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Falls in older Aboriginal people: risk factors, burden, and  
development of a culturally appropriate fall prevention  
intervention

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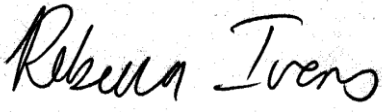
University of Sydney

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*This thesis is submitted in fulfilment of the requirements for the degree of  
Doctor of Philosophy*

## Supervisor's statement

As the primary supervisor of Caroline Lukaszuk's doctoral work, I certify that I consider this thesis to be suitable for examination.

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13th October, 2017

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## Candidate's statement

This is to certify that, to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis has been acknowledged.

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13th October, 2017

Caroline Lukaszuk

## Authorship attribution statement

<b>Chapter 2</b>	
Status:	Published
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Contribution:	I designed the study, conducted the literature search, performed data extraction and analysis and wrote the manuscript.

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Contribution:	I designed the study, extracted and analysed the data and wrote the manuscript.

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Contribution:	I designed the study and the data collection instruments, performed data collection, analysed the data and wrote the manuscript.

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Contribution:	I designed the study and the data collection instruments, assisted with data collection, analysed the data and wrote the manuscript.

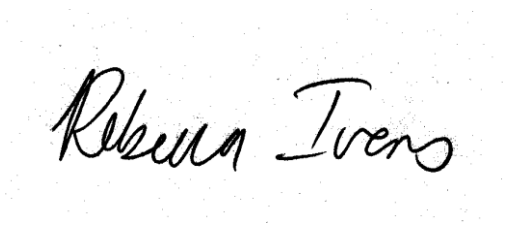
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Contribution:	I designed the study and the data collection instruments, managed data collection, analysed the data and wrote the manuscript.

In addition to the statements above, in cases where I am not the corresponding author of a published item (including manuscripts presented in Appendices to this thesis), permission to include the published material has been granted by the corresponding author.



Caroline Lukaszyk  
13th October, 2017

As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.



Rebecca Ivers  
13th October, 2017

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## Outcomes arising from this thesis

### Peer-reviewed publications

Lukaszyk, C., Harvey, L., Sherrington, C., Keay, L., Tiedemann, A., Coombes, J., Clemson, L., Ivers, R., Risk factors, incidence, consequences and prevention strategies for falls and fall-injury within older indigenous populations: a systematic review. *Australian and New Zealand Journal of Public Health* 40.6 (2016): 564-568.

Lukaszyk, C., Harvey, L., Sherrington, C., Close, JCT., Coombes, J., Mitchell, R., Moore, R., Ivers, R., Fall-related hospitalisations of older Aboriginal and Torres Strait Islander people and other Australians. *Medical Journal of Australia* 207 (1) (2017): 31-35.

Lukaszyk, C., Radford, K., Delbaere, K., Ivers, R., Rogers, K., Sherrington, C., Tiedemann, A., Coombes, J., Daylight, G., Draper, B., Broe, T., Risk factors for falls among older Aboriginal people in urban and regional communities in Australia. *Australasian Journal on Ageing* [In Press]

Lukaszyk, C., Coombes, J., Keay, L., Sherrington, C., Tiedemann, A., Broe, T., Lovitt, L., Ivers, R., Fall prevention services for older Aboriginal people: investigating availability and acceptability. *Public Health Research and Practice* 26.5 (2016): e2651659-e2651659.

Lukaszyk, C., Coombes, J., Turner, NJ., Hillmann, E., Keay, L., Tiedemann, A., Sherrington, C., Ivers, R., Yarning about fall prevention: community consultation to discuss falls and appropriate approaches to fall prevention with older Aboriginal and Torres Strait Islander people. *BMC Public Health*, 2018. **18:77**

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Clemson, L., Mackean T., Ivers, R., The Ironbark Program: implementation and impact of a community-based fall prevention program for older Aboriginal and Torres Strait Islander people [under review at the Health Promotion Journal of Australia]

### Related publications not included in this thesis

Angell B, Eades S, Ivers R, Keay L, Lukaszyk C, Coombes J, Jan S. *Patient preferences for an Aboriginal-specific falls prevention program: measuring the value of culturally-appropriate care*. Health Economics, 2017. [Under review]

Coombes J, Lukaszyk C, Sherrington C, Tiedemann A, Keay L, Moore R, Ivers R. *Perspectives on healthy ageing from First Nation Elders in NSW, Australia*. Asia Pacific Journal of Public Health, 2017. [Under review]

### Related reports not included in this thesis

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R., The Ironbark Project; Preventing falls in older Aboriginal people in NSW. Final project report to the Partnerships and Strategy Branch, Centre for Population Health (2016)



## Abstracts – oral conference presentations

Lukaszyk, C., Harvey, L., Sherrington, C., Close, J., Coombes, J., Mitchell, R., Moore, R., Ivers, R. Fall-related injury hospitalisations for Aboriginal and Torres Strait Islander people aged 50+ in New South Wales, Australia, *15<sup>th</sup> World Congress on Public Health*, April 2017, Melbourne, Australia

Lukaszyk, C., Harvey, L., Sherrington, C., Close, J., Coombes, J., Ivers, R. Investigating hospitalisations due to fall-related injury for older Aboriginal and Torres Strait Islander people in New South Wales, Australia, *7<sup>th</sup> Biennial Australia and New Zealand Falls Prevention Conference*, November 2016, Melbourne, Australia

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Preventing falls amongst older Aboriginal people: development and pilot evaluation of the Ironbark Program, *15<sup>th</sup> National Conference of Emerging Researchers in Ageing*, October 2016, Canberra, Australia

Lukaszyk, C., Approaches to preventing falls amongst older Aboriginal people, *Travelling Rural Fall Prevention Network Forum*, September 2016, Broken Hill, Dubbo, Australia, **invited speaker**

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Developing and trialling a culturally appropriate fall prevention program for older Aboriginal people, *Australian Health Promotion Association*, June 2016, Perth, Australia

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Approaches to developing a falls prevention program for older Aboriginal people, *Australian Injury Prevention Network*, November 2015, Sydney, Australia

Lukaszyk, C., Coombes, J., Falls Prevention in Older Aboriginal People: Approaches to Program Development, *Championing Falls in April Forum*, April 2015, Sydney, Australia, **invited speaker**

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Falls prevention in older Aboriginal people: service audit and yarning circle discussions, *Australian Injury Prevention Network*, November 2014, Sydney, Australia

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Mack, H., Ivers, R. The Ironbark Project: Fall Prevention in Older Aboriginal People in NSW, *Australian and New Zealand Falls Prevention Conference*, November 2014, Sydney, Australia

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Ironbark Project Service Audit on Fall Prevention in Aboriginal People, *Emerging Health Policy Research Conference*, October 2014, Sydney, Australia

## Abstracts – poster conference presentations

Lukaszyk, C., Coombes, J., Keay, L., Sherrington, C., Tiedemann, A., Turner, N.J., Cumming, R., Broe, T., Hillmann, E., Ivers, R. Working together to develop and trial a culturally appropriate fall prevention program for older Aboriginal people. *Lowitja Institute International Indigenous Health and Wellbeing Conference*, November 2016, Melbourne, Australia

Lukaszyk, C., Harvey, L., Close, J., Ivers, R. Investigating fall-related injury hospitalisations for older Indigenous people in Australia, *12th World Conference on Injury Prevention and Safety Promotion*, September 2016, Tampere, Finland

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Ivers, R. Developing and trialling a culturally appropriate fall prevention program for older Aboriginal people, *RICH forum*, March 2015, Multiple locations, Australia

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## Acknowledgement of Country

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## A note on terminology

As author of this thesis, I recognise the two distinctive First Nations populations of Australia; Aboriginal and Torres Strait Islander people. The vast majority of work for this thesis has taken place within New South Wales (NSW), where 95.4% of the First Nations population is Aboriginal. Due to this, the term 'Aboriginal' will be used when referring to Australian First Nations people throughout this thesis. This is for brevity only and is not intended in any way to diminish the importance of Torres Strait Islander people.

The following Aboriginal terminology is used within this thesis when providing cultural context to this work. Definitions have been provided by the Miromaa Aboriginal Language and Technology Centre:

**Land:** the term 'Land' is used by Aboriginal people to describe their ecosystems. This is a sum total of spiritual beliefs, including Dreamings, all living things, including totems, and all physical factors, such as sacred sites, water, air and geographical features.

**Country:** a term meaning the area of land, river and sea that is the traditional land of each Aboriginal language group or community.

**Kinship:** a key aspect of Aboriginal cultures and values. It includes the importance of all relationships, and of being related to and belonging to the land.

## List of abbreviated terms

<b>ABS</b>	Australian Bureau of Statistics
<b>ACCHO</b>	Aboriginal Community Controlled Health Organisation
<b>ADL</b>	Activity of Daily Living
<b>AH&amp;MRC</b>	Aboriginal Health and Medical Research Council
<b>AHW</b>	Aboriginal Health Worker
<b>AIHW</b>	Australian Institute of Health and Welfare
<b>APDC</b>	Admitted Patient Data Collection
<b>AUD</b>	Australian Dollar
<b>BCW</b>	Behaviour Change Wheel
<b>BMC</b>	BioMed Central
<b>BMI</b>	Body Mass Index
<b>CCI</b>	Charlson Comorbidity Index
<b>CDC</b>	Centers for Disease Control and Prevention
<b>CHeReL</b>	NSW Centre for Health Record Linkage
<b>CI</b>	Confidence Interval
<b>COREQ</b>	Consolidated Criteria for Reporting Qualitative Research
<b>DCE</b>	Discrete Choice Experiment
<b>HREC</b>	Human Research Ethics Committee
<b>ICD-10-AM</b>	International Statistical Classification of Diseases and Related Problems, 10 <sup>th</sup> Revision, Australian Modification
<b>IPEQ</b>	Incidental and Planned Exercise Questionnaire
<b>KGOWS</b>	Koori Growing Old Well Study
<b>LOS</b>	Hospital Length of Stay
<b>mKICA</b>	Modified Kimberley Indigenous Cognitive Assessment Tool
<b>MMSE</b>	Mini-Mental State Examination
<b>mPHQ-9</b>	Modified Patient Health Questionnaire
<b>NACCHO</b>	National Aboriginal Community Controlled Health Organisation
<b>NSW</b>	New South Wales
<b>PRISMA</b>	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
<b>RR</b>	Relative Risk
<b>SD</b>	Standard Deviation
<b>Short FES-I</b>	Shortened version of the Falls Efficacy Scale-International
<b>SPPB</b>	Short Physical Performance Battery
<b>SRR</b>	Age-standardised Rate Ratio
<b>STROBE</b>	STrengthening the Reporting of OBservational studies in Epidemiology
<b>TIDieR</b>	Template for Intervention Description and Replication
<b>US</b>	United States
<b>WA</b>	Western Australia

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## Abstract

Falls can have a devastating impact on the health and well-being of an older person. Severe fall-related injury can result in hospitalisation, permanent disability and placement in residential care. Approximately one in three Australians aged 65 years and older will experience at least one fall per year. To address this issue, a variety of effective fall prevention programs are delivered in community settings across the country.

Aboriginal people experience a greater burden and an earlier onset of health conditions associated with ageing than other Australians. This stems from high rates of chronic illness affecting Aboriginal people at younger ages. Prior to this thesis, limited available data suggested that falls may too have a significant impact on the health of older Aboriginal people. Aboriginal kinship systems place a large importance on older Aboriginal people maintaining their independence and ageing in community. Falls may prevent this from occurring.

This thesis investigates the burden and impact of falls and fall-related injury on older Aboriginal people, using this knowledge to guide the development and trial of a newly developed, Aboriginal-specific fall prevention program. Early research stages identified few available mainstream fall prevention programs to be accessed by older Aboriginal people despite an apparent need. Community consultation identified important features to incorporate into a relevant and enjoyable Aboriginal healthy ageing program. With guidance from Aboriginal community leaders, an Aboriginal-specific fall prevention program, the Ironbark Program, was developed and trialled in six Aboriginal communities over a 3-6 month period.

This thesis identifies a need for multifaceted, community-based, healthy ageing services for older Aboriginal people, delivered within culturally safe models of care in response to community priorities. It affirms the need for additional investment into community-based Aboriginal controlled health and community organisations for the provision of appropriate and effective healthy ageing support for older Aboriginal people.

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## Chapter 1: Introduction

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*“My late mother, a Kamilaroi woman, she was nearly 90 and she used to live on the banks of Currawong Creek in the Monaro. The nearest neighbour was seven or eight miles away. She generated her own electricity, pumped her own water up from the creek, every day of her life, cold water under the tank stand - summer, winter. We’re talking about the Monaro, icy cold.*

*I’m independent like my mother, I’m living on my own. What frightens me is if anyone tried to take me away. I’ve got a lot of trouble with my vision, I walk with a cane from time to time to stop falling over, so I can judge where the footpath is, and where everything else is. You’re not going to put me in a bloody retirement village; I need to be independent.”*

-Yarning Circle participant, Nowra

## 1.1 The context for health of Aboriginal people

Aboriginal and Torres Strait Islander people are the First Nations people of Australia, believed to have inhabited the Australian continent for over 65,000 years [1]. They maintain a close connection to land and Country, with land forming a core component of traditional Aboriginal lore and spirituality [2]. Historically, semi-nomadic hunter-gatherer lifestyles provided access to nutritious food, fresh water and promoted physical activity, facilitating good health [3]. Aboriginal communities collectively raised young children with complex concepts of kinship defining the relationships and roles of individuals [4]. Communities were led by Aboriginal Elders, who were recognised as ‘custodians of knowledge and lore’ who had ‘permission to disclose knowledge and beliefs’ to younger generations [5]. Connectedness to culture, Country and community was strong, promoting well-being [3].

In 1788, Australia was colonised by the British Empire. The resulting massacres, incarceration, forced removal from land and spread of disease decimated the Aboriginal population [6]. The devastation caused is reflected by the size of the Aboriginal population at this time, which decreased from an estimated 300,000 people prior to European settlement to 60,000 people in 1920 [7]. Attempts were made to forcibly assimilate Aboriginal people into Western culture from the late 1800s. During 1910-1970, Aboriginal children were removed from their homes and families by federal and state governments to be relocated into Western households and institutions [8]. These children are now referred to as the Stolen Generation.

Australia’s Aboriginal population continues to be impacted by the marginalisation and disempowerment caused by colonisation, reflected through high rates of poverty and poor health [9]. A high burden of chronic illness, infectious disease, social problems and injuries [6] result in average life expectancy being approximately 10 years less for Aboriginal people than for other Australians [10]. A number of behavioural, biomedical, psychological and socioeconomic factors have been identified as contributors to this outcome. Behavioural factors include low rates of physical activity, and high rates of smoking and alcohol consumption; biomedical factors include low birth weight, high rates of obesity among children and adults, and high blood pressure and cholesterol among adults; psychological factors include high levels of psychological distress, strongly associated with past removal from family; socioeconomic and environmental factors include low employment rates and an reluctance to seek healthcare due to previous experiences of discrimination within the healthcare system [10].

Within Aboriginal culture, concepts of health and wellbeing are distinctly different to Western biomedical models. For Aboriginal people, the concept of 'health' does not only refer to a physical condition, but additionally encompasses social, emotional and cultural wellbeing, for both an individual and their community [11, 12]. From this perspective, an individual's health is directly influenced by their connection to community, Country, culture and family. Aboriginal notions of 'healing' differ significantly to the Western concept of 'treatment' [13]. To date, Western health systems have struggled to provide services that effectively address Aboriginal concepts of health [14, 15].

## 1.2 The older Aboriginal population

The proportion of older people making up Australia's Aboriginal population is growing. In 2011, 7% of the Aboriginal population was aged 55 years and older, with projections highlighting this will double to 14% by 2026 [16]. As the size of the older population increases, so too does average life expectancy [17]. This will result in an increased need for aged care support services for Aboriginal people. Aged care services used by the general population are varied and include preventative programs, services for the management of chronic disease, home maintenance and modification, food and personal care, transport, carer services, rehabilitation services, and residential care [18]. These services are currently under high demand, with placement on wait lists often required for service use [19]. Further, the acceptability and relevance of these services to older Aboriginal people is unknown.

Older Aboriginal people are considered to be the decision makers and knowledge keepers of their communities, respected for their cultural knowledge and responsibility in sustaining cultural practices [20]. Within many Aboriginal families today, older Aboriginal people are household leaders and are the primary carers of grandchildren and great-grandchildren [21]. Through this carer role, grandparents have the opportunity to teach grandchildren cultural values, traditions and responsibilities [22]. The carer role often extends beyond immediate family into the broader community, resulting in older Aboriginal people being viewed as 'pivotal contributors to life in Aboriginal communities' [22].



*“Older Aboriginal and Torres Strait Islander peoples hold a unique place within their communities as they are held in deep respect within the family structure. They are role models, decision makers, care providers and educators. Connections to land and cultural traditions are central to personal and community wellbeing.”*

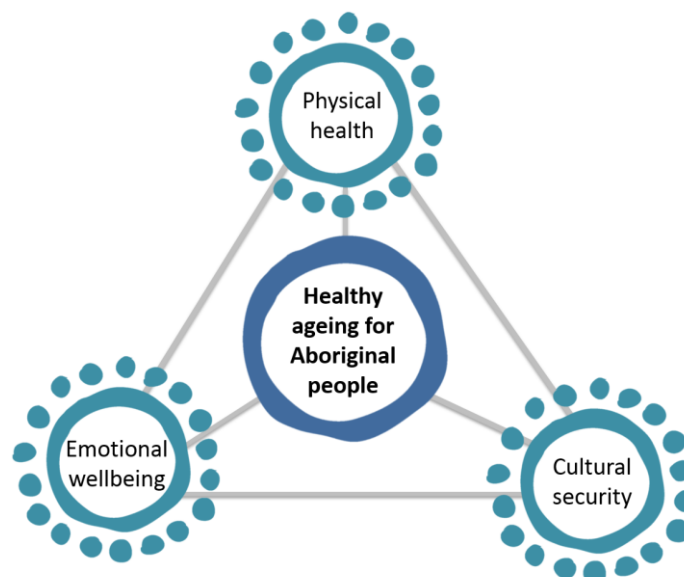
- Implementation Plan for the National Aboriginal and Torres Strait Islander Health Plan, 2013–2023, page 30

The Implementation Plan for the National Aboriginal and Torres Strait Islander Health Plan 2013–2023 [23] highlights the importance of providing older Aboriginal people with the resources they require to undergo the ageing process within their homes and communities. A principle vision from the health plan is as follows:

*“VISION: Older Aboriginal and Torres Strait Islander peoples remain active, healthy, independent and comfortable for as long as possible and have access to culturally secure and responsive aged care services.”*

- Implementation Plan for the National Aboriginal and Torres Strait Islander Health Plan, 2013–2023, page 30

This vision highlights three core factors central to healthy ageing for the Aboriginal population: 1) physical health 2) emotional wellbeing and 3) cultural security, depicted in Figure 1.1 below.



**Figure 1.1:** Three core factors central to healthy ageing for the Aboriginal population, concept derived from the *Implementation Plan for the National Aboriginal and Torres Strait Islander Health Plan, 2013–2023*, page 30

To achieve this vision, complex planning is required to enable access to appropriate support services within the community. Appropriate and high-quality healthcare services are required for the management of existing medical conditions and preventing the onset of new illness [24]. Safe and affordable housing increases an individual's security and creates an immediate environment which can be modified to suit the requirements of an older person [25]. Access to affordable transport enables older people to self-sufficiently move around their communities and prevents social isolation [26]. Services such as these work together to enabling individuals to maintain their independence and age in a method of their own choice [27].

### 1.3 Chronic conditions among Aboriginal people

Existing data show large disparities in the health status of Aboriginal people and other Australians, with the Aboriginal population being at significantly greater risk of a number of chronic illnesses including diabetes, cardiovascular disease and cancers [28]. Chronic illness has been linked to disadvantage, with individuals exposed to the highest level of disadvantage being 2.5 times more likely to develop ischemic heart disease, cancer or diabetes than individuals exposed to the lowest level of disadvantage [29]. Further, people residing in areas of high disadvantage are less likely to be reached by health prevention and promotion initiatives [29].

A high burden of chronic illness affects Aboriginal people at younger ages when compared to the general population [30]. Chronic illness leads to frailty and poor mobility and it is therefore considered to trigger an earlier onset of the ageing process [31]. Chronic illness among Aboriginal people has been associated with a number of determinants. Lifestyle factors, such as the consumption of high caloric foods and high smoking rates, are known contributors to the burden [10]. Other risk factors have been shown to predispose Aboriginal people to chronic illness during early developmental stages. Low birthweight is significantly associated with higher blood pressure in adult life, which is amplified by high body weight in adult life [32]. High blood pressure is a predisposing factor for a number of chronic health conditions including stroke, coronary heart disease, heart failure and chronic kidney disease [33]. Children born to Aboriginal mothers are more than twice as likely to have low birth weight as those born to other Australian women [10]. This highlights the need of planning for preventative and early intervention services targeted at expectant mothers to reduce risk of chronic illness later in life [34].

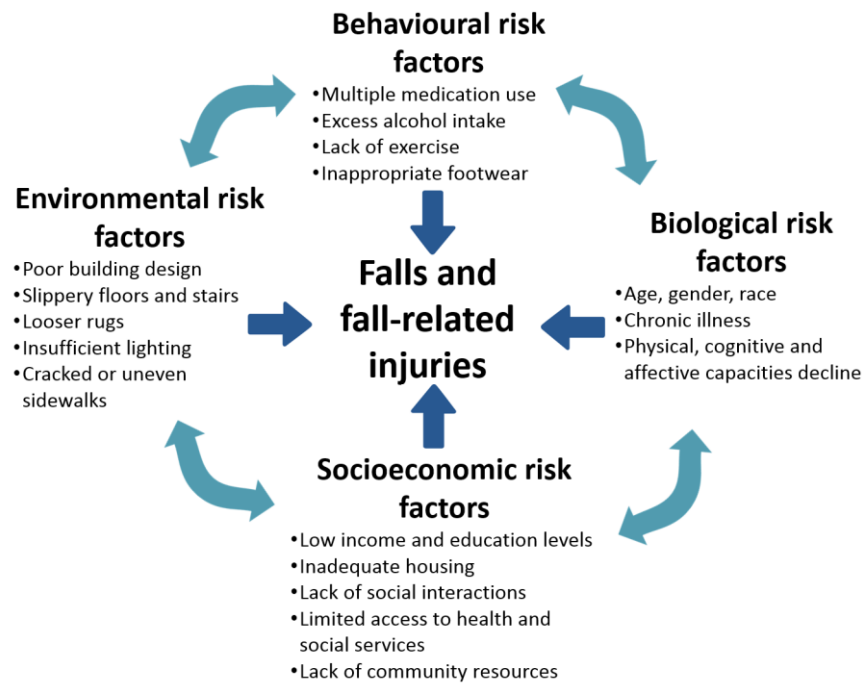
## 1.4 Falls in older people

Falls and fall-related injury have a major impact on the health and wellbeing of the older Australian population. A fall is defined as an event which results in a person coming to rest inadvertently on the ground or floor or other lower level [43]. It is estimated that one in three people aged 65 years and older will experience at least one fall per year. This was equivalent to 1.1 million Australians in 2014 [35].

The consequences of falls for older people can be severe. For Australians aged 65 years and older, the majority of fall-related hospital admissions are for fracture of the hip or thigh (35%) or injury to the head and neck (25%) [36]. These injuries often result in extended periods of hospitalisation, where the older person is removed from their home, daily routines and social networks. Length of hospital stay following a fall-related injury has been shown to increase with advanced age [36] and is associated with a higher likelihood of developing additional health complications [37]. Further, the effects of fall injury can persist beyond hospitalisation, with many patients requiring long-term rehabilitation post-discharge or in some cases, permanent placement in residential care [38]. Previous work has shown older individuals presenting to hospital with a fall-related injury to report a reduced quality of life up to 9 months post injury [39]. Common issues described by participants included problems with mobility (70%), a reduced ability to perform self-care tasks (41%) and the onset of anxiety and/or depression (28%) [39].

Falls that do not result in physical harm may have a psychological impact, causing older people to be less confident in performing regular daily tasks, such as grocery shopping or household chores [43]. This can lead to decreased physical activity and social isolation.

The prevention of falls and fall-related injury is a well understood area, informed by a rich body of work from the previous 30 years [40, 41]. A number of risk factors have been identified to increase a person's likelihood of falling, many of which are common among global ageing populations [42]. Falls are often caused by a combination of risk factors which have their own associated impacts on the health and wellbeing of an older person. A number of these are summarised in Figure 1.2 below.



**Figure 1.2:** Behavioural, biological, socioeconomic and environmental risk factors associated with falls and fall-related injury, adapted from the World Health Organization Global Report on Fall Prevention in Older Age, 2007, page 5

Biological risk factors for falls are often unmodifiable physical characteristics, with common examples including female gender, advanced age and the presence of chronic illness. Socioeconomic risk factors for falls may prevent an individual from having access to safe infrastructure or being able to access required health services. Environmental risk factors for falls increase with high exposure to hazardous objects and surroundings. Behavioural risk factors for falls correspond to high risk lifestyle choices being made by an individual, with examples including excessive alcohol consumption or the use of multiple medications [43].

Many behavioural risk factors and environmental risk factors are modifiable, providing a number of avenues to reduce falls risk. A range of fall prevention interventions have been established, evaluated and are currently offered in community settings globally. These interventions include, but are not limited to, exercise programs, education programs, and environmental modification [44]. Some interventions are comprised of a single component, while others are multicomponent, addressing a range of falls risk factors by the inclusion of a number of different intervention elements.

#### 1.4.1 Exercise programs to reduce falls

There is strong evidence that specific types of exercise can significantly decrease rate of falls and risk of falling [45], with 42% of falls able to be prevented through well-designed exercise programs [44].

Exercise is required to be practised regularly and over the long term, with recommendations stating two hours per week of targeted exercise over a six month period is required to prevent falls [44].

Exercise-based fall prevention interventions can be delivered in group settings or to individuals in their homes. Programs based on gait, balance and functional training have been shown to significantly reduce rate of falls and risk of falling in community dwelling people aged 65 years and older [45]. The balance challenging exercises included in these programs are a necessary component to their effectiveness [44]. Programs only containing strength/resistance training and general physical exercise, such as walking, have not been shown to reduce rate of falls or falls risk [45].

#### 1.4.2 Education programs to reduce falls

Through education programs, participants are informed of which risk factors predispose them to falls and are provided with practical suggestions on how exposure to these factors can be minimised [43]. Although interventions that use education as a sole component have not been shown to reduce rate of falls or risk of falling, a number of effective multicomponent fall prevention interventions include an education element [45].

#### 1.4.3 Environmental modification programs to reduce falls

Environmental assessments and home modifications can be performed, such as installing hand rails and removing loose rugs, to adapt a persons living environment to improve physical function while simultaneously decreasing falls risk [43]. Home safety interventions have been shown to be particularly effective in reducing rate of falls among people at a very high risk of falling [45]. There is some evidence that home safety interventions led by occupational therapists are more effective in reducing falls than those led by other personnel [45].

#### 1.4.4 Multicomponent fall prevention programs

A number of fall prevention programs are made up of a combination of the components outlined above. Components are either all delivered to all program participants, or are specifically selected for individual participants in response to the outcomes of a fall risk assessment [46].

A number of multicomponent fall prevention programs have been shown to be successful in reducing fall rates and fall risk [47]. An example is the Stepping On fall program, shown to reduce falls in community-dwelling older adults by 31% [48]. The core elements of the Stepping On Program are exercise and education, with elements of environmental and home safety, vision screening, and medication management incorporated.

The numerous effective approaches to preventing falls provide scope for effective programs to be developed that are tailored to meet the specific needs and interests of diverse populations.

## 1.5 Falls in older Aboriginal people

Falls can have a devastating impact on the health and wellbeing of an older Aboriginal person. Extended periods of hospitalisation can lead to separation from family and a loss of connectedness to community, which is often coupled with a fear of dying away from Country [49, 50]. With 33% of Aboriginal people aged 65 years and older living in rural and remote areas [51], additional barriers surround access to treatment and rehabilitation services. There are currently no Aboriginal-specific services in Australia which are equipped to address severe health issues resulting from a fall. This results in only mainstream hospital facilities being available for treatment, which may not be equipped to provide culturally safe care for older Aboriginal patients [49]. Long-term physical and psychological effects resulting from a fall can cause withdrawal from cultural and social responsibilities, making falls a threat to each of the three previously defined factors central to healthy ageing for the Aboriginal population; physical health, emotional wellbeing and cultural security.

Despite potentially devastating outcomes, very little is known about the burden or impact of falls on older Aboriginal people. Fall-related injury has a significant impact on the general Aboriginal population, with data from NSW reporting falls to be the leading cause of injury-related hospitalisations across all ages [52]. National data shows fall-related injury hospitalisations for older Aboriginal people to have increased by an average of 10.2% per year from 2007-08 to 2010-11, compared to a 4.3% average annual increase for all older Australians [53]. Although this data suggests falls have a significant and increasing impact on older Aboriginal people, limited information is available on the context of falls or the outcomes of falls for the Aboriginal population.

## 1.6 Health service use by older Aboriginal people

Treatment seeking behaviours and health service use differ significantly between Aboriginal people and other Australians. This is likely influenced by differences in disease burden between both populations, socioeconomic factors, and preferences in service type. A number of barriers to the access of mainstream health services have been identified by Aboriginal people with chronic illness [54]. These include past experiences of racism and discrimination in the healthcare system, an inability to communicate well with clinical staff, and costs associated with service use [54].

The Australian government currently funds 142 Aboriginal-Controlled Community Health Organisations (ACCHOs), which offer primary care in community settings focused on meeting the needs and preferences of Aboriginal people [55]. As a result, 75% of ACCHO clients identify themselves as Aboriginal and/or Torres Strait Islander. These services are used regularly; in 2012-13, the average ACCHO client received seven episodes of care per year [10]. Despite this, access to primary care

services for Aboriginal people requires improvement. Among Aboriginal people, the rate of preventable hospitalisation is 3.4 times the rate for other Australians, with the majority of preventable hospitalisations associated with chronic illness [10]. Preventable hospitalisations can signify a lack of use of primary healthcare services to treat health conditions which could have been avoided through early intervention.

Aboriginal people are shown to access existing aged care services at higher rates and at younger ages than other Australians [56]. As a result, aged care services are planned and made available to Aboriginal people aged 50 years and older and to members of the general Australian population aged 70 years and older [56]. Community Aged Care Packages (CACP) are a government initiative designed to enable frail older people to live at home rather than in low-level residential care. Of all Aboriginal people receiving CACP, 37% are aged below 65 years. This is considerably higher than the 2% of other Australians aged below 65 years receiving the same support [10]. Extended Aged Care at Home packages (EACH) are a similar initiative designed to enable people with complex needs to live at home rather than in high-level residential care. Within this scheme, 41% of Aboriginal recipients are aged below 65 years [10]. This highlights the requirement of community-based healthy ageing services for Aboriginal people of younger ages when compared to other Australians.

## 1.7 Role of cultural safety in healthcare

The determinants of health affecting Aboriginal people cannot be fully understood without considering Aboriginal culture and history [57]. Within anthropological literature surrounding health service provision to Indigenous people, concepts of 'cultural competence' and 'cultural safety' are discussed.

Cultural competence is defined as learning about other cultures, the sharing of cultural knowledge and establishing effective communication between cultures [57]. It is the attitude, knowledge and skills required to provide accessible, appropriate and effective care to individuals with different values and beliefs [58]. The concept of cultural competence can be used to inform operational guidelines for clinical staff working with Aboriginal people [59].

Cultural safety looks 'beyond the concept of cultural sensitivity to analysing power imbalances, institutional discrimination, colonization and colonial relationships as they apply to health care' [60, page 1]. It aims to reduce any negative impacts on the cultural identity of an individual during their receipt of health care [57]. Cultural safety ensures that care offered is responsive to the needs of the

recipient, and the care received is defined as safe by the patient [59]. It facilitates improved communication between patients and care providers, patient autonomy in decision making, the acknowledgement and resolution of any miscommunications or tensions between patients and care providers, and the ‘accepting and respecting’ of cultural differences [58]. A major component of offering culturally safe care is the recognition and acknowledgement of trauma stemming from colonisation [61].

*“The provision of [high quality] healthcare requires an intimate knowledge of a community and its health problems, with the community itself providing the most effective and appropriate way to address its main health problems, including promotive, preventative, curative and rehabilitative services.”*

-National Aboriginal Community Controlled  
Health Organisation (NACCHO), 2016

Health services that acknowledge and address the influence of culture and history on healthcare are more likely to be effective.

*“Ideas of ‘quality of care’ are, therefore, not centred only on standards of medical competence. Culture is also at the centre of care, and so quality begins with issues of traditional law, Country, and kinship.”*

-Smith et al., 2010, page 13

The National Aboriginal and Torres Strait Islander Health Plan 2013–2023 [62] has identified three key strategies (see below) to ensuring effective and culturally safe approaches are taken to achieving healthy ageing for Aboriginal people. These strategies can be used to guide the structure and delivery of effective and culturally safe healthy ageing services for the older Aboriginal population.



**Strategy 1**

Adopt coordinated and innovative models of care that provide opportunities for older Aboriginal and Torres Strait Islander people to maintain social and cultural connections and age on Country.

**Strategy 2**

Engage Elders and senior community members as key stakeholders and role models to champion culturally appropriate choices and approaches to health and wellbeing.

**Strategy 3**

Build the capacity of the health and aged care workforce to be sensitive to the needs of older Aboriginal and Torres Strait Islander people.

**Box 1:** Key strategies for healthy ageing from the National Aboriginal and Torres Strait Islander Health Plan, 2013–2023

### 1.7.1 Self-determination and Aboriginal leadership

For Aboriginal people, the use of health services is influenced by family, cultural and historical experiences, the complexity of individual health needs, language issues, cost and service availability [63]. How these factors impact a community are best understood by Aboriginal communities themselves and in turn, Aboriginal people are best positioned to identify local health needs and develop and implement solutions to address these needs [11]. As older Aboriginal people are community leaders, their involvement is crucial in identifying appropriate approaches to improving community health and wellbeing.

Previous work from Queensland, Australia has demonstrated the value associated with the engagement of older Aboriginal people in refining existing mental health support services [64]. This engagement not only improved the cultural integrity of existing services, but demonstrated respect and value for the insights of older Aboriginal people, promoting service use to the broader Aboriginal community. Through engaging older Aboriginal people in aged care service planning, it can be ensured that families are supported to care for older Aboriginal people using traditional methods of care together with complementary modern treatments [65].

### 1.7.2 Community-based care

Supporting older Aboriginal people to age within their communities, or on Country, promotes community connectedness and reduced distress, leading to improved wellbeing and better health

outcomes [62]. Community-based care enables Aboriginal people to stay within their support networks while receiving care and removes many barriers associated with travel time and costs for people living in rural and remote areas. Ensuring ease of access to primary care services is crucial to prevent the development of severe health complications, possible to prevent through timely intervention.

### 1.7.3 Sensitivity to patient needs

Services provided through ACCHOs are informed by the health needs of the local Aboriginal population, allowing each service to effectively respond to the priorities and changing needs of the local Aboriginal community [66]. To ensure each service is controlled by the local community, a locally elected Board of Management oversees service delivery [55]. Although the services form a network, each is independent and self-governing. ACCHOs have a strong cultural identity which resonates with the values and priorities of Aboriginal clients, strengthening inclusion, understanding and health [66].

### 1.7.4 Well-equipped and well-informed health workforce

Aboriginal health service staff have been shown to be better able to relate to the health and social issues affecting Aboriginal people [67] and therefore, have a better ability to provide quality care [65]. The employment of Aboriginal Health Workers (AHWs) has been reported to decrease communication barriers between healthcare providers and healthcare recipients, enabling patients to better understand their health from their own cultural perspective [68]. This better equips patients to make positive lifestyle changes for health improvements, enabling autonomy over their health and wellbeing. Aboriginal controlled health services, such as ACCHOs, preferentially employ Aboriginal staff to provide health services. Training the Aboriginal workforce to specifically respond to the healthcare needs of older Aboriginal people will enable health care professionals to provide culturally safe services which support healthy ageing.

Some older Aboriginal people are reluctant to engage with the healthcare system following past experiences of discrimination and racism [54]. Cultural competency training is not guaranteed to be provided to non-Aboriginal health service providers, leading to miscommunication and misunderstanding when working with Aboriginal patients [69]. Older Aboriginal people are particularly vulnerable due to the ongoing effects of historical disempowerment and trauma [54]. This can hinder the willingness of older Aboriginal people to access health services and to receive required treatment.

## 1.8 Knowledge gaps

Limited available evidence suggests that falls and fall-related injury have a significant impact on the health and wellbeing of older Aboriginal people. As within the general population, this impact is likely to extend beyond physical injury, affecting the mental and emotional wellbeing of individuals, compromising their independence. For older Aboriginal people, falls have the potential to cause disconnection from family and community networks, impacting the broader Aboriginal community.

Limited data on risk factors associated with falls among older Aboriginal people causes uncertainty as to whether existing fall prevention interventions developed for the general population are equally as effective for Aboriginal people. Further, the acceptability and appropriateness of existing fall prevention interventions for Aboriginal people is unknown. The need for Aboriginal-specific health services has been previously identified in broader domains of healthcare, where cultural safety is ensured through a variety of service features. A similar approach is likely required for services or programs with a focus on healthy ageing and fall prevention.

This study will investigate the differences in burden and impact of falls and fall-related injury between older Aboriginal people and other older people. Risk factors that contribute to falls will be compared between both populations and the differences in health and social outcomes following a fall will be investigated. This knowledge will contribute towards identifying appropriate and effective approaches to preventing falls among older Aboriginal people.

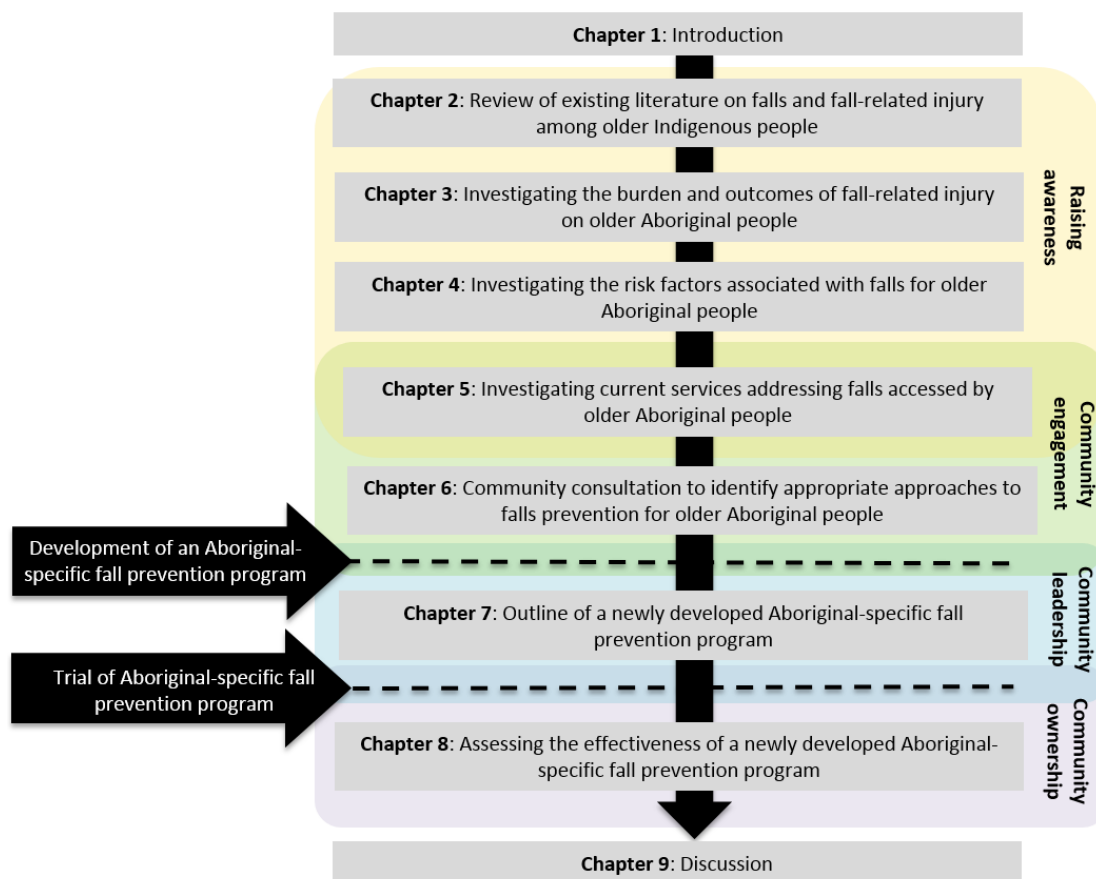
## 1.9 Outline of thesis

**This thesis describes a two-stage project. The first stage aimed to investigate the impact of falls and fall-related injury on the older Aboriginal population. The second stage aimed to reduce the incidence of falls among older Aboriginal people through the development and trial of a new Aboriginal-specific fall prevention program.**

The first stage of this thesis aimed to understand the burden, outcomes and risk factors associated with falls for the older Aboriginal population. Further work identified which community-based healthy ageing services frequently were accessed by older Aboriginal people, investigating whether these addressed fall prevention. Following identification of a gap in appropriate fall prevention services for older Aboriginal people, community consultation was held with older Aboriginal people and service providers working in Aboriginal aged care to discuss features that would likely contribute to a fall prevention program that was relevant and appealing to Aboriginal communities.

