauma hip fracture between the years 1999-2009 in WA. This included 11844 cases, of which 201 had identified as indigenous. Data from the 2006 census were used to calculate rates.	<ul style="list-style-type: none"> - Age-standardised hip fracture rate was 273.0/100,000 (95% CI 230.7-315.4) person years for indigenous adults and 148.8/100,000 (95% CI 146.1-151.5) person years for non-indigenous adults. - Standardised morbidity ratio was 2.2 (95% CI 1.9-2.5). 	A large study, limited to WA
Jamieson LM, Roberts-Thomson KF. 2007. Hospitalized head injuries among older people in Australia, 1998/1999 to 2004/2005. <i>Injury prevention.</i>	An observational analysis of national data on rates of hospitalised head injury in adults over 60 y/o.	Data was sourced from the AIHW National Hospital Morbidity Database from 1998/1999 to 2004/2005. Census data were used to calculate rates.	<ul style="list-style-type: none"> - Rate of head injury for Indigenous people was 1517.3/100,000 (95% CI 1497.8-1536.9)(all causes of injury/trauma included – not just falls) - Rates of head injury for Non-Indigenous people was 716.2/100,000 95% CI 716.1-716.3) (all causes of injury) - Falls accounted for 81.4% of head-injury hospital admissions 	The rates included head injury from all causes, not just falls

Surveys assessing the incidence of falls in a general Australian population have found that 25-30% of respondents report having had a fall in the previous year⁷⁻⁹. These studies have generally surveyed people aged over 65. LoGuidice et al (2012) report prevalence, rather than incidence over 12 months, and include a younger age group. As such it is difficult to compare the extent of the falls problem in the Kimberley group with that of the overall Australian population. Regardless, the report indicates that falls are a substantial issue for elderly in the Kimberley.

The literature search also identified two observational studies that looked at hospital presentations for trauma or injury, which included injuries from falls^{10,11}. However, neither study calculated age-standardised falls rates – their rate estimates included all age groups, even children, limiting their application to a geriatric population.

Hip fracture is the most common serious fall-related injury¹². The literature search identified three studies that relate to hip fracture rates in Aboriginal and/or Torres Strait Islander Australians.

The oldest of these, by Macintosh and Pearson (2001), analysed admissions for hip fracture to the Cairns Base Hospital over a 3-year period, including a cohort who identified as Aboriginal, Torres Strait Islander, or both. The authors calculated an age-standardised rate of femoral neck fracture of 30/10,000 population for Indigenous women, 30/10,000 for non-Indigenous women, 13/10,000 for Indigenous men, and 5/10,000 for non-Indigenous men¹³.

A much larger analysis was conducted by the Australian Institute of Health and Welfare (AIHW), using national data on hospitalisations for osteoporotic hip fracture. They reported an estimated incidence of hospitalisation for hip fracture of 247/100,000 for women, and 99/100,000 for men, aged ≥ 40 years in the financial year 2006/7. They found that, over the 2-year period of 2005-7, Indigenous men were twice as likely to have a hip fracture as other Australian men, and Indigenous women were 26% more likely to have a hip fracture than other Australian women¹⁴. Lastly, a study by Wong et al (2013) looked at hospitalisations for hip fracture in adults aged 40 years and over in Western Australia. The study reported an age-standardised hip fracture rate of 302.8/100,000 population for Indigenous women compared to 183.6/100,000 for other women. The age-standardised hip fracture rate was 244.6/100,000 for Indigenous men and 97.7/100,000 for other men. The relatively high rates of hip fracture seen in Indigenous men and

women were most pronounced in younger age groups¹⁵.

All three hip fracture studies demonstrate a significantly higher fracture rate among Indigenous men compared to other Australian men. With the exception of the study by Macintosh & Pearson (2001), rates of fracture were also shown to be higher in Indigenous women compared to other Australian women.

Macintosh & Pearson (2001) found that Indigenous women had the same rate of hip fracture as other women. The catchment area of Cairns includes the Torres Strait Islands, and as such, it seems likely that the population group in their study could have included a greater proportion of Torres Strait Islanders when compared to the other two studies. If the fracture risk profile of Torres Strait Islanders differs from that of some Aboriginal peoples this might, in part, account for the different result. However, the study had a number of limitations that restrict the inferences that can be made from its results. First, it had a relatively small sample size. Second, it relied on 1999 census data. The authors report that this census amalgamated data for Indigenous and non-Indigenous people aged over 75, which meant that they could only approximate age-specific rates.

Head injury is another serious potential consequence of falling¹². An analysis of Australian hospitalisation data on rates of head injury in adults aged ≥ 60 years, by Jamieson and Roberts-Thomson (2007), demonstrated a rate of head injury hospitalisation for Aboriginal and Torres Strait Islander Australians of 1517.3/100,000, compared to a rate of 716.2/100,000 for other Australians. These rates included head injury sustained from all causes, not just falls. The study reported that 81.4% of all head injury hospitalisations were caused by falls. However it did not report if there was a difference in the proportion of head injuries caused by falls in the Aboriginal and Torres Strait Islander group compared with the non-Indigenous population group¹⁶.

Summary – Falls: There have been a limited number of studies published that address the prevalence of falls or their consequences in Australian Aboriginal and Torres Strait Islander populations. The self-reported prevalence of falls in a sample of Aboriginal Australians aged over 45 years living in the Kimberley was 31%⁶. Rates of hip fracture hospitalisations have been estimated to be up to 1.26 to 1.65 times higher for Aboriginal and Torres Strait Islander women compared to other Australian women, and 2.01 to 2.5 times

higher for Aboriginal and Torres Strait Islander men compared to other Australian men^{14,15}. Younger age groups (i.e. 40-60 year olds) in particular suffer an increased rate of hip fracture when compared to non-Indigenous people of the same age¹⁵. Rates of head injury hospitalisations in elderly Australians, of which a large proportion are caused by falls, are also higher in the Aboriginal and Torres Strait Islander population¹⁶.

Dementia

This review aims to summarise what is known of dementia rates in Aboriginal and Torres Strait Islander peoples. This topic was also reviewed by Flicker and Holdsworth (2014) in a recent report for Alzheimer's Australia¹⁷.

The studies identified as relevant to dementia rates are given in table 4. The oldest, by Zann (1994) was conducted in far North Queensland over 6 study sites representing urban, rural and remote Aboriginal and Torres Strait Islander communities. The study found that 20% of participants aged 65 years and older had dementia. However, it did not use a validated cognitive assessment tool in the diagnosis of these cases¹⁸.

In the Kimberley region of Western Australia, high rates of dementia were suggested by an analysis of the first 116 cases seen by the Kimberley Aged Care Assessment Team in 1998. 40% of the cases had a diagnosis of dementia¹⁹.

A later study in the Kimberley, by Smith et al (2008), assessed 363 Aboriginal Australians aged ≥ 45 years²⁰. Study participants were screened with the Kimberley Indigenous Cognitive Assessment (KICA); a tool that had previously been validated in this population²¹. Participants with a score indicative of possible cognitive impairment, as well as a proportion of people with higher scores, were reviewed by a clinical specialist. Diagnosis of dementia was based on the specialist's assessment. The study reported a prevalence of dementia of 12.4% for those aged ≥ 45 years, and 26.8% for those aged ≥ 65 years. This can be compared to an estimated dementia prevalence of 3.6% in the general Australian population aged 45 and over²². The prevalence of cognitive impairment not dementia (CIND) in the Kimberley group was 8.0% in those aged ≥ 45 , and 13.4% in those ≥ 65 years²⁰.

TABLE 4: Summary of studies on dementia addressing an Australian Aboriginal and/or Torres Strait Islander population				
	Study Type	Data set	Results	Strengths and limitations
Zann S. 1994. Identification of support, education and training needs of rural/remote health care service providers involved in dementia care.	Cross-sectional study	6 aboriginal and TSI Communities in North Queensland	- 20 % of adults over 65 years of age had dementia	Non-validated instrument. Older study (1987). NQ only.
Bruce DG et al. 1998. A Preliminary Survey of Patients Seen by the Kimberley Aged Care Assessment Team. <i>Australas J Ageing.</i>	Retrospective review of ACAT cases	Review of the first 119 cases seen by the Kimberley Aged Care Assessment Team	- Chronic dementia was diagnosed in 40% of Aboriginal patients	Sample not representative of total community. High prevalence estimate anticipated.
Smith et al. 2008. High prevalence of dementia and cognitive impairment in Indigenous Australians. <i>Neurology.</i>	Cross-sectional study	Interviews, cognitive assessments (KICA), and specialist reviews of 363 Aboriginal Australians, over 45 y/o, living in rural and remote areas of the Kimberley.	<ul style="list-style-type: none"> - Prevalence of dementia was 12.4% for those ≥ 45 years old (95% CI 9.0-15.8%) - Prevalence of dementia was 26.8% for those ≥ 65 years old (95% CI 18.8-34.8%) - Prevalence of cognitive impairment no dementia (CIND) was 8.0% in those ≥ 45 years old and 13.4% in those aged ≥ 65 years old - Dementia was more frequent in men than in women (17% vs 9%) 	Validated tool Good coverage of target population -> minimize selection bias
Russel S et al. 2015. Ageing on Hammond Island: Is there cause for concern in the Torres Strait? <i>Aust J Rural Health.</i>	Small cross-sectional	Cognitive assessments (KICA modified slightly for TSI community) and Geriatric reviews of 20 residents (out of a possible 28) from one TSI community (Hammond Island) aged 45 years and over.	<ul style="list-style-type: none"> - Prevalence of dementia was 5% - Prevalence of cognitive impairment no dementia (CIND) was 20% 	Small study
Li SQ et al. 2014. Dementia prevalence and incidence among the Indigenous and non-Indigenous	Observational analysis	4 data sources: NT Hospital Separations Database, Primary Care Information System, NT Aged Care and Disability database, and NT death	<ul style="list-style-type: none"> - Estimated prevalence of dementia was 3.7/100 for the Indigenous population and 1.1/100 for the non-Indigenous population - Age-adjusted prevalence was 6.5/100 for the Indigenous population, and 2.6/100 for the 	Incomplete linkage between the 4 databases utilised could have meant that some dementia cases were counted more than