Drawing from the knowledge gained through initial research stages, together with input from Aboriginal community leaders, experts in fall prevention and aged care service providers, a new Aboriginal-specific fall prevention program was developed: the Ironbark Program. The program aimed to improve participant functional mobility and confidence in performing daily tasks, within a culturally safe environment. The Ironbark Program was trialled at six Aboriginal community sites in New South Wales over a 3 to 6 month period to investigate its impact and acceptability. Development and evaluation of the Ironbark Program constitutes the second stage of this thesis.

Input from Aboriginal community leaders and ongoing contributions from Aboriginal community members guided all aspects of study development and execution. An overview of study components are presented in Figure 1.3 below, with Aboriginal community engagement, leadership and ownership in relation to the different aspects of the project.



**Figure 1.3:** An overview of the study, demonstrating Aboriginal community involvement in each stage of the research process

Initial aims of this research were to investigate the impact of falls on older Aboriginal people, identifying appropriate and effective approaches to fall prevention for the older Aboriginal

population. Secondary aims were to document the development, implementation and evaluation of a new Aboriginal-specific fall prevention program, developed in response to the knowledge gained from initial research aims.

This research is built on the hypothesis that falls have different impacts and outcomes on the older Aboriginal population when compared to the general older Australian population. Therefore, different approaches may be required to preventing falls and fall-related injury for each group. Specifically, this project set out to answer the following research questions:

- What is currently known about the impacts, risk factors and outcomes of falls and fall-related injury for older Indigenous people worldwide?
- What proportion of the older Aboriginal population experiences a fall?
- What risk factors are associated with falls specifically for older Aboriginal people?
- What types of injury are commonly sustained as the result of a fall among older Aboriginal people?
- What is the burden of fall-related hospitalisation among older Aboriginal people and how has this changed over time? Does hospital utilization following fall-related injury differ between older Aboriginal people and other older Australians?
- What is the impact of falls on the wellbeing of older Aboriginal people?
- What level of existing knowledge do older Aboriginal people have on fall prevention?
- Which fall prevention and healthy ageing services are currently used by older Aboriginal people?
- What features are likely to contribute to a culturally acceptable fall prevention program for older Aboriginal people?

The outcomes of the research were used to develop an effective, appropriate and sustainable fall prevention program specifically for older Aboriginal people, owned by Aboriginal communities and delivered through Aboriginal Controlled Community Services.

### 1.9.1 Thesis structure

This thesis is comprised of eight chapters which tell the story of the Ironbark Project. Chapters two, three, four, five, six and eight correspond to academic publications.

Chapter summaries are provided below:

## **Chapter One**

An introduction to this thesis, establishing context and presenting the aims and scope of the research.

## **Chapter Two**

A systematic literature review examining the risk factors, incidence, consequences and existing prevention strategies for falls and fall-related injury in older Indigenous people, worldwide. This chapter has been formatted to correspond with the requirements of The Australian New Zealand Journal of Public Health, where it has been accepted for publication.

## **Chapter Three**

A population-based, retrospective, cohort data linkage study, comparing the rate of hospitalisation, use of hospital resources and survival following a fall-related injury between older Aboriginal people and other older Australians in NSW. This chapter has been formatted to correspond with the requirements of The Medical Journal of Australia, where it has been accepted for publication.

## **Chapter Four**

Secondary analysis of data collected through a cross-sectional survey performed in urban and regional communities in NSW, examining the associations between known fall risk factors identified previously in other populations and self-reported falls among older Aboriginal people. This chapter has been formatted to correspond with the requirements of The Australasian Journal of Ageing, where it has been accepted for publication.

## **Chapter Five**

A services audit and follow-up interviews used to investigate the use of available fall prevention services by older Aboriginal people in NSW, identifying features that are likely to contribute to program acceptability for Aboriginal communities. This chapter has been formatted to correspond with the requirements of Public Health Research and Practice, where it has been accepted for publication.

## **Chapter Six**

A qualitative study using Yarning Circles held with older Aboriginal people to investigate the impact of falls, assess the current level of existing knowledge on fall prevention, and to identify desirable elements of a fall prevention program developed specifically for Aboriginal communities. This chapter

has been formatted to correspond with the requirements of BMC (BioMed Central) Public Health, where it has been accepted for publication.

### **Chapter Seven**

An excerpt from the Final Project Report to the project funder; the Partnerships and Strategy Branch of the Centre for Population Health, NSW Health. This chapter summarises the major components of the program and introduces six Aboriginal community sites in NSW who trialled the program for either a 3 or 6 month period. This chapter provides additional context to Chapter 8 which contains greater detail on the delivery and evaluation of the Ironbark Program itself.

### **Chapter Eight**

A mixed methods study documenting the development, implementation and impact of The Ironbark Program: a community-based, Aboriginal-specific fall prevention program, trialled in six community sites in NSW for a 3-6 month period. This chapter has been formatted to correspond with the requirements of The Health Promotion Journal of Australia, where it has been re-submitted after peer review and is under consideration by the editor.

### **Chapter Nine**

A conclusion to the thesis, summarising the key findings of the research, highlighting their relevance and discussing the implications of the research outcomes.

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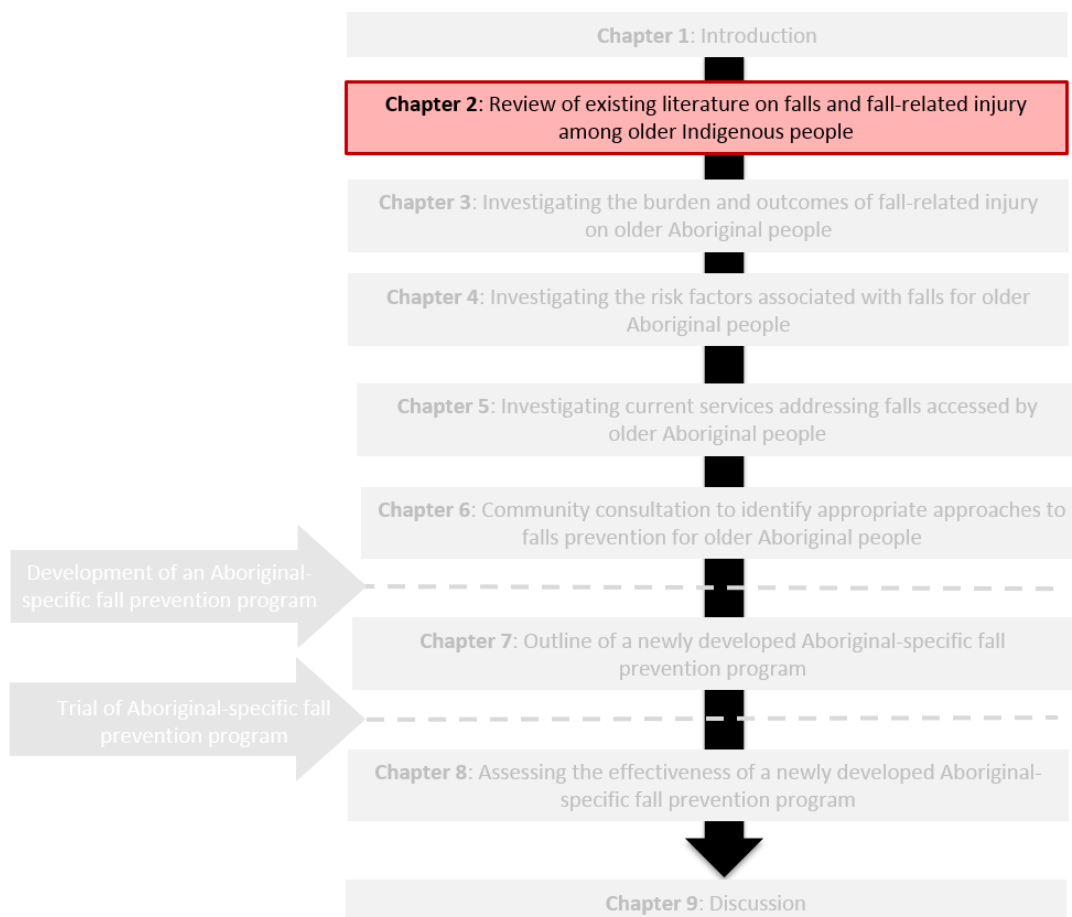
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## Chapter 2: Review of existing literature on falls and fall-related injury among older Indigenous people

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A systematic literature review was performed examining the risk factors, incidence, consequences and existing prevention strategies for falls and fall-related injury for older Indigenous people worldwide. A total of 13 studies were included in the review, conducted with Indigenous populations from Australia, the United States of America, Central America and Canada.

This systematic literature review was performed to gain insight on the impact of falls on older Indigenous peoples globally and to identify gaps in existing knowledge to inform the aims of future study stages.

**Contributions to this study:** I selected and refined the search terms used, performed the literature search, screened and extracted relevant publications, performed quality appraisal of selected studies, performed knowledge synthesis and drafted the manuscript.

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## 2.1 Introduction

Falls have been shown to be a major global cause of injury, death, and disability for people aged 65 years and older living in the community (1, 2). Previous studies from a variety of contexts have reported approximately 30% of older people experience at least one fall each year (3-8). The most common severe fall-related injury for older people is hip fracture, accounting for 75% of fall-related hospitalisations (9, 10), followed by injury to the head, accounting for 20% of fall-related hospitalisations (9, 11). Recovery following a severe fall injury can be a lengthy process with patients potentially never regaining their full functional ability, increasing their risk of being moved into residential care (12). For example, those who have suffered hip fracture are three times more likely to be functionally dependent (13, 14) and have a threefold greater risk of death within three months following the fracture than their peers (14). With increasing global life expectancy, falls are a growing health issue for older people worldwide (15, 16).

Falls have the potential to be a significant health priority for global Indigenous populations with greater numbers of Indigenous people living to older ages (17-19). Previous research has reported an earlier onset of a variety of health conditions associated with ageing within Indigenous populations, such as diabetes complications, cerebrovascular disease and cardiovascular problems (18, 20-22). These health conditions have been shown to increase a person's risk of falling and/or sustaining a fall-related injury (23, 24).

Although a variety of fall prevention interventions are known to be effective in reducing falls in the general community, it is unclear to what extent these programs are accessed by Indigenous people (23). Further, the content, structure and mode of delivery of effective and culturally appropriate programs for Indigenous people is known to be different to that of mainstream programs (25, 26). To our knowledge, the appropriateness and effectiveness of existing fall prevention interventions for Indigenous groups has not been investigated. With little knowledge about the incidence and consequences of falls among older Indigenous people, further research is needed to inform approaches to fall prevention specifically for this population. This topic has not previously been systematically reviewed.

This review aims to systematically summarise previous research on the burden of falls in older Indigenous populations worldwide. The following questions were addressed: (1) What is the burden of falls and fall related injury in older Indigenous populations? (2) What are the most common consequences following a fall in older Indigenous people? (3) What are the known risk factors for

experiencing a fall or fall-related injury specifically for older Indigenous people? (4) Have Indigenous - specific interventions with a sole focus on fall prevention been tested in community settings?

## 2.2 Methods

### 2.2.1 Search strategy

We systematically searched peer-reviewed and grey literature for studies relating to (1) people aged 45 years and older; (2) Indigenous status, (3) fall incidence, risk factors and outcomes, and (4) indigenous-specific interventions with a sole focus on fall prevention. The search was conducted in August 2015. Studies were identified through electronic database searches (Table 1), institutional websites and from the reference lists of relevant articles and published government reports. A total of 14 databases were accessed, selected on their relevance to injury, health and ageing, and/or Indigenous studies. Table 2.1 includes the number of records identified through each database in response to the search terms used.

Date	Database	Number of records
8/8/2015	AIATSIS: Indigenous Studies Bibliography	36
8/8/2015	ATSIhealth	51
8/8/2015	Web of Science	347
8/8/2015	Medline	316
8/8/2015	CINAHL	0
8/8/2015	AGELINE	2
8/8/2015	Australian Indigenous HealthInfoNet	326
8/8/2015	PsycInfo	19
8/8/2015	PubMed	159
8/8/2015	SCOPUS	170
12/8/2015	Lowitja	53
12/8/2015	Cochrane Library	2
12/8/2015	SafetyLit	93
12/8/2015	INFORMIT	139

**Table 2.1:** Databases searched by date and the number of potentially relevant records corresponding to search terms

Search terms surrounding Indigenous status; ageing, elders, seniors and older people; injury, falls/accidental falls and fracture were used to identify relevant literature (Table 2.2). Only articles written in English were reviewed with no publication date or other limits applied. The grey literature was searched using two online search engines (Google and Google Scholar) and four institutional websites (Australian Indigenous HealthInfoNet, New Zealand Ministry of Health, Indian Health Service and Health Canada).

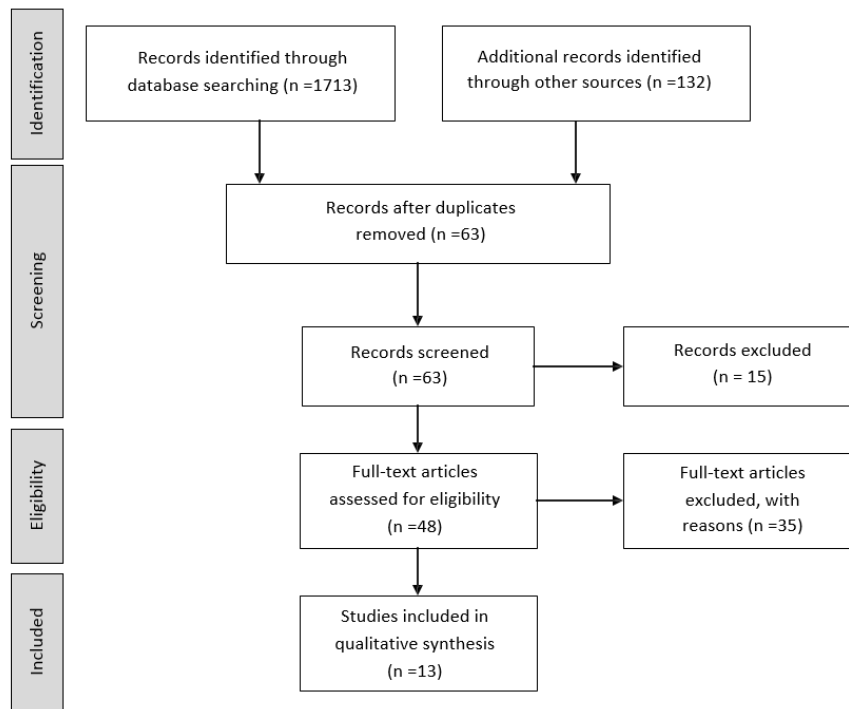
<b>Population</b>
aged/ elder* old* senior* "older people"
<b>Exposure</b>
Indigenous Aborigin* "Torres Strait Island*" or Oceanic Ancestry Group/ Tribe* Inuits/ Maori "American Indian" or Indians, North American/ "Native American" "First Nation" Metis "Alaska Native"
<b>Outcome</b>
injur* Fractures, Bone/ or Accidental Falls/ or fall* fractur* accident*

**Table 2.2:** Search terms used to identify relevant studies

### 2.2.2 Inclusion criteria, data extraction and quality appraisal

To be included in the review, studies were required to (1) present primary research; (2) specifically investigate unintentional falls or injuries most commonly resulting from falls in older people that require medical attention, for example, hip fracture and head injury; (3) include data on Indigenous people; and (4) include data on people aged 45 years and older. Studies meeting the above criteria were summarised in a standardised data extraction table (Appendix A). The quality of each study was measured against the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) Statement checklist for observational studies (27). This 22-item checklist provides an in-depth assessment of study and report quality. Relevant summary comments for each study are presented in the data extraction table (Appendix A). Relevant data from each study were extracted and summarised by one author (CL). This paper is reported in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Reporting Guidelines provided for systematic reviews and meta-analyses (28) (Figure 2.1).





**Figure 2.1:** PRISMA flow diagram of the number of records identified, included and excluded in the study

## 2.3 Results

### 2.3.1 Overview of identified papers

The electronic database search returned 1713 records and 132 records were identified from other sources. After screening the records for relevance and removing all duplicates, 63 reference citations were saved and their abstracts were reviewed for relevance to the review questions. Full text was obtained for 48 references. The articles retained addressed injury in Indigenous and/or ageing populations worldwide. The majority of articles focused on specific health outcomes with a relationship to falls, predominantly investigating hip fractures. From these articles, 13 met the inclusion criteria for the review.

Of the 13 studies included in the review, seven were from Australia (29-35), four from the United States of America (36-39), one from Central America (40) and one from Canada (41). Five studies had a specific focus on older age groups (30, 32, 34, 35, 38), six included data from all age groups (29, 31, 33, 37, 39, 40) and two included data from participants aged 18 years and older (36, 41). The majority of studies analysed data collected from the last decade (29-32, 34-37, 40) while the remainder used data collected between 1999-2004 (33, 38, 39, 41). Ten studies had a specific focus on indigenous populations (29-33, 35-37, 39, 41) while three compared data from multiple population groups (including indigenous) (34, 38, 40).

Five of the 13 studies included in the review had a primary focus on fractures (31-33, 36, 41), two on head injury (34, 39), two investigated general injury prevalence and outcomes (29, 37), three focused on the relationships between falls and other health issues (30, 35, 38) and one specifically investigated fall related deaths (40). All studies were observational, with the majority presenting morbidity data (29-36, 38, 39, 41) and the rest presenting mortality data (37, 40). Six of the 13 studies analysed hospitalisation data (29, 31-33, 39, 41) and four of the studies used questionnaires for data collection (30, 35, 36, 38).

### 2.3.2 The incidence of falls amongst older Indigenous people

Six studies included in the review investigated fall-related injury and death rates in older Indigenous people, with four drawing comparisons between Indigenous and non- Indigenous populations (see Table 3).

One American study and one Australian study, both investigating self-reported fall rates across selected sites, reported that 30-31% of Indigenous people living in the community aged 45 years and older, had experienced at least one fall during the past year (35, 38). Similar fall rates for the general population have been reported from both countries for people aged 65 years and older (42). One Australian study investigating state-wide (un-linked) hospitalisation data reported fall-related hospitalisations were rising at a significantly sharper rate in older Indigenous people when compared to non-Indigenous people aged 40 years and older (age-standardised hip fracture rate 273.0 [95%CI 230.7–315.4] per 100,000 person-years vs 148.8 [95%CI 146.1–151.5] per 100,000 person-years, respectively) (31).

One American study and one Australian study investigated self-reported fall rates and outcomes by age group (30, 38). Both studies showed older people to be more likely to report experiencing a fall, with the highest rates recorded in those aged 70 years and older. This trend was mirrored in the comparative non- Indigenous falls data provided in both studies. One American study examining linked national mortality records found the largest discrepancy in unintentional fall death rates between Indigenous and non- Indigenous people to be for the 45 to 54 year age group, where fall-related death rates were more than doubled for the Indigenous population (3.2/100,000 deaths [95%CI 3.0-3.4] vs 7.4/100,000 deaths [95%CI 5.9-9.3], respectively) (37).

### 2.3.3 Risk factors associated with falls for older Indigenous people

Nine studies investigated factors associated with falls and fall-related injury in older Indigenous people.

Two studies investigated the impact of gender on falls and fall consequences (37, 38). One American study found fatal fall rates to be significantly higher in older indigenous males in comparison to older Indigenous females (16.4/100,00 deaths [95%CI 14.2-18.2] vs 8.6/100,000 deaths [95%CI 7.4-9.9], respectively) (37). One Australian study reported the majority of fall-related hip fracture hospitalisations to occur in older Indigenous females, rather than older Indigenous males (females accounted for 54.2% of hip fracture hospitalisations) (38).

The influence of age on fall risk amongst older Indigenous people was investigated by four studies (30, 37, 38, 40). Older age was shown to increase the risk of falling (29, 38), the likelihood of sustaining an injury from a fall (40) and the likelihood of fall-related death (37). Fall risk factors predominantly affecting people aged 80 years and older included sensory impairment, a lack of exercise and lack of environmental aids (30).

Five studies investigated the link between various lifestyle factors and falls in older Indigenous people (30, 32, 35, 36, 40). Alcohol consumption was reported to significantly increase a person's risk of falling (30) and increase their likelihood of sustaining a fracture following a fall (36). Consistent with this, one Australian study reported significantly higher alcohol use in older Indigenous people admitted to hospital with a hip fracture in comparison to their non-Indigenous counterparts (32). Former and current cigarette smoking was linked to a greater prevalence of fall related fracture in older Indigenous men in one American study (35). One Central American study linked to high fall mortality rates to the agricultural nature of the study area, where commonplace activities such as riding animals, handling grain and operating large machinery led to falls in the local Indigenous and non-Indigenous population (40).

The impact of medical conditions and health status on fall and fall-injury risk was investigated by five studies (29, 30, 35, 36, 41). Two studies from Australia and America identified poor mobility, a history of stroke, epilepsy, head injury, poor hearing and urinary incontinence as health conditions that increase the risk of falls in older Indigenous people (29, 30). Additionally, poor vision, diabetes, dementia and renal disease were also shown to increase the risk of fall-related fracture (30, 36, 41). Two studies found an association between the diagnosis of 2 or more chronic medical conditions and an increased risk of sustaining a fall-related injury (35, 41). On the other hand, one American study and one Australian study reported older Indigenous people to be less likely to be Vitamin D deficient or to be taking five or more medications than their non-Indigenous counterparts (32, 36).

#### 2.3.4 Fall consequences for older Indigenous people

All 13 studies documented injury or mortality outcomes following a fall in older Indigenous people. One Australian study reported 12% of falls in older Indigenous people resulted in unspecified injury

(30). Four studies investigated hip fracture in older Indigenous people (29, 31-33), with two studies identifying falls to be the cause of nearly all hip fracture hospitalisations amongst Indigenous patients (31, 33). This supports reports of hip fracture being the most common type of hospitalised fall-related injury sustained by older Indigenous people (29). It is important to consider that only a small proportion of fall-related injuries result in hospitalisation, with the majority causing soft tissue injuries, followed by fractures. One Australian study found hip fracture hospitalisations to predominately occur for Indigenous women aged 80 years and older, and Indigenous men aged 70-79 years (31). Two studies investigated head injuries caused by falls in older Indigenous people (34, 39). One recent Australian study showed 81% of head injury hospitalisations in older Indigenous people to be the result of a fall (34), while an American study reported up to 45% of traumatic brain injuries in older Indigenous people to be caused by a fall (39).

Hip fracture hospitalisations were reported to be 1.8 to 3.3 times greater for older Indigenous people in comparison to their non-Indigenous counterparts (31, 33). One Australian study found hospital length of stay following a hip fracture to be marginally longer for older Indigenous people due to additional complications pre and post-surgery. This was attributed to Indigenous patients having greater numbers of comorbidities and difficulties in organising transport home, often to remote locations (33).

### 2.3.5 Indigenous-specific fall prevention interventions

No formally evaluated, indigenous-specific, fall prevention interventions were identified.

## 2.4 Discussion

Around 30% of Indigenous people aged 45 years and older report experiencing at least one fall during the past year. Caution should be used when interpreting this result as it is from studies using retrospective methods for data collection which have a high risk of participant recall bias, leading to under-reporting of falls. The most common hospitalised fall-related injuries amongst older Indigenous people were hip fracture and head injury. Factors identified to be significantly associated with falls within Indigenous populations included impaired mobility, a history of stroke, epilepsy, head injury, poor hearing and urinary incontinence, and excessive alcohol consumption. No formally evaluated, Indigenous-specific fall prevention interventions were identified.

Despite higher rates of comorbidities, a younger average life expectancy and a lower use of health services among indigenous people when compared to non-indigenous people (43), this study has found fall rates to be relatively similar between both groups. Further, Indigenous fall rates identified through this review are similar to those reported from the general populations of America, Australia,

England, China, New Zealand and Turkey (3, 4, 6, 8, 24, 44). The reasons behind this finding are largely unknown, but are likely to be influenced by methodological limitations of the included individual studies, such as small sizes of included indigenous study populations and the use of inconsistent sampling techniques. This review found fall injuries were more frequent amongst the oldest Indigenous people from each study population compared to younger people, with the most common injuries resulting in hospitalization reported as hip fracture and injury to the head. Both injuries have previously been reported as the most common fall outcomes leading to hospitalisation in community-dwelling people aged 65 years and older in the general population (1, 11). An Australian study showed fall injury rates to be increasing rapidly at 7.2% per year for Indigenous people aged 40 years and older, while decreasing at 3.4% per year for non-Indigenous people over the same 10-year time period (31). Another Australian study showed the average length of hospitalisation following a fall-related hip fracture to be marginally higher in Indigenous patients in comparison to non-Indigenous patients (33). Previous studies of general populations have identified a number of factors leading to prolonged hospitalisation following hip fracture: increased age, a decreased level of daily activity prior to hospitalisation and post-surgery delays to patient mobilisation (45). The majority of these factors correspond to observations made by the above Australian study.

Falls risk factors identified amongst Indigenous people had some dissimilarities to those known in the general population (46) in particular medical conditions such as epilepsy, head injury and hearing impairment. Other falls risk factors are disproportionately represented in Indigenous populations. Dementia prevalence is increasing within Indigenous populations, affecting larger numbers of indigenous people from younger ages (18). Previous studies have shown dementia to double a person's risk of falling (7). Fall risk has been shown to increase with visual impairment, increasing as vision worsens (48). The rates of cataract-related blindness are 12 times higher for Indigenous Australians when compared to their non-Indigenous counterparts (49). Diabetes is diagnosed at 5 times the rate amongst Indigenous Australians when compared to the general Australian population (50) while Indigenous Canadians are diagnosed at 4 times the rate of their non-Indigenous peers (51). There is an association between diabetes and falls, with people living with diabetes more likely to have other risk factors for falls (52).

A report from the Australian federal government has shown Indigenous people to be more likely to completely abstain from drinking alcohol than their non-Indigenous peers however, those who did drink alcohol were more likely to drink to harmful levels (53). Similarly, in the USA, non-Indigenous people were reported more likely to binge drink than Indigenous people, yet Indigenous people consumed a greater number of drinks per drinking session (54). Previous studies have reported that the intake of 14 alcoholic drinks or more per week is associated with an increased risk of falling in

community dwelling adults aged 65 years and older (55). However, alcohol consumption amongst participants was defined differently in each study included in this review, inhibiting our ability to make comparisons. One study from Australia simply recorded whether or not participants consumed alcohol (30), another Australian study reported whether participants had an alcohol intake level exceeding national guideline recommendations (32), while a study from America recorded whether participants consumed three or more standard drinks per day (36).

The low prevalence of certain falls risk factors in Indigenous populations, such as polypharmacy and Vitamin D deficiency, is notable. A recent study showed 61% of the general American population over the age of 65 years to take at least one prescription medication, with the majority of people taking three to five (56). Multiple barriers to medication use by Indigenous people have previously been reported. These include the cost of purchasing medication, communication issues at mainstream health services leading to Indigenous patients not understanding the necessity of each prescription, and side-effects causing Indigenous people to stop taking medication, rather than seeking further medical advice (57). Similarly, Vitamin D deficiency was reported as a significant problem amongst the general American population aged 55 to 64 years, with 48% of people testing as Vitamin D deficient (58). A previous study has shown Canadian Indigenous women to have high levels of Vitamin D in their diets however, their residence in northern latitudes, skin pigmentation and certain lifestyle factors caused Vitamin D deficiency to remain a problem in the community (59).

A variety of interventions to prevent falls and fall-related injury have been successfully used worldwide, including targeted exercise, multifactorial interventions, home safety assessment and modification, first eye cataract surgery, podiatry for people with disabling foot pain, psychotropic medication withdrawal and prescription modification programs (5). Whether these interventions are equally as effective and accessible to older Indigenous people is unknown. To be able to develop effective and culturally appropriate fall prevention interventions specifically for older Indigenous people, various social, cultural and historical factors must be considered.

It has been well documented that Indigenous people often feel uncomfortable accessing mainstream health services due to fear of discrimination, judgement or problems in communication with both service staff and other participants (60). Differing health priorities and cultural beliefs of Indigenous people may conflict with the content and structure of mainstream interventions, making them inappropriate (61). Many existing fall prevention interventions have an associated cost and as fewer older Indigenous people have held long-term jobs with workplace benefits when compared to their ageing non-Indigenous counterparts (62), most have limited financial security in later years. Additionally, differing family structures result in many older Indigenous people acting as full-time

carers and financial supporters of grandchildren and great-grandchildren (62), adding further barriers to accessing preventative health services for themselves which may be considered 'optional; in comparison to other health services.

A detailed understanding of fall risk factors and incidence is needed to be able to determine which type of intervention would best apply to indigenous populations. As there are some common fall risk factors between Indigenous and non-Indigenous people, exercise interventions focused on improving strength and balance may be worth pursuing. However, it is critical that any fall prevention programs designed or implemented for Indigenous communities take into consideration the sociocultural issues that often affect older Indigenous people. Health programs focused on managing chronic disease and providing accessible referral pathways to health procedures such as cataract surgery may also be beneficial in reducing falls risk factors within Indigenous populations.

#### 2.4.1 Strengths and limitations

To our knowledge, this is the first systematic review of studies investigating the burden of falls specifically in older Indigenous people. This review emphasises the lack of information available on this topic, and highlights the need for more large-scale, comparative studies to be done in this area. All studies included in the review were descriptive and only seven out of 13 studies provided prevalence calculations from their data (29, 30, 32, 34, 38-40). There were many methodological variations between the studies, making direct comparisons between study outcomes difficult. This systematic review predominantly identified ecological studies of populations in which Indigenous people were a minority. This caused generalisations to be made at a population level for small Indigenous sample sizes. The five cross-sectional studies included in the review also had small sample sizes, further diminishing the validity of their outcomes.

Inconsistent sampling techniques and often small sample sizes made results difficult to generalise across entire populations. The majority of studies examining routinely collected administrative data analysed unlinked patient records. Studies that used questionnaires for data collection (30, 36, 38) relied on self-reported information from older participants regarding past falls, introducing a high potential for recall bias. The authors acknowledge that publication bias is a possibility but believe it is unlikely to be a major limitation due to the relatively low availability of high quality data.

The existing literature only provides limited insight to the burden and outcomes of falls in older Indigenous people. Many studies were descriptive with small sample sizes, documenting populations in specific geographical areas (30, 32, 33, 35, 36, 38). Most studies discussed difficulties with accurately identifying Indigenous participants in their study population (29, 31-33, 37-39, 41).

Identification issues were thought to be due to administrative errors, coding errors (29, 31) or participants being unwilling to identify as Indigenous when accessing health services in fear of discrimination (29, 34, 37). Issues with the identification of Indigenous status were thought to underestimate the impact of injury on older Indigenous people (37). One American study reported their national mortality data as having approximately 21% of Indigenous death records coded incorrectly (29). Suggestions for improving indigenous identification include introducing more informative administrative systems, more standardised coding practices across health services, encouraging Indigenous people to identify at health services, and the development of more complex Indigenous-identifier algorithms for increased accuracy in data analysis.

#### 2.4.2 Recommendations for further research

There is clearly scope for further research in this area of Indigenous health. There is a need for larger studies to be conducted that are focused specifically on falls and fall-related injuries, in order to gather more detailed information about fall prevalence and outcomes across entire populations. Having an understanding of not only the physical health burden of falls within Indigenous populations, but also of impacting social, cultural and historical influences is required to gain a complete understanding of falls as an issue in Indigenous communities. Through achieving this, a more targeted approach can be taken to developing appropriate fall prevention interventions for older Indigenous people.

Further investigation into the accuracy of indigenous status coding in routinely collected health data would be useful in determining whether this is an effective approach to mapping disease burden in Indigenous populations. Through this, suggestions could be made to improve current coding and administrative practices, improving future data collection methods.

### 2.5 Conclusion

Falls and fall-related injury were found to have a significant health burden on older Indigenous people living in community. Despite the seemingly large health burden falls have on older Indigenous people, there are few large-scale, population-wide studies that investigate the issue, nor focus on identifying methods of preventing falls for Indigenous populations. Additionally, no formally evaluated, Indigenous-specific fall prevention programs were identified. Further research into fall patterns and fall-related injury amongst Indigenous people is necessary for the development of appropriate fall prevention interventions.



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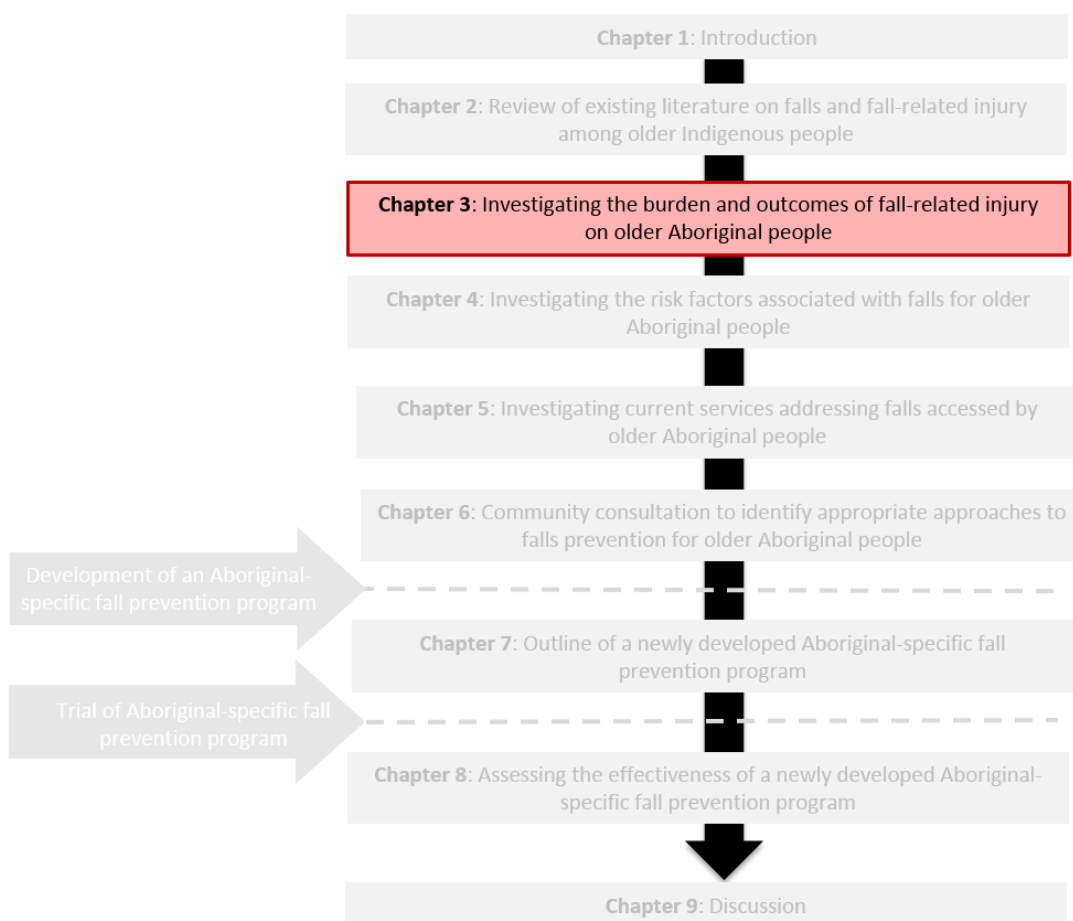
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## Chapter 3: Investigating the burden and outcomes of fall-related injury on older Aboriginal people

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Analysis of linked administrative data was performed to investigate all fall-related hospitalisations for Aboriginal people and other Australians aged 50 years and older in NSW, between January 2003 and December 2012. This manuscript describes the characteristics of older Aboriginal people and other older Australians hospitalised for a fall-related injury, compares rates of hospitalisation by injury type, and explores hospital utilisation and survival following a fall injury for both groups.

This study was undertaken to understand whether there are differences in the characteristics of fallers, patterns of injury, or outcomes following hospital admission between older Aboriginal people and other older Australians. Differences could suggest that alternate approaches are required to prevent and treat fall injuries for each population.

**Contributions to this study:** I linked the three major data sets used in this study and performed all aspects of analysis under the supervision of the manuscripts second author. I interpreted the outcomes of the analysis and drafted the manuscript.

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### 3.1 Introduction

Globally, falls are the cause of 5-8% of all hospitalisations for people aged 65 years above, with hip fracture the most common hospitalised injury (1, 2). In Australia, fall-injury hospitalisations are less prevalent (2.7%), with injuries to the hip or thigh being the most common injury types (3). Falls are the leading cause of injury hospitalisations for Aboriginal and Torres Strait Islander people in New South Wales (NSW), Australia (4). Fall-related injury amongst older Aboriginal and Torres Strait Islander people in Australia has been reported to have increased by an average of 10.2% per year from 2007-08 to 2010-11, compared to a 4.3% average annual increase for all older Australians (3).

Severe fall injuries sustained by older people have been linked to reduced mobility, a loss of independence and for some, the need for placement in residential care (5). For older Aboriginal and Torres Strait Islander people, this potentially translates to the removal from home, country, community and culture. Despite the growing rates of fall injury amongst older Aboriginal and Torres Strait Islander people, little is known about injury profile, hospitalisation characteristics or outcomes experienced by older Aboriginal and Torres Strait Islander people, or how these compare to those of the general Australian population.

The aims of this study were to describe older Aboriginal and Torres Strait Islander people and other older people hospitalised for a fall-related injury in terms of 1) sociodemographic characteristics and type of injury sustained, 2) hospital utilisation and survival following a fall injury and 3) rates of hospitalisation by injury type over time.

### 3.2 Methods

#### 3.2.1 Data source and linkage

Two data sources were linked for this study; NSW Admitted Patient Data Collection (APDC), and death records from the NSW Register of Births, Deaths and Marriages (RBDM). The APDC is a census of all admitted patient services provided by all of the approximately 400 hospitals in NSW, of which 55% are public (6). Details of each hospitalisation are coded according to the Australian Modification of the International Statistical Classification of Diseases and Related Problems, 10<sup>th</sup> revision (ICD-10-AM)(7). Probabilistic linkage of the data extracts was performed by the NSW Centre for Health Record Linkage (CHeReL) (8). As most of the NSW Aboriginal and Torres Strait Islander population is Aboriginal (95.4%) (9), this population is referred to as 'Aboriginal' in this manuscript.

#### 3.2.2 Case selection

Cases included all people aged 50 years and older, admitted to a NSW hospital for a fall-related injury over the ten year period from 1<sup>st</sup> of January 2003 to 31 of December 2012. An admitted patient is a

person who requires a level of care provided in an inpatient setting, and who has undergone the admission process but has not yet been separated by the facility. In total, the cohort comprised 234,979 people. Fall injury cases were identified as having an ICD-10-AM principal diagnosis code of injury in range 'S00-T75' or 'T79' and a principal external cause code in range 'W00-W19'. A cut-off of 50 years was used to define 'older' in this study, allowing results to be directly comparable to data published by the Australian Institute of Health and Welfare (AIHW).

Indigenous status is coded for each hospital episode of care in the APDC dataset. A person was classified as Indigenous if 1) out of one episode of care, they were listed as Indigenous on their hospitalisation record, 2) out of two episodes of care, they were listed as Indigenous on at least one of their hospitalisation records or 3) out of three or more episodes of care, they were listed as Indigenous on at least two of their hospitalisation records. This algorithm is the recommended approach for linking Aboriginal and Torres Strait Islander Peoples on Population Datasets in New South Wales (10), best accounting for reporting, administrative and coding errors.

Age was categorised into five-year age groups. Comorbidities contributing to the Charlson Comorbidity Index (CCI) were identified using the validated ICD-10 coding algorithm developed by Quan (11), including a 12 month look back period (12).

Hospital length of stay (LOS) was defined as the number of days between the date of admission and date of final discharge from the health system. Hospitalisations that consisted of multiple contiguous episodes of care for an injury were considered as one hospital stay and included in the total LOS calculation. Records with an unusually long length of stay (more than three standard deviations above the mean) were excluded as they were considered to reflect atypical care practices or potential coding errors (13).

Thirty-day mortality was defined as death from any cause within 30 days of admission to hospital, following a fall-related injury. Twenty-eight day hospital readmission was defined as a readmission within 28-days of hospital discharge, to any hospital in NSW, for any cause.

### 3.2.3 Statistical analysis

The proportion of different types of injury, mechanism of injury and place of injury were compared between Aboriginal people and other older Australians. The mean length of hospital stay was calculated, with linear regression used to adjust for age and sex differences. Thirty-day mortality was calculated for both groups. Age-standardised rates were calculated by dividing the number of hospitalisations in five-year age groups by the NSW population in that age group of the corresponding

year, using direct standardisation with the 2001 Australian standard population. Negative binomial regression analysis was used to examine the statistical significance of changes in trend over time.

SAS Enterprise Guide 6.1 was used to perform all statistical analysis (14).

### 3.2.4 Ethical approval

Ethics approval for the study was obtained from the NSW Population and Health Service Research Ethics Committee and the Aboriginal Health and Medical Research Council (HREC/13/CIPHS/49).

## 3.3 Results

There were 312,758 fall-related injury hospitalisations for people aged 50 years and older over the ten-year study period. Of these hospitalisations, 0.9% (2,660) were identified as being for Aboriginal people and the majority were to a public hospital (91.5%), with a smaller proportion of Aboriginal people being admitted to a private hospital (2.1% vs 8.5%  $p < 0.0001$ ).

### 3.3.1 Cohort and injury characteristics

Amongst both Aboriginal people and other older Australians in NSW, a higher proportion of fall-related injury hospitalisations occurred for females (55% and 67%, respectively). Fall-related injury hospitalisations for people aged under 75 years accounted for 74% of hospitalisations for Aboriginal people compared to 34% of hospitalisations for other older Australians (Table 3.1).



	Older Aboriginal people (n=2,660)		Other older Australians (n=310,098)		p-value
	n	%	n	%	
<b>Gender</b>					
Male	1,202	45.2	102,932	33.2	<0.0001
Female	1,458	54.8	207,166	66.8	
<b>Age Group</b>					
50-54	549	20.6	16,127	5.2	<0.0001
55-59	418	15.7	18,827	6.1	
60-64	382	14.4	20,623	6.7	
65-69	324	12.2	22,007	7.1	
70-74	296	11.1	28,021	9	
75-79	231	8.7	41,636	13.4	
80-84	210	7.9	58,942	19	
85-89	157	5.9	58,968	19	
90+	93	3.5	44,947	14.5	
<b>Number of comorbidities (CCI)</b>					
0	1,476	55.5	177,195	57.1	<0.0001
1-2	886	33.3	107,076	34.5	
3+	298	11.2	25,827	8.3	
<b>Common injury types</b>					
<b>Fracture</b>					
Fracture of head and neck	48	1.8	7,405	2.4	0.0495
Fracture of trunk	288	10.8	36,678	11.8	0.1114
Fracture of arm	389	14.6	54,747	17.7	<0.0001
Fracture of hip	263	9.9	57,097	18.4	<0.0001
Fracture of leg	281	10.6	27,489	8.9	0.0022
Fracture of other	35	1.3	3,053	1	0.0853
<b>Non-fracture</b>					
Non-fracture injury to the head and neck	491	18.5	43,040	13.9	<0.0001
Traumatic brain injury	128	4.8	12,301	4	0.0263
Non-fracture injury of the arm	199	7.5	19,375	6.2	0.0089
Non-fracture injury of the trunk	191	7.2	15,502	5	<0.0001
Non-fracture injury of the leg	308	11.6	29,558	9.5	0.0003
Non-fracture of other	39	1.5	3,853	1.2	0.3002
<b>Mechanism of fall</b>					
Fall on same level (low trauma)	1,395	52.4	174,224	56.2	0.0001
Fall involving furniture (low trauma)	190	7.1	21,269	6.9	0.5639
Fall from one level to another (high trauma)	372	14.0	41,798	13.5	0.4468
Other/Unspecified	703	26.4	72,807	23.5	0.0004
<b>Place of injury</b>					
Home	1,257	47.3	150,328	48.5	0.2092
Residential institution	201	7.6	56,752	18.3	<0.0001
Public area	350	13.2	37,071	12	0.0569
Other/Unspecified	852	32.0	65,947	21.3	<0.0001
<b>Hospital readmission</b>					
Readmitted within 28 days	434	16.6	35,063	11.5	<0.0001

**Table 3.1:** Demographic and injury characteristics, fall-related injury hospitalisations, persons aged 50 years and over, linked hospitalisation and mortality data, NSW 2003-2012

There was a smaller proportion of hospitalisations due to fall-related fracture injuries for Aboriginal people when compared to other older Australians. This was particularly evident for fall-related hip fractures, which accounted for 10% of fall-related hospitalisations for Aboriginal people and 19% of fall-related hospitalisations for other older Australians ( $p < 0.0001$ ).

A larger proportion of hospitalisations for fall-related non-fracture injuries occurred in Aboriginal people. This differential was particularly higher for non-fracture injuries to the head and neck, accounting for a more than 5% higher proportion of fall-related hospitalisations for Aboriginal people (19%) than for other older Australians (14%,  $p < 0.0001$ ).

The home was the most common place of injury for both Aboriginal people and other older Australians. A large proportion of records listed place of injury as 'Other/Unspecified' for Aboriginal people (32%) compared to other older Australians (21%). A smaller proportion of hospitalisations for Aboriginal people resulted in readmission within 28 days when compared to hospitalisations for other older people (11.5% vs 16.6%,  $p < 0.0001$  respectively).

### 3.3.2 Length of hospital stay

The average length of hospital stay for a fall-injury was 9.1 days for Aboriginal people and 14.0 days for other older Australians. Length of stay was shorter for Aboriginal people for all injury types with the exception of hip fracture and traumatic brain injury, where there was no difference (Table 3.2). Rates of self-discharge were low over all (0.7%), but higher for Aboriginal people than other older Australians (3.4% vs 0.6%,  $p < 0.0001$ ).

Injury type	Observed length of stay (days)					Age and sex adjusted		
	Older Aboriginal people		Other older Australians		p-value	Older Aboriginal people (95%CI)	Other older Australians (95%CI)	p-value
	Mean (95%CI)	Median	Mean (95%CI)	Median				
All fall related injury	9.1 (8.5-9.6)	3.0	14.0 (13.9-14.0)	6.0	0.0012	9.5 (9.3-9.7)	13.7 (13.7-13.7)	<0.0001
Hip fracture	25.6 (23.0-29.2)	19.5	26.5 (26.3-26.6)	22.0	0.8925	25.0 (24.8-25.3)	26.5 (26.5-26.5)	<0.0001
TBI	9.6 (7.1-12.8)	2.0	12.8 (12.6-13.2)	6.0	0.4289	10.4 (10.0-10.8)	12.9 (12.9-12.9)	<0.0001
All other fracture (non-hip)	9.9 (9.0-10.8)	4.0	13.7 (13.6-13.8)	5.0	<0.0001	9.2 (8.9-9.6)	13.8 (13.8-13.8)	<0.0001
All other non-fracture injuries (non-TBI)	4.4 (3.9-4.9)	1.0	7.1 (7.0-7.2)	2.0	0.0056	4.8 (4.7-4.9)	7.1 (7.1-7.2)	<0.0001

**Table 3.2:** Length of hospital stay (days) following fall-related injury admission, persons aged 50 years and older, linked hospitalisation and mortality data, NSW 2003-2012

### 3.3.3 Mortality following hospital admission

Fewer hospitalisations for older Aboriginal people resulted in death within 30-days of admission when compared to hospitalisations for other older Australians (2.9% vs 4.2%,  $p=0.0006$  respectively). Notably, 30-day mortality for TBI was less than half for older Aboriginal people compared to other older Australians (7.8% vs 16.2%,  $p=0.0105$ ) however, caution should be taken when interpreting this result as TBI numbers were very small for older Aboriginal people. There was no difference in mortality for hip and other fracture injuries. The small number of deaths for Aboriginal people prevented adjustment for sex and age (Table 3.3).

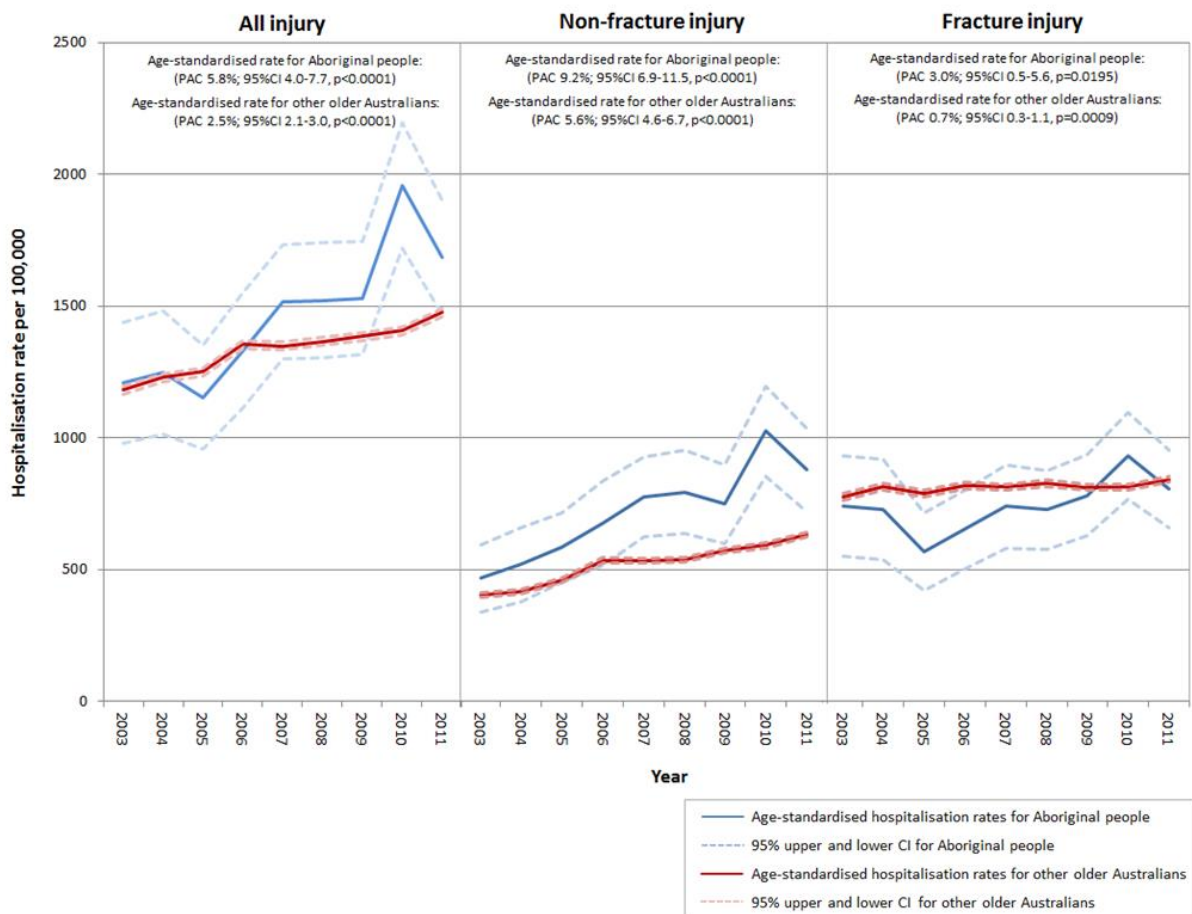
Injury type	Older Aboriginal people		Other older Australians		p-value
	n	%	n	%	
All fall related injury	76	2.9	13,034	4.2	0.0006
Hip fracture	18	7.9	4,535	6.8	0.5019
All other fracture (non-hip)	22	2.2	2,995	2.4	0.7022
TBI	10	7.8	1,988	16.2	0.0105
All other non-fracture injuries (non-TBI)	26	3.1	3,495	2.1	0.0407

**Table 3.3:** Thirty-day mortality, fall-related injury hospitalisations, persons aged 50 years and older, linked hospitalisation and mortality data, NSW 2003-2012

### 3.3.4 Age-standardised hospitalisation rates

The age-standardised rate for all fall-related injury was higher for Aboriginal people overall (ARR 1.17; 95%CI 1.11-1.23,  $p<0.0001$ ); however the rate was only significantly higher over the last two years of data. Age-standardised hospitalisation rates for hip fracture were similar (ARR 0.91; 95%CI 0.79-1.05,  $p=0.1882$ ) for Aboriginal people and other older Australians, but Aboriginal people had higher rates for TBI (ARR 1.27; 95%CI 1.24-1.30,  $p=0.0262$ ).

Hospitalisation rates for both Aboriginal people and other older Australians increased over time, but the increase was greater for Aboriginal people (Figure 3.1).



**Figure 3.1:** Age-standardised fall injury hospitalisation rates for older Aboriginal people and other older Australians aged 50 years and older, linked hospitalisation and mortality data, NSW 2003-2012

Trends varied by injury type. Age-standardised fall-related fracture hospitalisations increased at a faster rate amongst Aboriginal people when compared to other older Australians over the study period (3.0% annual increase vs 0.7% annual increase, respectively). Non-fracture fall-related injury hospitalisations occurred at a similar rate for both groups, yet increased at a faster rate for Aboriginal people in comparison to other older Australians over the study period (9.2% annual increase vs 5.6% annual increase, respectively).

### 3.4 Discussion

This study found the majority of fall-related injury hospitalisations for Aboriginal people to be for those aged below 75 years. This is consistent with results from previous work in NSW which shows 61% of fall-injury hospitalisations for Aboriginal people are for those aged 50 to 64 years, while only 23% of fall-related hospitalisations occurred for other older Australians from the same age group (15). Similarly, all-cause national hospitalisations for people aged 65 years and older account for 14% of hospital separations for Aboriginal people, and 42% of hospital separations for other Australians (16).

High rates of polypharmacy among other older Australians may contribute to the high rate of fall-related injury hospitalisations observed for this group. Polypharmacy is likely to affect a smaller proportion of the younger Aboriginal cohort included in this study, amplified by other barriers to medication use experienced by the Aboriginal population, such as access issues and a preference for traditional medicines (17).

Aboriginal people were less likely to have been admitted to a hospital with a fall-related fracture injury than other older Australians, particularly for hip fracture admissions. This is possibly attributable to higher levels of obesity in the Aboriginal population. An elevated BMI has been shown to increase femoral neck bone mineral density in older people, protecting it against fracture (18). The presence of excess fat around the hip also absorbs and diverts energy away from the hip in the event of impact (19). There are higher rates of obesity in older Aboriginal people, affecting 75% of Aboriginal people aged 55 years and older and 59% of other older Australians (20). The substantial burden of early onset chronic health conditions within the Aboriginal population coupled with high Aboriginal mortality rates at younger ages (20) may result in the Aboriginal people surviving to older ages being the healthiest and strongest members of the population. This would lead to fewer hospitalisations occurring from health conditions related to ageing within this group, such as hip fracture.

There was a higher proportion of fall-related non-fracture injury hospitalisations for Aboriginal people than for other older Australians, particularly for non-fracture injuries to the head and neck. Injury to the head and neck following a fall suggests impaired neuroprotective reflexes which ordinarily lead to a person's arms being used to break a fall (21). A previous study has reported hospitalised injuries to the head occurring amongst Aboriginal people aged 60 years and older at 1.7 times the rate when compared to other older Australians, where 81% of head injury cases were caused by a fall (22).

Aboriginal people experienced a shorter hospital length of stay for all injury types when compared to other older Australians. A number of factors are known to make hospitalisation a traumatic experience for Aboriginal people, causing a push towards earlier discharge. These include separation from family and community networks, issues with communication and language barriers, and the fear of dying away from home country (22, 23). This raises questions about the appropriateness of mainstream health care settings providing care for Aboriginal people. Shorter length of hospital stay for older Aboriginal people may reflect lower referral rates for surgical and specialist care within this group. There were a small proportion of self-discharges for Aboriginal people, however this was unlikely to have influenced the overall length of stay.

In this study, fewer hospitalisations for older Aboriginal people resulted in death within 30-days of admission when compared to hospitalisations for other older Australians. The age distribution of people hospitalised with a fall injury could contribute to this, with younger Aboriginal people experiencing a faster recovery directly following injury in comparison to older and frailer other older Australians.

From the current study, fall injury rates for Aboriginal people increased at approximately twice the rate as for other older Australians. This is consistent with the findings from a nation-wide study of people aged 65 years and older which reported fall-related injury hospitalisations for Aboriginal people increased at 2.4 times the rate than for other Australians from 2007-2011. Treatment seeking behaviours between Aboriginal people and other Australians differ significantly. Aboriginal and Torres Strait Islander people use public hospital admitted patient services at a four-time greater rate than other Australians, yet are less likely to be admitted to a private hospital (24). Past experiences of discrimination and communication issues have been reported to deter Aboriginal people from accessing mainstream health services (22). Currently, 52 Aboriginal Community Controlled Health Services (ACCHS) operate across NSW (25), many of which have the clinical facilities to treat less severe fall related injuries. These services could potentially allow older Aboriginal people to avoid accessing the hospital system for treatment.

#### 3.4.1 Strengths and limitations

To our knowledge, this is the first study investigating fall injury hospitalisations and outcomes specifically for older Aboriginal people in NSW. The population-based nature of the study maximised its statistical power and the relatively long study timeframe allowed hospitalisation trends to be observed. Through using information from all hospitalisation records for an individual, there was a high likelihood Aboriginal people were identified over the study period.

Despite this, issues with the correct identification of Aboriginal people on presentation to health services are likely to underestimate Aboriginal hospital admissions within the study. A report released by the AIHW in 2010 highlighted that 11% of Aboriginal and Torres Strait Islander people were not identified correctly in their hospitalisation records (26). However, levels of Indigenous identification have increased by 8% in NSW public hospitals between 2005 and 2010 (26). This may contribute to the observed trend of increased injury hospitalisation rates for Aboriginal people over time compared with other Australians. The APDC is considered to be a reliable data source which is routinely monitored and quality checked however, minor errors may exist caused by coding errors, clerical errors or data conversion errors.

Further research is required to determine how hospital services can utilize the results of this study to make their services more appropriate in providing care to older Aboriginal people. Additionally, the results of this study may guide the design and implementation of fall prevention programs for Aboriginal communities, as this study identifies specific falls risk factors for the Aboriginal population.

### 3.5 Conclusion

There were different patterns of injury observed between older Aboriginal people and other older Australians. Fall injury hospitalisation rates rose more rapidly over the period studied for Aboriginal people than for other older people. This may be influenced by the use of alternative Aboriginal-specific health services, an underreporting of Indigenous status on presentation to medical services and/or changes in reporting practices overtime.

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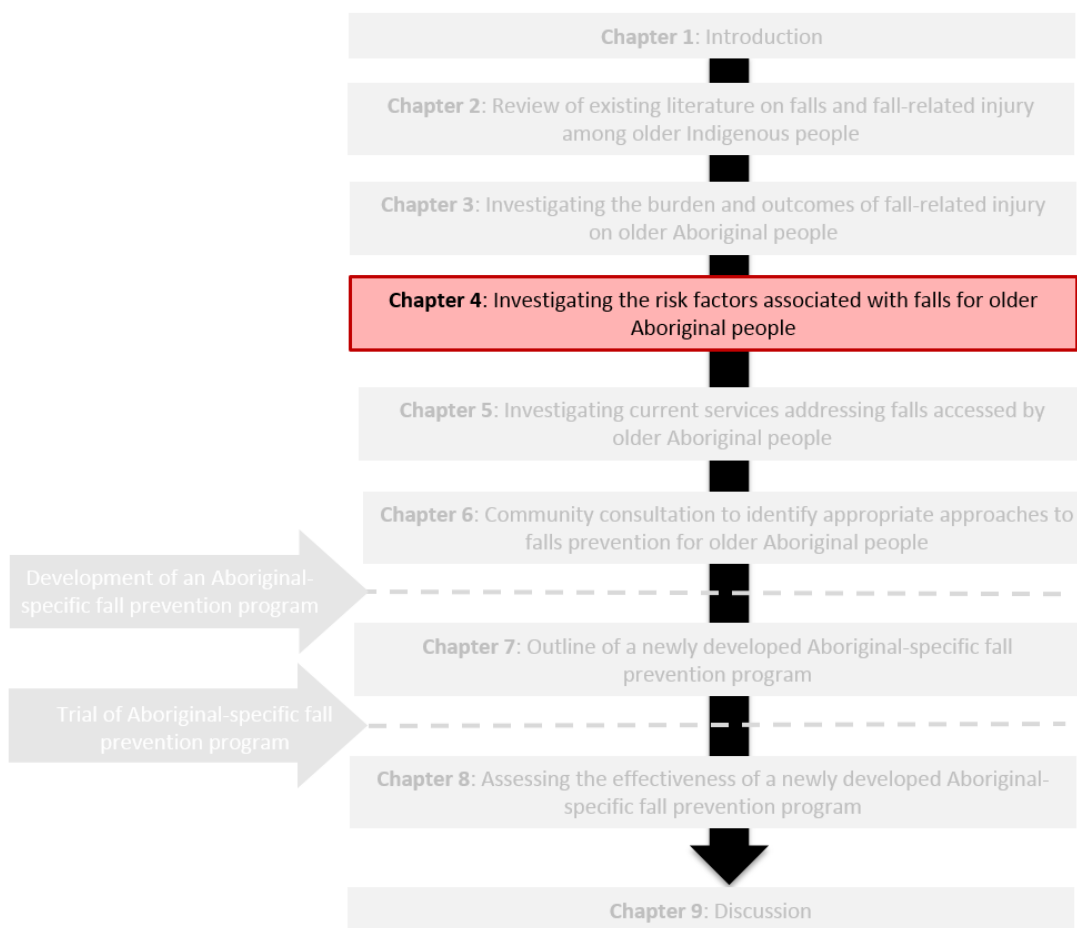


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# Chapter 4: Investigating the risk factors associated with falls for older Aboriginal people

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Secondary analysis was performed on cross-sectional survey data collected through the Koori Growing Old Well Study. Here, Aboriginal people aged 60 years and older residing in five urban and regional communities in NSW were surveyed during 2010-2012. This manuscript investigates the associations between participant self-reported falls and self-reported risk factors known to increase falls within other populations.

This study was performed to investigate the prevalence of falls and to identify risk factors associated with falls specifically for older Aboriginal people. Understanding which falls risk factors have a significant impact on older Aboriginal people highlights priority areas to address through a prevention intervention developed specifically for the Aboriginal population.

**Contributions to this study:** I obtained access to existing Koori Growing Old Well Study data sets, merging relevant data. I worked with manuscript co-authors to identify relevant study variables for inclusion in the present analysis. I performed the regression analysis, interpreted the outcomes and drafted the manuscript.

This chapter has been published in the *Australasian Journal on Ageing*:

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## 4.1 Introduction

Australia's Aboriginal and Torres Strait Islander population is ageing, with the proportion of people aged 55 years and older predicted to more than double between 2006 and 2021 (1). It has been suggested that Aboriginal and Torres Strait Islander people age prematurely in comparison to other Australians, driven by a large burden of chronic disease affecting the middle-aged Aboriginal and Torres Strait Islander population (2). Due to this, Aboriginal and Torres Strait Islander people aged 50 years and older are classified as 'ageing', while for the general population, this term is commonly reserved for people aged 65 years and older (3). This presents challenges in comparing health outcomes associated with ageing between both groups. Healthy ageing is becoming an increasingly important priority, with the National Aboriginal and Torres Strait Islander Health Plan 2013-2023 (4) stating a primary aim of supporting older Aboriginal and Torres Strait Islander people to remain active, healthy and independent.

Healthy ageing can be adversely impacted by falls. Falls are the leading cause of unintentional injury among people aged 65 years and older in Australia, accounting for 77% of all injury-related hospitalisations (5). A rich body of work from the previous 30 years (6, 7) has identified a number of environmental, physical, medical and lifestyle factors associated with an increased risk of falling, many of which are related to ageing. Examples include reduced mobility, cognitive impairment and the use of multiple medications. Previous work from the Kimberly Region in Western Australia found 32% of Aboriginal and Torres Strait Islander people aged 45 years and older had fallen at least once in the past year (8). This is similar to the proportion of falls reported by the general population aged 65 years and older, where approximately 30% of people experience at least one fall per year. Due to the difference in population health profiles, fall risk factors among Aboriginal and Torres Strait Islander people may be different to those identified in the general population. Previous research in this area, focussed on Aboriginal and Torres Strait Islander people, has highlighted the lack of observational research exploring risk factors (9), despite high burden, which in turn has inhibited the development of preventive programs (10). Further investigation into falls is crucial for improving individual patient management and for informing the development of targeted and effective fall prevention programs for the Aboriginal and Torres Strait Islander population.

The Koori Growing Old Well Study (11), conducted from 2010 to 2012, aimed to investigate ageing, cognition and dementia among community-dwelling Aboriginal people aged 60 years and older, living in New South Wales (NSW). Structured interviews were used to investigate the sociodemographic characteristics, life history and health and well-being of older Aboriginal people across five urban and

regional study sites. The aim of this study was to examine associations between fall risk factors identified for other populations and self-reported falls within the Koori Growing Old Well Study cohort.

The authors recognise the two distinctive Indigenous populations of Australia; Aboriginal and Torres Strait Islander people. As the vast majority of the NSW Aboriginal and Torres Strait Islander population is Aboriginal (95.4%) (12), this population will be referred to as 'Aboriginal' in this manuscript. When referring to Australia's Indigenous population, the term 'Aboriginal and Torres Strait Islander' will be used.

## 4.2 Methods

### 4.2.1 Participants

Participants were recruited from five urban and regional Aboriginal communities in NSW; two within metropolitan Sydney (La Perouse, Campbelltown) and three on the mid-north coast (Kempsey, Coffs Harbour, Nambucca). Methods of recruitment are described elsewhere (11). For inclusion in the study, participants were required to be Aboriginal and/or Torres Strait Islander, be aged 60 years or older, and been a resident of one of the five project sites for a minimum of six months. Individuals who had experienced a stroke within three months prior to data collection were excluded due to a high likelihood of temporary cognitive impairment following the event. A census performed through reviewing Aboriginal community organisation lists from each site, with additional input from local Aboriginal community members, identified 546 people to be eligible for the study across all five sites. A total of 336 (61.5%) people participated in the study, with no significant differences in age, gender, or urban/regional distribution compared to those who did not participate.

### 4.2.2 Data collection

Consultation, consent and partnership was established with each Aboriginal community prior to participant recruitment. Local Aboriginal researchers were employed and trained to support recruitment. As has been reported elsewhere (11) assessments were piloted prior to the study and procedures or instruments adapted according to community feedback to ensure their appropriateness for this population. In addition, community guidance groups consisting of 3-6 local Elders were created at each study site to provide ongoing feedback on study processes to the project team. Structured interviews were held with all study participants, and were conducted by trained project staff in community settings between March 2010 and September 2012. Each interview took approximately 2 hours, gathering data on participant sociodemographic characteristics, life history and health and well-being. Variables of specific relevance to this study (6, 7) are listed in Table 4.1, included at the end of this chapter. Participants self-ranked their ability to independently perform activities on a 3 or

4-point descriptive scale, based around cut-off points such as 'requires no assistance', 'some assistance needed' and 'complete assistance needed' (13). Participants were asked to self-rate their level of mobility, with those reporting no difficulties with movement, inside or outside of the house, classified as 'fully mobile'. Participants who reported they were a) mobile inside and outside the house with difficulty, b) mobile only inside the house, with no assistance, c) mobile only inside the house, but with assistance or d) bed or chair-bound, were grouped and classified as having 'problems with mobility' due to small participant numbers in each category. Body mass index (BMI) was calculated using weight and height obtained at the time of assessment. Project staff recorded medications from packaging presented during the interview, or from medication lists. Both prescription and non-prescription medications were ascertained. Cognition was assessed using the Mini-Mental State Examination (MMSE), which has been previously validated for use with older Aboriginal and Torres Strait Islander people in urban and regional settings (14), but is generally not suitable in remote settings (15). Dementia was assessed using the modified Kimberley Indigenous cognitive assessment tool (mKICA) (14, 15), and depression using the modified Patient Health Questionnaire (mPHQ-9) (16, 17).

Past falls were assessed by asking the question: 'Have you had any falls in the last year and if so, how many falls have you had?' Falls were defined as 'an unexpected loss of balance resulting in coming to rest on the floor, the ground, or an object below knee level' (18).

Study participants were each asked to nominate a contact person. Each consenting contact person completed a 60 minute interview with questions mirroring those asked through participant interviews. This was used as a method of providing information for questions participants were unable to answer themselves. Additional questions were included in the contact person interviews investigating observed participant functional decline and/or changes to behaviour.

#### 4.2.3 Statistical analysis

Study participants were divided into two groups; those who had reported one or more falls in the past year, and those who had not reported any falls in the past year. Sociodemographic characteristics, health conditions and ability to perform activities of daily living were compared between the groups.

A number of categorical and continuous variables were grouped due to small participant numbers. Modified Poisson regression was used to estimate relative risk (19), with all variables adjusted for age and sex. Variables significantly associated with past falls ( $p < 0.2$ ) from the initial regression analysis were included in the initial multivariable model, and a backward elimination strategy was used for variable selection. Variables with  $p > 0.2$  were systematically removed from the model to estimate mutually adjusted relative risk. There was minimal missing data in each individual variable (Table 4.1)

apart from BMI, so a complete-case analysis was done for each individual variable (and age and sex) in the minimally adjusted models, and similarly for the mutually adjusted model.

SAS 9.4 with SAS/STAT 14.1 was used to perform all statistical analysis.

#### 4.2.4 Ethics

The study was approved by the Aboriginal Health and Medical Research Council (AHMRC; 615/07), the University of New South Wales Human Research Ethics Committee (HREC 08003), and NSW Population & Health Services Research Ethics Committee (AU RED Ref: HREC/09/CIPHS/65; Cancer Institute NSW Ref: 2009/ 10/187).

All aspects of the study were guided by an Aboriginal Reference Group, which included Elders and prominent Aboriginal people from medicine, academia, and public policy, who were otherwise independent of the study (11).

### 4.3 Results

From a total of 546 eligible potential participants, 336 (62%) individuals participated in the study. Of the 210 individuals who did not participate, 123 refused, 31 could not be contacted, 11 moved away, nine passed away prior to data collection and 36 were unable to be interviewed due to other reasons. As described previously (11), there were no significant differences in sociodemographic characteristics between individuals who participated in the interviews and those who did not.

The 336 study participants had a mean age of 67 years (SD 6.3), the majority were female (59%) and resided in regional areas (58%) [42% resided in urban areas].

Of the 114 people who agreed to take part in the study as contact persons, 38 (33%) were the daughter of a participant and 27 (24%) were the spouse of a participant. Nearly all contact persons (98%) reported knowing the participant well or very well.

#### 4.3.1 People who had experienced a fall

Self-reported fall data were missing for 21 (6%) participants, who were older (mean age of 74 years, SD 8.9) and more likely to have cognitive impairment (50% of participants who had missing fall data were cognitively impaired). Fall data for 10 of these participants was provided through interviews held with nominated contact people.

Of the 330 participants with reported fall data, 48 (15%) reported one fall in the past year, and 37 (11%) reported 2 or more falls in the past year (Table 4.1). People who had experienced a fall were predominantly female (72%), had a mean age of 66 years (SD 5.8), were more likely to reside in

regional areas (63%) and had a BMI within the 'obese category' (49%). Three falls (4%) resulted in fracture injuries to the leg, arm, hip and/or back. Contact person interviews for 10 participants who were unable to self-report falls data showed half to have experienced a fall in the previous 12 months.

### 3.4.2 Risk factors for falls

Associations between past falls and self-reported exposure to 22 possible predictor variables are shown in Table 6. After adjusting for age and sex, eight of the 22 possible predictor variables were significantly associated with an increased risk of falls.

After adjusting for age and sex, the risk factor with the largest relative risk (RR) was the use of 3 or more medications (RR=3.7, 95%CI:1.25-2.4), followed by macular degeneration (RR=2.0, 95%CI: 1.2-3.2), moderate/severe depression (RR=1.9, 95%CI:1.3-2.9), history of stroke (RR=1.9, 95%CI:1.3-2.9), inability to do own housework (RR=1.8, 95%CI:1.2-2.7), female gender (RR=1.7, 95%CI:1.1-2.7, adjusted for age), osteoarthritis and/or inflammatory arthritis (RR=1.6, 95%CI:1.1-2.7) and inability to do own shopping (RR=1.6, 95%CI:1.1-2.4).

In multivariate analyses (including gender) after systematically excluding non-significant factors via a backward elimination process, the inability to do own housework (RR=1.9, 95%CI: 1.2-3.0,  $p>0.01$ ) and the presence of osteoarthritis and/or inflammatory arthritis (RR=1.8, 95%CI: 1.0-3.2  $p=0.03$ ) remained significantly associated with past falls.

## 4.4 Discussion

It is well-documented that health services developed specifically for Aboriginal and Torres Strait Islander people provide better access and can be more effective in addressing the unique needs of this population (20). Falls can have a severe impact on the health and wellbeing of an older person, potentially leading to long-term hospitalisation or permanent placement in residential care. To older Aboriginal and Torres Strait Slander people, this translates to removal from home, country and community. It is important to understand which falls risk factors are particularly significant for this population to provide relevant fall prevention services in response.

Within this study of Aboriginal people aged 60 years and older, 23% of participants experienced one or more falls within the year preceding data collection. The proportion of people reporting falls in this study is lower than the proportion previously reported by Aboriginal and Torres Strait Islander people aged 45 years and older in Western Australia (WA), where 32% of the study population experienced at least one fall within a one year period (8). Similar methods of participant recruitment and data collection were used in both studies. Differences in study outcomes may be due to the greater



proportion of older participants included in the WA study (25 participants aged 80+ years) having poorer memory, potentially causing recall bias (21). Further, fall-related hospitalisation rates and mortality rates are higher for older people living in rural and remote areas than in urban areas, potentially contributing to the differences in fall rates reported between studies (22). Within the general Australian population, approximately 30% of people aged 65 years and older fall at least once per year (23). Of all falls reported through this study, 4% resulted in a fracture injury. This is comparable to reports from the general population, where fractures are an outcome of approximately 5% of all falls (24).

Multiple factors were associated with an increased risk of falls. This study showed women were more likely to experience a fall than men (RR=1.7 and 1.2, respectively), similar to previous studies in the general population (7). Within the general population, females experience higher rates of falls than men due to their greater exposure to a number of falls risk factors, including a higher likelihood of past stroke, nutritional risk and the consumption of one or more alcoholic drinks per week (25).

Activities of daily living (ADLs) investigate an individual's ability to live independently and care for themselves (26). Previous studies have linked an inability or a lack of confidence in performing ADLs to impaired mobility and an increased risk of falls among older people (27). Within this study, an inability to do one's own housework was associated with a 1.9 times increased risk of falls in multivariate analyses (95%CI: 1.2-3.0, p=0.0067). Of the seven ADLs included in data collection, housework is considered one of the most physically demanding activities, possibly explaining its stronger association with past falls in our population.

In multivariate analyses, study participants who reported osteoarthritis and/or inflammatory arthritis had a 1.8 times greater risk of experiencing a fall than those without (95%CI: 1.0-3.2 p=0.0256). Similar outcomes have been reported for the general population aged 70 years and older, where arthritis in the knees and hips both increased fall risk (RR=1.4 and 1.7, respectively). Arthritis can damage cartilage, ligaments and bone, leading to pain, often in the knee, hip or back. Avoiding movement to prevent pain can lead to muscle deconditioning and a loss of strength (28), increasing a person's likelihood of experiencing an injurious fall.

### *Strengths and limitations*

This study collected information on a wide range of social, medical, physical and environmental factors associated with the health and well-being of older Aboriginal people in NSW. Approaches to participant recruitment and data collection were guided by Aboriginal Elders local to each study site, ensuring the research was conducted appropriately and in accordance with community expectations.

Limitations of this study include the retrospective collection of falls data from participants, leading to a high potential for recall bias, particularly with a one year look-back period. Further recall bias may have been introduced through the self-report of several falls risk factors. No existing studies were identified which used prospective data collection methods to investigate fall rates among older Aboriginal and Torres Strait Islander people. It would be beneficial to trial methods of prospective falls data collection often used in the general population with Indigenous groups. A potentially suitable method may be the use of daily calendars for recording falls (29). The study was not representative of the national Aboriginal and Torres Strait Islander population, limiting the generalisability of its outcomes. As the Koori Growing Old Well Study did not have a specific focus on falls, information surrounding a number of known falls risk factors from the general population was not collected, limiting the scope of the analysis. The cut-off points used to classify cognitive impairment and dementia have relatively low sensitivity within the older Aboriginal and Torres Strait Islander population. Participants with cognitive impairment and/or dementia were more likely to be missing falls data and were therefore more likely to be excluded from this analysis. Both these factors may have contributed to the null findings of cognitive impairment and/or dementia as a risk factor for falls.

#### 4.4.1 Clinical implications and directions for future research

Falls risk factors for older Aboriginal people identified in this research are similar to those identified in the general older population by previous research. Due to variations in comparison study populations and differences in selection criteria, this finding is only suggestive and requires further investigation. Many fall risk factors were found to be more prevalent within the Aboriginal and Torres Strait Islander population than within the general population however, fall rates remained similar between both groups. Higher rates of comorbid conditions may cause activity levels to be lower among older Aboriginal and Torres Strait Islander people, providing fewer opportunities for a fall to occur. Additionally, past falls may have been underreported by study participants due to falls data being collected retrospectively through both this study and the closest comparable study conducted in WA (8). This highlights the need for a large-scale prospective study in this area.

Further research is needed to fully understand the fall risk factors in Aboriginal people and establish optimal fall prevention programs. Further investigation using prospective fall reporting is required to further examine differentials in fall rates in Aboriginal and Torres Strait Islander people.

## 4.5 Conclusion

Falls were shown to affect approximately one quarter of the Aboriginal study population aged 60 years and older. These factors identified to be associated with falls are known to also increase falls risk in the general population. The engagement of Aboriginal and Torres Strait Islander health and

community services is necessary for identifying effective and acceptable approaches to addressing the high-priority falls risk factors identified through this study. Future research conducted in partnership with Aboriginal organisations investigating acceptable approaches to addressing falls risk factors in community settings would be of great value.