populations of the Northern Territory. <i>Med J Aust.</i>		registrations. Identified 784 diagnosed dementia cases in June 2011. Used statistical analysis to estimate unknown cases and overall prevalence.	<p>non-Indigenous population.</p> <ul style="list-style-type: none"> - Age-adjusted incidence in the Indigenous NT population aged ≥ 45 years old was 10.7/1000 person years - Rate ratios between age groups demonstrate an earlier onset of dementia in the Indigenous population compared to the non-Indigenous population 	once -> overestimation. Reliance on cases having a clinical diagnosis could have -> underestimation (although attempts were made to estimate the number of possible missed cases).
Radford K et al. 2015. Prevalence of dementia in urban and regional Aboriginal Australians. <i>Alzheimers Dement.</i> "The Koori Growing Old Well Study"	Cross-sectional study	Structures interviews and cognitive screening tests with 336 Indigenous people aged 60 years and above living across 5 urban communities – 2 in metropolitan Sydney and 3 on midnorth coast.	<ul style="list-style-type: none"> - Crude dementia prevalence was 13.4% (95% CI, 9.6–17.2) and age-Standardised prevalence was 21% (95% CI, 12.8–29.2) - Most common types were Alzheimer's (44%) and mixed dementia syndrome - Estimated prevalence of MCI was 17.7% (95% CI, 13.4–21.9) - No significant difference in dementia rate was found between women and men - 	Fairly good recruitment - ~60% Validated tools
LoGuidice D et al. 2015. Incidence and predictors of cognitive impairment and dementia in Aboriginal Australians: A follow up study of 5 years. <i>Alzheimers Dement.</i>	Longitudinal/cohort study	The cohort originally recruited for Smith et al (2008) were re-assessed ~ 5 years later. Response rate was 74% at follow up. Some extra measures were recorded at follow up that had not been recorded at recruitment (e.g. HbA1C).	<ul style="list-style-type: none"> - Incidence of dementia was 7.3 (95% CI 3.7-14.7) per 1000 person-years for those ≥ 45 years old - Incidence of dementia was 21.0 (95% CI 10.5-42.1) per 1000 person-years for those ≥ 60 years old - Factors associated with decline to cognitive impairment or dementia included previous stroke, head injury, analgesic medication, low BMI, higher systolic BP. 	Some of the exposure measures relied on self- (or informant-) reporting & could be subject to recall bias, e.g. past head injury. Some measures were subjective (e.g. alcohol use), and some of the objective measures, e.g. once off BP, may not be reflective of a long-term issue.

A follow up study of the same Kimberley cohort seen ~5 years later reported an incidence of dementia of 7.3 per 1000 person-years for those aged ≥ 45 , and 21.0 per 1000 person-years for those aged ≥ 60 years. The study included an analysis of factors postulated to be associated with cognitive decline, and found that previous stroke, head injury, analgesic medication, low BMI and higher systolic BP were associated with a decline to cognitive impairment or dementia within the cohort²³.

Dementia in the Northern Territory was explored in a study by Li et al (2014), which looked at the number of dementia diagnoses in 4 data sources, and used statistical analyses to estimate overall prevalence²⁴. The study reported a prevalence of 3.7/100 for Indigenous people and 1.1/100 for other people aged ≥ 45 years in the Northern Territory. The age-adjusted incidence of dementia in the Indigenous population aged ≥ 45 years was 10.7/1000 person years. Age-adjusted prevalence rate ratios were highest in younger age groups, suggesting that Indigenous people were often younger at time of diagnosis. A potential limitation of this study is its reliance on database recording of clinical diagnoses. It is possible that some cases were missed, or misdiagnosed. However, the authors employed modelling in their statistical analysis to attempt to estimate and account for undiagnosed cases²⁴.

Dementia prevalence in urban and regional populations of New South Wales was explored in the Koori Growing Old Well Study (KGOWS)²⁵. 336 Aboriginal and/or Torres Strait Islander people aged 60 and above living across 5 metropolitan and regional communities were screened for cognitive impairment using validated tests and structured interviews. The study reported a crude dementia prevalence of 13.4%, and an age-adjusted prevalence of 21%, contrasting with an estimated dementia prevalence of 7% in the general Australian population aged 60 and over²². Alzheimer's disease was the most common type of dementia diagnosed in the KGOWS. The estimated prevalence of mild cognitive impairment was 17.7%²⁵.

Preliminary evidence also suggests high rates of cognitive impairment and dementia in people of the Torres Strait. A study of 20 (out of an eligible 28) residents aged ≥ 45 years living in the Torres Strait community of Hammond Island, utilising geriatrician review and cognitive testing, found a prevalence of cognitive impairment of 25%, including one case of dementia. All of the participants diagnosed with dementia or CIND were men²⁶. This study is being followed by a

larger study looking at dementia prevalence across the Torres Strait.

Summary – Dementia:

Studies on dementia prevalence in Aboriginal and Torres Strait Islander populations have been conducted across 3 states or territories, in urban, regional, rural and remote populations. Consistently, these studies have demonstrated higher rates of dementia in their study populations than are seen in the general Australian population. Furthermore, it appears that this difference is most marked in younger age groups²⁴.

Vision and Hearing impairment

The self-reported prevalence of vision and hearing problems in Australian Aboriginal and Torres Strait Islander people has been reported in the Australian Bureau of Statistic's 2012-2013 Australian Aboriginal and Torres Strait Islander Health Survey (AATSIHS). This survey questioned ~ 13,000 Aboriginal and Torres Strait Islander people, and found that 87.2% of people aged 45-54, and 92.4% of people aged ≥ 55 years reported an eye or vision problem^{1,27}.

Of people aged between 45-54 years, 22.3% reported a hearing problem; a rate 1.6 times greater than that for non-Indigenous Australians in this age group. 28.5% of Aboriginal and Torres Strait Islander Australians aged ≥ 55 years reported having a hearing problem, similar to the prevalence reported for other Australians in this age group (31.3%)¹.

The literature search did not identify any other studies that addressed rates of hearing loss in an elderly Aboriginal or Torres Strait Islander population group; however, it did identify a number of studies relating to rates of eye disease (see table 5).

Results of the National Indigenous Eye Health Survey (NIEHS), a large cross-sectional study that surveyed 1189 people aged 40 and over from 30 geographical areas around Australia in 2008, were published in an AIHW report²⁸ and a series of journal articles²⁹⁻³². The population sampled in this study was chosen to represent a cross-section of the overall Australian Aboriginal and Torres Strait Islander population.