Participants who completed interview (n=315)							
Variable	Missing data for variable		0 reported falls in the past year (n=240)		1+ reported falls in the past year (n=75)		Adjusted for age and sex
	n	%	n	%	n	%	Rate ratio (95% CI)
<b>Age group, y</b>							
60-69	0	0	182	76	57	76	1.0
70-79			52	22	15	20	0.9 (0.5-1.5)
80+			6	3	3	3	0.9 (0.3-2.4)
<b>Sex</b>							
Male	0	0	107	45	21	28	1.0
<b>Female</b>			<b>133</b>	<b>55</b>	<b>54</b>	<b>72</b>	<b>1.7 (1.1-2.7)*</b>
<b>Current residence</b>							
Regional (other NSW)	0	0	138	58	47	63	1.0
Urban (Sydney)			102	43	28	37	1.2 (0.8-1.9)
<b>BMI</b>							
Underweight/Normal weight (<18.50- 24.99)	48	14	32	13	8	10	1.0
Overweight (25.00 - 29.99)			61	25	19	25	1.2 (0.6-2.7)
Obese (≥30.00)			108	45	39	52	1.2 (0.6-2.6)
<b>Past head injury with loss of consciousness</b>							
None	2	1	171	71	53	71	1.0
1 head injury			44	18	14	19	1.1 (0.7-1.9)
2+ head injuries			23	10	8	14	1.4 (0.7-2.7)
<b>Visual conditions</b>							
None	2	1	172	72	46	61	1.0
Glaucoma			30	13	10	13	1.2 (0.7-2.1)
<b>Macular degeneration</b>			<b>22</b>	<b>9</b>	<b>14</b>	<b>19</b>	<b>2.0 (1.2-3.2)*</b>
Cataracts			14	6	5	7	1.5 (0.7-3.2)
<b>Arthritic conditions</b>							
None	5	1	86	36	16	21	1.0
<b>Osteoarthritis and/or inflammatory arthritis</b>			<b>149</b>	<b>60</b>	<b>59</b>	<b>78</b>	<b>1.6 (1.1-2.7)*</b>
<b>Diabetes</b>							
No	0	0	141	59	35	47	1.0
Yes			99	41	40	53	1.4 (0.9-2.1)
<b>Parkinson's Disease</b>							
No	4	1	238	71	72	96	-
Yes			0	0	1	0*	-
<b>Mobility</b>							
Fully mobile	3	1	187	78	48	64	1.0
Problems with mobility			50	22	27	35	1.5 (0.9-2.2)
<b>Medication use</b>							
No medications	0	0	23	10	3	4	1.0
1 or 2 medications			58	24	9	12	1.8 (0.5-6.0)
<b>3+ medications</b>			<b>159</b>	<b>66</b>	<b>63</b>	<b>84</b>	<b>3.7 (1.2-2.4)*</b>
<b>Cognition (MMSE)</b>							
Normal cognition (24+ points)	0	0	211	88	65	87	1.0
Any cognitive impairment (23 points or less)			29	12	10	13	0.9 (0.5-1.7)
<b>Dementia (mKICA)</b>							
No (score: 34-39)	0	0	224	93	70	93	1.0
Yes (score: 0-33)			15	6	5	7	0.7 (0.3-1.7)
<b>Depression (mPHQ-9)</b>							
None/mild/minimal depression (score: 0-9)	4	1	201	84	52	69	1.0
<b>Moderate/severe depression (score: 10-27)</b>			<b>35</b>	<b>17</b>	<b>23</b>	<b>31</b>	<b>1.9 (1.3-2.9)*</b>
<b>History of stroke</b>							
No	1	0^	198	83	46	61	1.0
<b>Yes</b>			<b>42</b>	<b>18</b>	<b>28</b>	<b>37</b>	<b>1.9 (1.3-2.9)*</b>

Activities of daily living

Able to cook for self							
Yes	4	1	190	79	58	77	1.0
No			47	20	16	21	1.0 (0.6-1.6)
Able to dress independently							
Yes	6	2	217	90	69	92	1.0
No			19	8	4	5	0.8 (0.3-1.9)
Able to eat independently							
Yes	3	1	232	97	74	99	1.0
No			5	2	1	1	0.4 (0.1-2.7)
Able to do all own housework							
Yes	4	1	160	67	35	47	1.0
No			77	32	39	52	1.8 (1.2-2.7)*
Has problems controlling bladder or bowel							
Yes	6	2	198	83	63	84	1.0
No			36	15	12	16	0.9 (0.5-1.5)
Able to do own shopping							
Yes	4	1	172	72	42	56	1.0
No			65	27	32	43	1.6 (1.1-2.4)*
Able to use toilet independently							
Yes	6	2	225	94	72	96	1.0
No			9	4	3	4	0.6 (0.2-2.0)

\*P < 0.05 (variables significantly associated with past falls)

^Less than 0.01%

**Table 4.1:** Demographic and clinical characteristics of reported fallers and non-fallers, adjusted for age and sex, with data collected through participant and contact person interviews

## Reference list for Chapter 4

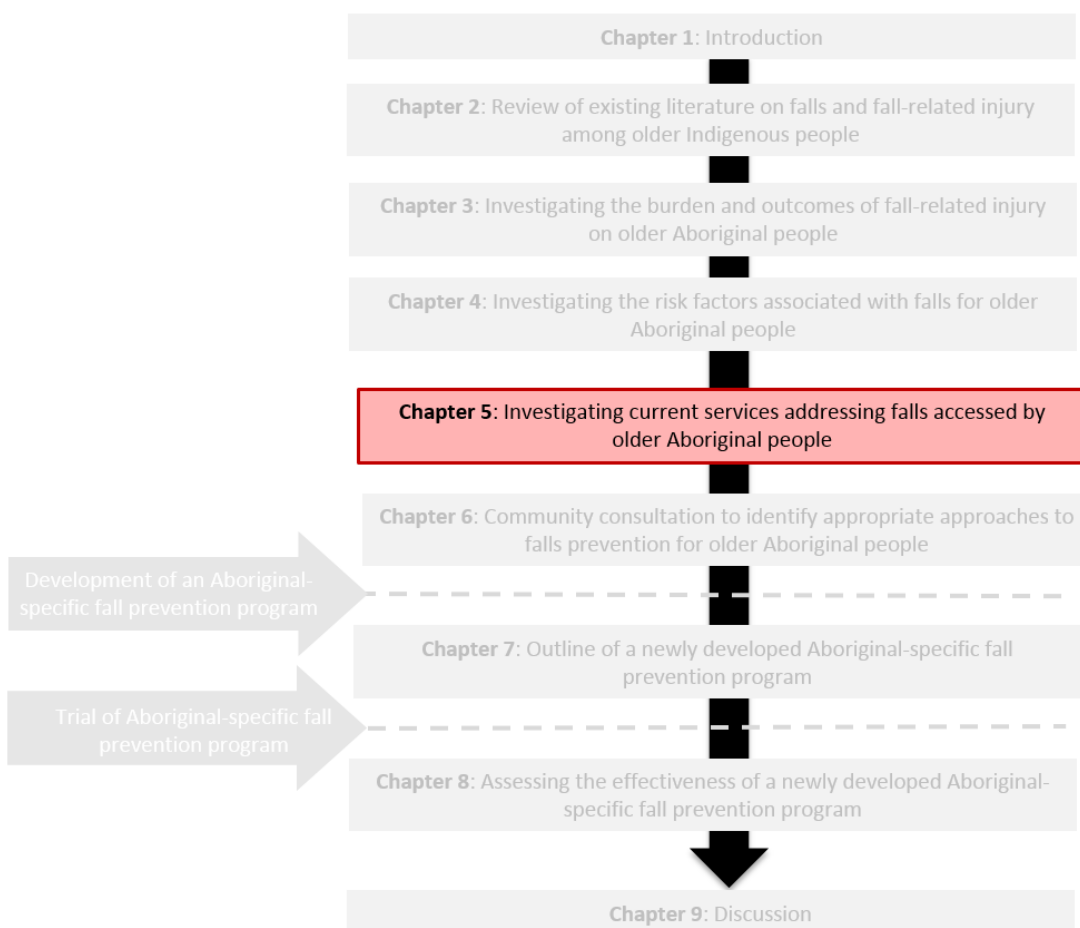
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# Chapter 5: Investigating current services addressing falls accessed by older Aboriginal people

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A questionnaire was distributed to Aboriginal and mainstream, health and community services operating in NSW to investigate the use of existing fall prevention programs by older Aboriginal people. Interviews were held with relevant service staff to discuss strategies towards the development of an effective and acceptable Aboriginal-specific fall prevention program.

This manuscript investigates what fall prevention programs are available to older Aboriginal people and which healthy ageing services are commonly used by older Aboriginal people in NSW. It attempts to identify program features that are likely to contribute to a culturally acceptable fall prevention program for older Aboriginal people from the perspective of service providers experienced in Aboriginal aged care.

**Contributions to this study:** I led development of both the audit tool and interview tool used in this study. I identified relevant services and distributed the audit tool. I performed analysis of audit results and performed all service provider interviews. I analysed interview data and drafted the manuscript.

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**Corresponding author:** Caroline Lukaszyk

**Date of acceptance:** 1<sup>st</sup> September 2016

## 5.1 Introduction

Australia's Aboriginal and Torres Strait Islander population is ageing: in 1996, people aged 65 years and older accounted for 2.8% of Australia's total Aboriginal and Torres Strait Islander population but this proportion is predicted to more than double to 6.5% by 2026 (2). As this older age group grows in size, so too does the burden of age-related health conditions among Aboriginal and Torres Strait Islander people.

Falls significantly impact the health of older people living in Australia, with approximately one third of people aged 65 years and over experiencing at least one fall each year (3). Fall-related injury is the leading cause of injury hospitalisations for Aboriginal people in NSW (4), predominantly affecting women aged 65 years and older, and men aged 60-64 years (5). Fall injury rates have increased by an average of 10.2% per year for older Aboriginal people from 2007-08 to 2010-11, compared to a 4.3% average annual increase for other older Australians (6).

Multiple fall prevention programs are currently being run in community settings across Australia (7). However, it is uncertain whether these programs are being accessed by older Aboriginal and Torres Strait Islander people or how effective or acceptable they are for this population.

Previous studies have described difficulties with promoting the uptake of fall prevention services in other populations (8). This has been attributed to the embarrassment associated with falling amongst older age groups and a lack of awareness surrounding an individual's personal ability to decrease their risk of falling. There are further concerns surrounding the acceptability of mainstream health services for older Aboriginal and Torres Strait Islander people, with past experiences of discrimination and communication difficulties potentially deterring from service use (9).

This study aimed to describe fall prevention services being delivered in New South Wales (NSW), and investigate their use by older Aboriginal people. Investigating how a fall prevention program could be developed that is culturally acceptable and appealing for older Aboriginal people is a key focus of this research.

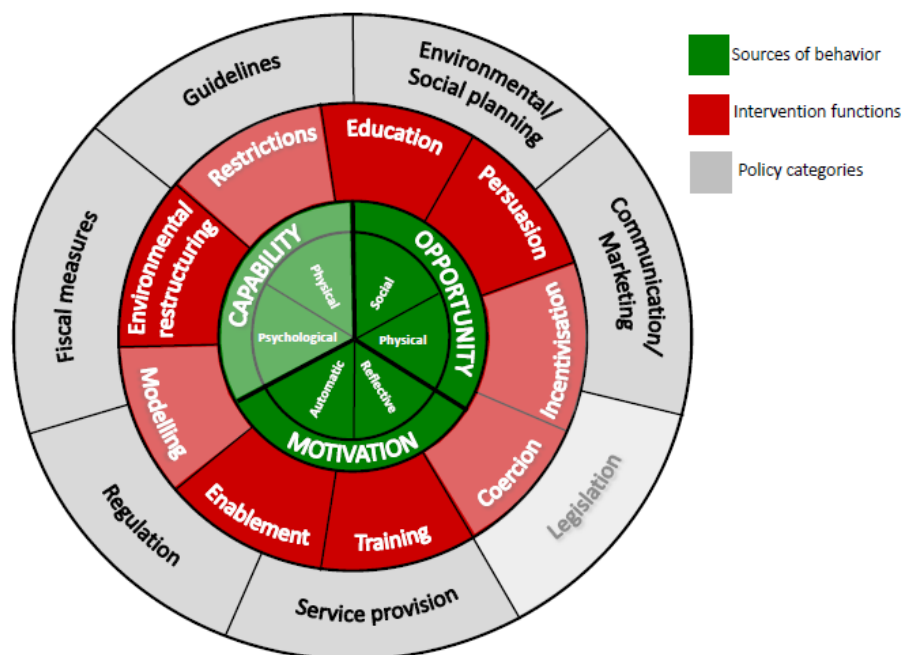
## 5.2 Methods

A questionnaire investigating the use of both healthy ageing services and fall prevention services by older Aboriginal people was distributed via email and fax to Aboriginal and mainstream, health and community services operating in NSW. Initial service identification occurred through meeting with the Clinical Excellence Commission NSW Falls Co-ordinator Collaborative in April 2014. The project team identified additional services through online healthcare service databases such as Australian Indigenous HealthInfoNet, Aboriginal Medical Service directories and government chronic care

contact lists. A total of 628 emails containing a hyperlink to the online questionnaire were sent over a two week period. Additionally, 27 paper-based questionnaires were faxed to services on request if there was an issue of unreliable internet connectivity.

Services that indicated any experience in providing fall prevention programs specifically for older Aboriginal people were contacted via telephone by two researchers (CL and JC) to gain additional information on their structure and operation. An interview invitation was extended to members of staff who worked predominantly with the older Aboriginal clients at each service. An Aboriginal Research Officer (JC) performed follow-up with all Aboriginal-controlled health services identified.

For each service provider who consented to be interviewed, follow-up occurred either over the phone or in person. A structured interview guide was used, based on the framework of the Behaviour Change Wheel (BCW)(10). The BCW (Figure 5.1) investigates how elements of health policy and features of health services influence client interactions with health services, and can be used to inform a ‘more efficient design of effective interventions’ (10). The BCW framework has previously been used to guide the design of interventions, select approaches to intervention implementation and in performing intervention monitoring and evaluation.



**Figure 5.1:** Behaviour Change Wheel categories relating to themes discussed by service providers

The interview questions explored the ability of health services to deliver appropriate fall prevention programs to Aboriginal people, and aimed to identify intervention features that would be beneficial and appealing to older Aboriginal people. Both researchers confirmed when new ideas and insights

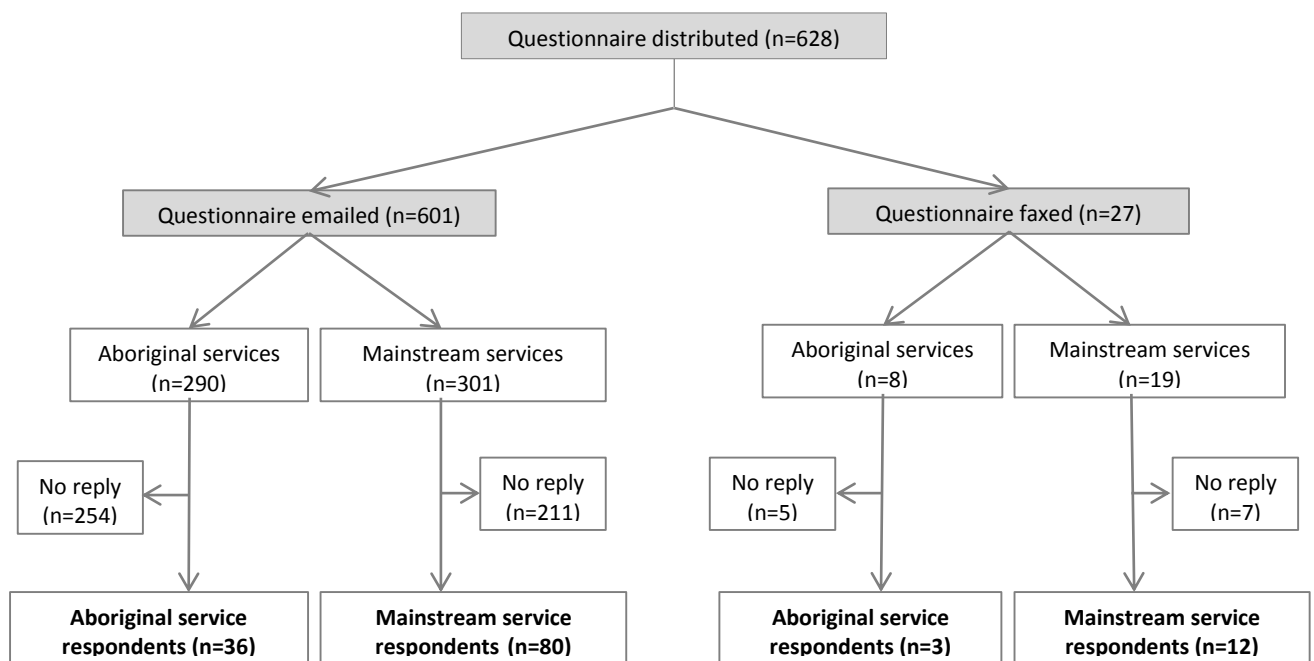
ceased to be provided through the interviews, indicating that data saturation had been achieved. Each interview was audiotaped and transcribed verbatim, with transcripts checked for accuracy and coded in QSR NVivo 10 Software.

The responses were analysed with the use of thematic analysis, where codes based on the BCW framework were assigned to sections of each interview transcript (11). This paper is reported in accordance with both STORBE and COREQ (Consolidated criteria for reporting qualitative research) reporting guidelines (12, 13).

All aspects of the study were overseen by an Aboriginal steering committee, ensuring the study was run in a culturally appropriate way, that study tools developed were suitable, and that study goals remained relevant. Ethical approval was granted by the Aboriginal Health and Medical Research Council (AH&MRC) Ethics Committee (1010/14).

### 5.3 Results

A total of 131 services responded to the questionnaire (131 / 628\*100 gives an overall response rate of 21%) with representation from all rural, regional and metropolitan NSW Local Health Districts (Figure 5.2).



**Figure 5.2:** Flow chart illustrating questionnaire distribution and response rates

From all completed and submitted questionnaires, 121 out of 131 respondents (92%) were unaware of any fall prevention services that were specifically run for Aboriginal people in their area. Only 4 out of 131 (3%) services reported to have provided a mainstream fall prevention program specifically to

Aboriginal people. Additionally, 107 out of 131 respondents (82%) were not aware of whether Aboriginal people attended mainstream fall prevention programs.

The four services that reported providing fall prevention interventions for Aboriginal communities were selected by the project team for follow-up (comprising of two Aboriginal services and two mainstream services). On follow-up, it was learnt that each service had past experience in offering fall prevention programs to older Aboriginal people, with no programs being offered at the time of data collection. The past programs had either been run by external parties who no longer had a relationship with the service, or by staff who had since left the service. Due to this, little information was available about past program content, delivery or outcomes. A further five key Aboriginal services which delivered healthy ageing programs specifically for older Aboriginal people living in community were additionally followed-up. Ten service providers were nominated from within the nine services to be interviewed.

The 10 interviewed service providers were from a variety of backgrounds, each experienced in working with older Aboriginal people in a healthcare context. All service providers reported falls as a major health issue for their older Aboriginal clients and service providers from Aboriginal health services stated that many older clients had never attended a program specifically for fall prevention. The five mainstream fall prevention service providers interviewed reported they were unsure of how to promote their programs to local Aboriginal communities, while the five service providers working in Aboriginal health services were unsure where to refer older Aboriginal clients to fall prevention interventions being run in the general community.

The interview data was analysed within the BCW framework. Certain themes reached over a number of BCW categories, demonstrating the complex relationships between client perspectives, health service functions and the influence of health policy. Direct quotes which best corresponded to these themes were taken from transcripts and used as subheadings to aid in interpreting the data.

Several BCW categories were not acknowledged by service providers (faded out segments in Figure 5.1: psychological and physical capability, modelling, restrictions, coercion, incentivisation and legislation). These areas may potentially be less relevant for program design and delivery in this context, or may have not been captured due to the design of the questionnaire.

### 5.3.1 Reasons for older Aboriginal people not accessing existing fall prevention programs

***“A lot of clients won’t go to mainstream programs”***

Two staff members from Aboriginal services and two staff members from mainstream services discussed their older Aboriginal clientele feeling uncomfortable with accessing mainstream programs. Trust in local, well-known, familiar Aboriginal services gave clients confidence to trial new programs there.

*“Most of our clients come here because they don’t feel safe in the mainstream exercise class. They just don’t feel comfortable.”* [Aboriginal Services Coordinator]

***“In reality, falls is not a huge consideration for most people”***

Three service providers from mainstream services reported that many of their clients didn’t see the benefit of attending a fall prevention program as they didn’t view falls as a health concern for themselves. Despite this, all service providers observed falls as having a significant health impact on their older Aboriginal clients.

*“Clients don’t believe it’s an issue for them, especially with the over 50 group, it’s not an issue, until they have a fall.”* [Exercise Physiologist]

***“We need to make our Aboriginal community aware of what’s available”***

The majority of service providers reported their older Aboriginal clientele to be unaware of existing fall prevention classes being available and therefore, ‘missing out’ on the opportunity to attend these. It was suggested that this could be the result of poor health promotion between Aboriginal and mainstream services, or gaps in fall prevention education for health service providers.

### 5.3.2 Service provider perspectives for developing a successful Aboriginal fall prevention program

***“You have to acknowledge the importance of cultural safety”***

All Aboriginal service providers saw it necessary to integrate a fall prevention program for older Aboriginal people into existing, well-established and trusted Aboriginal organisations. The combination of a known community venue with familiar staff and previously used transport options were thought to encourage program use, particularly with older people who may be more confronted to change. Additionally, promotion and referral to the program would be possible through other programs at each service.

*“If [the program] comes here, our clients will come, because they already come here. They’re not going to source [the program] somewhere else.”* [Service coordinator]

***“It’s a social occasion for participants”***

The Aboriginal service providers reported that relationships built between participants and program staff over the course of other Aboriginal healthy ageing programs acted as motivation for ongoing attendance.

*“A client might have been told [to use the program] 10 times but then they just decide to come because their friend is coming.”* [Exercise Physiologist]

Socialising amongst participants was additionally reported as a good educational tool, with both physical and mental health benefits.

*“All people can meet in a group and share similar stories and similar experiences. I think it can be a very valuable tool.”* [Occupational Therapist]

***“Aboriginal groups need Aboriginal instructors”***

The Aboriginal service providers viewed both Aboriginal staff members and Aboriginal instructors as more capable of relating to Aboriginal clients, which contributed to creating a culturally safe environment.

*“You need to have somebody that knows where [our Aboriginal clients] are coming from because they’re not going to come and see a person that has no clue.”* [Registered Nurse]

Additionally, through employing Aboriginal people from the local community, an immediate familiarity exists between participants and staff. Local staff were thought to remain in their roles for longer periods of time, preventing frequent staff turn-over.

*“[If we use] Aboriginal fitness leaders, people will come to the program because they’re supporting the community and vice versa.”* [Accredited Exercise Physiologist]

***“We need to meet the criteria”***

Despite the program needing to be culturally appropriate, one staff member from an Aboriginal service and one staff member from a mainstream service stated concern that the programs validity and effectiveness in reducing falls risk should not be compromised to meet this.

*“We want to maintain and completely acknowledge the importance of cultural appropriateness, we also want to ensure best practice - evidence-based best practice isn’t lost in trying to be too entirely culturally appropriate.” [Aboriginal Health Service Manager]*

The need for formally trained staff was discussed, with the skills to adjust the programs content and delivery method to suit participants while maintaining its effectiveness.

***“Flexibility is a big thing”***

The inflexibility of many previous mainstream health programs had left staff from both mainstream and Aboriginal services unable to adjust or modify the programs to meet the specific needs of their older Aboriginal clients which differed to those of the general older Australian population, leading to poor participant engagement.

*“The community [need to] understand it, so that they can relate to it, they can familiarise with it.” [Aboriginal care coordinator]*

### 5.3.3 Support required for the delivery of a successful fall prevention program to older Aboriginal people

***“Limited money, limited time, limited resources”***

Service providers working in Aboriginal health organisations identified high client numbers coupled with a lack of funding, staff and resources as major barriers to providing culturally appropriate Aboriginal fall prevention programs. Funding was seen as necessary for the training and employment of Aboriginal staff for program delivery, and for ensuring program sustainability.

*“I guess it’s our vision if we were able to source funding - this is something we would look at - developing our programs.” [Aboriginal Health Service Manager]*

Cost was reported as a barrier to clients accessing health services. Program fees were identified as particularly troublesome for older people who were often reliant on aged care pensions. Costs associated with client transport to and from health services added an additional barrier, particularly in widely-distributed communities.

***“Competing priorities”***

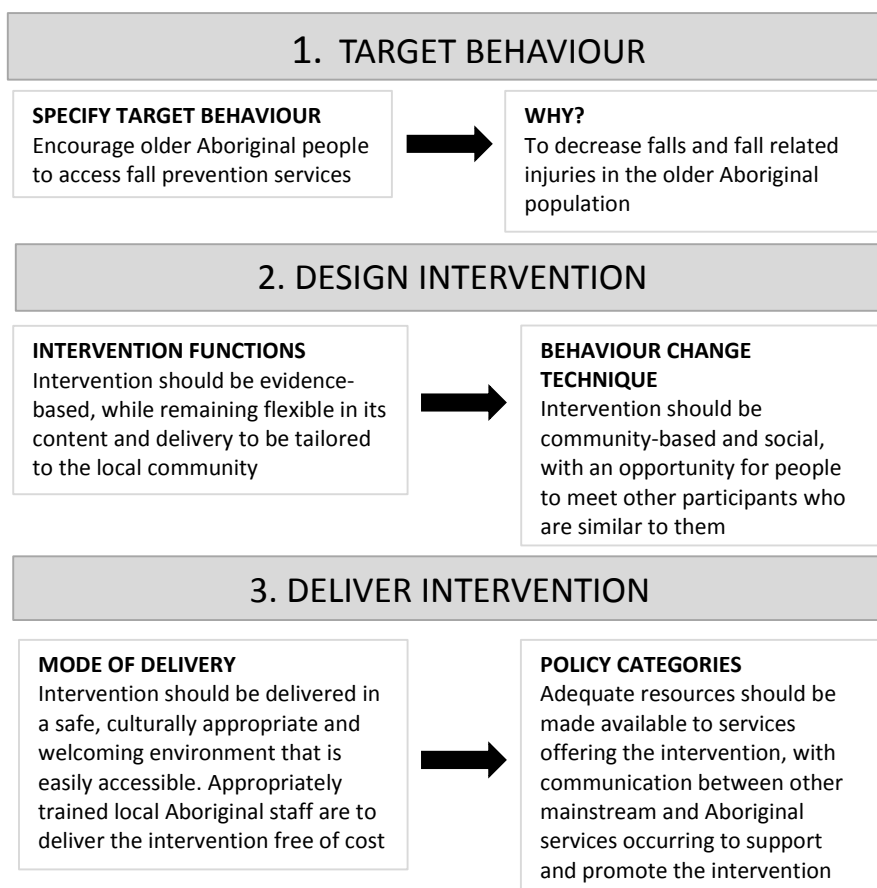


Despite the availability of many effective and frequently used Aboriginal community health services, staff from Aboriginal services reported that a lack of communication between the services and the lack of emphasis placed on fall prevention was thought to cause high falls-risk clients to be overlooked from receiving fall prevention assistance when required.

*“I guess when people get caught up in that medical model where you’ve got multi-disciplinary teams from different angles looking at different things there. Falls is probably not even a huge consideration in reality.”* [Aboriginal Health Service Manager]

Within Aboriginal services, there was uncertainty as to which service providers were responsible for assessing and referring at-risk patients to fall prevention programs, or delivering appropriate fall prevention advice. There was confusion not only between mainstream and Aboriginal services, but also between various health providers.

Themes repeatedly discussed by the service providers during the interviews were included in a program design template, also developed by Susan Michie as an element of her BCW framework (Figure 5.3). A concise program outline was generated using the interview data, highlighting how a fall prevention program could be structured for older Aboriginal people, from the perspective of the service providers.



**Figure 5.3:** Interpretation of interview themes within the Behaviour Change Wheel framework, applied to inform the design and delivery of an Aboriginal-specific fall prevention program

## 5.4 Discussion

This study identified a gap in the availability of acceptable fall prevention programs designed for, and delivered to, older Aboriginal people in NSW. Barriers preventing services from offering appropriate fall prevention programs to their older Aboriginal clients were identified, including limited funding, a lack of available Aboriginal staff, and communication difficulties between health services and sectors. According to service providers, an effective and acceptable fall prevention intervention would be evidence based, flexible, community-oriented and social, held in a familiar and culturally safe location and delivered free of cost. Further consultation with older Aboriginal people is necessary to determine how an appropriate and effective program can be designed and delivered.

It has been reported that participation in fall prevention programs by older people is typically less than 50% (14), and can be often as low as 10% (15). A qualitative study published by Yardley et al. in 2006 found older people to disengage from fall prevention programs for a number of reasons. Many participants did not view themselves as being at risk of falling while others associated falls with

embarrassment. Most commonly, participants were not aware of their ability to reduce their own risk of falling (8). The majority of these reasons were mentioned by the service providers when discussing fall prevention and their older Aboriginal clients. The unfamiliarity of mainstream programs for Aboriginal people added an additional deterrent to accessing available programs.

Difficulties with funding have been a long-standing obstacle for Aboriginal services in offering long-term health programs and are not unique to aged care. Public Aboriginal health funding can originate from a range of federal and state/ territory sources (16). As many Aboriginal services offer a variety of programs, funding for one service is often received from numerous grants and funding schemes which can be 'overlapping and unclear' (17). Additionally, the majority of these grants are only short to medium term in length. The ambiguity surrounding funding sources and a lack of funding security puts strong restrictions on the type and number of programs Aboriginal services are able to offer. As mentioned by the Aboriginal service providers, fall prevention is not often viewed as a priority in the Aboriginal aged care setting and therefore, frequently misses out on funding allocation.

There have been multiple studies that have shown a low use of mainstream healthcare services by Aboriginal people (18). Fee-charging health services are rarely accessed by Aboriginal people, with 72% of all Aboriginal health expenditure attributed to public hospital care and free-to-use community and health services (18). Currently, nearly all fall prevention programs run in NSW charge an attendance fee ranging from a donation to \$22 per session (7).

Communication difficulties and a history of discrimination within mainstream health services have left many Aboriginal people (particularly from older generations) hesitant to use Western health services and programs (19). Staff who have not received cultural competency training coupled with a high staff turnover rate at many public services, creates an unfamiliar environment to older Aboriginal clients, making trust difficult to establish between clients and health workers (20).

Employing Aboriginal staff in health services has proven to have positive effects on service use by the local Aboriginal community and on patient satisfaction with the service (21). Aboriginal health staff are rare with only 4,891 Aboriginal and Torres Strait Islander people working in the health industry nation-wide in 2006, comprising 1.0% of Australia's total health workforce (22). The content and delivery of an exercise-based fall prevention program must meet very specific guidelines to guarantee the program's effectiveness (23). As a result, allied health professionals or fitness instructors with extensive experience in working with older adults are ideal candidates to run such programs. However, roles such as this would be difficult to fill from the existing Aboriginal health workforce, where only

75 Aboriginal and Torres Strait Islander physiotherapists were registered in Australia in 2011, representing 0.6% of the total national physiotherapist workforce (24).

#### 5.4.1 Strengths and limitations

The health and community services questionnaire was able to document fall prevention and healthy ageing programs across the state, inquiring about their use by older Aboriginal people. Although we were not able to contact every service in NSW, the use of snowball sampling coupled with referral from key stakeholders (involved in fall prevention and/or Aboriginal aged care) assisted the project team in identifying and making contact with highly relevant key organisations. Responses to the questionnaire were received from services located in metropolitan (28% of replies), rural and regional areas (60% of replies) and from services available state-wide (12% of replies). This wide distribution of responses reflects a broad reach of the questionnaire, which is considered a strength of the study. Despite this, there was a differential response rate between Aboriginal services (response rate of 13%) and mainstream services (response rate of 33%). As both groups differ in meaningful ways, this may have introduced non-response bias to the study. No rigorous follow-up was performed and no payments for time were offered for participation in the study, potentially contributing to the relatively low response rate. It was anticipated that services with specific interest or experience in fall prevention for older Aboriginal people would respond to the questionnaire. Despite this, due to the low response rate, the results of this study cannot be used to provide a definitive picture of fall prevention services for Aboriginal people in NSW.

An Aboriginal Research Officer (JC) initiated contact and conducted all interviews with Aboriginal service staff, ensuring staff members felt comfortable in sharing their opinions and ideas, thereby potentially minimising response bias.

Future research investigating the views of older Aboriginal people towards fall prevention and healthy ageing is necessary to inform the content and delivery of an appropriate fall prevention intervention. This was investigated by the project team through Yarning Circles held with older Aboriginal community members, in a separate study reported elsewhere (25).

## 5.5 Conclusion

This study identifies a gap in the availability of fall prevention programs specifically designed for and delivered to older Aboriginal people in NSW. While a variety of mainstream fall prevention programs are delivered across the state, there were multiple barriers to attendance by older Aboriginal people,

with a lack of cultural competency highlighted as a key factor. While service providers working in Aboriginal services felt that fall prevention programs would benefit their older Aboriginal clientele, limits on funding, difficulties in communication between existing health services and a lack of available Aboriginal health staff prevented their ability to offer appropriate programs. Further consultation with older Aboriginal people is necessary to determine how an acceptable and effective program can be designed and delivered.

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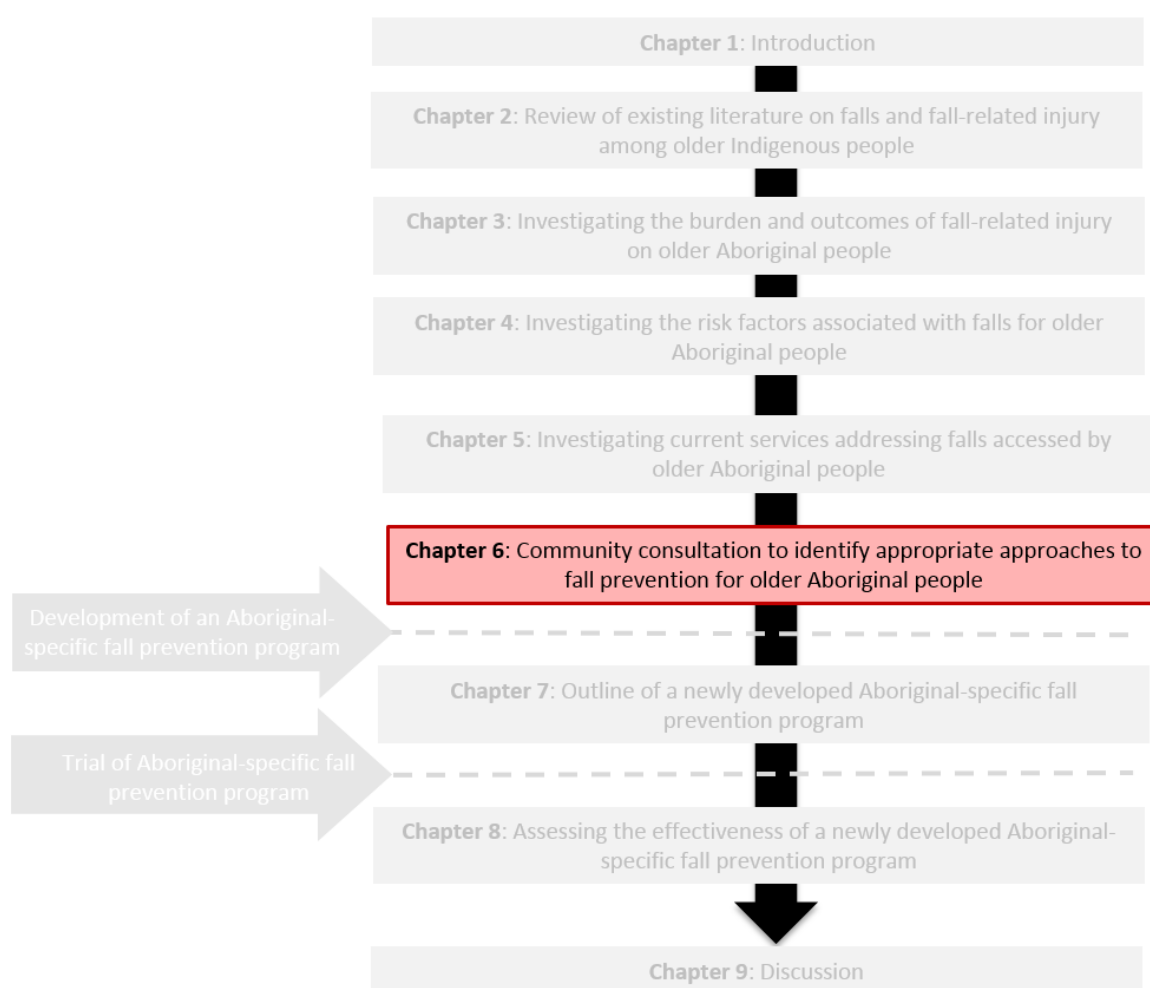
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## Chapter 6: Community consultation to identify appropriate approaches to fall prevention for older Aboriginal people

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Yarning Circle discussions were held with 76 older Aboriginal people at six urban, regional and rural community sites across NSW. Discussion topics used to guide each Yarning Circle investigated the impact of falls on the health and wellbeing of older Aboriginal people, assessed existing knowledge older Aboriginal people had on fall prevention, and identified desirable elements to incorporate into an Aboriginal-specific fall prevention program.

This manuscript identified falls to have a significant physical, social and emotional impact on older Aboriginal people. It highlights that an Aboriginal-specific fall prevention program requires a different structure and mode of delivery to existing fall prevention programs available to the general population in order to be relevant, effective, appropriate and accessible for older Aboriginal people.

**Contributions to this study:** I led the development of discussion topics used to guide the Yarning Circles, assisted in coordinating data collection sessions, acted as the note taker during each Yarning Circle, led the analysis of study data and drafted the manuscript.

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## 6.1 Background

Community consultation is important in the planning and implementation of community-based health programs [1]. It allows for communication between community members, program developers and funding bodies, ensuring community-based health programs address the issues affecting the health and wellbeing of local populations. Community consultation has shown to be particularly valuable in the development of health programs for Indigenous populations worldwide [2]. Consultation not only allows for programs to respond to the unique needs and priorities of Indigenous populations, but importantly, allow Indigenous people to become active partners in identifying key problems and solutions for themselves and their communities [3], facilitating self-determination.

Falls and fall-related injury are becoming a growing concern for global Indigenous populations as they age [4-6]. For Australia's Aboriginal and Torres Strait Islander population, fall injury rates have increased by an average of 10.2% per year from 2007-08 to 2010-11, compared to a 4.3% average annual increase for other older Australians [7]. Falls are now the second most common cause of injury for all Aboriginal and Torres Strait Islander people in Australia [8], with the highest fall-injury rates reported for females aged 65 years and older, and males aged 60-64 years [9]. For older people, there is a high likelihood that a fall can cause injury, potentially resulting in significant functional decline or even permanent disability [10]. Experiences of past falls can also lead to an increased fear of falling, preventing people from performing daily tasks and limiting their independence [11].

Despite high and rapidly increasing fall-injury rates, there is little knowledge about the impact of falls in Aboriginal and Torres Strait Islander people in Australia, or in older Indigenous people worldwide [12]. Further, while there are a variety of fall prevention programs currently run in community settings, it is uncertain whether these programs are accessed by older Indigenous people or whether they are effective or acceptable for these populations. Previous research has shown that successful health programs implemented in Indigenous communities have different content, structure and methods of delivery than those developed for the general population [13]. Indigenous leadership and community ownership of health programs ensures they answer to local community needs, can be modified readily to suit changing community priorities and are run corresponding to local belief systems and practices [14, 15].

Yarning Circles are a method of storytelling, education and preserving cultural knowledge, used for thousands of years by Indigenous people in Australia, Canada and North America [16]. 'Research Topic Yarning' is well-documented and has been previously used to gain community input for the design/delivery of community-based health programs for Indigenous populations [17, 18]. It is

comparable to a semi-structured interview and described as ‘a yarn with a purpose’ [19]. It enables researchers to learn from the stories and experiences of Yarning Circle participants in relation to a specific issue or question.

Within this study, Yarning Circles were used by our team of Indigenous and non-Indigenous researchers to explore three key areas: 1) investigate the impact of falls on the health and wellbeing of older Aboriginal and Torres Strait Islander people; 2) assess the level of existing knowledge older Aboriginal and Torres Strait Islander people have on fall prevention; and 3) to identify desirable elements of a fall prevention program from the perspective of older Aboriginal and Torres Strait Islander people.

As the majority of the New South Wales (NSW) Aboriginal and Torres Strait Islander population is Aboriginal (97.2%), this population will be referred to as ‘Aboriginal’ in this manuscript.