TABLE 5: Summary of studies on visual impairment addressing an Australian Aboriginal and/or Torres Strait Islander population

	Study Type	Data set	Results	Strengths & limitations
Taylor et al. 2010. The prevalence and causes of vision loss in Indigenous Australians: the National Indigenous Eye Health Survey. <i>MJA</i> .	A cross-sectional study looking at prevalence and causes of vision loss in Indigenous people living in 30 geographical areas across Australia.	1189 Indigenous people ≥40 y/o from 30 geographical areas around Australia. Data collected in 2008. Participants were recruited with aid of existing Aboriginal Medical Services, and using community promotional material.	<ul style="list-style-type: none"> - 9.4% (95% CI 0.04-0.5%) of adults ≥40 y/o had low vision (i.e.VA <6/12 to ≥ 6/60) - 1.9% (95% CI 1.1-2.6%) of adults ≥40 y/o had blindness (i.e.VA < 6/60) - The principle causes of bilateral low vision were refractive error, cataract and diabetic retinopathy. The principle causes of bilateral blindness were cataract, refractive error and optic atrophy. 	A large study, representing urban, regional and remote communities across Australia.
Taylor HR et al. 2010. Cataract in indigenous Australians: the National Indigenous Eye Health Survey. <i>Clin Experiment Ophthalmol</i> .	A cross-sectional study looking at prevalence of vision loss due to cataract in Indigenous people living in 30 geographical areas across Australia.	A standardised questionnaire was used to collect information of eye health and service utilisation. A standard eye exam was performed for each participant. When visual acuity was worse than 6/2 in an eye, a lens photograph was taken to assess for cataract.	<ul style="list-style-type: none"> - 2.52% (95% CI 1.63-3.41%) of those ≥40 y/o had low vision due to cataract - 0.59% (95% CI 0.24-1.21%) of those ≥40 y/o had blindness due to cataract - The proportion of those with visually significant cataract who had been operated on was 65% (95% CI 55.0-74.6%) 	Potential for selection bias due to the necessary recruitment methods.
Arnold AL et al. 2012. Near vision impairment and unresolved vision problems in Indigenous Australian adults. <i>Clin Experiment Ophthalmol</i> .	A cross-sectional study looking at near-vision acuity and prevalence of self-reported vision problems in Indigenous people living in 30 geographical areas across Australia.		<ul style="list-style-type: none"> - 39.7% (468/1177) presented with near-vision impairment. Of those with near-vision impairment, 37% reported not having correction. - Those in older age groups, most markedly in the age group 50-59, had increased odds of near vision impairment compared to the 40-49 age group (OR 1.91, 95% CI 1.07-3.40) - Those in the age groups 60-69 and 70+ had a decreased odds of having near-vision correction (OR 0.52 (95% CI 0.30-0.92) and OR 0.66 (95% CI 0.37-1.17) respectively) 	
Landers J et al. 2010. The prevalence and causes of visual impairment in indigenous Australians within central Australia: the Central Australian Ocular Health Study. <i>Br J Ophthalmol</i> .	A clinic-based cross-sectional analysis	1884 Indigenous adults living in one of 30 remote communities within Central Australia. Participants were recruited as they presented to the eye clinic during the period of July 2005 to June 2008.	<ul style="list-style-type: none"> - 25.1% of those ≥40 y/o had bilateral vision impairment - 3.6% of those ≥40 y/o had bilateral blindness - Adjusted Odds Ratios for bilateral vision impairment and bilateral blindness increased with advancing age. 	Large sample group. Represents Central Australia only. Potential for selection bias as clinic-based.

Landers J et al. 2012. Incidence of visual impairment and blindness in indigenous Australians within Central Australia: the Central Australian Ocular Health Study. <i>Clin Experiment Ophthalmol.</i>	A clinic-based cohort study looking at incidence of visual impairment in a Central Australian Indigenous population	Of the 1884 Indigenous adults recruited for the Central Australian Ocular Health study (see above), 608 were reviewed again between 6 months and 3 years. Snellen visual acuity testing, subjective refraction measurement and an assessment of anterior and posterior segments was performed for each participant.	<ul style="list-style-type: none"> - Annual incidence of bilateral visual impairment was 8.12% per year for those ≥ 40 y/o - Annual incidence of blindness was 0.62% per year for those ≥ 40 y/o - Refractive error, followed by cataract and diabetic retinopathy were the main causes for bilateral visual impairment and blindness. 	There were more females than males in the cohort, particularly in the follow-up groups
Landers J et al. 2013. Incidence of visual impairment due to cataract, diabetic retinopathy and trachoma in indigenous Australians within Central Australia. <i>Clin Experiment Ophthalmol.</i>	A clinic-based cohort study looking at incidence of visual impairment by cause in a Central Australian Indigenous population		<ul style="list-style-type: none"> - Incidence of visual impairment in at least one eye was 7.9% per year for cataract, 1.5% per year for diabetic retinopathy, and 0.7% per year for trachoma, for adults ≥ 40 y/o. - Advancing age was the main risk factor for all three. 	
Landers J et al. 2012. Incidence of diabetic retinopathy in indigenous Australians within Central Australia: the Central Australian Ocular Health Study. <i>Clin Experiment Ophthalmol.</i>	A clinic-based cohort study looking at incidence of diabetic retinopathy in a Central Australian Indigenous population	423 Indigenous adults with diabetes mellitus (within the Central Australian Ocular Health Study cohort) were reviewed in an initial examination, and again 6 m to 3 y later.	<ul style="list-style-type: none"> - Of those with diabetes mellitus but without retinopathy at baseline, 9.42% per year of those ≥ 40 y/o developed diabetic retinopathy. - 0.92% of those ≥ 40 y/o without diabetic retinopathy at baseline, and 9.55% of those ≥ 40 y/o with non-proliferative diabetic retinopathy at baseline, developed vision-threatening diabetic retinopathy per year. 	
Wright HR et al. 2009. Trachoma, cataracts and uncorrected refractive error are still important contributors to visual morbidity in two remote indigenous communities of the Northern Territory, Australia. <i>Clin Experiment Ophthalmol.</i>	A cross-sectional survey	260 participants. All indigenous adults ≥ 40 y/o living in 2 communities (one coastal and one desert) in the Northern Territory were invited to participate and a door-to-door survey was conducted. Visual acuity and near vision measurement (using E chart) and eye examination was performed for each.	<ul style="list-style-type: none"> - Prevalence of visual impairment (VA $< 6/12$ in the better eye) was 17% - Prevalence of blindness (VA $< 3/60$ in the better eye) was 2% - Only 34% of adults aged 60+ had vision of 6/12 or better (in their better eye) - Visual acuity deteriorated with increasing age - Trachomatous scarring was more common in the desert community (present in 78% of adults) compared to the coastal community (26%) 	