## 6.2 Methods

### 6.2.1 Participants

Invitations to host Yarning Circles were extended to a selection of Aboriginal health and community services across NSW, frequently accessed by older Aboriginal people. These services were identified through consultation with the project’s Aboriginal Steering Committee. The study was promoted by posters displayed at each service and through active recruitment by service staff. People interested in participating either registered with service staff or contacted the project’s Aboriginal research officer (JC). A greater burden of chronic health conditions affects Aboriginal and Torres Strait Islander people at younger ages when compared to the general population. [20]. Due to this, Aboriginal and/or Torres Strait Islander people aged 45 years and older were eligible to register for the study, rather than the cut-off age of 65 years typically used to classify older adults.

### 6.2.2 Data collection

Each Yarning Circle was held at a venue and time convenient to participants and host service staff. An Aboriginal facilitator trained in qualitative research methods guided each Yarning Circle (JC), ensuring cultural safety was maintained during each discussion. A research officer was present to take notes and make observations (CL). There was time reserved before the Yarning Circles for the visiting project team to meet with Yarning Circle participants over morning tea, build rapport and establish a welcoming environment. All Yarning Circle discussions began with both the participants and the project team introducing themselves and sharing their family origins. The facilitator introduced six

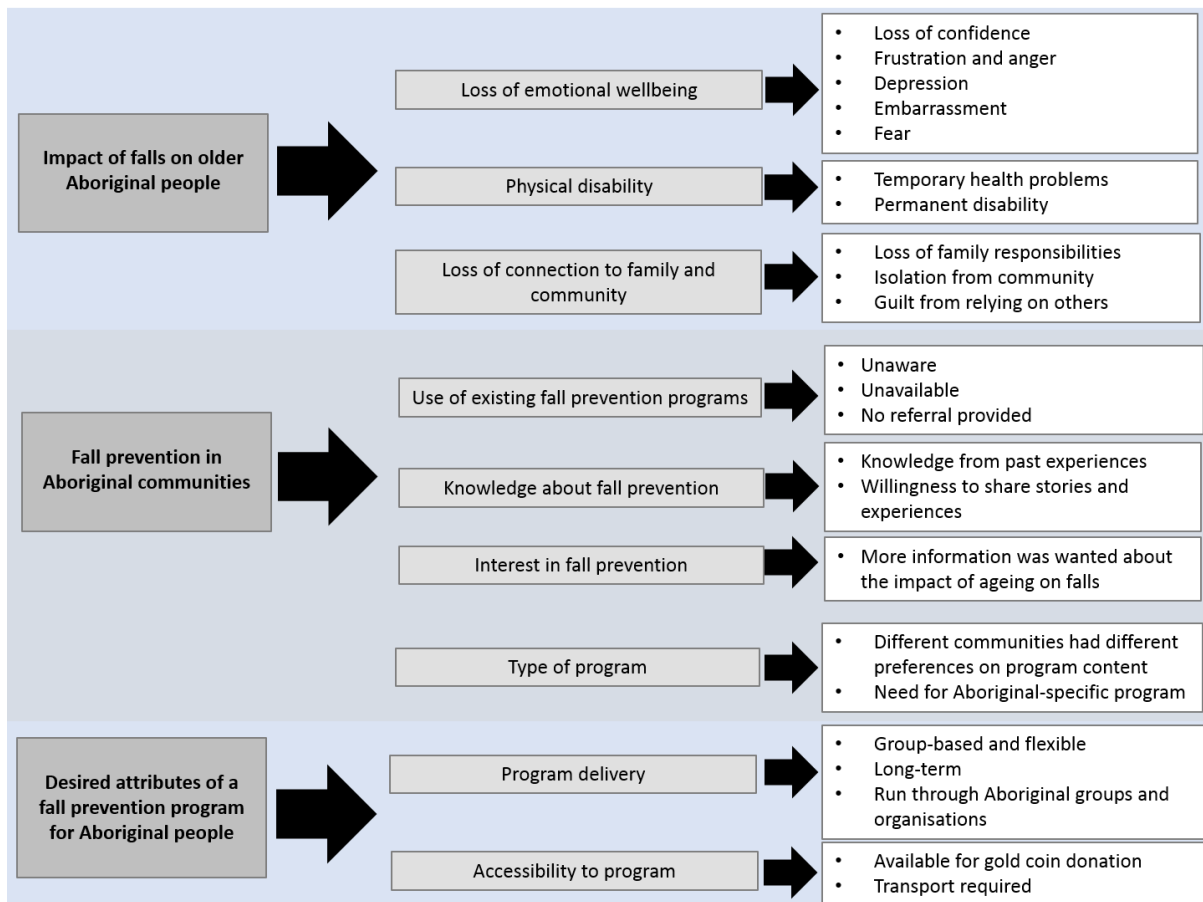
open-ended questions into each Yarning Circle over time (Table 6.1) and prompted Yarning Circle participants to continue the discussion when appropriate.

1.	Has anyone had a fall recently? Can you talk about what happened?
2.	Is it important to find ways to prevent falling?
3.	Are you aware of any fall prevention programs in your community?
4.	Would you attend an Aboriginal-specific fall prevention program if it was available?
5.	Are there any things that would/do stop you from attending a fall prevention program? Do you have any ideas about how these things could be addressed?
6.	<i>[Laminated cards with pictures representing existing fall prevention programs distributed]</i> Are there any parts of these programs that you would like to see incorporated into a falls program for Aboriginal people?

**Table 6.1:** Question guide for Yarning Circles

### 6.2.3 Data analysis

Each Yarning Circle ran for between 30 minutes and one hour, was audio recorded and transcribed verbatim. Data were managed in NVivo10 (QSR International PTY Ltd) software. Conventional content analysis was used to analyse the transcripts due to the variety of topics addressed in the study which could not be confined to fit within a pre-existing methodological framework [21]. By avoiding the use of preconceived categories for coding data, the core messages that emerged from the Yarning Circles were able to be captured and presented as key findings. Each Yarning Circle transcript was independently and sequentially coded by three researchers, two of whom are Aboriginal (CL, JC, EH). Each researcher repeatedly read all transcripts, immersing themselves in the data. Following coding, discussion and comparison took place, where themes were grouped under broader categories presented in Figure 6.1. A senior Aboriginal community spokesperson who was present during multiple Yarning Circles (NJT) reviewed the results, provided feedback and was closely involved with the writing of this manuscript. This manuscript is reported in line with the COREQ (Consolidated criteria for reporting qualitative research) statement, supporting transparency in reporting qualitative research [22].



**Figure 6.1:** Themes which emerged from Yarning Circle transcripts, grouped into broader categories

#### 6.2.4 Ethical approval

The study received ethical approval from the Aboriginal Health & Medical Research Council of NSW (AH&MRC) (1084/15). Written consent was given by all study participants for Yarning Circles to be audio recorded and transcribed, with de-identified results permitted to be published.

### 6.3 Results

A total of 10 Yarning Circles were held with 76 participants (16 males, 60 females) across six sites in Sydney, the Central Coast, Central West and Illawarra Shoalhaven, NSW (Table 6.2). Each Yarning Circle consisted of 7 to 10 participants. When over 10 participants were present at a site, multiple Yarning Circles were held.

Host service type	Location	Number of male participants	Number of female participants
Aboriginal chronic care group	Central Coast	1	9
Aboriginal Medical Service	Central Coast	3	5
Aboriginal community organisation	Central Coast	3	15
Aboriginal chronic care group	Illawarra Shoalhaven	8	14
Aboriginal Land Council	Central West	1	6
Aboriginal community organisation	Sydney	0	11
<b>Total</b>		<b>16</b>	<b>60</b>

**Table 6.2:** Yarning Circle host organisation type, location and number of Yarning Circle participants

### 6.3.1 Impact of falls on older Aboriginal people

#### Physical disability

Many Yarning Circle participants shared stories of falling, often with multiple falls reported by one person. Temporary health problems and permanent disabilities that had occurred due to past falls were discussed. One female participant spoke of mobility loss caused by a fall-related leg injury, leading to weight gain and a further loss of balance, recalling that ‘one thing seemed to lead to another’.

*“[After my fall] I couldn’t walk the way I wanted to walk to lose the weight. And because I’ve put the weight on, it’s impacted on my health.” (F)*

Rehabilitation services required post fall-related injury were reported to be inflexible, too expensive and difficult to access.

#### Loss of emotional wellbeing

Yarning Circle participants spoke of feeling angry, embarrassed and frustrated after having a fall. They shared stories of losing mobility and/or losing confidence, preventing them from independently performing activities of daily living or being active in the community. This had the potential to lead to isolation and depression.

*“It’s pretty frustrating and it makes you angry, makes you sad, you get depressed ‘cause you can’t do what you used to do.” (M)*

Some Yarning Circle participants described feeling guilty for relying on family participants to care for them after a fall.

*“I felt so useless because even when I did eventually come home [following a fall-related hospitalisation] I couldn’t do a lot. It was a horrible feeling because the kids had to come over and bring meals, my brother brought a few meals, and it’s a horrible feeling, horrible.” (F)*

### Loss of connection to family and community

The majority of Yarning Circle participants spoke of acting as carers for their extended families. This was seen as an extremely valued and important responsibility. Those who had experienced health problems due to a fall spoke of feeling uncomfortable in becoming dependant on their children or siblings for care. Stories were shared of family members overcompensating in supervising a loved one following a fall, further limiting their independence.

*“No, I do miss walking. But I’m not to be trusted out alone anymore. So I have keepers.” (F)*

A fear of falling was reported to make Yarning Circle participants less likely to try new things. This prevented people from attending social occasions, leading to social isolation and loneliness.

*“I think falls shake your confidence. So regardless of whether it’s a minor fall, a major fall or whatever, it can affect your mental attitude to things. So, if it rocks your confidence you’re less likely to try and do other things.” (M)*

### 6.3.2 Fall prevention in Aboriginal communities

#### Use of fall prevention programs

Generally, Yarning Circle participants reported they were unaware of existing fall prevention programs. A few participants spoke vaguely about past involvement in short-term programs run through larger health services however, they were unsure as to why they were referred or how the program was meant to benefit them.

*“I went to a falls program that one Wednesday, and all they did was make me stand up and sit down. I refused to do anything.” (F)*

#### Knowledge about fall prevention

Within each Yarning Circle, participants shared a great deal of knowledge about fall prevention amongst themselves, despite very few having exposure to formal fall prevention education. ‘Lessons had been learnt’ by participants who had previously fallen and were willing to share their experiences with the group. They went on to explain the precautions they now took to prevent further falls.

*“You become conscious of it too as far as other people are concerned. I caught my wife the other day on the rocking chair dusting up [the ceiling]. I said to her, “What are you doing up there?” (M)*

## Interest in fall prevention

Yarning Circle participants were interested to understand how aged-related changes to their physical ability increased their risk of falling. Some participants spoke of reporting a fall to their GP, but no referral to a fall prevention program being given. Others spoke of long wait times to access regularly run, short-term programs.

*“I’m not a faller at all and in the last six months I’ve had two really, really bad falls, and I’ve ended up in hospital on both occasions and I can’t believe that it was me. I’m starting to think that if I don’t start doing something now, it’s going to be worse for me when I do get to that stage where, yeah...” (F)*

### 6.3.3 Desired attributes of a fall prevention program for Aboriginal people

#### Type of program

Different communities voiced different preferences for program content, ranging from dance, Tai Chi to light gym work. There was a consensus that the program shouldn’t be physically demanding, allowing everyone to feel confident in participating.

It was important to Yarning Circle participants that specific issues relating to older Aboriginal people were acknowledged through the program. Participants wanted to show that Aboriginal communities were able take responsibility for their health, in their own way. Each community was enthusiastic to make the program ‘their own’ by tailoring it to their interests and health needs.

*“We could stand up and show what we’ve been doing, you know? Advertise it, let people see that we actually are trying to get healthy. That’d show them that we are doing something.” (M)*

Aboriginal programs were discussed as more inclusive of all people and as places of less judgement. They were seen as culturally safe and more flexible than programs developed for the general population. People felt relaxed among their own community, where everyone was seen as equal. Others saw Aboriginal programs as an opportunity to learn more about local Aboriginal history and culture, with the potential of meeting other members of their family who they may have not met before.

*“I have found, just from my experience that the Aboriginal programs are a lot friendlier, a lot more relaxed, not so rigid, and not so judgmental. And you don’t need that judgmental stuff. You just need people who have the same or similar problems as you that are willing to accept*



*you as you are, and you're going to find some common ground with being able to help them, and they help you. And I think that's one of the major differences." (F)*

### Program delivery

Having the program delivered in a group setting was unanimously important to Yarning Circle participants. Participants wanted the group to be friendly, where they had an opportunity to share stories and feelings openly and safely. 'Getting out of the house' was associated with mental health benefits as it presented an opportunity to meet new people. Happiness and emotional wellbeing were seen as important outcomes of the program. Group-based programs were thought to motivate people to return on a regular basis and to introduce challenge via friendly competition between participants.

*"I'd like a group because you can enjoy it and you can have a laugh and a joke or carry-on a bit. It'll do more good than sitting there trying to do it yourself at home. If it's up to me to do something at home, I'd say bugger it." (F)*

Yarning Circle participants wanted the program to be flexible and self-paced, catering to the abilities and needs of the local community. Participants preferred that the program should have no age limit so that partners, children and carers were welcome to attend. It was preferred for the program to be held within existing community groups, ideally through local Aboriginal organisations.

There was a strong preference for an on-going long-term program rather than a short-term program. Yarning Circle participants shared concerns of missing a short-term program due to other family, health or community commitments. It was reported to take time to 'get used to' a new program, and to form friendships between program participants. It was also seen as important to follow-up with program participants over the long term.

*"This six weeks or this eight weeks thing, it's just no good for the Koori [Aboriginal] community because people get sick. People drop out through winter. People drop out for various reasons but they can come back, pick up where they left off and continue on. You can't offer Koori communities short term fixes because it doesn't fix anything." (F)*

### Accessibility to program

The majority of Yarning Circle participants were willing to pay a small fee from AUD\$1 to AUD\$10 to participate in a fall prevention program. It was important for participants to see value in the program; participants wanted to know how the program could benefit them and wanted it delivered by professionally trained staff. Other financial commitments, particularly those surrounding family, were often seen as a higher priority. Despite this, paying a weekly fee to prevent falls was seen as valuable.

*“Well when you think about it in the long run: you’re paying \$5 a week for a group as opposed to not being as strong and having falls. When you have a fall you lose so much independence in the way of washing, drying, all that sort of stuff. Five dollars a week in the scheme of things is not a huge amount.” (F)*

Yarning Circle participants were concerned that issues with transport could leave people who are unable to reach the program independently becoming further isolated. Some people reported to not be physically able or confident to catch public transport, while others had little to no public transport available in their area.

*“We’ve got a lot of older people that want to do these exercise classes but just can’t get to the place whether it be ‘cause they don’t have a licence or do have a licence but don’t have a car, or can’t afford busses.” (F)*

Yarning Circle participants from existing community groups were able to assist each other with transport to a service or a program, highlighting the importance of community cohesion.

## 6.4 Discussion

The Yarning Circles highlighted concerns around falls and the significant impact falls have on social and community life for older Aboriginal people. The importance of community consultation was demonstrated, with many issues discussed surrounding falls and fall prevention being unique to the older Aboriginal population. In line with previous research [2, 3], a strong and consistent theme that emerged from the Yarning Circles was the need for fall prevention services specifically designed and delivered for Aboriginal people. Yarning Circle participants voiced a strong preference for a group-based program, tailored to suit local interests and health priorities. It was essential that all community members were included and able to participate in the program. The provision of transport as part of the program was considered important and a small donation was viewed as appropriate for program use.

The limited research available investigating falls and fall-related injury in older Indigenous populations suggests different patterns and outcomes of falls when compared to equivalent mainstream populations [23-26]. Despite this, many issues surrounding falls documented from general populations mirror those discussed by Aboriginal Yarning Circle participants. Common issues included sustaining serious injuries that cause chronic pain and disability, a loss of independence, loss of confidence, depression and developing a fear of falling [27-29]. The loss of family and community responsibilities were additional issues discussed by Yarning Circle participants.

The previous uptake of fall prevention programs by other older populations has been reported to be low. Typically, 10-50% of an eligible population participates in fall prevention interventions at a community level [29]. These low rates are associated with people not viewing themselves as 'at risk' of falling, or being unaware that falls are preventable. In previous studies, falls have been associated with a loss of control and seen as an indication of a transition into old age [30]. Previous studies have also documented older people as being very reluctant to discuss falls due to embarrassment. On the contrary, Yarning Circle participants were very willing to discuss personal stories of past falls within each group, listening to each other's experiences with interest and providing suggestions on how to prevent future falls from occurring, or how to manage resulting health issues. A lack of awareness about fall prevention interventions emerged as the predominant reason for Yarning Circle participants not using existing fall prevention programs. Service providers working in Aboriginal aged care within NSW have provided similar feedback, stating that few older Aboriginal clients access fall prevention services as they are unaware they are available [31].

There was unanimous agreement by participants that the program should be Aboriginal-specific, acknowledging issues of particular importance and relevance to older Aboriginal people. Previous studies have identified a number of health and social issues that affect Indigenous populations and mainstream populations differently [32, 33], leading to different areas needing to be prioritised by health services and health programs for Indigenous communities [34]. Yarning Circle participants additionally expressed the need for a program with the flexibility to be customised to suit the diverse range of Aboriginal communities across the state, while remaining evidence-based and effective. Ensuring cultural safety through providing an Aboriginal-specific program was also stated as important by Yarning Circle participants. Previous studies have documented Indigenous people's experiences of discrimination, judgement and communication difficulties when accessing mainstream health services [35-37].

The inclusive, group-based setting requested for a fall prevention program by Yarning Circle participants has previously been identified as an effective approach towards community participation and promoting community ownership of a program [38]. Community ownership has been reported as a key contributor to the success of Indigenous health services and health programs worldwide [39, 40]. Previous successful Indigenous-specific programs delivered in 'safe and supportive group environments' have led to a greater sense of participant well-being and support amongst group members [41]. The request for a long-term, ongoing program is not unique to this study. Many initiatives run in Aboriginal communities are a product of short-term grants which do not get funded

in the long term [42]. Similar issues have been reported for the funding of Indigenous health services worldwide [39].

Costs associated with accessing health services have been reported as a barrier to their use by approximately one third of Australia's Aboriginal population [43], particularly when costs are ongoing [44]. Nearly all existing fall prevention programs run in NSW charge an attendance fee ranging from a donation to \$22 per session [45]. Although the majority of Yarning Circle participants agreed that a small donation was appropriate for program use, there were concerns that other community members may not be able to afford this and would therefore be excluded. Transport to and from regular program sessions introduces a secondary barrier to program use, particularly in remote communities. Long distance, poor roads and a lack of public transport cause people living remotely (particularly older people) to have a strong reliance on private and community transport options, which can be expensive and in high demand [46]. Transport availability and cost were highlighted by participants as a concern and ongoing programs would need to address this.

The strengths of this study include the involvement of Aboriginal people in all aspects of study design, participant recruitment, data collection, data analysis and manuscript preparation. To our knowledge, this is the first qualitative study which documents the views of older Indigenous people regarding healthy ageing, worldwide. A greater proportion of women participated in the study than men. This may mean that perspectives from older Aboriginal men may not have been appropriately considered. Furthermore, this study only reflects the views of Aboriginal community members from NSW, Australia. Although the results of this study are anticipated to be generalizable, repetition of this study within different Indigenous populations, both within Australia and internationally, would be valuable for comparison. Nonetheless, there are many similarities in the health and social issues that affect Indigenous populations worldwide and it is anticipated the findings of this study may inform the development of prevention programs for other older Indigenous populations.

## 6.5 Conclusion

Yarning circles with older Aboriginal people facilitated important discussions of the impact of falls. Many Yarning Circle participants shared stories of falls impacting their health, well-being and connection to family and community. Existing mainstream fall prevention programs were generally not used by Yarning Circle participants due to their lack of availability in certain areas, no referral provided for fall prevention services by GPs and/or being unaware of existing programs. Despite few Yarning Circle participants receiving formal fall prevention education, significant knowledge was

shared from past experiences and individual ideas for minimising fall risk and managing recovery from fall-related injury. Feedback from participants highlighted that an ongoing, Aboriginal-specific, group-based fall prevention program was preferred, that could be run through established Aboriginal organisations with the flexibility to be tailored to specific communities while remaining effective and evidence based. Multiple issues discussed by participants in relation to falls and fall prevention were unique to the older Aboriginal population and were not being met by existing services, highlighting the importance of community consultation, but also Aboriginal leadership and program ownership. The findings of this study will guide the development and implementation of appropriate fall prevention programs for older Indigenous populations worldwide.

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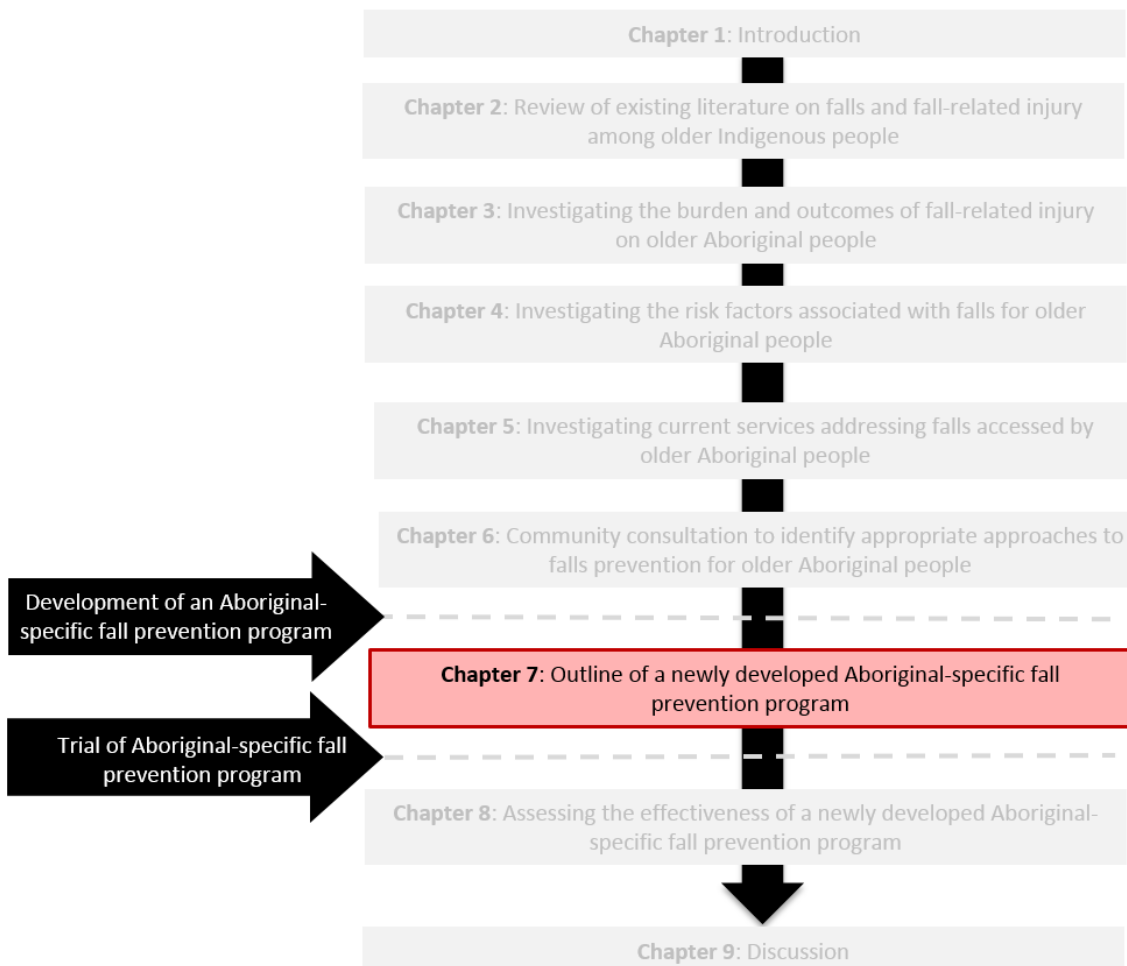
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# Chapter 7: Introduction to a newly developed Aboriginal-specific fall prevention program

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The outcomes of the preliminary research stages showed falls to have a significant impact on the health and wellbeing of older Aboriginal people. Additionally, a clear service gap was identified in the availability of appropriate fall prevention programs for the older Aboriginal population. In response, the **Ironbark Aboriginal Fall Prevention Program** was developed. The content, structure and delivery of the program was guided by consultation with Aboriginal Elders, Aboriginal community groups, service providers working in Aboriginal aged care, and academics specialising in fall prevention.

This chapter details the development, aims and objectives of the Ironbark Program, as presented in the Final Project Report to the project funder; the Partnerships and Strategy Branch of the Centre for Population Health, NSW Health. It summarises the major components of the program and introduces six Aboriginal community sites in NSW who trialled the program for either a 3 or 6 month period. This chapter provides additional context to Chapter 8 which contains greater detail on the delivery and evaluation of the Ironbark Program itself.

**Contributions to this study:** I was employed as Project Manager on the Ironbark Pilot Program, funded through a grant received from the Centre for Population Health, NSW Health. This funding was contestable, awarded to by PhD supervisor Prof Rebecca Ivers in November 2013 for a 2.5 year period. The funding covered all program related costs including the development of program resources, employment of program staff, equipment costs, site support payments and training costs. Through my joint role as Project Manager and PhD Candidate, I contributed to program development and in establishing approaches to program implementation. I coordinated meetings with stakeholders, recruited Aboriginal communities to host the pilot program, recruited and provided training to Aboriginal research assistants and site managers, coordinated training from program facilitators, personally supervised a number of program sessions and supervised data collection as quality assurance. I collected regular feedback from project sites, responding to suggestions. I oversaw project budget and timelines.

This chapter has been reviewed and accepted as part of a Final Project Report by the Partnerships and Strategy Branch of the Centre for Population Health, NSW Health:

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Broe, T., Cumming, B., Ivers, R. Preventing falls in older Aboriginal people in NSW: Final project report to the Partnerships and Strategy branch. Developed for Centre for Population Health, NSW Health 2016

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**Date of acceptance:** 6<sup>th</sup> February 2017

## 7.1 Development of the Ironbark Program

A Steering Committee comprised of senior Aboriginal community representatives with at least 10 years of experience working in roles associated with Aboriginal health and/or education was established prior to the commencement of the project. Results of earlier research stages were reviewed by members of the Steering Committee, together with government stakeholders, experts in fall prevention and aged care service providers. Through discussion and collaboration, a number of priorities were identified for an Aboriginal-specific fall prevention program: it was required to be effective in improving participant strength and balance, be culturally acceptable, sustainable and transferable among diverse Aboriginal and Torres Strait Islander community settings. Based on these priorities, further consultation among this diverse group of stakeholders informed the development of the Ironbark Fall Prevention Program. Aboriginal Steering Committee members continued to provide oversight to all aspects of program implementation over the course of the trial, ensuring the cultural safety of project participants and their communities was acknowledged and respected. Table 7.1 highlights how findings from preliminary research stages have influenced the design and implementation of the Ironbark Program.

**Table 7.1** Influence of findings from preliminary research stages on the design and implementation of the Ironbark Program

Findings from preliminary research stages	Influence on Ironbark Program design and implementation
<b>Systematic literature review of the impact of falls on older indigenous people globally:</b>	
Approximately 30% of community-dwelling indigenous people aged 45 years and older experience at least one fall per year.	There is a need for community-based fall prevention interventions for indigenous populations worldwide.
<b>Burden of fall-related injury hospitalisations among older Aboriginal people:</b>	
Fall-related injury hospitalisations have increased at over double the rate for older Aboriginal people when compared to other older Australians, from 2003 to 2013.	Fall-related injury is having an increasing impact on the health of older Aboriginal people, suggesting existing fall prevention services are not having an impact on this population.
A higher proportion of Aboriginal people are hospitalised for fall-related non-fracture injuries when compared to other older Australians.	Differences in fall injury outcomes between older Aboriginal people and other older Australians suggest that approaches to fall prevention and management may need to be different for both populations.
<b>Risk factors associated with falls for older Aboriginal people:</b>	
Falls affect approximately one quarter of the community-dwelling Aboriginal people in NSW aged 60 years and older.	There is a need for community-based fall prevention interventions for older Aboriginal people in NSW.
Participants had an increased fall risk if they were female, used three or more medications, had arthritis, macular degeneration, depression, history of stroke, were unable to do own housework or were unable to do own shopping.	An intervention must address specific risk factors for falls among older Aboriginal people in order to be effective.
<b>Existing fall prevention programs and their use by older Aboriginal people:</b>	
Despite a variety of mainstream fall prevention programs being currently available across NSW, few older Aboriginal people access these on a regular basis.	Existing mainstream fall prevention programs may not be suitable for older Aboriginal people.
According to service providers, an effective and acceptable fall prevention program would be evidence based, flexible,	The content and approaches to the delivery of an acceptable fall prevention program for older Aboriginal

community-oriented and social, held in a familiar and culturally safe location and delivered free of cost.	people differ to those of a program designed for the general population.
<b>Preferences of older Aboriginal people for a fall prevention program:</b>	
<p>Many participants were unaware of existing fall prevention programs.</p> <p>Although few Yarning Circle participants had received formal fall prevention education in the past, extensive knowledge was shared from personal experiences for minimising fall risk and managing recovery from fall-related injury.</p> <p>Participants reported that an ongoing, Aboriginal-specific, low-cost, group-based fall prevention program was likely to be of most benefit to them.</p>	<p>More effective approaches are required to promote fall prevention to the older Aboriginal population.</p> <p>Older Aboriginal people have substantial knowledge on minimising fall risk and managing recovery from fall-related injury, providing opportunities for knowledge sharing.</p> <p>A fall prevention program which corresponds to the interests and priorities of older Aboriginal people has a higher likelihood of being successful.</p>

## 7.2 Program aim and objectives

The aim of the Ironbark program was to improve the balance, strength and mobility of community-dwelling older Aboriginal participants, increasing their confidence in performing daily tasks and helping them maintain their independence. The goal of improving the strength and stability of older Aboriginal people led the program to be named after the native Australian Ironbark tree, evoking images of strong trees with their roots running deep into the earth, standing tall and strong as they age. Additionally, the bark of the Ironbark tree has medicinal qualities and is traditionally used for healing in Aboriginal culture [1].

A Wiradjuri artist from the Central Coast named Kylie Cassidy was approached with this concept and presented the following painting to use as a symbol for the project.



**Figure 7.1:** Painting of an iron bark tree, created as a symbol for the Ironbark Aboriginal Fall Prevention Program by Wiradjuri artist Kylie Cassidy

*“The symbols I have used in the tree are representing land and water. The tree symbolises strength and growth, the root system symbolises life and staying grounded. Around the tree are dreaming symbols representing our people and our cultural connection.”*

- Kylie Cassidy, artist of the Ironbark painting

This artwork was adapted by an Aboriginal graphic designer to create a logo for the project, pictured below.



**Figure 7.2:** Logo for the Ironbark Project, developed using the original artwork created for the project by Kylie Cassidy

## 7.3 Program outline

The Ironbark Program is a group-based, balance and strength exercise class with an education component held within Yarning Circles. The program is designed to be ongoing, run in 1.5 hour sessions and attended on a weekly basis.

### 7.3.1 Program participants

Program participants were recruited from six Aboriginal communities in NSW using the following criteria: Aboriginal and/or Torres Strait Islander people, living in the community, aged 50 years and older. However, people aged below 50 years and non-Indigenous partners/carers of participants were also able to attend in response to community engagement and need at different sites. People were excluded if they had severe cognitive impairment or a medical condition precluding exercise.

### 7.3.2 Exercise component

Eighteen strength and balance training exercises form the core of Ironbark exercise sessions. They are based on those developed through the home-based Otago Exercise Programme from New Zealand, shown to effectively reduce the number of falls by 30% in the general population [2]. Exercises were introduced to participants individually and gradually over time, dependant on each participant's physical ability. A trained Exercise Physiologist was required to deliver this portion of the program, supervising participant technique. Handouts with instructions for performing each Otago exercise were developed and distributed to participants over the course of the program, with examples included as Appendix A. Participants were encouraged to practice the Otago exercises at home on a daily basis.

A variety of games that challenged participant balance, strength and cognitive skills comprised the remainder of each exercise session. Balance pads, balance beams, resistance bands and foam balls were provided for each site to use for these activities. An exercise guide was developed for program facilitators, containing tips on how to deliver the exercise portion of the program specifically to older Aboriginal people. An example of manual content is included as Appendix B.

### 7.3.3 Education component

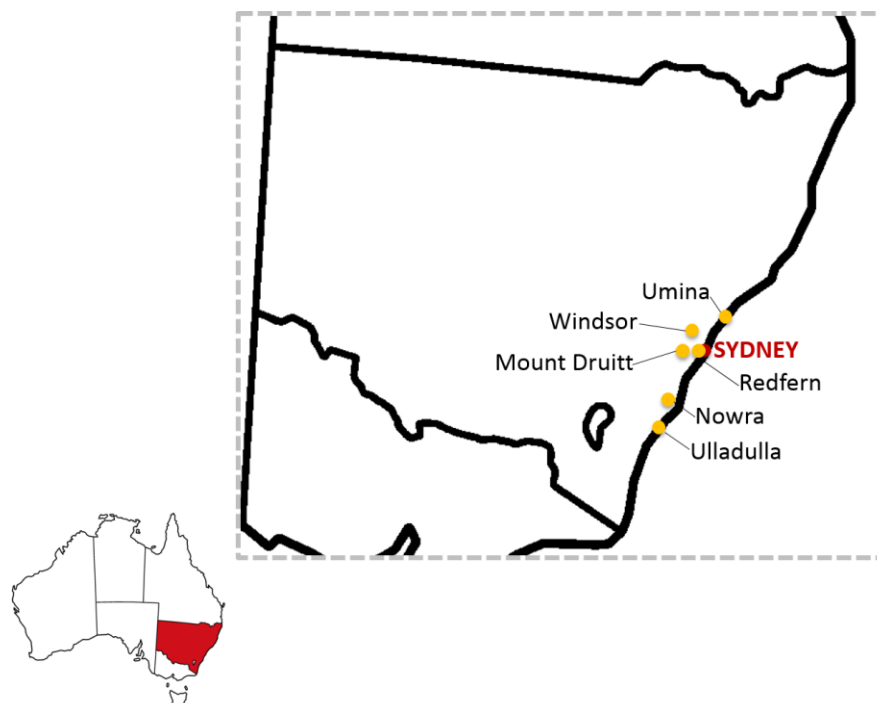
A list of group discussion topics was developed surrounding falls, fall risk factors and healthy ageing. Discussion topics shared similarities to those developed as part of the Stepping On fall prevention program, shown to reduce falls in the general population by 31% [3]. Group discussions were held within a Yarning Circle format to ensure the group discussions were familiar and meaningful to older Aboriginal people. Yarning Circles provided an equal platform for all program participants to share

their own knowledge and experiences of falls with each other, with additional information contributed by the program facilitator where appropriate.

A 'Yarning Both Ways' manual was developed which included instructions on how to facilitate a Yarning Circle particularly tailored towards non-Indigenous program facilitators. Examples of 'Yarning Both Ways' manual pages are included as Appendix C. Handouts for participants were developed for many of the Yarning Circle topics, with examples included as Appendix D.

## 7.4 Pilot sites

The Ironbark pilot program was run in partnership with older Aboriginal people and their communities. Face-to-face visits were conducted with local Aboriginal community leaders from potential pilot sites, where the project was explained and interest in offering a fall prevention program to the local community was gauged. Identification of potential pilot sites by Aboriginal Steering Committee members was crucial in establishing initial contact between the researchers and Aboriginal host organisations. A total of six urban and regional Aboriginal communities in NSW committed to trialling the Ironbark pilot program for a 3 or 6 month period.



**Figure 7.3:** Location of the six Ironbark pilot sites in NSW

The program was hosted by well-established and well-recognized Aboriginal health or community services at each location. Details of each host service are provided below.

**Mingaletta Aboriginal & Torres Strait Island Corporation – Umina, Central Coast**

Mingaletta offers a variety of services to the Aboriginal & Torres Strait Islander community on the peninsular of the Central Coast. The organisation aims to improve quality of life for community members by providing programs focused on promoting health and wellbeing. The organisation provides a meeting place and social support centre for advocacy services, cultural programs, youth engagement, health awareness and community dialogue. A weekly Elders group is held, where older Aboriginal meet to socialise and take part in knowledge-sharing projects. Many participants for the Ironbark Program were recruited from this group.

**Aunty Jeans Chronic Care Program – Nowra, Illawarra Shoalhaven**

The Aunty Jeans Chronic Care Program was specifically developed for Aboriginal people with chronic and complex care needs. It has been delivered on a weekly basis for over 30 years and is a place for Aboriginal people to meet, receive a health check-up, participate in light exercise and share lunch. The Aunty Jeans program was developed with the belief that better results in health outcomes would be achieved with Aboriginal Elders leading the way and Aboriginal community working together.

**Baabayn Aboriginal Corporation – Mount Druitt, Western Sydney**

Baabayn is a community centre which aims to provide a supportive, healing and nurturing environment for Aboriginal women, their families, young people and children of all ages. Baabayn encourages members to strengthen their culture and spirituality, which in turn increases their confidence and self-esteem through connecting and sharing with older female Elders. Although a large number of older Aboriginal women regularly use the service, there were no healthy ageing programs available prior to the Ironbark Program.

**Hawkesbury Community Health Centre – Windsor, Hawkesbury**

The Hawkesbury Community Health Centre offers a variety of services including support groups, counselling, outreach services and nursing. There is a specific focus on Aboriginal health and a full-time Aboriginal Liaison Officer is employed at the centre. The Aboriginal Liaison Officer works closely with a large number of older Aboriginal clients, assisting them with identifying and accessing appropriate healthcare services. Through this connection, an Ironbark Project pilot site was established at a local community meeting place.

**Aunty Jeans Chronic Care Program – Ulladulla, Illawarra Shoalhaven**



A second Aunty Jeans Chronic Care Program takes place in the remote coastal town of Ulladulla. Following positive feedback on the Ironbark program from the original Aunty Jeans group in Nowra, program leaders proposed the Ulladulla Aunty Jeans group as an additional Ironbark Program pilot site.

### **Wyanga Aboriginal Aged Care Program – Redfern, Sydney**

Wyanga Aboriginal Aged Care Program provides a range of services for older Aboriginal people and their carers in their homes and communities. One of these services is the Dreamtime Group, which offers a gathering space and activities to assist older Aboriginal people in keeping in touch with their culture and community. Many participants for the Ironbark program were recruited from this group.

Each service provided a venue for the program to be run at. Venues ranged from outdoor courtyard spaces to large community halls. Five out of six services were able to provide free participant transport to the Ironbark program by extending existing community transport requests.

#	Pilot site location	Local Health District	Type of service	Provided venue for pilot program?	Provided transport for pilot program?	Duration of pilot program at site (months)
1	Nowra	Illawarra Shoalhaven	Aboriginal Chronic Care Program	Yes	Yes	6
2	Umina	Central Coast	Aboriginal Corporation	Yes	Yes	6
3	Mt Druitt	Western Sydney	Aboriginal Corporation	Yes	Yes	6
4	Ulladulla	Illawarra Shoalhaven	Aboriginal Chronic Care Program	Yes	Yes	6
5	Windsor	Nepean Blue Mountains	Aboriginal Elders group	Yes	No	6
6	Redfern	Sydney	Aboriginal Aged Care Service	Yes	Yes	3*

\* The Ironbark pilot program was run at Redfern for 3 months, not 6 months, due to study time constraints

**Table 7.2:** Summary of the six Ironbark pilot program sites in NSW, Australia

Each pilot site received a weekly stipend through the project for costs associated with the use of their premises, for providing morning tea for participants at the end of program sessions, or to contribute towards participant transport.

Training manuals, handouts, balance pads, balance beams, resistance bands and foam balls remained with sites after the pilot had finished, enabling trained service staff at each host organisation to continue delivering the program after the conclusion of the pilot.

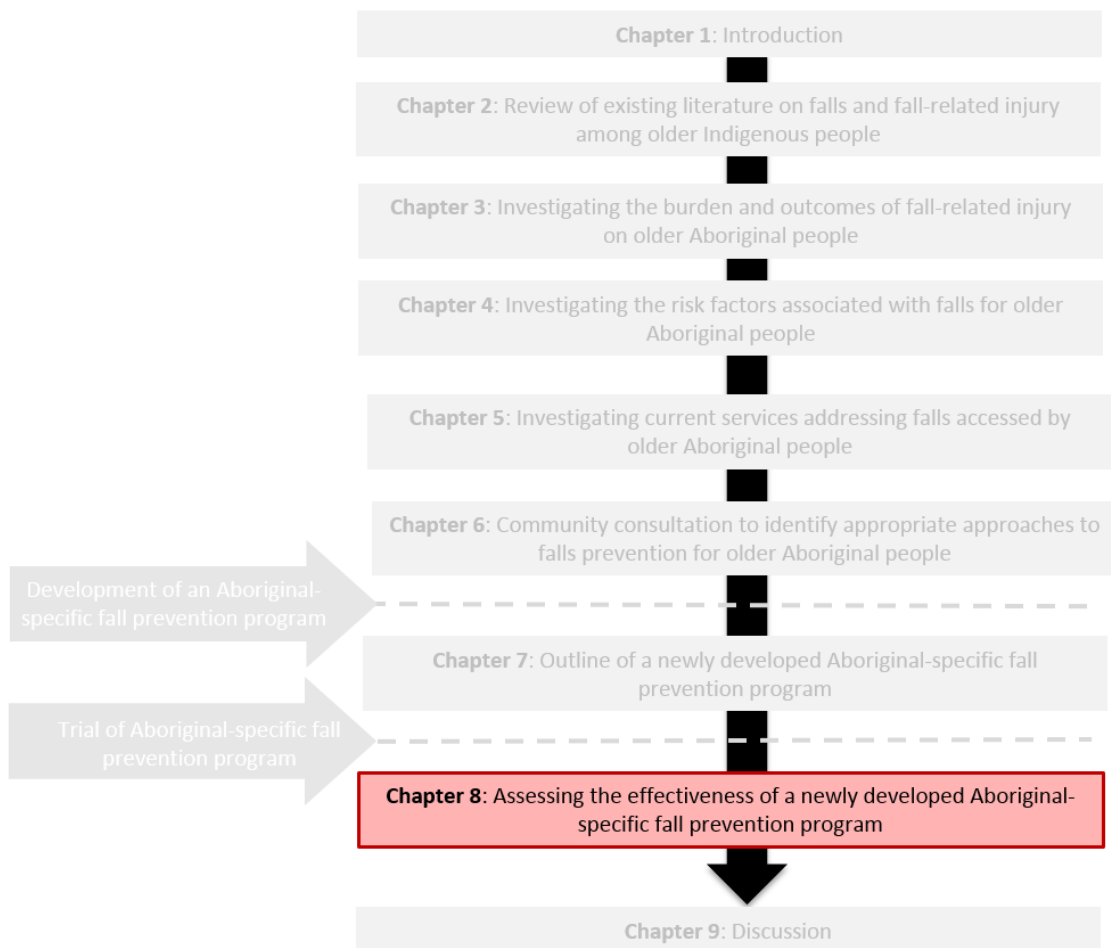
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# Chapter 8: Assessing the effectiveness of a newly developed Aboriginal-specific fall prevention program

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The newly developed Ironbark Aboriginal Fall Prevention Program was trialled in six Aboriginal communities in NSW for a three or six month period.

This manuscript provides detail on pilot program implementation, presents within-group outcomes of the program, and reports on patient experiences with the program.

**Contributions to this study:** I assisted in selecting and testing data collection tools, personally supervised data collection and performed quality assurance, performed all data analysis (qualitative and quantitative), interpreted data and drafted the manuscript.

This chapter is currently under review at the Health Promotion Journal of Australia:

Lukaszyk, C., Coombes, J., Sherrington, C., Keay, L., Tiedemann, A., Cumming, R., Broe, T., Clemson, L., Mackean T., Ivers, R., The Ironbark Program: implementation and impact of a community-based fall prevention program for older Aboriginal and Torres Strait Islander people [under review]

**Corresponding author:** Caroline Lukaszyk

## 8.1 Introduction

As the life expectancy of Aboriginal and Torres Strait Islander people in Australia increases (1), so too does the need for appropriate programs for older people. Due to different views of health and wellbeing, different community priorities and the ongoing effects of marginalisation, disempowerment and trauma (2), healthy ageing services for older Aboriginal and Torres Strait Islander people require tailored content and context. A number of features have been identified that contribute towards accessible and appropriate health services for Aboriginal and Torres Strait Islander people, including community ownership and involvement of Aboriginal workforce (3). To provide appropriate services, it is necessary for services to operationalise Aboriginal definitions of health which are inclusive of physical, social, emotional and cultural wellbeing, both for the individual and for their community (4, 5).

Falls and fall-related injury are a growing health concern for older Aboriginal and Torres Strait Islander people in New South Wales (NSW), Australia (6-9). Analysis of hospitalisation data from NSW shows that older Aboriginal and Torres Strait Islander people experience higher rates of fall-related injury compared to other older Australians (9). A health and community service audit conducted across NSW identified few fall prevention programs used by older Aboriginal people despite an evident need (7). Consultation with older Aboriginal people in NSW highlighted interest in an Aboriginal-specific fall prevention program to be made available in a community setting (8). Through initiating collaboration and partnership formation (10), discussions between representatives from Aboriginal communities, government stakeholders, academics and health service providers took place to identify approaches to addressing these gaps. As a result, the Aboriginal-specific Ironbark Fall Prevention Program was developed. The Ironbark Program is comprised of an exercise component and an education component, each derived from two existing, effective fall prevention programs developed for the general population.

Pilot studies are essential in providing preliminary evidence on the feasibility and impact of interventions prior to their large-scale implementation (11) and to identify any implementation issues (12), particularly in high-risk populations with unique needs. In order to assess the Ironbark Programs feasibility and likelihood of success, it was trialled in six Aboriginal communities in NSW for a 3-6 month period. The length of the trial period was influenced by pilot funding timelines and regulatory processes.

This manuscript reports on the pilot study that evaluated the implementation and impact of the Ironbark Program. Specifically, the pilot study aimed to 1) document approaches to program

implementation, 2) assess program use at each pilot site, 3) report changes in participant physical mobility over the duration of the pilot; and 4) document participant feedback about the program.

## 8.2 Methods

### 8.2.1 The intervention

The Ironbark Program was delivered on a weekly basis through existing Aboriginal health and community services, overseen by local Aboriginal staff.

#### *Exercise component*

The exercise component of the Ironbark Program was based on 14 core leg muscle strengthening and balance retraining exercises, developed as part of the Otago Home-based Exercise Programme. The Otago Programme has been shown to effectively reduce both the number of falls and the number of injuries resulting from falls by 30% in both men and women living in community (13). Otago Programme resources were modified by an Aboriginal graphic designer to be relevant and appealing to older Aboriginal people. An Exercise Manual was developed which included Otago exercise techniques and examples of group exercise activities that challenge balance, strength and cognition. Traditional Aboriginal dance moves were incorporated into group exercise activities by Aboriginal staff where appropriate.

#### *Education component*

The education component of the Ironbark Program was developed in collaboration with the creators of the group-based Stepping On fall prevention program, shown to reduce falls in the general population by 31% (14). As within the Stepping On program, Ironbark participants were encouraged to make informed lifestyle changes to decrease their risk of falls through facilitated group discussion. Different topics related to falls and fall prevention were introduced each week. A number of topics of specific relevance to older Aboriginal people were included, such as discussing potential interactions between traditional 'bush medicines' and Western medication, and guidelines to incorporating native Australian foods into diet to improve nutrition.

To make the group discussion process meaningful and familiar to Ironbark participants, each discussion was facilitated as a 'Yarning Circle'. Yarning Circles are a method of storytelling, education and preserving cultural knowledge, used for thousands of years by Indigenous people in Australia, Canada and North America (15). Although group discussions and Yarning Circles share many similarities, Yarning is focused on establishing a level platform for knowledge exchange to occur

between all participants, recognizing each individual as expert in their own right, promoting open sharing of experiences and ideas. A Yarning Circle Manual with information on falls risk factors was developed to support program facilitators. Information handouts on fall-related risk factors were developed for participants, based on the content of the Yarning Circle Manual.

The components of the Ironbark Program are further detailed in Appendix E.

### 8.2.2 Intervention implementation

Pilot sites were identified through consultation with the project Steering Committee. Six Aboriginal organisations committed to trialling the program for either a 3 or 6 month period, supplying a formal letter of support. Each organisation provided a venue for the program and many offered free transport for participants.

Staff were recruited to fill three key roles within the project: 1) Program Facilitators 2) Aboriginal Site Managers and 3) Aboriginal Research Assistants. Further detail on each role is available in Appendix E. Program staff attended training sessions delivered by Steering Committee members and researchers specializing in fall prevention, ensuring the program was delivered appropriately and effectively, and that data collection used robust methods. Regular workshops with program staff provided an opportunity for feedback to be given to the project team.

The program was tailored in a number of ways to meet the needs and interests of clients between sites. For example, one pilot site expressed a specific interest in diet, resulting in the healthy eating education topic being revisited over the course of three program sessions rather than once, and the incorporation of a facilitator-guided supermarket visit into the program. Modifications were made to the program and to program resources over the duration of the pilot in response to staff feedback to optimize program content and delivery. This process was based on the Framework for Program Evaluation in Public Health developed by the Centers for Disease Control and Prevention (CDC) (16), which provides a guide to evaluating public health interventions through consultation with individuals involved in program operations.

### 8.2.3 Participants

The program was aimed at Aboriginal and/or Torres Strait Islander people, living in the community, aged 50 years and older. However, people aged below 50 years and non-Indigenous partners/carers of participants were also able to attend in response to community demands and need at different

sites. People were excluded if they had severe cognitive impairment or a medical condition precluding exercise.

#### 8.2.4 Quantitative measures

A number of standardised physical measurements were collected from program participants at baseline, 3 month and 6 month time points by the trained Aboriginal Research Assistants. The Short Physical Performance Battery (SPPB) (17) was used to measure participant balance, gait speed and leg strength. Balance was measured by participant's ability to hold a series of balance-challenging stances for up to 10 seconds, gait speed was measured by time taken for participants to walk four meters, and leg strength was measured by participant speed in performing five repetitions of the sit-to-stand exercise. A shortened version of the Falls Efficacy Scale-International (Short FES-I) (18) measured participant fear of falling and the Incidental and Planned Exercise Questionnaire (IPEQ) (19) was used to estimate current physical activity participation levels. To promote social inclusion, non-Indigenous partners and carers took part in the data collection sessions at each time point however, their results were not incorporated into the final dataset used to generate the outcome measures reported.

##### *Statistical analysis:*

Participant outcomes at each time point were combined across all pilot sites and a mean value was generated for each measurement. Paired sample t-tests were used to compare the means of each outcome between pre-program and post-program (3-6 months after commencement).

#### 8.2.5 Qualitative measure measures

Participants provided feedback on the program through the exit questionnaire and a semi-structured interview administered during final program sessions. A trained Aboriginal Project Officer used a guide of 11 core questions to investigate program suitability, relevance and impact. The interviewer encouraged participants to expand on their responses by asking follow-up questions where appropriate. Interview times varied amongst participants, ranging from five minutes to 20 minutes and all responses audio recorded. The interviews were transcribed verbatim.

##### *Thematic analysis:*

Transcripts were independently and sequentially coded by two researchers (CL and JC), with content analysis used to identify emerging themes (20). Following coding, discussion and comparison took place to group identified themes beneath broader categories related to program design,



implementation and impact. Categories were ranked by the strength of endorsement and concurrence in views across all participants. Data were managed in NVivo10 (QSR International PTY Ltd) software.

## 8.2.6 Ethics

Ethical approval was received from the Aboriginal Health and Medical Research Council (AH&MRC) Ethics Committee (1084/15) and the University of Sydney Human Research Ethics Committee (2015/299). Written informed consent was obtained from all participants prior to commencement.

## 8.3 Results

A total of six Aboriginal community organisations across NSW piloted the Ironbark Program. Across the six pilot sites, 98 Aboriginal people registered for the study, 77 (79%) of whom were present at all assessment time points. The average age of study participants was 64 years (SD 9.7, range 40 to 90 years). Study participant characteristics are presented in Table 8.1.

Characteristics	Pilot site location						All sites (n= 77)
	Nowra (n=27)	Umina (n=10)	Mt Druitt (n=14)	Ulladulla (n=10)	Windsor (n=8)	Redfern (n=8)	
Mean (SD) age	65 (8.8)	59 (12.7)	57 (7.9)	68 (9.4)	65 (9.5)	69 (7.9)	<b>64 (9.4)</b>
Participants aged below 50 years: n (%)	1 (4)	3 (30)	3 (21)	1 (10)	0	0	<b>8 (10)</b>
Female gender: n (%)	15 (56)	6 (60)	14 (100)	7 (70)	6 (75)	5 (63)	<b>53 (69)</b>
English spoken at home: n (%)	26 (96)	10 (100)	14 (100)	10 (100)	8 (100)	8 (100)	<b>76 (99)</b>
Lives alone: n (%)	7 (26)	4 (40)	3 (21)	1 (10)	1 (13)	5 (63)	<b>21 (27)</b>
Number of people with following medical conditions:							
Vascular conditions: n (%) <sup>1</sup>	22 (81)	5 (50)	10 (74)	8 (80)	6 (75)	8 (100)	<b>56 (77)</b>
Musculoskeletal conditions: n (%) <sup>2</sup>	17 (63)	5 (50)	4 (29)	5 (50)	6 (75)	8 (100)	<b>45 (58)</b>
Neurological conditions: n (%) <sup>3</sup>	10 (37)	3 (30)	3 (21)	7 (70)	3 (38)	3 (38)	<b>29 (38)</b>
Respiratory diseases: n (%) <sup>4</sup>	7 (26)	3 (30)	2 (14)	2 (20)	1 (13)	3 (38)	<b>18 (23)</b>
Visual and hearing conditions: n (%) <sup>5</sup>	9 (33)	0	1 (7)	1 (10)	4 (50)	0	<b>15 (19)</b>
Other: n (%) <sup>6</sup>	19 (70)	5 (50)	9 (64)	6 (60)	6 (75)	5 (63)	<b>50 (65)</b>
Number of medical conditions per person							
0 (%)	3 (11)	2 (20)	3 (21)	1 (10)	0	0	<b>9 (12)</b>
1 (%)	3 (11)	2 (20)	2 (14)	0	2 (25)	0	<b>9 (12)</b>
2 (%)	2 (7)	1 (10)	3 (21)	2 (20)	0	1 (13)	<b>9 (12)</b>
3 (%)	3 (11)	1 (10)	0	3 (30)	1 (13)	2 (25)	<b>10 (13)</b>
4+ (%)	16 (59)	4 (40)	6 (43)	4 (40)	5 (63)	5 (63)	<b>40 (52)</b>
Mean baseline BMI	31.8 (8.0)	30.6 (6.9)	31.3 (4.7)	32.6 (5.4)	36.8 (10.3)	29.8 (11.1)	<b>32.1 (7.7)</b>
Mean baseline IPEQ total physical activity (h/wk)	22.3 (19.2)	47.8 (44.4)	32.8 (29.9)	36.6 (15.0)	38.9 (22.5)	17.6 (19.5)	<b>31.0 (25.1)</b>

<sup>1</sup> Angina / Heart disease / Heart attack / Low blood pressure / High blood pressure / Vascular disease / Diabetes / Leg ulcer

<sup>2</sup> Arthritis / Hip or Knee replacement / Osteoporosis / Degenerative disc disease

<sup>3</sup> Neurological disease / Stroke / Epilepsy / Depression / Anxiety

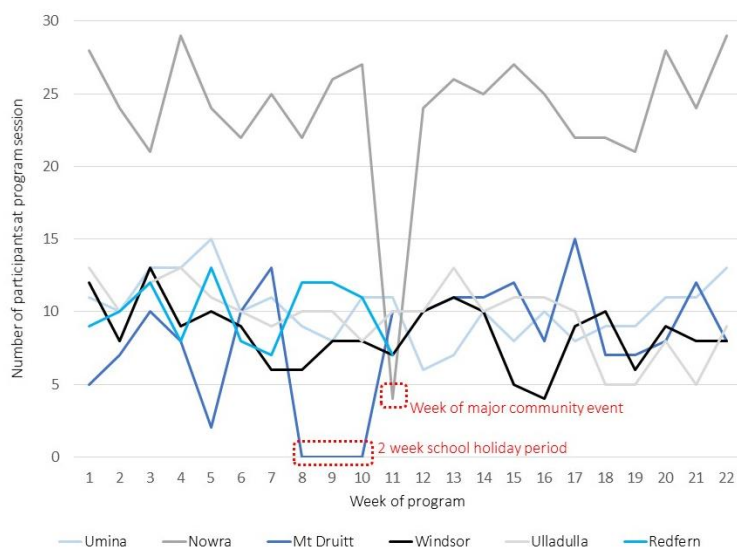
<sup>4</sup> Asthma / COPD

<sup>5</sup> Visual impairment / Hearing impaired

<sup>6</sup> Cancer / Thyroid disease / Liver disease / Kidney disease / Incontinence / Upper gastrointestinal disease

**Table 8.1:** Baseline characteristics of Ironbark pilot program participants present at all assessment time points, by pilot site

Participant attendance at the program was consistent across all sites, dropping during school holidays and during other major community events (Figure 8.1).



**Figure 8.1.** Weekly participant attendance to the Ironbark pilot program, by site

### 8.3.1 Impact on physical measures:

Between baseline and 6-month follow-up, significant improvements were seen in average standing balance score, sit-to-stand performance and gait speed (Table 8.2). As a result, there were significant improvements in average Short Physical Performance Battery Score (SPPB). A significant decrease in BMI was observed from baseline to 6-month follow up, but there were no significant changes to participant fear of falling or participant time spent doing weekly planned/incidental activity.

	Baseline (n=77) mean (SD)	3 months (n=77) mean (SD)	Change between baseline and 3 months mean (SD), p	6 months (n=69)* mean (SD)	Change between baseline and 6 months mean (SD), p
Standing balance (sec out of 50) <sup>^</sup>	43.3 (9.6)	44.8 (8.1)	1.4 (8.8), 0.16	46.8 (7.5)	2.3 (7.5), <0.01
Sit to stand (sec) <sup>†</sup>	15.4 (4.4)	13.3 (4.5)	-2.1 (2.8), <0.01	11.2 (2.9)	-3.7 (3.6), <0.01
Gait speed (m/sec) <sup>^</sup>	0.7 (0.3)	0.8 (0.3)	0.2 (0.3), <0.01	1.07 (0.4)	0.4 (0.4), <0.01
Short Physical Performance Battery Score (out of 12) <sup>^</sup>	8.3 (2.0)	9.4 (2.1)	1.1 (1.5), <0.01	10.7 (1.9)	2.3 (1.7), <0.01
BMI	32.0 (7.7)	31.4 (7.5)	-0.6 (1.2), <0.01	31.6 (6.9)	-0.6 (1.5), <0.01
Falls self-efficacy (out of 28) <sup>†</sup>	11.3 (4.5)	10.4 (3.9)	-0.9 (4.5), 0.09	11.4 (5.1)	-0.01 (6.1), 0.98
IPEQ total physical activity (h/wk) <sup>^</sup>	31.2 (27.0)	39.2 (30.8)	7.7 (30.6), 0.03	32.1 (26.6)	0.98 (28.5), 0.78

\* The Ironbark pilot program was run at Redfern for 3 months, not 6 months, due to study time constraints

<sup>^</sup>Higher values indicate participant improvement

<sup>†</sup>Lower values indicate participant improvement

**Table 8.2:** Ironbark pilot program participant outcomes, all pilot sites grouped

### 8.3.2 Exit interviews:

In response to structured survey questions used to guide each exit interview, all participants reported they enjoyed the program and stated they would recommend it to others (Table 8.3).

Question	n (%)
<b>Was the program relevant to your needs?</b>	
Yes	71 (92)
<b>How much knowledge did you have on fall prevention before the program started?</b>	
Nothing at all/not much	42 (45)
<b>How much knowledge do you have on fall prevention now?</b>	
A lot	73 (95)
<b>Did you enjoy the program?</b>	
Yes	77 (100)
<b>What did you like about the program?*</b>	
Exercises	66 (86)
One-on-one attention from the trainer	63 (82)
Group discussion	70 (91)
Education	66 (86)
Aboriginal-specific	63 (82)
Socialising	66 (86)
<b>Did you have time to come to every session?</b>	
Yes	64 (83)
<b>If you chose no, could you please explain why?*</b>	
Health problems	5 (38)
Weather	1 (8)
Doctors' appointments	1 (8)
Hospitalisation	2 (15)
Family	3 (23)
No baby sitter available	1 (8)
<b>Would you like to continue being involved in the program?</b>	
Yes	77 (100)
<b>Would you be will to pay a small fee to keep the program running?</b>	
Yes	71 (92)
<b>If you answered yes, how much would you be willing to pay per week?</b>	
\$1	5 (5)
\$2	55 (77)
\$5	8 (11)
\$10	3 (4)
<b>Would you recommend this program to others?</b>	
Yes	77 (100)

\*More than one response for each person

**Table 8.3:** Participant responses to survey questions from the Ironbark Pilot Program exit interview

Health problems and family commitments were reported to be the main reasons for participants missing program sessions. Nearly all participants were willing to pay to use the program, with \$2 per session most commonly nominated as an appropriate fee. Beyond the structured interview questions,

participants described positive aspects of program design and spoke of perceived benefits from their participation in the program (Table 8.4).

Participant comments on program design and implementation
<p><b>#1: Importance of having an Aboriginal-specific program</b></p> <p>“We need Aboriginal programs. There are a lot of things with Aboriginal community that the white community do not understand. Okay, we all bleed the same colour blood, but it goes deeper than that. You know, especially around the Hawkesbury area, we don’t have anyone to relate to, we need someone to sit down with and talk to on a different level.” [Man, Windsor]</p> <p>“It’s important to have an Aboriginal specific program as we feel welcomed here and we see our Auntie’s and sisters.” [Woman, Mt Druitt]</p> <p>“I found it more relaxing, more comfortable doing [the program] with people from my own culture. I think it is important.” [Man, Ulladulla]</p>
<p><b>#2: An opportunity to socialise and form friendships</b></p> <p>“It’s helped me be around other people. Since I retired, I have gone into myself and into my own shell. By doing [the program], it’s made me get out more.” [Man, Ulladulla]</p> <p>“The people who come feel like a family now, it has helped with loneliness and death within our group. Each of us has each other and it has enhanced our lives.” [Man, Umina]</p> <p>“It makes me get out. I became so home bound and it’s sort of a day out for me. I enjoy it when I get here.” [Woman, Mt Druitt]</p>
<p><b>#3: Acknowledging ageing and the needs of Elders</b></p> <p>“It’s been helpful to talk about the issues you get as you get older. It puts focus on things we would not have thought about.” [Man, Ulladulla]</p> <p>“This is a very good program because it is about respecting us as Elders, what our needs are and whether or not we are comfortable with things.” [Woman, Redfern]</p> <p>“It’s good for us as older people and it makes us think: if you don’t use it, you will lose it.” [Woman, Nowra]</p>
Participant comments on program impact
<p><b>#1: Improved wellbeing</b></p> <p>“I got a life again. I could not move - I was a really old person - and now I feel young again.” [Woman, Windsor]</p> <p>“I love Tuesdays now. My son always asks: ‘why you are so happy on Tuesdays?’ Cause of the exercises, sharing stories, you release good endorphins so you are feeling good.” [Man, Redfern]</p> <p>“I just love it. I get satisfaction out of this and I don’t have time to cry... I love coming here.” [Woman, Nowra]</p>
<p><b>#2: Physical improvement</b></p> <p>“100% my balance and strength are great. I don’t use a walking stick now, I have put it away.” [Man, Umina]</p> <p>“Learning what to do with exercise is a good part [of the program] because my doctor told me that if I keep sitting on the couch, I’ll keep freezing up. Doing this has prevented that. We need this sort of thing to keep us going.” [Man, Windsor]</p> <p>“Everyone has gotten stronger and it’s because of the exercises that they do. You can see how much stronger they have gotten in getting up and down, and getting out of a chair. Everyone is more stable now.” [Man, Nowra]</p>

### **#3: Lifestyle changes**

"I have put safety equipment in my house because of what I have learnt." [Woman, Nowra]

"I do things more gracefully now. I'll be honest, I'm more mindful of how I get up now, and how I step, how I walk."  
[Woman, Redfern]

"I didn't usually walk far but now I have better confidence. I do my exercises every day." [Woman, Umina]

"I go around to others that live in my retirement village and move hazards." [Woman, Nowra]

**Table 8.4:** Participant feedback related to program design/implementation and impact, recorded during semi-structured exit interviews

## 8.4 Discussion

The Ironbark Fall Prevention program was developed in partnership with Aboriginal communities in NSW and is the first fall prevention program developed specifically Aboriginal people (7). The pilot was successfully undertaken in six different communities spanning urban and large regional areas. Retention was relatively high and participant feedback was consistently positive. Pre-post measures of physical performance demonstrate program-related improvements in leg strength, balance and gait speed. There was a statistically significant decrease in participant BMI which, although clinically minimal, remains an objective measure indicating likely health benefits for participants.

The average age of Ironbark participants was relatively low for a fall prevention program (64 years), with people as young as 40 years in regular attendance. A significantly greater proportion of hospitalisations due to fall-injury have been documented for Aboriginal and Torres Strait Islander people aged 50 to 75 years than for those aged 75 years and over (9). This may be due to the earlier onset of health conditions associated with ageing amongst Aboriginal and Torres Strait Islander people, such as diabetes, cerebrovascular and cardiovascular disease (21, 22), which have been shown to increase a person's risk of falling and/or sustaining a fall-related injury (23). The majority of fall prevention programs available to the general Australian population are targeted to people aged 65 years or above (24), excluding many Aboriginal and Torres Strait Islander people who would benefit from accessing these services.

The option to attend an Aboriginal-specific program was deemed important by the majority of participants. Previous studies have shown Aboriginal-specific programs to have a greater ability to address issues of specific importance to Aboriginal people and to be more capable of providing a culturally safe environment (2). Through acknowledging the broader concepts of health and well-being, Aboriginal-led services are better positioned to consider the physical, social, emotional and

cultural needs of clients. Ability to address these Aboriginal paradigms of health indicates a high chance of program success, leading to integrated, long-term program implementation.

Nearly all participants reported the group discussion to be one of the strongest aspects of the program, stating it gave them an opportunity to share thoughts and stories. The importance of story-sharing as a method of healing and maintaining well-being has been documented in Indigenous populations worldwide (25). Participation in 'Talking circles' or 'Yarning circles' has been reported to promote peace and balance (26).

#### 8.4.1 Study strengths and limitations

Falls among older people have been a heavily researched area for a number of decades (23) and general approaches to preventing falls are well known and commonly practiced (24). As the Ironbark Program content was derived from two effective, existing fall prevention programs implemented widely within Australia, the program content met established guidelines for an effective fall prevention program. Through input from Aboriginal stakeholders, additional dimensions were introduced to the program aimed at building participant mind, body and spirit within a cultural context (4). This added to the likelihood of the programs acceptability.

Although participants showed significant physical improvements within-group, the lack of a control group prevents robust evaluation of the programs' effectiveness in this pilot study. Some improvement observed with-in group may be attributed to a learning effect, where participants became increasingly practised in performing each physical test between measurement time points. However, the significant decrease in BMI suggests that participants improved their physical fitness and/or lifestyle habits over the course of the pilot.

As the pilot had a short time-frame, a long-term trial would be useful to investigate the sustainability of the Ironbark program within existing services. A longer study period may also be more effective in promoting sustained uptake of physical activity.

#### 8.4.2 Key recommendations

On reviewing the results of the Ironbark Program pilot study, several important points should be considered prior to large-scale implementation of the program. Both the Yarning Circles and the exercise components were shown to be enjoyable elements of the program at all pilot sites. This confirms the program content was suitable, appropriately delivered and transferrable between Aboriginal communities in urban and regional areas of NSW. The program should not only be promoted to people aged 65 years and older but participation of younger people with chronic health conditions encouraged. Attendance to every program session should remain non-compulsory, with

the program run over the long-term. Despite this, participants should be encouraged to attend as many program sessions as possible, as a higher dose of exercise will increase the programs likelihood of preventing falls (27). Local Aboriginal people from the community should manage the program at each site as this facilitates the engagement of the local community and retains capacity within the community, increasing the likelihood of program sustainability. A donation of \$2 could be asked for attendance to each program session. A robust, large scale evaluation is needed to determine if the Ironbark Program can reduce falls in this population.

## 8.5 Conclusion

The implementation of the Ironbark Fall Prevention Pilot Program in six Aboriginal communities demonstrated its likely effectiveness in improving participant mobility and physical function. Program enjoyment was reflected through relatively high participant retention over the duration of the program and the positive feedback received from participants. A larger randomised controlled trial is required to determine whether the Ironbark Program is effective in directly preventing falls on a population level.

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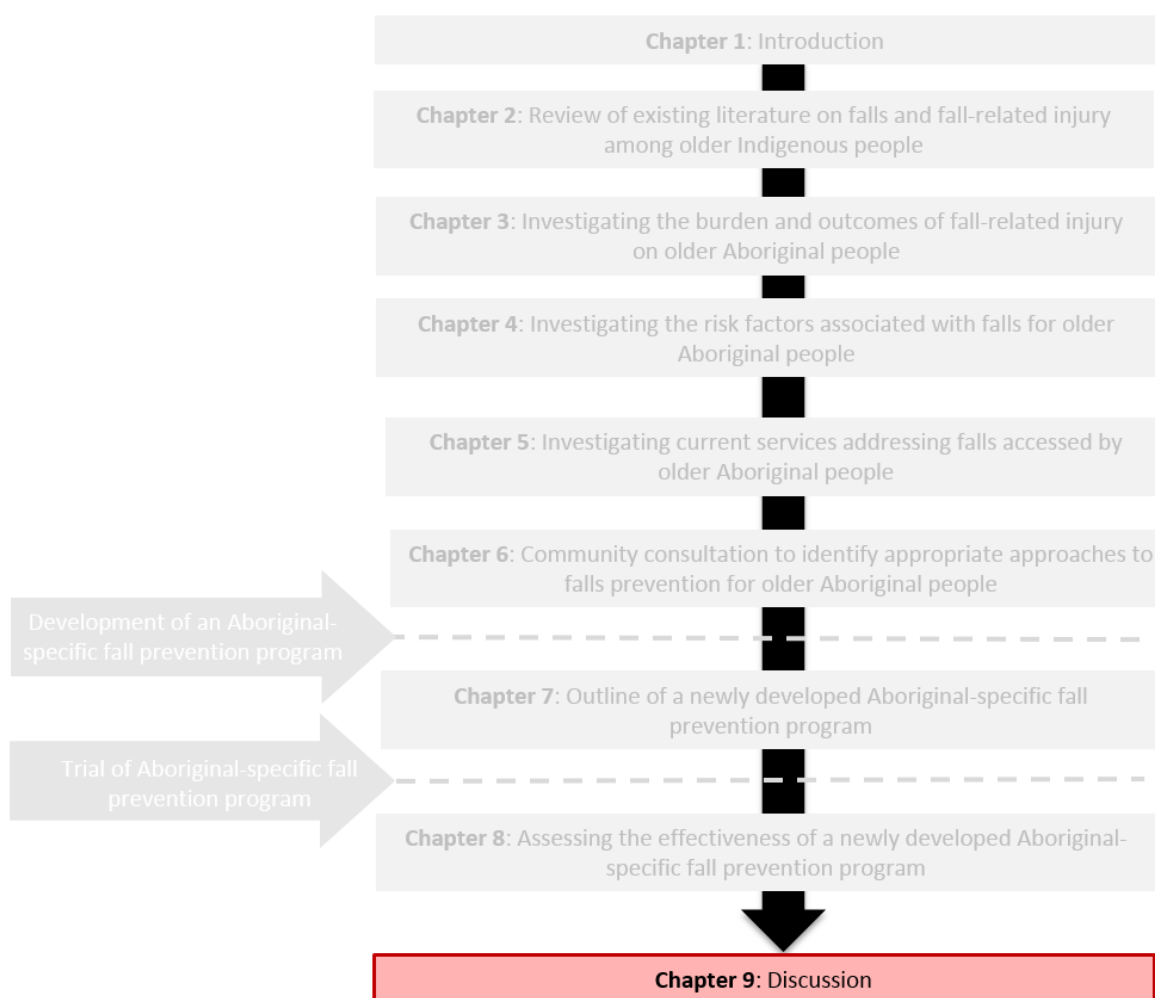


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## Chapter 9: Discussion and Conclusions

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## 9.1 Summary of study findings

### 9.1.1 Addressing the aims of this study

This study investigated the impact of falls on older Aboriginal people, and developed and evaluated a program aimed at reducing risk of falling specifically for Aboriginal communities. Prior to this study, existing evidence suggested falls have a significant impact on the health of older Aboriginal people [1]. As the proportion of Aboriginal people aged 65 years and older grows [2] and as average life expectancy of the Aboriginal population increases, falls and fall-related injury are likely to be a growing health priority for Aboriginal communities. Despite a large number of mainstream fall prevention programs being available in community settings across Australia [3], it is unclear whether these programs are equally as effective for Aboriginal people or whether they are considered to be relevant and appropriate by Aboriginal people.

Through this thesis, a rich body of research has been produced which a) explores and summarises available knowledge on falls within Indigenous populations worldwide, b) investigates the impact of fall-related injury and outcomes of fall-related hospitalisations for older Aboriginal people and c) examines which falls risk factors identified from other populations are associated with falls among community-dwelling older Aboriginal people.

To identify appropriate and effective approaches to fall prevention for the older Aboriginal population, existing healthy ageing services in NSW commonly accessed by older Aboriginal people were sought out. Consultation with staff from these services, and with older Aboriginal people, provided insight into how an effective and appropriate fall prevention program should be structured and delivered to be enjoyable and relevant to the older Aboriginal population.

In response to these findings, and in partnership with Aboriginal community organisations, government stakeholders, academics and health service providers, a new Aboriginal-specific fall prevention program was developed; the Ironbark Program. The program was trialled in six Aboriginal communities in NSW for a 3 or 6 month period, delivered through Aboriginal Controlled Community Services. The development, implementation and evaluation of the Ironbark Program has been reported on.

### 9.1.2 Burden and risk factors for falls and fall-related injury

In this thesis, a systematic review was conducted to identify international health literature investigating falls in Indigenous populations globally [4]. This review revealed that approximately 30% of Indigenous people aged 45 years and older experience at least one fall per year. Despite this high

prevalence of falls amongst Indigenous people, few large-scale, population-wide studies were found to investigate the issue, while even fewer focused on identifying appropriate methods of prevention.

Fall-related hospitalisations for Aboriginal people and other Australians aged 50 years and older, admitted to a NSW hospital for a fall-related injury between January 2003 and December 2012 were investigated [5]. The patterns and outcomes of fall-injury hospitalisations differed between older Aboriginal people and other older Australians. A higher proportion of Aboriginal people were hospitalised for fall-related non-fracture injuries when compared to other older Australians over the study period. Aboriginal people had a shorter length of hospital stay and lower 30-day mortality, yet had a higher age-standardised rate of fall-related injury when compared to other older Australians. This suggests different approaches may be required for the prevention and management of fall injury between both groups.

Secondary analysis of cross-sectional survey data collected through the Koori Growing Old Well study showed that falls affect approximately one quarter of the community-dwelling Aboriginal study population aged 60 years and older [6]. Participants had an increased fall risk if they were female, used three or more medications, had arthritis, macular degeneration, depression, history of stroke, were unable to do own housework or were unable to do own shopping. This study identified risk factors associated with an increased falls risk specifically for older Aboriginal people, which are necessary to address for effectively reducing falls in this population.

### 9.1.3 Understanding community requirements for fall prevention

To investigate the use of existing fall prevention programs by older Aboriginal people, a questionnaire was distributed to over 600 health and community services in NSW, with 131 (21.8%) responses received [7]. Results highlighted that despite a variety of mainstream fall prevention programs being currently available across the state, few older Aboriginal people accessed these on a regular basis. Just four services reported to have previously provided a fall prevention service specifically for Aboriginal people. Interviews with staff from relevant services identified a number of barriers thought to deter older Aboriginal people from accessing existing fall prevention services. These included clients not feeling comfortable with accessing mainstream programs, not viewing themselves as at risk of falling, or not being aware that fall prevention programs were available. Strategies towards the development of an effective and acceptable Aboriginal-specific fall prevention program were discussed with service providers.

Yarning Circle discussions held with 76 older Aboriginal people across NSW revealed falls to be a major concern for the vast majority of participants [8]. Despite this, many participants were unaware of

existing fall prevention programs. Although few Yarning Circle participants had received formal fall prevention education in the past, extensive knowledge was shared from personal experiences for minimising fall risk and managing recovery from fall-related injury. Participants reported that an ongoing, Aboriginal-specific, low-cost, group-based fall prevention program was likely to be of most benefit to them. Multiple issues discussed by participants in relation to falls and fall prevention were unique to the older Aboriginal population and were not being met by existing services.

#### 9.1.4 Development and evaluation of the Ironbark Program

Informed by over one year of consultation with Aboriginal Elders, Aboriginal community groups, service providers working in Aboriginal aged care, clinicians and academics specialising in fall prevention, the Ironbark Aboriginal Fall Prevention Program was developed. The aim of the program was to enable participants to maintain their independence by improving their balance, mobility and strength, while increasing their confidence in performing daily tasks.

The Ironbark Program was developed as an ongoing, group-based, balance and strength exercise class with an education component held within Yarning Circles. The 1.5 hour program sessions were designed to be attended once per week. Participants were guided through a 45 minute class of strength and balance training, followed by a 45 minute structured discussion (Yarning session) about falls and fall prevention. The Ironbark Program was trialled through six Aboriginal health or community organisations at urban and regional community sites across NSW: MINGALETTA Aboriginal & Torres Strait Islander Corporation in Umina (6 month trial), Aunty Jeans Chronic Care Program in Nowra and Ulladulla (6 month trial), Baabayn Aboriginal Corporation in Mt Druitt (6 month trial), Hawkesbury Community Services in Windsor (6 month trial) and Wyanga Aboriginal Aged Care Program in Redfern (3 month trial).

Across the six pilot sites, 98 older Aboriginal people aged 45 years and older registered for the study, 77 (79%) of whom were present at all assessment time points. There were significant improvements in participant leg strength, gait speed and balance between baseline and final measurement time points [9]. As a result, significant improvement was seen in the average participant Short Physical Performance Battery Score (SPPBS), which increased from 8.3 (reflecting moderate physical function) to 10.7 (reflecting high physical function) over the duration of the study. A clinically small yet statistically significant decrease in average BMI was observed between baseline and final measurement time points. Healthy lifestyle choices, such as healthy eating plans and regular physical activity sessions, were self-implemented by participants. There was a noticeable increase in

participants becoming involved with social activities and outings, including the formation of walking groups outside of program sessions.

All participants reported having enjoyed the program, and all were willing to recommend the program to others. The most popular element of the program was the Yarning Circle discussion sessions. Many people were not able to attend every program session due to health problems, the weather, doctor's appointments, hospitalisation and/or family duties. The majority of participants were willing to pay a fee to attend the program, with AUD\$2 per week considered to be an appropriate amount.

All sites continued to run the Ironbark Program after the conclusion of the pilot. Existing staff from host organisations were able to deliver the program after extensive onsite training by exercise facilitators over the duration of the pilot. Program manuals, hand-outs and equipment which remained with communities has assisted with program continuation. The Ironbark Program has now been incorporated as a permanent feature of the Aunty Jeans Chronic Care Program.

## 9.2 Translational outcomes of this thesis

### 9.2.1 Implications for clinical practice

Few older Aboriginal people were found to access existing fall prevention services, despite an apparent need and the wide-spread availability of mainstream fall prevention programs in community settings (Chapter 5). This lack of service use was attributed to a) a lack of awareness of falls and fall prevention and b) the inability of mainstream health programs to meet the sociocultural needs of older Aboriginal people.