The study found that ~9.4% of the group had low vision and ~1.9% had blindness. In age-adjusted analysis, this rate of blindness was estimated to be 6 times higher than that of the general Australian population. The principal causes of bilateral low vision were refractive error, cataract and diabetic retinopathy. The principal causes of blindness were cataract, refractive error and optic atrophy. Trachoma was also a significant cause of vision loss. In contrast to the general Australian population, age related macular degeneration was not a major cause of either visual impairment or blindness³².

Near-vision impairment was also common, with 39.7% of the group being unable to read text the size of newsprint without corrective lenses. Of those with impairment, 37% reported not having near-vision correction²⁹.

Another large study published in a series of papers - the Central Australian Ocular Health Study - looked at rates of eye disease in Aboriginal adults from 30 remote communities within Central Australia seen by a visiting eye team in 2005-08³³⁻³⁶. The clinic-based nature of this study leaves it subject to selection bias; people seen in a clinic are more likely to be unwell. The study found relatively high rates of vision impairment (25.1%) and blindness (3.6%). As in the NIEHS, refractive error, followed by cataract and diabetic retinopathy were the main causes of bilateral visual impairment. Trachoma was also a concern, with an incidence of 0.7% per year³⁶.

A smaller study by Wright et al (2009) surveyed 260 Indigenous adults aged 40 and over living in 2 remote communities - one coastal and one desert - in the Northern Territory. They found a prevalence of visual impairment of 17% and a prevalence of blindness of 2%. Trachomatous scarring was ~3 times more common in the desert community compared to the coastal community³⁷.

Several older studies were also identified, but for the sake of brevity they have not been included in this review.

Summary – Vision and Hearing Impairment:

Recent studies demonstrate high rates of vision impairment in Aboriginal and Torres Strait Islander populations^{32,34}. One of the largest of these estimated that the rate of blindness in Aboriginal and Torres Strait Islander adults aged over 40 years was 6 times that seen in other Australians of the same age²⁸. When compared to the general Australian population, the Aboriginal and Torres Strait Islander population suffers a larger burden of eye disease related to diabetic retinopathy and

trachoma, and a lesser burden related to age related macular degeneration and glaucoma²⁸.

There has been little published on the prevalence of hearing impairment in older Aboriginal and Torres Strait Islander Australians. In the 2012-13 AATSIHS, rates of self-reported hearing impairment in adults aged 45 and older were similar or greater than age-matched rates in other Australians¹.

Incontinence

Two studies were identified that addressed rates of incontinence in Aboriginal population groups.

Benness and Manning surveyed a group of 281 rural-dwelling Aboriginal women using a doctor-administered questionnaire, and found a prevalence of urinary incontinence of 54%. Their data were presented at a National Continence Foundation of Australia Conference in 1999, and cited in a report by Millard et al (2001)³⁸. The age range of the women sampled and the questions asked in the survey were not stated in the report.

LoGiudice et al (2012), in their study of 363 Aboriginal Australians of the Kimberley region ≥ 45 years old, found a self-reported rate of incontinence of 9%⁶.

Both of these studies surveyed a relatively small sample and used a questionnaire that had not been previously validated for assessing continence.

Both studies report a prevalence of incontinence that appears higher than that seen in the general Australian population. It has been estimated that 7.2% of Australians ≥ 65 years of age experience severe incontinence, defined by the need for continence aids and/or assistance with bladder or bowel control³⁹. Certainly several risk factors for incontinence, including diabetes and dementia, are known to be more common in Australian Aboriginal and Torres Strait Islander populations when compared to the general Australian population⁴⁰.

Frailty

Frailty is a clinically recognisable state of increased vulnerability to stressors, which is thought to result from the accumulation of impairments in multiple physiological systems over time^{41,42}. Different methods have been used for the empirical assessment of frailty for the purposes of diagnosis and research^{43,44}. Estimates of the prevalence of frailty in Australia depend on the criteria used for diagnosis⁴⁵.

This review found no studies that addressed the prevalence of frailty in an Aboriginal or Torres Strait Islander cohort. However, the Freemantle Diabetes Study, a cohort study which followed people with type 2 diabetes including a small number who identified as Indigenous Australian, found that Indigenous ethnicity was a predictor of the development of difficulties with basic activities of daily living over a ~5 year follow up period ⁴⁶. This suggests an increased risk of frailty in this group.