#### **Raising awareness of falls among older Aboriginal people**

A potential approach to raising awareness on fall prevention within Aboriginal communities is to promote falls risk screening through ACCHOs. It is important to ensure that all clinicians working at ACCHOs are aware of appropriate secondary services they are able to refer high falls risk patients onto. These could include home modification services or be additional medical services for eye testing, nutrition or podiatry. A case manager may be required to perform service coordination for individual patients if a number of referrals are provided, particularly for patients of advanced age. Additionally, Aboriginal Liaison Officers may be required to escort older Aboriginal patients to services, especially if the services are unfamiliar or transportation is required. Ideally, an ACCHO clinician would refer a high falls risk patient to a local, appropriate, multifaceted, fall prevention program, such as the Ironbark Program, which works with patients to improve their functional mobility while providing appropriate support.

There may be alternative Aboriginal community organisations to ACCHOs which are well positioned to provide falls risk screening. An example is MINGALETTA Aboriginal and Torres Strait Islander Corporation, which delivered the Ironbark Pilot Program on the Central Coast. Although not an ACCHO, MINGALETTA hosts a general practitioner one day per week who provides free health consultations to Aboriginal clients who regularly access the organisation. In many cases, these consultations are the only type of health care received by MINGALETTA clients and therefore, incorporating falls risk screening to similar services may reach individuals who do not regularly access the formal healthcare system.

It is important to note that exercise programs made broadly available, beyond people at high risk of falls, have been shown to effectively reduce falls within the wider population [10]. It may therefore be beneficial to promote a fall prevention program which includes both education and exercise components, such as the Ironbark Program, to the broader older Aboriginal population, and not only to clients referred through falls screening. Optimal management of specific falls risk factors can then be performed through the program on a case-by-case basis.

#### **Effectiveness of community based services in delivering care**

Embedding the Ironbark program into ACCHOs and existing Aboriginal community-based services which focus on healthy ageing is a potential approach to ensuring program accessibility and acceptability. Both ACCHOs and Aboriginal healthy ageing services are likely to have a high proportion of existing older clients who would benefit from attending a fall prevention program, removing barriers associated with participant identification and recruitment. Existing Aboriginal-controlled services are predominately managed and staffed by Aboriginal people, providing access to service staff who are equipped to answer to the needs of older Aboriginal people to guide program implementation. Further, a familiar venue with known transport options can reduce the apprehension participants may feel in trialling a new program. Services with an existing in-depth understanding of the local older Aboriginal community will have the ability to efficiently adjust the program to specifically suit local needs and preferences. The likelihood of program sustainability may be increased through its integration as a regular on-going feature of well-established services with access to ongoing funding.

#### **Community leadership and ownership**

As previously documented, community consultation was shown to be an effective approach to identifying service gaps and informing the development of the Ironbark Program. Performing a healthy ageing services audit identified relevant health service staff with which to discuss the status of fall

prevention in Aboriginal communities (Chapter 5), Yarning Circles held with older Aboriginal people investigated appropriate and relevant features for a fall prevention intervention (Chapter 7), and the establishment of an Aboriginal Steering Committee guided all research processes and informed program development and implementation (Chapter 8).

Through basing program structure and content on the requirements and interests of older Aboriginal people and their communities, the acceptability of program content and delivery was ensured. This facilitated Aboriginal organisations in hosting the pilot program, the recruitment of Aboriginal staff to be involved in program delivery, the recruitment of older Aboriginal people to participate in the program trial, and the retention of Aboriginal participants over the duration of the trial. Community ownership over the program drove services to continue delivering the program once the pilot had come to an end. An important feature leading to community ownership was Aboriginal leadership in all aspects of program development and implementation.

### **Appropriate approaches to program delivery**

A key finding of this research showed that methods used for program delivery were critical to its acceptability. This was clearly stated during Yarning Circles held with older Aboriginal people (Chapter 7) where participants discussed a number of priority features to incorporate into a fall prevention program, including its need to be Aboriginal-specific, group-based, flexible and long-term. This was further confirmed through the exit interviews held at the completion of the Ironbark pilot program, where the vast majority of participants reported to enjoy the program being Aboriginal-specific and having a group-based delivery (Chapter 8). A Discrete Choice Experiment (DCE) performed with Ironbark participants indicated a strong preference for health services that are Aboriginal-specific, with participants having a willingness to pay of \$1.76 (95% CI: \$0.68-\$2.83) for an Aboriginal-specific service relative to a mainstream population session [11] [Appendix H].

## 9.2.1 Implications for health policy

### **Rethinking systems of health funding**

Through Yarning Circles (Chapter 6), older Aboriginal people reported to prefer accessing non-government, Aboriginal controlled health and community services for healthy ageing support. The majority of organisations which hosted the Ironbark program relied on philanthropy or on project grants from a range of funders to be able to operate. This type of funding tends to be short-term and sporadic, leading to fragmented and temporary service availability. Competing family and community priorities cause older Aboriginal people to access health services irregularly (Chapter 8) and therefore, the provision of ongoing, long-term healthy ageing programs is required. Government funding can be



provided by either federal, state or territory sources and is often associated with different requirements and guidelines. This can be time consuming to identify and confusing to coordinate, particularly for smaller organisations which rely on volunteer staff, who may not have experience in this area.

Grants tend to sit within funding schemes, focused on improving specific health outcomes identified by the funding body which may not be of equal priority to all Aboriginal communities. This may also cause less understood health problems, such as falls, to be overlooked in lieu of more frequently publicised issues. This is demonstrated through the scope of projects currently funded through the Close the Gap Campaign, where no key campaign targets have a specific focus on the ageing population despite an apparent service gap [12]. There is a clear requirement for significant, sustained investment into community based, Aboriginal-specific healthy ageing services and programs.

### **Additional support required for ACCHOs**

Although the National Aboriginal and Torres Strait Islander Health Plan 2013–2023 has identified healthy ageing as a priority to improving health outcomes for the Aboriginal population [13], additional support appears to be required by ACCHOs to increase their capacity for offering ongoing community-based healthy ageing programs. Multiple ACCHOs were initially approached when seeking avenues for Ironbark pilot program implementation. Despite showing an interest in the program and confirming there was a need for fall prevention among older clients, no ACCHO accepted the opportunity to host the program trial. This was attributed to overburdened services, affected by a shortage of staff and resources. As a result, services outside the health sector were approached which had the flexibility to incorporate the Ironbark pilot within regular organisational operations.

### **Communication and collaboration**

As falls are influenced by multiple risk factors, it will not always be possible to offer all services required to address falls risk through a single service provider. Due to this, communication channels are required to be strengthened between ACCHOs, other Aboriginal community organisations and mainstream health and community services. In many cases, particularly in rural and remote areas, partnership formation between Aboriginal services and mainstream services is likely to be the most effective approach to offering comprehensive healthy ageing support, inclusive of fall prevention, to older Aboriginal people. Through these partnerships, ACCHOs could work with mainstream services to increase their cultural competency, which may encourage their use by the broader Aboriginal community.

### 9.3 Strengths of this research

Prior to this research, limited information was available on the impact of falls and the status of fall prevention for the older Aboriginal population. As a result, the separate studies presented as chapters in this thesis each address novel research questions, contributing knowledge to a previously little understood area.

Ongoing oversight of this research provided by an Aboriginal Steering Committee ensured the cultural safety of project participants and their communities was acknowledged and respected. Aboriginal Steering Committee members provided input on approaches to participant recruitment, reviewed and modified data collection tools, oversaw the analysis and interpretation of data, and contributed to the production of all study outputs. Further, all aspects of this research were reviewed and approved by the state-based Aboriginal Health and Medical Research Council (AH&MRC) of NSW. The AH&MRC provided formal ethical approval for each individual study and reviewed all research outputs prior to their public availability, including all academic publications, reports and conference presentations.

Partnerships established with Aboriginal services and organisations were crucial for performing data collection and intervention delivery. It is recognised that Aboriginal people may be reluctant to participate in Western-style research due to a history of exploitation, disrespectful experimentation and a misunderstanding of cultural practices, with little benefit gained by individual Aboriginal study participants, their communities or by the broader Aboriginal population [14]. The enthusiastic response to both the Yarning Circles (Chapter 6) and participation in the Ironbark pilot (Chapter 8) may reflect acceptability of research processes, the importance of the research topic to Aboriginal communities and/or a significant perceived benefit from involvement in the project.

This research has drawn on existing data where possible, avoiding any potential inconvenience or unanticipated harms caused by primary data collection processes to a vulnerable and over-researched population. A systematic literature review (Chapter 2) was performed to prevent duplication of existing work, survey data previously collected through the Koori Growing Old Well Study was analysed in light of a new research question (Chapter 4), and de-identified hospitalisation data was analysed to examine severe fall injuries (Chapter 3).

This program of research was strong because it was directly informed by the priorities and contributions of older Aboriginal people, which facilitated the development of a program directly addressing their needs. It maintained a positive aim: to enable older Aboriginal people to preserve their wellbeing and independence as they age. This strengths-based approach highlighted the effectiveness of community based programs that build on collective wisdom. The community

consultation used to inform program design gave communities ownership over the program and therefore, increased their willingness to participate in both initial research stages and the pilot program. Community consultation has been shown to be particularly valuable in health program development with Indigenous populations worldwide [15].

A number of factors were shown to facilitate the successful trial of the Ironbark Fall Prevention Pilot Program in community settings. Participants felt comfortable attending a program run through existing Aboriginal health and community organisations, managed and delivered by local Aboriginal staff. Local staff often had contacts in other Aboriginal services, which assisted with promoting the program beyond each host organisation. On conclusion of the pilot, Aboriginal program staff remained within their communities and were able to continue delivering the program locally as part of their original positions within host organisations. These outcomes highlight the benefits of embedding the program into existing community-based healthy ageing programs, ensuring its acceptability and sustainability.

This body of research demonstrates that future studies investigating ageing within Indigenous populations should ensure data they collect, or gain access to, includes participants as young as 45 years of age. This consistency will a) allow study outcomes to be more comparable, b) enable a more accurate understanding of the 'early onset of ageing' reported for Indigenous people, c) help direct funding and resources to potentially unidentified priority areas and d) ensure available programs and services meet the needs of younger people who may require the same assistance and support to people aged 65 years and above in the general population.

## 9.4 Limitations of this research

Although a number of different approaches were taken to investigating falls and fall related injury among older Aboriginal people in the presented body of work, all were undertaken with urban or regional Aboriginal communities in NSW. Due to the diversity of Aboriginal communities, further work may be of use to confirm the generalisability of study outcomes. Further, the relevance of these findings to global Indigenous populations is unknown.

Investigating fall related hospitalisations across NSW (Chapter 3) provided valuable population-level data on severe fall injuries. However, problems with correctly identifying older Aboriginal people through routinely collected administrative data are anticipated to have affected the accuracy of study findings. To minimise identification issues, an algorithm was applied which is the recommended approach for linking Aboriginal and Torres Strait Islander Peoples on Population Datasets in New South Wales [16], best accounting for reporting, administrative and coding errors.

Chapter 4 investigated self-reported falls among older Aboriginal people and their association with falls risk factors identified for other populations. Data was provided from a cross-sectional survey conducted as part of the Koori Growing Old Well Study. The analysis of self-reported, retrospective data from older study participants may have introduced recall bias, particularly with a one-year look back period for reporting past falls. Methods of retrospective data collection for investigating fall rates are common within the fall-related literature. Moderate agreement has shown to be achieved between prospective monitoring and the retrospective self-reporting of falls among community-dwelling older people [17].

For the healthy ageing services audit described in Chapter 5, challenges were encountered in establishing contact with relevant services, particularly those located in remote locations with limited access to internet. Further, the reliance on snowball sampling may have omitted potentially relevant services from the study.

The Ironbark pilot program was not run alongside a control group and therefore, its effectiveness in improving participant functional mobility can only be demonstrated by within-group impact through this study (Chapter 8). Further, this study was not designed and powered to detect a change in rate of falls. A larger randomised controlled trial is required to determine whether the Ironbark program is effective in directly preventing falls on a population level.

## 9.5 Directions for future research

This study investigated the burden of falls and the risk factors associated with falls for older Aboriginal people. An Aboriginal-specific fall prevention program was developed and trialled in community settings, with changes to participant strength, balance and mobility studied over the duration of the pilot.

A larger randomised controlled trial is required to determine whether the Ironbark program is effective in directly preventing falls on a population level. Ideally, this trial would have Ironbark pilot sites established in multiple states, with a greater variety of Aboriginal communities participating in the program. This would be a true test of the programs flexibility.

A major consideration for a larger trial would be allocating enough time for initial community consultation and partnership formation. For the pilot program, this step took longer than initially anticipated as the project team moved within the time frames and availabilities of each host

organisation. As these organisations each offer and coordinate numerous programs, classes and services on an ongoing basis, it can be challenging for services to prioritise new programs.

Significant time and resources are required to be allocated towards staff recruitment for future up-scale of the program. Through the pilot, local staff led the program at each site, with their input instrumental in how the program was developed and delivered. The careful recruitment of high quality, appropriate staff is crucial for the program's success, as is establishing strong communication between staff and the project team.

## 9.6 Concluding comments

This research used a number of approaches to investigate the impact of falls and fall-related injury on older Aboriginal people. A significant burden was identified and in response, community consultation was used to inform the development of a new Aboriginal-specific fall prevention program; the Ironbark Program. This program was trialled in six Aboriginal communities in NSW over a three or six month period. Across all pilot sites, significant improvements in participant strength, balance and mobility were observed. Participant retention remained high over the duration of the pilot, with participants reporting to enjoy attending the program.

This study has demonstrated approaches to the development and implementation of an Aboriginal-specific community-based health program. Through ensuring the program addressed a variety of issues affecting older Aboriginal people, it extended beyond fall prevention in many ways. The Ironbark Program addressed a number of risk factors associated with chronic illness, one of which was obesity, demonstrated by a significant decrease in participant BMI across all study sites. Chronic illness, in turn, is a risk factor for falls. Participants reported to enjoy the group-based delivery of the program, stating the social nature of the program provided mental health benefits. Depression and social isolation have additionally been identified as risk factors for falls.

A priority of maintaining the cultural safety of program participants resulted in the program being delivered through existing, well-known Aboriginal community services, overseen by local Aboriginal people. This allowed capacity building of Aboriginal service staff and staff retention within host organisations after the completion of the pilot. ACCHOs may be appropriate host organisations for future program implementation, following the provision of suitable long-term support and funding.

Importantly, this study demonstrates that Aboriginal community knowledge is crucial to improving health outcomes for Aboriginal communities themselves. It shows that an effective multifaceted fall prevention intervention, delivered in response to the needs and interests of older Aboriginal people,

can make positive changes to the physical and emotional health of Aboriginal people living in community, facilitating independence and ageing on Country.

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# Appendices

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## Appendix A: Studies included in literature review

Standardised data extraction table summarising studies included in the review.

#	Study	Study period	Place	Indigenous group studied	Age group	Sample size	Study design and methods	Exposure measure	Outcome measure	Relevant results	Comments on study quality
1	Frech, T. Ma, K. Ferrucci, E. Lanier, A. McFadden, M. Tom-Orme, L. Slattery, M. Murtaugh, M. <b>2013</b>	2004-2007	America	American Indians and Alaskan Natives	18 years and older	8,039	<b>Cross sectional study:</b> questionnaire and physical measurements (AK)	Self-reported demographic characteristics, lifestyle factors and clinical history	Osteoporotic fracture data was self-reported, collected through audio computer-assisted interviews and touch screens	Risk factors for osteoporotic fracture in Alaskan Native and Navajo people aged 40 years and over is discussed, as are protective factors preventing fracture	Self-reported retrospective data was collected - high potential for recall bias. Sample size is substantial considering study methods and time period. Response rate was not recorded.
2	Irie, F. Pollard, C. Bellamy, N. <b>2008</b>	2003-2005	Australia (QLD)	Aboriginal and Torres Strait Islanders	All ages	38,036	<b>Ecological study:</b> analysis of state injury data (QLD)	Demographic characteristics from hospitalisation records	Fall-related hospitalisation data from a state trauma registry (QTR)	Falls specific data for Indigenous patients aged 40-64 years (external cause of injury, location of injury on body, nature of injury)	QTR records are considered to be a reliable data source. Indigenous status listed on hospitalisation records may not be accurate.
3	Jamieson, L. Roberts-Thomson, K. <b>2007</b>	1998-1999 to 2004-2005	Australia	Aboriginal and Torres Strait Islanders	60 years and older	164,233	<b>Ecological study:</b> analysis of hospitalisation data (nation-wide)	Demographic characteristics from hospitalisation records	Head-injury hospitalisation data from a national hospital morbidity database (AIHW-HMD)	Head injury prevalence and type in older Aboriginal people reported, comparison between Indigenous and Non-Indigenous Australians made	Nation-wide, reliable data source used. Limited characteristics of the study population were reported. Indigenous status listed on hospitalisation records may not be accurate.

4	Lai, M. Waldron, N. <b>2011</b>	2005-2010	Australia	Aboriginal and Torres Strait Islanders	45 years and older	276	<b>Ecological study:</b> analysis of hospitalisation data from one hospital (WA)	Demographic characteristics, clinical history and lifestyle factors from hospitalisation records	Hip fracture hospitalisation data from a local orthogeriatric database	Comparison of health status and lifestyle between Indigenous and non-Indigenous patients following hip fracture	Study population from one hospital site and therefore the sample size was small, particularly for Indigenous patients (n=46). The publication was brief with little detail provided on study design or outcomes.
5	Leslie, W. Derksen, S. Metge, C. Lix, L. Salamon, E. Steiman, P. Roos, L. <b>2004</b>	1987-1999	Canada	Canadian First Nations people	20 years and older	32,692	<b>Ecological study:</b> Health database analysis (national)	Demographic characteristics and details of other fracture injuries from hospitalisation records and physician records	Hip fracture data from national health databases	Age was strongly associated with hip fractures: rapid increase in prevalence for Indigenous and non-Indigenous men and women over the age of 60	Multiple data sources used to identify Indigenous status. Few cohort characteristics were reported. A small proportion (9.3%) of study participants were both Indigenous and aged 60 years or older.
6	LoGiudice, D. Smith, K. Atkinson, D. Dwyer, A. Lautenschlager, N. Almeida, OA. Flicker, L. <b>2010</b>	2004-2006	Australia	Aboriginal and Torres Strait Islanders	45 years and older	363	<b>Cross-sectional study:</b> Questionnaire (WA)	Self-reported demographic characteristics, lifestyle factors and clinical history. Clinical review for 40% of participants, with health records viewed	Self-reported data on past falls and fall injuries, collected through a questionnaire administered by trained Indigenous community members	Self-reported falls and associations to 7 lifestyle and health variables	Self-reported retrospective data on falls and fall injury was collected - high potential for recall bias. Data collected from both participants and a nominated informant. High response rate (94.3%) but no target sample size provided.
7	Macintosh, D. Pearson, B. <b>2001</b>	1997-2000	Australia	Aboriginal and Torres Strait Islanders	All ages	247	<b>Cross-sectional study:</b> Analysis of hospital admissions at	Demographic characteristics, clinical history and lifestyle	Data on falls from the Clinical Pathways database,	Comparison of health status and health outcomes in Indigenous and	Very small sample size of Indigenous participants (n=15); likely not

							one hospital (QLD)	factors from hospitalisation records	internal to Cairns Base Hospital, QLD	Non-Indigenous patients following a femoral neck fracture	representative of local Indigenous population. Very detailed data reported for Indigenous participants.
8	Murphy, T. Pokhrel, P. Worthington, A. Billie, H. Sewell, M. Bill, N. <b>2014</b>	1990-2009	America	American Indians and Alaska Natives	All ages	469,493	<b>Ecological study:</b> Analysis of death records (national)	Place and age of death from death certificate data	Fall-related mortality data from the National Centre for Health Statistics' National Vital Statistics System	Falls specific death rates for American Indians and Alaskan Natives given by age, gender and location	Nation-wide data source used. Record linkage with the Indian Health Service database was used to identify Indigenous status.
9	Quandt, S. Stafford, J. Bell, R. Smith, S. Snively, B. Arcury, T. <b>2006</b>	1998-2000	America	Native American	65 years and older	691	<b>Cross-sectional study:</b> Questionnaire, blood sample collection (NC)	Self-reported personal characteristics, healthcare seeking behaviours and clinical history	Self-reported number of falls in past 12 months, collected via replies to a paper-based questionnaire	Fall rates recorded over a 12 month period across different ethnicities, including Native American	Self-reported retrospective data on was collected - high potential for recall bias. Participants selected through random sampling, a high proportion of which were Indigenous (26%).
10	Rutland-Brown, W. Wallace, D. Faul, M. Langlois, J. <b>2005</b>	1997-1999	America	American Indians and Alaskan Natives	All ages	182,130	<b>Ecological study:</b> Analysis of hospitalisation data (13 states)	Age from hospitalisation records	Traumatic brain injury hospitalisation data from national electronic hospital discharge sets	Analysis of traumatic brain injuries caused by falls, comparison between Indigenous and non-Indigenous Americans made	State-specific health data used. TBI rates varied greatly between states and data from only 13 states was analysed - may not be representative of the national Indigenous population.
11	Smith, K. Flicker, L.	-	Australia	Aboriginal and Torres	40 years	363	<b>Cross-sectional study:</b>	Self-reported demographic	Self-reported falls data	Prevalence of various falls risk	A cognitive assessment tool

	Dwyer, A. Atkinson, D. Almeida, O. Lautenschlager, N. LoGiudice, D. <b>2010</b>			Strait Islanders	and older		Cognitive assessment tool (WA)	characteristics, lifestyle factors and clinical history	collected through a validated cognitive assessment tool (KICA) administered by Aboriginal community workers	factors in an older Aboriginal cohort, impact of dementia on falls in older Aboriginal people (also divided into male/female comparisons)	validated for use with Indigenous populations was used for data collection. A target sample size was provided. Response rate was high (94.5%). Participants selected through random sampling.
12	Wendelboe, A. Landen, M. <b>2011</b>	1999-2005	Central America	American Indians	All ages	98,503	<b>Ecological study:</b> Analysis of death records and injury data (national)	Age of death, sex and place of death from mortality and injury records	Fall-related mortality data from state and national vital records data	Prevalence of fall-related mortality in American Indians living in New Mexico aged 50 years and over compared to that of other ethnicities and to US rates	State and nationwide data sources used. Relatively short study period (5 years). Indigenous status determined from death records.
13	Wong, Y. Flicker, L. Draper, G. Lai, M. Waldron, N. <b>2013</b>	1999-2009	Australia	Aboriginal and Torres Strait Islanders	All ages	11,844	<b>Ecological study:</b> Analysis of state hospitalisation data (WA)	Demographic characteristics from hospitalisation records	Hip fracture data from a state-wide hospitalisation administrative database	Number of fractures resulting in hospitalisation caused by falls in older Indigenous and non-Indigenous people	State-specific data source used. Indigenous status listed on hospitalisation records may not be accurate.

Abbreviations:

AK: Alaska, United States of America

QLD: Queensland, Australia

WA: Western Australia

NC: North Carolina, United States of America

**Ecological study:** data is presented as aggregated statistics with exposure and outcome not linked to individuals

**Cross-sectional study:** exposure and outcome are collected at the same time point from individuals; no follow-up occurs

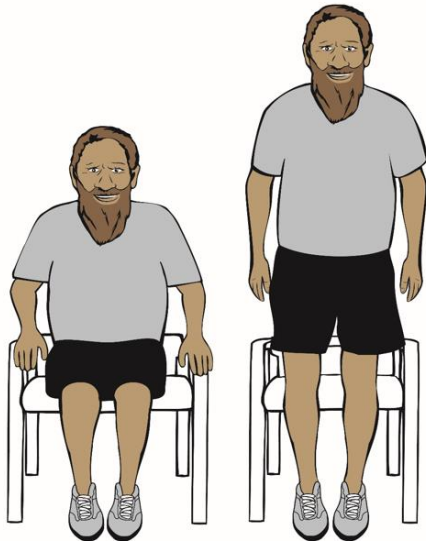
## Appendix B: Example of Ironbark Program exercise handouts

One-page handouts demonstrating the correct techniques for performing Otago exercises developed as a take-home resource for participants of the Ironbark Fall Prevention Program.

### Exercise 2 – Sit to stand

#### Level 1: use two hands

- Sit on a chair that is not too low
- Put your hands on the chair
- Bring your feet under your knees
- Lean forward
- Push up with both hands to stand up tall
- Reach both hands back to the chair and sit down safely
- Repeat 4-6 times



*Tip: This exercise will help you to move into and out of chairs with greater ease. It will help your legs to get stronger*

### Exercise 4 – Side-hip strengthening exercise

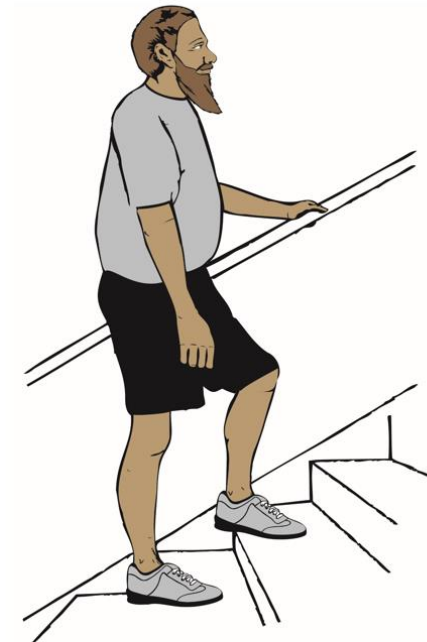
- Stand up tall beside the kitchen bench and hold on with one hand
- Slowly lift your leg to the side
- Keep your foot pointing forward, about 2 inches off the floor
- Repeat 6-10 times
- Turn around and repeat with your other leg 6-10 times
- To make this exercise harder, you might like to try holding your leg out in the air for longer



*Tip: This exercise will help strengthen your hip and buttock muscles, helping with many daily movements. Don't try to lift your foot too high off the ground; this can be bad for your back.*

### Exercise 14 – Stair walking

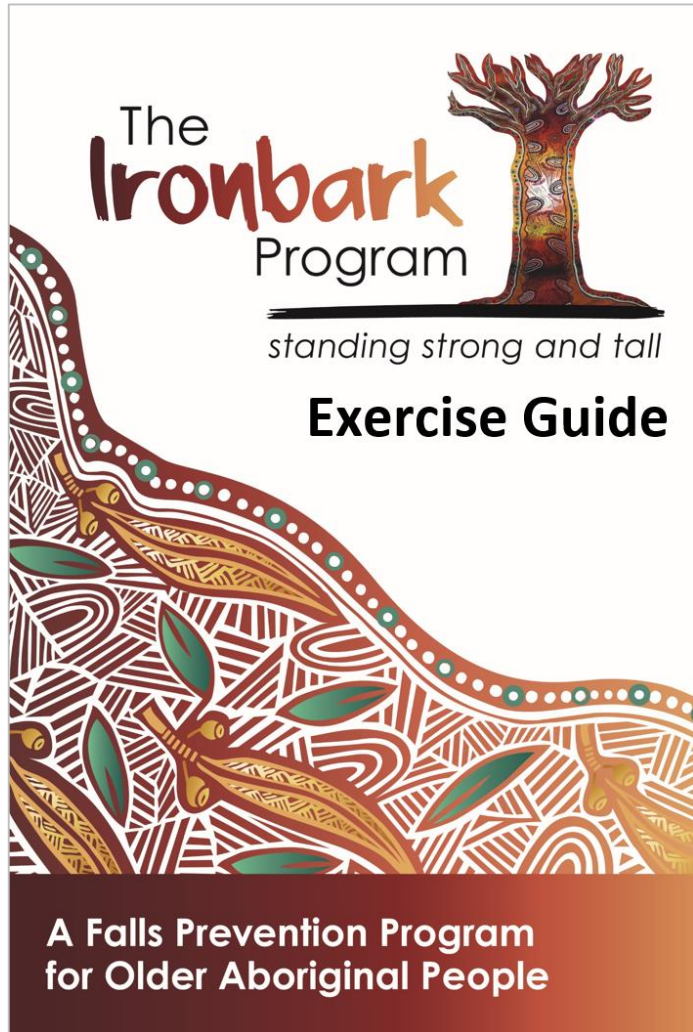
- Hold onto the hand rail for this exercise
- Go up and down the stairs.
- Repeat 1-2 times if performing 8 steps or more.
- Repeat 3-4 times if performing less than 8 steps



*Tip: Stand tall when walking up stairs. Take one step at a time. This exercise is a combination of strength and balance.*

## Appendix C: Example of Ironbark Program exercise manual

Examples of pages from the Exercise Manual developed for participants and facilitators of the Ironbark Program.



### Balance and strength exercises to prevent falls

These exercises have been selected to help keep you independent and reduce the chance of you having a fall. When you do these exercises you can improve:

- Balance
- Muscle strength

Aim to practice 6 exercises each day. Choose 2 exercises that are challenging for you and follow them with 4 bonus easier ones.

### Tips for exercise

- Good form is important with every exercise. Your group leader will help you learn the positions and movements
- Good form means:
  - Using the muscles the exercise is supposed to use.
  - Doing the exercise safely and decreasing the risk of pain.
- Looking straight ahead helps promote good posture with standing and walking exercises.
- Use slow and steady movements.

- Don't hold your breath! Holding your breath while training can cause changes in your blood pressure. Breathe normally with each exercise. Try to breathe out during exertion (hardest part of the exercise) and breathe in during relaxation.

- Listen to your body and do what feels right for you.
  - You will have days when you can do more and days when you need to do less, this is okay.
  - Everyone has their own pace.
  - It's okay to rest in between exercises.
  - You don't have to do all the exercises at once.
  - You can do them at different times of the day.
  - The exercises should be a challenge. If they get easier, we can make some changes. That way you will keep improving.

### Stretching

Stretching exercises are an important part of your physical activity program it help to maintain your flexibility. They give you more freedom of movement for your exercises and for everyday activities. Stretching exercises can improve your flexibility but will not improve your endurance or strength.

# Appendix D: Example of Ironbark Program ‘Yarning Both Ways’ manual

Examples of pages from the ‘Yarning Both Ways’ Manual developed for participants and facilitators of the Ironbark Program.

## YARNING ABOUT FALL PREVENTION

### Benefit of a Yarning circle

Yarning circles have been traditionally used in Aboriginal communities for thousands of years and are central to building respect, learning from each other, storytelling and protecting and preserving cultural knowledge.

Everyone within the yarning circle becomes an equal, and so the facilitator also becomes an equal to the participants, while still gently guiding the conversation so that learning continues. It is very important that the facilitator lets every one share their stories and that no one leaves the circle feeling as though they have not been heard. **Yarning circles should always end on a positive note.**

Yarning circles allow participants to form a connection to each other and they become a place of learning, where falls can be spoken about without feelings of shame. Through sitting in a circle, everyone is made equal – including the facilitator. Participants can talk about their personal experiences, and conversation shouldn't be limited strictly to falls. It is a safe place where Aboriginal knowledge sharing and communication takes place. Each person who has something to share can do so without being interrupted by others. **While someone is talking, the others are learning,** and no one's opinions or stories are dismissed or judged. Yarning circles bring about a connectedness, respect and a sense of belonging to a community. They allow participants to reflect on their lives; past, present and future.

*“Yarning allows for honesty and openness to unfold through the relationships that are developed and renewed as the yarn progresses. Yarning enables Indigenous people to talk freely about their experiences, thoughts and ideas.”*

*(Bessarab & Ng'andu 2010)*



1

## TOPIC 13: WALKING COUNTRY AND POTENTIAL HAZARDS

Objectives for this topic:

1. Discuss how to walk safely outside
2. Practise techniques

### BE ALERT TO HAZARDS

1. Uneven or cracked footpath
2. Holes, dips, rocks and fallen branches when walking on land

### WALKING SAFELY

1. Scan ahead as you walk
2. Placing the foot down heel-and-toe as you walk
3. Holding your head up, chin in and shoulders back, helps you to look ahead and walk with confidence. If this isn't possible, try using a walking stick



### SAFELY GETTING ABOUT IN COMMUNITY

- Wear sturdy shoes
- Use the handrails
- Use your stronger leg first going up a step, and your weaker leg first when going down a step
- Cross at the lights only when the pedestrian light is green. If the light starts to flash in the middle of your crossing, don't panic. Walk calmly across the street at a safe speed without rushing.
- Try to always cross the road with other people
- Be extra careful in windy weather
- Wear bright-coloured clothing
- If you feel unsteady, don't be embarrassed to ask for help



## TOPIC 14: THOSE INDOOR MENACES

Objectives for this topic:

1. Raise awareness of the type and range of fall hazards they may have in their homes
2. Show participants how to be able to recognize hazards in their homes
3. Suggest adaptations and problem solve ways to reduce home fall hazards

Read out loud a written fall story such as the following (taken from a story shared during our yarning circles by an Aboriginal woman living at home):

*Now, I've got to tell you, I'm not a faller - I'm not a faller at all - and in the last six months I've had two really, really bad falls. I've ended up in hospital on both occasions. I can't believe that it was me. Because of those two falls, I'm now totally aware of how to get out of bed and how to go down my back step with the little drainpipe sticking out of it.*

*I have a little tip for all of you: when you get out of bed in the morning, put one foot on the floor - make sure you can feel it - and then second one, because I jump up first thing and go to the toilet. But, one morning, I couldn't bring my leg around - it was dead, it was heavy, like lead, and I went over. Now I get out of bed carefully, one leg at a time, and I know I can get mobile and into the bathroom. So that's a good lesson for all of you; two feet on the floor before you venture out.*

Discuss the following:

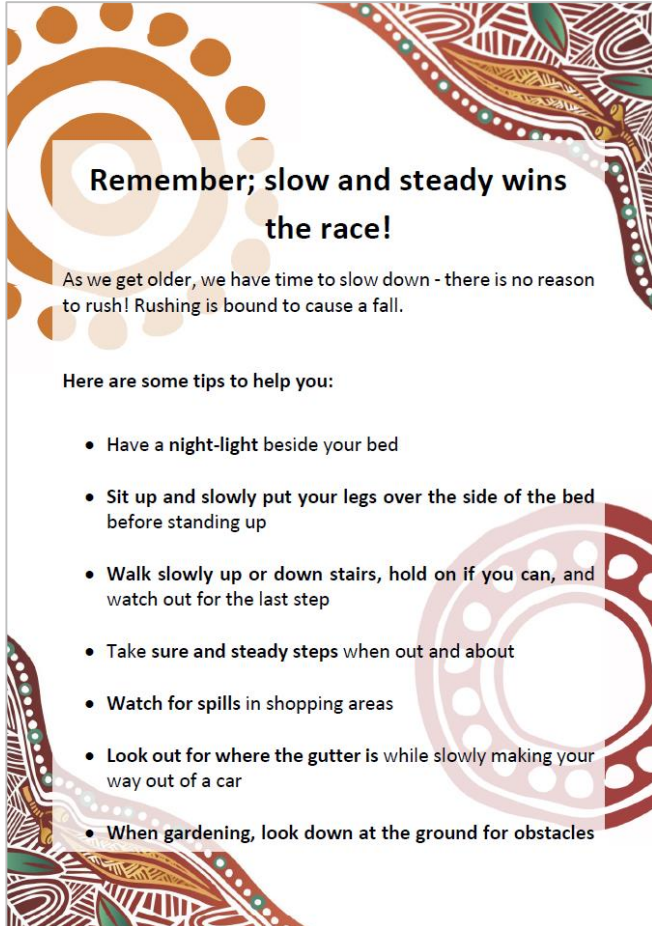
- What are some home hazards?
- What could we do to change them?
- What might make us feel like we don't want the change?
- How can we make sure that we keep our homes safe?

We often **don't notice** things that we might trip over because they are a part of our everyday life. We might need to make some changes.



## Appendix E: Example of Ironbark Program education handouts

Examples of handouts supporting content within the 'Yarning Both Ways' manual, developed for participants of the Ironbark Program.



### Remember; slow and steady wins the race!

As we get older, we have time to slow down - there is no reason to rush! Rushing is bound to cause a fall.

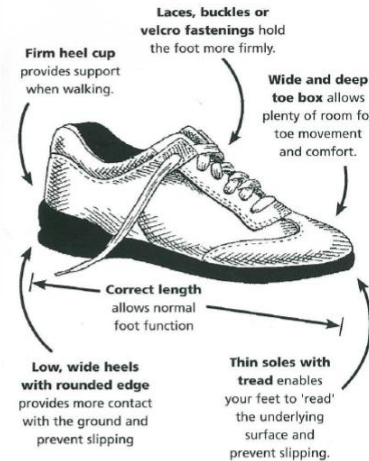
Here are some tips to help you:

- Have a night-light beside your bed
- Sit up and slowly put your legs over the side of the bed before standing up
- Walk slowly up or down stairs, hold on if you can, and watch out for the last step
- Take sure and steady steps when out and about
- Watch for spills in shopping areas
- Look out for where the gutter is while slowly making your way out of a car
- When gardening, look down at the ground for obstacles

### Choose the right shoes

#### Look after your feet

- See your doctor if you have foot problems or foot pain
- If you are diabetic, take special care of your feet
- Visit your podiatrist regularly to review your feet, cut your nails and manage any corns
- Dry your feet well, especially in between the toes



#### Shopping tips

- Sometimes, feet swell during the day so try shoes on mid-afternoon, with usual socks, stockings and orthotics
- Have your shoes properly fitted. Try on both shoes and buy for fit, not for size
- Walk around the shop to make sure that the shoes fit properly and the heels don't slip
- Don't be pressured by the sales staff – if the shoes are not right, don't buy them



Reduce the amount of caffeine you have each day and avoid caffeinated drinks after lunchtime



Make sure your bedroom is not too hot or cold



Avoid naps during the day. If you do nap, keep it to 20 minutes and before 3pm.



Ensure you are comfortable and your bedroom is quiet and dark.



Avoid heavy meals, exercise, smart phones or working on the computer in the evening



Don't stay in bed if you are awake for more than 20 minutes – go to another room and do something relaxing



# Appendix F: Example of Ironbark Program community newsletters

Example of some pages from a regular Ironbark Program newsletter, developed for participants and pilot host organisations.



**The Ironbark Project**  
Standing Strong and Tall

**Issue No.4 January 2016**

**Background**

Falls are a leading cause of hospitalisation for older Aboriginal people in NSW and can lead to isolation, loneliness and depression. Despite the high burden of falls amongst Aboriginal people, there are few programs addressing falls specifically for Aboriginal communities.

**Project Aims and Objectives**

The Ironbark Project developed a culturally appropriate falls prevention program, designed by Aboriginal people, for Aboriginal people, allowing them to stay healthy and strong in their homes and communities.



Doug, from Umina, no longer uses his walking stick



In 2015, the Ironbark fall prevention program was piloted in Nowra, Mt Druitt and Umina for a 6 month period. In 2016, we will be trialing The Ironbark Program in Ulladulla, Redfern and Windsor. These sites will be the last of the pilot project.

This project has enabled older Aboriginal people to have control of their own health, with Aboriginal community involved from the very beginning. The improvements we've seen and heard about from the 3 original sites have been remarkable.

Many people have now found they do not need to use their canes or walking sticks as much and are feeling stronger, more confident and have even lost that extra weight they have been trying to get rid of for years. Some have started up walking groups together with other program participants and healthy eating is now becoming part of their new healthy lifestyles.

In return for their contributions to the project, each community has received a culturally appropriate and sustainable fall prevention program which they can



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Standing Strong and Tall

continue to use in their communities into the future.



*"The Nowra Auntie Jean's group thoroughly enjoyed participating in the 6 months Ironbark Standing Strong and Tall program. With attendance between 20-30 participants each week the yarning topics were thought provoking, educational, practical, and a great way of sharing wisdom within the group. Everyone had a chance to have a say and contribute equally, which is wonderful in a large group. The exercises were enjoyable with most of the group adding these exercises into their home routine. The Auntie Jean's Nowra group plan on continuing with the Ironbark exercises and yarning circles to share knowledge in the New Year. Thanks so much to Caroline, Julieann, and all the workers of the Ironbark Project at the George Institute for your support and for including our group."*

*Susan Doves (Facilitator from Nowra)*



Karen, Liz and Mary at Nowra



Karen and Annalise at Mt Druitt

Over the time of the program, our research assistants enjoyed travelling and meeting our Elders from the different communities.