The rates of many chronic diseases are known to be high in Aboriginal and Torres Strait Islander populations. Furthermore, Aboriginal and Torres Strait Islander Australians are more likely than other Australians to have more than one chronic medical condition ⁴⁰. Given the presumed cumulative contribution of multiple medical conditions towards the development of frailty, it would be reasonable to hypothesise that frailty will be prevalent among elderly Aboriginal and Torres Strait Islanders.

Sarcopaenia and Malnutrition

Sarcopaenia has been defined as a combination of low muscle mass and low strength and/or performance ⁴⁷. Malnutrition is a potential contributor to both sarcopaenia and frailty.

This review did not identify any studies that addressed the prevalence of sarcopaenia in an Aboriginal or Torres Strait Islander cohort. Additionally, while there is a wealth of published literature regarding nutritional concerns in Aboriginal and Torres Strait Islander Australians, no articles were identified that specifically addressed malnutrition in an older age group. The AATSIHS suggests high rates of inadequate fruit and vegetable intake across all ages, as well as high rates of both underweight and overweight status in adults ⁴⁰.

Immobility and Gait Disturbance

The 2012 Survey of Disability, Ageing and Carers (SDAC) found that 21% of Australian women and 14% of men aged ≥ 65 years reported needing assistance for mobility ⁴⁸.

The SDAC reported higher rates of disability in Aboriginal and Torres Strait Islander people than in other Australians across all age groups. However, the contribution of poor mobility to overall disability was not clear ⁴⁹.

In the 2012-13 AATSIHS, 47.0% of people aged 45-54 years, and 59.8% of people aged ≥ 55

years, reported having a long-term musculoskeletal condition ¹.

As part of their study on dementia in the Kimberley, Smith et al (2010) collected information on a variety of potential associated factors, including poor mobility. They found that 50% of their sample population reported a history of poor mobility ⁵⁰.

This review did not identify any other research papers addressing gait disturbance or mobility limitation in an Aboriginal or Torres Strait Islander cohort.

Delirium and Pressure Ulcers

No studies were identified that addressed the incidence of delirium or pressure ulcers in Australian Aboriginal or Torres Strait Islander cohorts. It remains to be seen if rates differ from those seen in the general population.

Discussion

This report reviews the literature on the prevalence of selected conditions of ageing within Australian Aboriginal and Torres Strait Islander populations. The methodology used to search for publications aimed to be comprehensive; three databases were searched using Boolean strings that were intended to identify any relevant publications, and these searches were supplemented by examining the reference lists of key papers for additional resources. Nevertheless, it is possible that some relevant studies were missed.

The search revealed that, despite numerous gaps in the published literature, there is evidence to suggest that Aboriginal and Torres Strait Islander peoples experience high rates of a number of geriatric conditions.

A number of fairly robust studies have demonstrated higher rates of dementia, hip fracture and visual impairment in Aboriginal and Torres Strait Islander population groups, compared to non-Indigenous groups. Preliminary research also suggests higher rates of incontinence, hearing impairment and poor mobility in Aboriginal and/or Torres Strait Islander cohorts.

For some conditions, such as delirium and pressure sores, there is an absence of published literature addressing prevalence in Aboriginal or Torres Strait Islander populations. Additionally, there have been no studies published that specifically address the prevalence of frailty in these populations. However, given the presumed cumulative contribution of multiple medical

conditions towards its development, and the high rates of chronic disease and disability that are seen in Aboriginal or Torres Strait Islander populations, it would be reasonable to hypothesise that frailty prevalence will be high.

There is a suggestion that conditions of ageing tend to affect Aboriginal and Torres Strait Islander people at a younger age than they do other Australians. This has been established most robustly for dementia and hip fracture, but also may be true of a number of other conditions. This does not mean that Aboriginal and Torres Strait Islander people grow old faster than non-Indigenous Australians. Rather, it is thought that conditions experienced in younger life predispose to the early onset of syndromes that would classically be seen at older ages⁵¹. Current policy allows for the provision of aged care services to Aboriginal and Torres Strait Islanders at a younger age (i.e. over 50 y/o) than other Australians. It has been argued that this incorrectly labels Aboriginal and Torres Strait Islanders aged over 50 years of age as 'old', and does not reflect the fact that a non-Indigenous person in their 70s will have different service needs to an Aboriginal or Torres Strait Islander person in their 50s⁵².

Why are there so few studies on geriatric syndromes in Aboriginal and Torres Strait Islander peoples? The paucity may relate to the difficulties inherent in studying some of these conditions. For example, research on delirium rates can be challenged by the fact that it can be an under-reported condition⁵³. The lack of studies might also reflect difficulties specific to conducting research in Aboriginal and Torres Strait Islander communities, where cultural barriers require negotiation and where, in some cases, remoteness might pose a physical barrier. It might also be the result of a focus within Aboriginal and Torres Strait Islander health research on conditions that affect younger age groups, such as circulatory disease and diabetes, which contribute to the life expectancy inequality that is the focus of Close the Gap efforts.

Close the Gap initiatives are likely to influence the health of the ageing Aboriginal and Torres Strait Islander population in a number of ways. Efforts to eliminate trachoma from remote communities are having success, which will translate to improvements in rates of vision impairment⁵⁴. Strategies to address chronic diseases and their risk factors are also having some success. For example smoking rates in Aboriginal and Torres Strait Islander adults, which have been the target of public health campaigns, are declining⁵⁵. Given that some geriatric conditions (e.g. dementia) share many risk factors of mid-life chronic

diseases, and that chronic diseases themselves can confer risk for later life geriatric syndromes, Close the Gap efforts are likely to translate, over time, to a healthier aged population. However, with improvements to mid-life mortality we will see more people reaching older ages and having the potential to develop conditions of ageing. This might lead to an increase in the total number of people living with these syndromes.

There is a call for further research into all of the geriatric syndromes discussed in this report. Knowledge of the prevalence of these conditions will allow resources to be targeted towards areas of need. Furthermore, an understanding of the risk and protective factors for these conditions could be used to inform prevention strategies. It is clear that geriatric syndromes play a role in the health inequalities faced by Australian Aboriginal and Torres Strait Islander populations. It is important that, in addition to targeting equality of life expectancy, future initiatives aim to address life quality, which includes the provision of accessible aged care support for Aboriginal and Torres Strait Islander people.

References

1. Australian Institute of Health and Welfare. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples. 2015;Cat. no. IHW 147. Canberra.
2. Australian Institute of Health and Welfare. Older Aboriginal and Torres Strait Islander people. 2011;Cat. no. IHW 44. Canberra.
3. Holland C. Close the Gap Progress & Priorities Report, Close the Gap Campaign Steering Committee for Indigenous Health Equality, 2016. <https://http://www.humanrights.gov.au/our-work/aboriginal-and-torres-strait-islander-social-justice/publications/close-gap-progress;>
4. Inouye SK, Studenski S, Tinetti ME, Kuchel GA. Geriatric syndromes: clinical, research, and policy implications of a core geriatric concept. *Journal of the American Geriatrics Society* 2007;55:780-91.
5. Won CW, Yoo HJ, Yu SH, et al. Lists of geriatric syndromes in the Asian-Pacific geriatric societies. *European Geriatric Medicine* 2013;4:335-8.
6. LoGiudice DC, Smith K, Atkinson D, et al. Preliminary evaluation of the prevalence of falls, pain and urinary incontinence in remote living

Indigenous Australians over the age of 45 years. *Internal medicine journal* 2012;42:e102-7.

7. Gill T, Taylor AW, Pengelly A. A population-based survey of factors relating to the prevalence of falls in older people. *Gerontology* 2005;51:340-5.

8. NSW Department of Health. New South Wales Falls Prevention Baseline Survey: 2009 Report. Centre for Health Advancement and Centre for Epidemiology and Research. 2010. NSW Sydney.

9. Lord SR, Ward JA, Williams P, Anstey KJ. An epidemiological study of falls in older community-dwelling women: the Randwick falls and fractures study. *Australian journal of public health* 1993;17:240-5.

10. Clapham KF, Stevenson MR, Lo SK. Injury profiles of Indigenous and non-Indigenous people in New South Wales. *The Medical journal of Australia* 2006;184:217-20.

11. Gowing CJ, McDermott KM, Ward LM, Martin BL. Ten years of trauma in the 'top end' of the Northern Territory, Australia: a retrospective analysis. *International emergency nursing* 2015;23:17-21.

12. Bradley C. Hospitalisations due to falls by older people, Australia 2009–10. 2013; *Injury research and statistics series no. 70*. Cat. no. INJCAT 146; Canberra: AIHW.

13. MacIntosh DJ, Pearson B. Fractures of the femoral neck in Australian Aboriginals and Torres Strait Islanders. *The Australian journal of rural health* 2001;9:127-33.

14. Australian Institute of Health and Welfare. The problem of osteoporotic hip fracture in Australia. 2010; *Bulletin no. 76*. Cat. no. AUS 121. Canberra: AIHW.

15. Wong YY, Flicker L, Draper G, Lai MM, Waldron N. Hip fractures among indigenous Western Australians from 1999 to 2009. *Internal medicine journal* 2013;43:1287-92.

16. Jamieson LM, Roberts-Thomson KF. Hospitalized head injuries among older people in Australia, 1998/1999 to 2004/2005. *Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention* 2007;13:243-7.

17. Flicker L, Holdsworth K. Aboriginal and Torres Strait Islander People and Dementia: A

review of the research A report for Alzheimer's Australia. Paper 41. 2014.

18. Zann S. Identification of support, education and training needs of rural/remote health care service providers involved in dementia care. Rural health, support, education and training (RHSET) Project Progress Report. 1994. Northern Regional Health Authority, 4, Queensland.

19. Bruce DG, Baird M, Saddler AH, Goldswain P. A Preliminary Survey of Patients Seen by the Kimberley Aged Care Assessment Team. *Australasian journal on ageing* 1998;17:95-7.

20. Smith K, Flicker L, Lautenschlager NT, et al. High prevalence of dementia and cognitive impairment in Indigenous Australians. *Neurology* 2008;71:1470-3.

21. LoGiudice D, Smith K, Thomas J, et al. Kimberley Indigenous Cognitive Assessment tool (KICA): development of a cognitive assessment tool for older indigenous Australians. *International psychogeriatrics / IPA* 2006;18:269-80.

22. Australian Institute of Health and Welfare. Australia's health 2014. *Australia's health series no. 14*. Cat. no. AUS 178. Canberra: AIHW. 2014.

23. Lo Giudice D, Smith K, Fenner S, et al. Incidence and predictors of cognitive impairment and dementia in Aboriginal Australians: A follow-up study of 5 years. *Alzheimer's & dementia : the journal of the Alzheimer's Association* 2015.

24. Li SQ, Guthridge SL, Eswara Aratchige P, et al. Dementia prevalence and incidence among the Indigenous and non-Indigenous populations of the Northern Territory. *The Medical journal of Australia* 2014;200:465-9.

25. Radford K, Mack HA, Draper B, et al. Prevalence of dementia in urban and regional Aboriginal Australians. *Alzheimer's & dementia : the journal of the Alzheimer's Association* 2015;11:271-9.

26. Russell S, Strivens E, LoGiudice D, Smith K, Helmes E, Flicker L. Ageing on Hammond Island: Is there cause for concern in the Torres Strait? *The Australian journal of rural health* 2015.

27. Australian Bureau of Statistics. Australian Aboriginal and Torres Strait Islander Health Survey: First Results, Australia, 2012-13 2013; ABS cat. no 4727.0.55.001. Canberra.

28. Australian Institute of Health and Welfare. Eye health in Aboriginal and Torres Strait Islander people. 2011; Cat. no. IHW 49. Canberra.
29. Arnold AL, Goujon N, Busija L, et al. Near-vision impairment and unresolved vision problems in Indigenous Australian adults. *Clinical & experimental ophthalmology* 2013;41:223-30.
30. Taylor HR, Fox SS, Xie J, Dunn RA, Arnold AL, Keeffe JE. The prevalence of trachoma in Australia: the National Indigenous Eye Health Survey. *The Medical journal of Australia* 2010;192:248-53.
31. Taylor HR, Xie J, Arnold AL, et al. Cataract in indigenous Australians: the National Indigenous Eye Health Survey. *Clinical & experimental ophthalmology* 2010;38:790-5.
32. Taylor HR, Xie J, Fox S, Dunn RA, Arnold AL, Keeffe JE. The prevalence and causes of vision loss in Indigenous Australians: the National Indigenous Eye Health Survey. *The Medical journal of Australia* 2010;192:312-8.
33. Landers J, Henderson T, Abhary S, Craig J. Incidence of diabetic retinopathy in indigenous Australians within Central Australia: the Central Australian Ocular Health Study. *Clinical & experimental ophthalmology* 2012;40:83-7.
34. Landers J, Henderson T, Craig J. The prevalence and causes of visual impairment in indigenous Australians within central Australia: the Central Australian Ocular Health Study. *The British journal of ophthalmology* 2010;94:1140-4.
35. Landers J, Henderson T, Craig JE. Incidence of visual impairment and blindness in indigenous Australians within Central Australia: the Central Australian Ocular Health Study. *Clinical & experimental ophthalmology* 2012;40:657-61.
36. Landers J, Henderson T, Craig JE. Incidence of visual impairment due to cataract, diabetic retinopathy and trachoma in indigenous Australians within central Australia: the Central Australian Ocular Health Study. *Clinical & experimental ophthalmology* 2013;41:50-5.
37. Wright HR, Keeffe JE, Taylor HR. Trachoma, cataracts and uncorrected refractive error are still important contributors to visual morbidity in two remote indigenous communities of the Northern Territory, Australia. *Clinical & experimental ophthalmology* 2009;37:550-7.
38. Millard R CP, Bower W, Szonyi G & Talley N. The epidemiology of urinary incontinence within the community. Canberra: DoHA; 2001.
39. Australian Institute of Health and Welfare. Incontinence in Australia. 2013; Cat. no. DIS 61. Canberra.
40. Australian Bureau of Statistics. Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results, 2012-13. 2014; ABS cat. no 4727.0.55.006. Canberra.
41. McMillan GJ, Hubbard RE. Frailty in older inpatients: what physicians need to know. *QJM : monthly journal of the Association of Physicians* 2012;105:1059-65.
42. Xue QL. The frailty syndrome: definition and natural history. *Clinics in geriatric medicine* 2011;27:1-15.
43. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. *The journals of gerontology Series A, Biological sciences and medical sciences* 2001;56:M146-56.
44. Rockwood K, Andrew M, Mitnitski A. A comparison of two approaches to measuring frailty in elderly people. *The journals of gerontology Series A, Biological sciences and medical sciences* 2007;62:738-43.
45. Widagdo IS, Pratt N, Russell M, Roughead EE. Predictive performance of four frailty measures in an older Australian population. *Age and ageing* 2015;44:967-72.
46. Bruce DG, Davis WA, Davis TM. Longitudinal predictors of reduced mobility and physical disability in patients with type 2 diabetes: the Fremantle Diabetes Study. *Diabetes care* 2005;28:2441-7.
47. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. *Age and ageing* 2010;39:412-23.
48. Australian Bureau of Statistics. Disability, Ageing and Carers, Australia: Summary of Findings, 2012. 2013; ABS cat. no 4430.0. Canberra.
49. Australian Institute of Health and Welfare. Aboriginal and Torres Strait Islander people with disability: wellbeing, participation and support. 2011; IHW 45. Canberra.

50. Smith K, Flicker L, Dwyer A, et al. Factors associated with dementia in Aboriginal Australians. *The Australian and New Zealand journal of psychiatry* 2010;44:888-93.
51. Maguire G, Wenitong M. Indigenous ageing: walking backwards into the future. *Baker IDI Perspectives* 2012;6:5-7.
52. Cotter P, Anderson I, Smith LR. Indigenous Australians: Ageing without longevity? In: Borowski A, Encel S, Ozanne E, eds. *Longevity and Social Change in Australia*. Sydney: UNSW Press; 2007:65-98.
53. Davis DH, Kreisel SH, Muniz Terrera G, et al. The epidemiology of delirium: challenges and opportunities for population studies. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry* 2013;21:1173-89.
54. Commonwealth of Australia, Department of the Prime Minister and Cabinet. *Closing the Gap Prime Minister's Report 2016*.
55. Australian Health Ministers' Advisory Council, 2015, *Aboriginal and Torres Strait Islander Health Performance Framework 2014 Report*, AHMAC, Canberra.