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**The Ironbark Project**  
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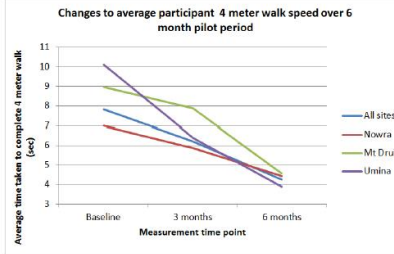


Karen and Cherie at Ulladulla

*"I never want this program to end, I have enjoyed coming and being a part of this wonderful community, I don't use my walking stick anymore and have lost 10 kg"*  
*Donna from Umina*



The figure below shows improvements in the time it has taken participants to walk 4 meters at our 3 original pilot sites, from the beginning of the program, at 3 months, and at the end of the program. This shows that the mobility of participants has improved over the 6 months.



*"This has been the best program I have ever done. I had a fall and the doctor sent me to the hospital fall program they have, and they said that I should go back to [Ironbark] because I was too advanced for them, so I came back here to my mob and I am better every day for it"*  
*Betty from Ulladulla*



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## Appendix G: Overview of the Ironbark Fall Prevention Program

Modification of the TIDieR (Template for Intervention Description and Replication) Checklist, detailing the key components and outcomes of the Aboriginal-specific Ironbark Fall Prevention Program, trialled in six communities across NSW over a 3 or 6 month period

Item number	Brief item name	Description
1.	Provide the name or a phrase that describes the intervention.	<p>The Ironbark Program: standing tall and strong</p> <p>The goal of improving the strength and stability of older Aboriginal people led the program to be named after the native Australian iron bark tree, evoking images of strong trees with their roots running deep into the earth, standing tall and strong as they age. Additionally, the bark of the iron bark tree has medicinal qualities and is traditionally used for pain relief in Aboriginal culture.</p>
2.	Describe any rationale, theory, or goal of the elements essential to the intervention.	<p>The Ironbark Program aimed to improve participant strength, balance and mobility, while increasing confidence in performing daily tasks, helping participants maintain their independence.</p>
3.	Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.	<p>The Ironbark program consisted of two major components:</p> <p><b>1. Exercise</b> Exercises designed to improve participant strength, balance and gait speed were incorporated into each program session, with participants encouraged to practice exercises at home. The core exercises were adopted from the Otago Exercise Programme, previously shown to effectively reduce the number of falls by 30% in the general population.</p> <p><b>2. Education</b> Weekly ‘Yarning circles’ provided an opportunity for participants to discuss healthy ageing and share experiences related to falls in a group setting. Yarning circle facilitators introduced weekly discussion topics surrounding different falls risk factors identified to have specific relevance for older Aboriginal people. The Yarning Circle discussion topics were comparable to those used within the Stepping On fall prevention program, shown to reduce falls in the general population by 31%.</p>
4.	Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers.	<p>A Yarning Circle Manual was developed to support Yarning Circle facilitators. Information handouts on fall-related risk factors were developed for participants, based on the content of the Yarning Circle Manual. An Exercise Manual was developed, including Otago exercise techniques and examples of group activities that challenge balance, strength and cognition, with instructional diagrams adapted to be culturally appropriate for older Aboriginal participants. An Aboriginal graphic designer and an Aboriginal artist created culturally relevant images and page elements for all program resources. Aboriginal staff were included on the resource development team to ensure the content and appearance of each resource was suitable.</p>

5.	For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.	<p><b>1. Program Facilitators</b> were required to:</p> <ul style="list-style-type: none"> <li>• Be an allied health worker, with a highest preference for exercise physiologists</li> <li>• Have experience in delivering healthy ageing programs or exercise-based classes to older people</li> <li>• Have experience in working with Aboriginal people in health care or community settings</li> </ul> <p><b>2. Aboriginal Site Managers</b> were required to:</p> <ul style="list-style-type: none"> <li>• Be Aboriginal and/or Torres Strait Islander</li> <li>• Be an active member of their local community</li> <li>• Have some form of management experience</li> <li>• Have an understanding of the issues affecting older Aboriginal and Torres Strait Islander people</li> </ul> <p><b>3. Aboriginal Research Assistants</b> were required to:</p> <ul style="list-style-type: none"> <li>• Be Aboriginal and/or Torres Strait Islander</li> <li>• Be available to participate in an intensive data collection training course</li> </ul>
6.	Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	The program was group-based and delivered face-to-face. Participants were required to obtain medical clearance from their GP before they were able to join.
7.	Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features.	The program was run through existing, well-established, Aboriginal-controlled health and community services. Each was selected due to the high proportion of older Aboriginal clients regularly accessing the service, and a perceived need for a fall prevention program identified by service staff. For further information, please refer to Table 1.
8.	Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.	The intervention was delivered once per week over the duration of the study period (3 or 6 months). Each program session ran for 1.5 hours to 2 hours. Longer program sessions were a regular result of extended Yarning Circle discussions. The time and day of program sessions varied between pilot sites, selected to be most convenient for participants. All sessions were delivered between 9am and 1pm, Monday to Friday.
9.	If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how.	Exercises provided to participants over the course of the program were individually prescribed by program facilitators, based on the functional mobility of each participant. The Yarning Circle discussions were tailored in a number of ways to meet the needs and interests of clients between sites. For example, one pilot site expressed a specific interest in diet, resulting in the healthy eating education topic being revisited over the course of three program sessions rather than one, and the incorporation of a facilitator-guided supermarket visit into the program.
10.	Planned: If intervention adherence or fidelity was assessed, describe how and by whom.	A number of standardised physical measurements were collected from program participants at baseline, 3 month and 6 month time points by the trained Aboriginal Research Assistants.

		<ul style="list-style-type: none"> <li>• The Short Physical Performance Battery (SPPB) was used to measure participant balance, gait speed and leg strength</li> <li>• A shortened version of the Falls Efficacy Scale-International (Short FES-I) measured participant fear of falling</li> <li>• The Incidental and Planned Exercise Questionnaire (IPEQ) was used to estimate physical activity participation levels</li> <li>• An exit questionnaire and semi-structured interview collected data on the acceptability of program content and its delivery</li> </ul>
<b>11.</b>	Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	<p>Across the six pilot sites, 98 older Aboriginal people registered for the study, 77 (79%) of whom were present at all assessment time points.</p> <p>Between baseline and 6-month follow-up, the average standing balance score (single-leg balancing stance: increased from 5.6 sec to 7.8 sec, <math>p &lt; 0.01</math>), sit-to-stand performance (15.4 sec to 11.2 sec, <math>p &lt; 0.01</math>) and gait speed (0.66m/s to 1.07m/s, <math>p &lt; 0.01</math>) all improved. A significant decrease in BMI was observed from baseline to 6-month follow up (32.0 to 31.6, <math>p &lt; 0.01</math>). There were no significant changes to participant fear of falling or time spent doing weekly planned/incidental activity.</p>

## Appendix H: Publications resulting from this PhD

Lukaszyk, C., Harvey, L., Sherrington, C., Close, JCT., Coombes, J., Mitchell, R., Moore, R., Ivers, R., Fallrelated hospitalisations of older Aboriginal and Torres Strait Islander people and other Australians. *Medical Journal of Australia* 207 (1) (2017): 31-35.

Lukaszyk, C., Coombes, J., Keay, L., Sherrington, C., Tiedemann, A., Broe, T., Lovitt, L., Ivers, R., Fall prevention services for older Aboriginal people: investigating availability and acceptability. *Public Health Research and Practice* 26.5 (2016): e2651659-e2651659.

Lukaszyk, C., Harvey, L., Sherrington, C., Keay, L., Tiedemann, A., Coombes, J., Clemson, L., Ivers, R., Risk factors, incidence, consequences and prevention strategies for falls and fall-injury within older indigenous populations: a systematic review. *Australian and New Zealand Journal of Public Health* 40.6 (2016): 564-568.

Lukaszyk, C., Coombes, J., Turner, NJ., Hillmann, E., Keay, L., Tiedemann, A., Sherrington, C., Ivers, R., Yarning about fall prevention: community consultation to discuss falls and appropriate approaches to fall prevention with older Aboriginal and Torres Strait Islander people. *BMC Public Health*, 2018. **18:77**

Lukaszyk, C., Radford, K., Delbaere, K., Ivers, R., Rogers, K., Sherrington, C., Tiedemann, A., Coombes, J., Daylight, G., Draper, B., Broe, T., Risk factors for falls among older Aboriginal people in urban and regional communities in Australia. *Australasian Journal on Ageing* [In Press]



# Risk factors, incidence, consequences and prevention strategies for falls and fall-injury within older indigenous populations: a systematic review

Caroline Lukaszuk,<sup>1</sup> Lara Harvey,<sup>2</sup> Cathie Sherrington,<sup>3</sup> Lisa Keay,<sup>1</sup> Anne Tiedemann,<sup>3</sup> Julieann Coombes,<sup>1</sup> Lindy Clemson,<sup>4</sup> Rebecca Ivers<sup>1</sup>

Falls have been shown to be a major global cause of injury, death, and disability for people aged 65 years and above living in the community.<sup>1,2</sup> Studies from a variety of contexts have reported that about 30% of older people experience at least one fall each year.<sup>3-8</sup> The most common severe fall-related injury for older people is hip fracture (75% of fall-related hospitalisations),<sup>9,10</sup> followed by injury to the head (20% of fall-related hospitalisations).<sup>9,11</sup> Recovery following a severe fall injury can be a lengthy process, with patients potentially never regaining their full functional ability, increasing their risk of being moved into residential care.<sup>12</sup> For example, those who have suffered hip fracture are three times more likely to be functionally dependent<sup>13,14</sup> and have a three-fold greater risk of death within three months following the fracture than their peers.<sup>14</sup> With increasing global life expectancy, falls are a growing health issue for older people worldwide.<sup>15,16</sup>

Falls have the potential to be a significant health priority for global indigenous populations with more indigenous people living to older ages.<sup>17-19</sup> Research has reported earlier onset of a variety of health conditions associated with ageing within indigenous populations, such as diabetes complications, cerebrovascular disease and cardiovascular problems.<sup>18,20-22</sup> These conditions have been shown to increase a person's risk of falling and/or sustaining a fall-related injury.<sup>23,24</sup>

Although a variety of fall prevention interventions are known to be effective in

## Abstract

**Objective:** To examine the risk factors, incidence, consequences and existing prevention strategies for falls and fall-related injury in older indigenous people.

**Methods:** Relevant literature was identified through searching 14 electronic databases, a range of institutional websites, online search engines and government databases, using search terms pertaining to indigenous status, injury and ageing.

**Results:** Thirteen studies from Australia, the United States, Central America and Canada were identified. Few studies reported on fall rates but two reported that around 30% of indigenous people aged 45 years and above experienced at least one fall during the past year. The most common hospitalised fall injuries among older indigenous people were hip fracture and head injury. Risk factors significantly associated with falls within indigenous populations included poor mobility, a history of stroke, epilepsy, head injury, poor hearing and urinary incontinence. No formally evaluated, indigenous-specific fall prevention interventions were identified.

**Conclusion:** Falls are a significant and growing health issue for older indigenous people worldwide that can lead to severe health consequences and even death. No fully-evaluated, indigenous-specific fall prevention programs were identified.

**Implications for Public Health:** Research into fall patterns and fall-related injury among indigenous people is necessary for the development of appropriate fall prevention interventions.

**Key words:** indigenous, injury, falls, ageing

reducing falls in the general community, it is unclear to what extent these programs are accessed by indigenous people.<sup>23</sup> The content, structure and mode of delivery of effective and culturally appropriate programs for indigenous people is known to be different to that of mainstream programs.<sup>25,26</sup> To our knowledge, the appropriateness and effectiveness of fall prevention interventions for indigenous groups has not been investigated. Further research is needed to inform approaches to fall prevention specifically for this population. This topic has not previously been systematically reviewed.

This review aims to systematically summarise previous research on the burden of falls in older indigenous populations worldwide. The following questions were addressed: (1) What is the burden of falls and fall related injury in older indigenous populations? (2) What are the most common consequences following a fall in older indigenous people? (3) What are the known risk factors for experiencing a fall or fall-related injury specifically for older indigenous people? (4) Have indigenous-specific fall prevention interventions been tested in community settings?

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The authors have stated they have no conflict of interest.

## Methods

### Search strategy

In August 2015, we systematically searched peer-reviewed and grey literature for studies relating to people aged 45 years and above; indigenous status and fall incidence, risk factors and outcomes. Studies were identified through electronic database searches (see Supplementary Table 1), institutional websites and from the reference lists of relevant articles and published government reports. A total of 14 databases were accessed, selected on their relevance to injury, health and ageing, and/or indigenous studies. Supplementary Table 1 includes the number of records identified through each database in response to the search terms used. Search terms surrounding indigenous status; ageing, elders, seniors and older people; injury, falls/accidental falls and fracture were used to identify relevant literature (see Supplementary Table 2). Only articles written in English were reviewed with no publication date or other limits applied. The grey literature was searched using two online search engines (Google and Google Scholar) and four institutional websites (Australian Indigenous HealthInfoNet, New Zealand Ministry of Health, Indian Health Service and Health Canada).

### Inclusion criteria, data extraction and quality appraisal

To be included in the review, studies were required to (1) present primary research; (2) specifically investigate unintentional falls or injuries most commonly resulting from falls in older people that require medical attention, e.g. hip fracture and head injury; (3) include data on indigenous people; and (4) include data on people aged 45 years and above. Studies meeting these criteria were summarised in a standardised data extraction table (see Supplementary Table 3). The quality of each study was measured against the STROBE Statement checklist for observational studies.<sup>27</sup> This 22-item checklist provides an in-depth assessment of study and report quality. Relevant summary comments for each study are presented in the data extraction table (see Supplementary Table 3). Relevant data from each study were extracted and summarised by one author (CL). This paper is reported in accordance with the PRISMA Reporting Guidelines provided for systematic reviews and meta-analyses<sup>28</sup> (see Supplementary Figure 1, available with the online version of this article).

## Results

### Overview of identified papers

The electronic database search returned 1,713 records and 132 records were identified from other sources. After screening the records for relevance and removing duplicates, 63 reference citations were saved and their abstracts reviewed for relevance to the review questions. Full text was obtained for 48 references. These articles addressed injury in indigenous and/or ageing populations worldwide. The majority of articles focused on specific health outcomes with a relationship to falls, predominantly investigating hip fractures. From these articles, 13 met the inclusion criteria for the review.

Seven of the 13 studies were from Australia,<sup>29-35</sup> four from the United States,<sup>36-39</sup> one from Central America<sup>40</sup> and one from Canada.<sup>41</sup> Five studies had a specific focus on older age groups,<sup>30,32,34,35,38</sup> six included data from all age groups<sup>29,31,33,37,39,40</sup> and two included data from participants aged 18 years and above.<sup>36,41</sup> The majority of studies analysed data collected from the last decade<sup>29-32,34-37,40</sup> while the remainder used data collected between 1999 and 2004.<sup>33,38,39,41</sup> Ten studies had a specific focus on indigenous populations,<sup>29-33,35-37,39,41</sup> while three compared data from multiple population groups (including indigenous).<sup>34,38,40</sup>

Five of the 13 studies included in the review had a primary focus on fractures,<sup>31-33,36,41</sup> two on head injury,<sup>34,39</sup> two investigated general injury prevalence and outcomes,<sup>29,37</sup> three focused on the relationships between falls and other health issues<sup>30,35,38</sup> and one specifically investigated fall related deaths.<sup>40</sup> All studies were observational, with the majority presenting morbidity data<sup>29-36,38,39,41</sup> and the rest presenting mortality data.<sup>37,40</sup> Six of the 13 studies analysed hospitalisation data<sup>29,31-33,39,41</sup> and four of the studies used questionnaires for data collection.<sup>30,35,36,38</sup>

### The incidence of falls

Six studies investigated fall-related injury and death rates in older indigenous people, with four drawing comparisons between indigenous and non-indigenous populations (see Supplementary Table 3).

One American and one Australian study, both investigating self-reported fall rates across selected sites, reported that 30-31% of Indigenous people living in the community aged 45 years and above, had experienced at least one fall during the past year.<sup>35,38</sup> Similar fall rates for the general population have

been reported from both countries for people aged 65 years and above.<sup>42</sup> One Australian study investigating state-wide (un-linked) hospitalisation data reported fall-related hospitalisations were rising at a significantly sharper rate in older Indigenous people when compared to non-Indigenous people aged 40 years and above.<sup>31</sup>

One American and one Australian study investigated self-reported fall rates and outcomes by age group.<sup>30,38</sup> Both showed older people to be more likely to report experiencing a fall, with the highest rates in those aged 70 years and above. This trend was mirrored in the comparative non-indigenous falls data provided in both studies. One American study examining linked national mortality records found the largest discrepancy in unintentional fall death rates between indigenous and non-indigenous people to be for the 45-54 year age group, where fall-related death rates were more than doubled for the indigenous population.<sup>37</sup>

### Risk factors associated with falls

Nine studies investigated factors associated with falls and fall-related injury in older indigenous people.

Two studies investigated the impact of gender on falls and fall consequences.<sup>37,38</sup> One American study found fall rates to be significantly higher in older indigenous males in comparison to older indigenous females.<sup>37</sup> One Australian study reported the majority of fall-related hip fracture hospitalisations to occur in older Indigenous females, rather than older Indigenous males.<sup>38</sup>

Four studies investigated the influence of age on fall risk among older indigenous people.<sup>30,37,38,40</sup> Older age was shown to increase the risk of falling,<sup>29,38</sup> the likelihood of sustaining an injury from a fall<sup>40</sup> and the likelihood of fall-related death.<sup>37</sup> Fall risk factors predominantly affecting people aged 80 years and above included sensory impairment, a lack of exercise and lack of environmental aids.<sup>30</sup>

Five studies investigated the link between various lifestyle factors and falls in older indigenous people.<sup>30,32,35,36,40</sup> Alcohol consumption was reported to significantly increase a person's risk of falling<sup>30</sup> and the likelihood of sustaining a fracture following a fall.<sup>36</sup> Consistent with this, one Australian study reported significantly higher alcohol use in older Indigenous people admitted to hospital with a hip fracture compared



with their non-indigenous counterparts.<sup>32</sup> Former and current cigarette smoking was linked to a greater prevalence of fall-related fracture in older indigenous men in one American study.<sup>35</sup> One Central American study linked to high fall mortality rates to the agricultural nature of the study area, where commonplace activities such as riding animals, handling grain and operating large machinery led to falls in the local indigenous and non-indigenous population.<sup>40</sup>

Five studies investigated the impact of medical conditions and health status on fall and fall-injury risk.<sup>29,30,35,36,41</sup> Two studies from Australia and America identified poor mobility, a history of stroke, epilepsy, head injury, poor hearing and urinary incontinence as health conditions that increase the risk of falls in older indigenous people.<sup>29,30</sup> Poor vision, diabetes, dementia and renal disease were also shown to increase the risk of fall-related fracture.<sup>30,36,41</sup> Two studies found an association between the diagnosis of two or more chronic medical conditions and an increased risk of sustaining a fall-related injury.<sup>35,41</sup> One American study and one Australian study also reported older indigenous people to be less likely to be Vitamin D deficient or to be taking five or more medications than their non-indigenous counterparts.<sup>32,36</sup>

### Fall consequences

All 13 studies documented injury or mortality outcomes following a fall in older indigenous people. One Australian study reported 12% of falls in older Indigenous people resulted in unspecified injury.<sup>30</sup> Four studies investigated hip fracture in older indigenous people,<sup>29,31–33</sup> with two studies identifying falls to be the cause of nearly all hip fracture hospitalisations among indigenous patients.<sup>31,33</sup> This supports reports of hip fracture being the most common fall-related injury sustained by older indigenous people.<sup>29</sup> One Australian study found hip fracture hospitalisations to predominately occur for Indigenous women aged 80 years and above, and Indigenous men aged 70–79 years.<sup>31</sup> Two studies investigated head injuries caused by falls in older indigenous people.<sup>34,39</sup> One recent Australian study showed 81% of head injury hospitalisations in older Indigenous people to be the result of a fall,<sup>34</sup> while an American study reported up to 45% of traumatic brain injuries in older indigenous people to be caused by a fall.<sup>39</sup>

Hip fracture hospitalisations were reported to be 1.8 to 3.3 times greater for older indigenous people in comparison to their

non-indigenous counterparts.<sup>31,33</sup> One Australian study found hospital stays following a hip fracture to be marginally longer for older Indigenous people due to additional complications pre- and post-surgery. This was attributed to Indigenous patients having more comorbidities and difficulties in organising transport home, often to remote locations.<sup>33</sup>

### Indigenous-specific fall prevention interventions

No formally evaluated, indigenous-specific, fall prevention interventions were identified.

### Discussion

Around 30% of indigenous people aged 45 years and above reported experiencing at least one fall during the past year. Caution is needed when interpreting this result as it is from studies using retrospective methods for data collection that have a high risk of participant recall bias, leading to under-reporting of falls. The most common hospitalised fall-related injuries among older indigenous people were hip fracture and head injury. Factors identified to be significantly associated with falls within indigenous populations included impaired mobility, a history of stroke, epilepsy, head injury, poor hearing and urinary incontinence, and excessive alcohol consumption. No formally evaluated, indigenous-specific fall prevention interventions were identified.

Indigenous fall rates were found to be similar to those reported from the general populations of America, Australia, England, China, New Zealand and Turkey.<sup>3,4,6,8,24,43</sup> This review found fall injuries were more frequent among the oldest indigenous people from each study population compared to younger people, with the most common injuries reported as hip fracture and injury to the head. Both injuries have previously been reported as the most common fall outcomes leading to hospitalisation in community-dwelling people aged 65 years and above in the general population.<sup>1,11</sup> An Australian study showed fall injury rates to be increasing rapidly at 7.2% per year for Indigenous people aged 40 years and above, while decreasing at 3.4% per year for non-Indigenous people over the same 10-year period.<sup>31</sup> Previous studies of general populations have identified a number of factors leading to prolonged hospitalisation following hip fracture: increased age, a decreased level of daily activity prior to hospitalisation and post-surgery delays to

patient mobilisation.<sup>44</sup> Most of these factors correspond to observations made by the above Australian study. Furthermore, 61% of individuals older than age 65 take at least one prescription medication, with most taking an average of 3–5 medications.

Falls risk factors identified among Indigenous people had some dissimilarities to those known in the general population<sup>45</sup> in particular medical conditions such as epilepsy, head injury and hearing impairment. Other falls risk factors are disproportionately represented in indigenous populations. Dementia prevalence is increasing within indigenous populations, affecting larger numbers of indigenous people from younger ages.<sup>18</sup> Previous studies have shown dementia to double a person's risk of falling.<sup>46</sup> Fall risk has been shown to increase with visual impairment, increasing as vision worsens.<sup>47</sup> The rates of cataract-related blindness are 12 times higher for Indigenous Australians than their non-Indigenous counterparts.<sup>48</sup> Diabetes is diagnosed at five times the rate among Indigenous Australians than the general Australian population<sup>49</sup> while Indigenous Canadians are diagnosed at four times the rate of their non-Indigenous peers.<sup>50</sup> There is an association between diabetes and falls, with diabetics more likely to have other risk factors for falls.<sup>51</sup>

An Australian federal government report has shown Indigenous people to be more likely to completely abstain from drinking alcohol than their non-Indigenous peers, however, those who did drink alcohol were more likely to drink to harmful levels.<sup>52</sup> Similarly, in the US, non-Indigenous people were reported more likely to binge drink than Indigenous people, yet Indigenous people consumed a greater number of drinks per drinking session.<sup>53</sup> Previous studies have reported that the intake of 14 alcoholic drinks or more per week is associated with an increased risk of falling in community dwelling adults aged 65 years and above.<sup>54</sup> However, alcohol consumption among participants was defined differently in each study included in this review, inhibiting our ability to make comparisons. One Australian study simply recorded whether or not participants consumed alcohol,<sup>30</sup> another reported whether participants had an alcohol intake level exceeding national guideline recommendations,<sup>32</sup> while an American study recorded whether participants consumed three or more standard drinks per day.<sup>36</sup> The low prevalence of certain falls risk factors in indigenous populations, such as

polypharmacy and Vitamin D deficiency, is notable. A recent study showed 61% of the general American population over the age of 65 years to take at least one prescription medication, with the majority taking 3–5.<sup>55</sup> Multiple barriers to medication use by indigenous people have previously been reported. These include the cost of buying medication, communication issues at mainstream health services leading to indigenous patients not understanding the necessity of each prescription, and side-effects causing indigenous people to stop taking medication, rather than seeking further medical advice.<sup>56</sup> Similarly, Vitamin D deficiency was reported as a significant problem among the general American population aged 55–64 years, with 48% of people testing as Vitamin D deficient.<sup>57</sup> A previous study has shown Canadian Indigenous women to have high levels of Vitamin D in their diets; however, their residence in northern latitudes, skin pigmentation and certain lifestyle factors caused Vitamin D deficiency to remain a problem in the community.<sup>58</sup>

A variety of interventions to prevent falls and fall-related injury have been successfully used worldwide, including targeted exercise, multifactorial interventions, home safety assessment and modification, first eye cataract surgery, podiatry for people with disabling foot pain, psychotropic medication withdrawal and prescription modification programs.<sup>5</sup> Whether these interventions are equally effective and accessible for older indigenous people is unknown. To develop effective and culturally appropriate fall prevention interventions specifically for older indigenous people, various social, cultural and historical factors must be considered.

It has been well documented that indigenous people often feel uncomfortable accessing mainstream health services due to fear of discrimination, judgement or problems in communication with both service staff and other participants.<sup>59</sup> Differing health priorities and cultural beliefs of indigenous people may conflict with the content and structure of mainstream interventions, making them inappropriate.<sup>60</sup> Many existing fall prevention interventions have an associated cost and as fewer older indigenous people have held long-term jobs with workplace benefits when compared to their ageing non-indigenous counterparts,<sup>61</sup> most have limited financial security in later years. Additionally, differing family structures result in many older indigenous people acting as full-time carers

and financial supporters of grandchildren and great-grandchildren,<sup>61</sup> adding further barriers to accessing preventative health services for themselves that may be considered 'optional'; in comparison to other health services.

A detailed understanding of fall risk factors and incidence is needed to be able to determine which type of intervention would best apply to indigenous populations. As there are some common fall risk factors between indigenous and non-indigenous people, exercise interventions focused on improving strength and balance may be worth pursuing. However, it is critical that any fall prevention programs designed or implemented for indigenous communities consider the sociocultural issues that often affect older indigenous people. Health programs focused on managing chronic disease and providing accessible referral pathways to health procedures such as cataract surgery may also help reduce falls risk factors within indigenous populations.

### **Strengths and limitations**

To our knowledge, this is the first systematic review of studies investigating the burden of falls specifically in older indigenous people. This review emphasises the lack of information available on this topic, and highlights the need for more large-scale, comparative studies to be done in this area. All studies included in the review were descriptive and only seven of the 13 provided prevalence calculations from their data.<sup>29,30,32,34,38–40</sup> There were many methodological variations between the studies, making direct comparisons between outcomes difficult. This systematic review predominantly identified ecological studies of populations in which indigenous people were a minority. This caused generalisations to be made at a population level for small indigenous sample sizes. The five cross-sectional studies included in the review also had small sample sizes, further diminishing the validity of their outcomes.

Inconsistent sampling techniques and often small sample sizes made results difficult to generalise across entire populations. The majority of studies examining routinely collected administrative data analysed unlinked patient records. Studies that used questionnaires for data collection,<sup>30,36,38</sup> relied on self-reported information from older participants regarding past falls, introducing a high potential for recall bias.

The existing literature provides limited insight to the burden and outcomes of

falls in older indigenous people. Many studies were descriptive with small sample sizes, documenting populations in specific geographical areas.<sup>30,32,33,35,36,38</sup> Most discussed difficulties with accurately identifying indigenous participants in their study population.<sup>29,31–33,37–39,41</sup> Identification issues were thought to be due to administrative errors, coding errors<sup>29,31</sup> or participants being unwilling to identify as indigenous when accessing health services in fear of discrimination.<sup>29,34,37</sup> Issues with the identification of Indigenous status were thought to underestimate the impact of injury on older indigenous people.<sup>37</sup> One American study reported their national mortality data as having about 21% of indigenous death records coded incorrectly.<sup>29</sup> Suggestions for improving indigenous identification include more informative administrative systems, more standardised coding practices across health services, encouraging indigenous people to identify at health services, and the development of more complex indigenous-identifier algorithms for increased accuracy in data analysis.

### **Research recommendations**

Larger studies that are focused specifically on falls and fall-related injuries are needed to gather more detailed information about fall prevalence and outcomes across entire populations. Understanding not only the physical health burden of falls within indigenous populations, but also the social, cultural and historical influences is required to understand falls as an issue in indigenous communities. This would enable a more targeted approach to be taken in developing appropriate fall prevention interventions for older indigenous people.

Further investigation of the accuracy of indigenous status coding in routinely collected health data would be useful in determining whether this is an effective approach to mapping disease burden in Indigenous populations. Through this, suggestions could be made to improve current coding and administrative practices, improving future data collection methods.

### **Conclusion**

Falls and fall-related injury were found to have a significant health burden on older indigenous people living in community. Despite the seemingly large health burden falls have on older indigenous people, there are few large-scale, population-wide studies that investigate the issue, nor focus on identifying methods of preventing falls

for indigenous populations. Additionally, no fully-evaluated, indigenous-specific fall prevention programs were identified.

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## Supporting Information

Additional supporting information may be found in the online version of this article:

**Supplementary Table 1:** Databases searched by date and the number of potentially relevant records corresponding to search terms.

**Supplementary Table 2:** Search terms used to identify relevant studies.

**Supplementary Table 3:** Standardised data extraction table summarising studies included in the review.

**Supplementary Figure 1:** PRISMA flow diagram of the number of records identified, included and excluded in the study

## Research

# Risk factors for falls among older Aboriginal and Torres Strait Islander people in urban and regional communities

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**Objective:** *To examine associations between fall risk factors identified previously in other populations and falls among Aboriginal people aged 60 years and older, living in New South Wales, Australia.*

**Methods:** *Interviews were conducted with older Aboriginal people in five urban and regional communities.*

*Associations between past falls and 22 fall predictor variables were examined using linear and multiple regression analyses.*

**Results:** *Of the 336 participants, 80 people (24%) reported at least one fall in the past year, and 34 (10%) reported two or more falls. Participants had an increased fall risk if they were female; used three or more medications; had arthritis, macular degeneration, depression, history of stroke; were unable to do their own housework; or were unable to do their own shopping.*

**Conclusion:** *Falls were experienced by one-quarter of study participants. Fall risk factors identified for older Aboriginal people appear to be similar to those identified in the general population. Understanding of fall risk factors may assist with the development of appropriate and effective community-led fall prevention programs.*

**Policy Impact:** Falls were found to affect a significant proportion of the Aboriginal study population aged 60 years and older. Falls risk factors were similar to the general population. The engagement of Aboriginal and Torres Strait Islander health and community services is necessary for identifying effective and acceptable approaches to addressing the high priority falls risk factors identified through this study.

**Practice Impact:** The findings of this study will be useful in guiding the development of effective and acceptable Aboriginal-specific fall prevention programs/services, which specifically address the high-priority falls risk factors for this population.

**Key words:** *Aboriginal and Torres Strait Islander, ageing, falls, Indigenous, injury.*

## Introduction

Australia's Aboriginal and Torres Strait Islander population is ageing, with the proportion of people aged 55 years and above predicted to more than double between 2006 and 2021. It has been suggested that Aboriginal and Torres Strait Islander people age prematurely in comparison with other Australians, driven by a large burden of chronic disease affecting the middle-aged Aboriginal and Torres Strait Islander population [1]. Due to this, Aboriginal and Torres Strait Islander people aged 50 years and above are classified as 'ageing', while for the general population, this term is commonly reserved for people aged 65 years and

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above [2]. This presents challenges in comparing health outcomes associated with ageing between both groups. Healthy ageing is becoming an increasingly important priority, with the National Aboriginal and Torres Strait Islander Health Plan 2013–2023 [3] stating a primary aim of supporting older Aboriginal and Torres Strait Islander people to remain active, healthy and independent.

Healthy ageing can be adversely impacted by falls. Falls are the leading cause of unintentional injury among people aged 65 years and older in Australia, accounting for 77% of all injury-related hospitalisations [4]. A rich body of work from the previous 30 years [5,6] has identified a number of environmental, physical, medical and lifestyle factors associated with an increased risk of falling, many of which are related to ageing. Examples include reduced mobility, cognitive impairment and the use of multiple medications. Previous work from the Kimberly Region in Western Australia (WA) found 32% of Aboriginal and Torres Strait Islander people aged 45 years and older had fallen at least once in the past year [7]. This is similar to the proportion of falls reported by the general population aged 65 years and older, where approximately 30% of people experience at least one fall per year. Due to the difference in population health profiles, fall risk factors among Aboriginal and Torres Strait Islander people may be different to those identified in the general population. Previous research in this area, focussed on Aboriginal and Torres Strait Islander people, has highlighted the lack of observational research exploring risk factors [8], despite high burden, which in turn has inhibited the development of preventive programs [9]. Further investigation into falls is crucial for improving individual patient management and for informing the development of targeted and effective fall prevention programs for the Aboriginal and Torres Strait Islander population.

The Koori Growing Old Well Study (KGOWS) [10], conducted from 2010 to 2012, aimed to investigate ageing, cognition and dementia among community-dwelling Aboriginal people aged 60 years and above, living in New South Wales (NSW). Structured interviews were used to investigate the sociodemographic characteristics, life history and health and well-being of older Aboriginal people across five urban and regional study sites. The aim of this study was to examine associations between fall risk factors identified for other populations and self-reported falls within the KGOWS cohort.

The authors recognise the two distinctive Indigenous populations of Australia: Aboriginal and Torres Strait Islander people. As the vast majority of the NSW Aboriginal and Torres Strait Islander population is Aboriginal (95%) [11], this population will be referred to as ‘Aboriginal’ in this article. When referring to Australia’s Indigenous population, the term ‘Aboriginal and Torres Strait Islander’ will be used.

## Methods

### Participants

Participants were recruited from five urban and regional Aboriginal communities in NSW: two within metropolitan Sydney (La Perouse, Campbelltown) and three on the mid-north coast (Kempsey, Coffs Harbour, Nambucca). Methods of recruitment are described elsewhere [10]. For inclusion in the study, participants were required to be Aboriginal and/or Torres Strait Islander, be aged 60 years or older and been a resident of one of the five project sites for a minimum of six months. Individuals who had experienced a stroke within three months prior to data collection were excluded due to a high likelihood of temporary cognitive impairment following the event. A census performed through reviewing Aboriginal community organisation lists from each site, with additional input from local Aboriginal community members, identified 546 people to be eligible for the study across all five sites. A total of 336 (62%) people participated in the study, with no significant differences in age, sex or urban/regional distribution compared to those who did not participate.

### Data collection

Structured interviews were held with all study participants and were conducted by trained project staff in community settings between March 2010 and September 2012. Each interview took approximately two hours, gathering data on participant sociodemographic characteristics, life history and health and well-being. Variables of specific relevance to this study [5,6] are listed in Table 1. Participants self-ranked their ability to independently perform activities on a 3- or 4-point descriptive scale, based around cut-off points such as ‘requires no assistance’, ‘some assistance needed’ and ‘complete assistance needed’ [12]. Participants were asked to self-rate their level of mobility, with those reporting no difficulties with movement, inside or outside of the house, classified as ‘fully mobile’. Participants, who reported that they were: (i) mobile inside and outside the house with difficulty; (ii) mobile only inside the house, with no assistance; (iii) mobile only inside the house, but with assistance; or (iv) bed or chair-bound, were grouped and classified as having ‘problems with mobility’ due to small participant numbers in each category. Body mass index (BMI) was calculated using weight and height obtained at the time of assessment. Project staff recorded medications from packaging presented during the interview or from medication lists. Both prescription and non-prescription medications were ascertained. Cognition was assessed using the Mini-Mental State Examination (MMSE), which has been previously validated for use with older Aboriginal and Torres Strait Islander people in urban and regional settings [13], but is generally not suitable in remote settings [14].

Dementia was assessed using the modified Kimberley Indigenous Cognitive Assessment tool (mKICA) [13,14]

**Table 1: Demographic and clinical characteristics of reported people who fell and people who did not fall, adjusted for age and sex, with data collected through participant and contact person interviews (n = 325)**

Variable	Missing data for variable		0 reported falls in the past year (n = 245)		1+ reported falls in the past year (n = 80)		Adjusted for age and sex Rate ratio (95% CI)
	n	%	n	%	n	%	
Age group, years							
60–69	0	0	183	76	58	73	1.0
70–79			55	22	17	21	0.9 (0.5–1.5)
80+			7	3	5	6	0.9 (0.3–2.4)
Sex							
Male	0	0	108	45	24	28	1.0
Female			137	55	56	72	1.7 (1.1–2.7)*
Current residence							
Regional (other NSW)	0	0	141	58	50	63	1.0
Urban (Sydney)			104	43	30	37	1.2 (0.8–1.9)
BMI							
Underweight/normal weight (<18.50–24.99)	48	14	35	13	11	14	1.0
Overweight (25.00–29.99)			62	25	21	26	1.2 (0.6–2.7)
Obese (≥30.00)			109	45	39	49	1.2 (0.6–2.6)
Past head injury with loss of consciousness							
None	6	1	174	71	55	69	1.0
1 Head injury			44	18	15	19	1.1 (0.7–1.9)
2+ Head injuries			23	10	8	10	1.4 (0.7–2.7)
Visual conditions							
None	3	1	175	72	49	61	1.0
Glaucoma			30	13	11	14	1.2 (0.7–2.1)
Macular degeneration			23	9	15	19	2.0 (1.2–3.2)*
Cataracts			14	6	5	6	1.5 (0.7–3.2)
Arthritic conditions							
None	5	1	838	36	16	20	1.0
Osteoarthritis and/or inflammatory arthritis			152	60	64	80	1.6 (1.1–2.7)*
Diabetes							
No	0	0	143	59	39	49	1.0
Yes			102	41	41	51	1.4 (0.9–2.1)
Parkinson's disease							
No	5	1	242	71	77	96	—
Yes			0	0	1	0*	—
Mobility							
Fully mobile	3	1	187	78	48	60	1.0
Problems with mobility			55	22	31	40	1.5 (0.9–2.2)
Medication use							
No medications	0	0	23	10	3	4	1.0
1 or 2 medications			61	24	11	14	1.8 (0.5–6.0)
3+ medications			161	66	66	82	3.7 (1.2–2.4)*
Cognition (MMSE)							
Normal cognition (24+ points)	0	0	212	88	65	81	1.0
Any cognitive impairment (23 points or less)			33	12	15	19	0.9 (0.5–1.7)
Dementia (mKICA)							
No (score: 34–39)	0	0	229	93	75	94	1.0
Yes (score: 0–33)			15	6	5	8	0.7 (0.3–1.7)
Depression (mPHQ-9)							
None/Mild/Minimal depression (score: 0–9)	4	1	206	84	57	71	1.0
Moderate/Severe depression (score: 10–27)			35	17	23	29	1.9 (1.3–2.9)*
History of stroke							
No	1	0*	199	83	49	61	1.0
Yes			46	18	30	37	1.9 (1.3–2.9)*
Activities of daily living							
Able to cook for self							
Yes	4	1	191	79	58	73	1.0
No			50	20	21	27	1.0 (0.6–1.6)
Able to dress independently							
Yes	11	2	217	90	70	88	1.0
No			22	8	5	6	0.8 (0.3–1.9)
Able to eat independently							
Yes	3	1	234	97	76	95	1.0
No			8	2	4	5	0.4 (0.1–2.7)

Table 1: Continued

Variable	Missing data for variable		0 reported falls in the past year (n = 245)		1+ reported falls in the past year (n = 80)		Adjusted for age and sex Rate ratio (95% CI)
	n	%	n	%	n	%	
Able to do all own housework							
Yes	4	1	160	67	35	44	1.0
No			82	32	44	66	1.8 (1.2–2.7)*
Have problems controlling bladder or bowel							
Yes	6	2	199	83	67	83	1.0
No			40	15	13	17	0.9 (0.5–1.5)
Able to do own shopping							
Yes	4	1	172	72	42	53	1.0
No			70	27	37	47	1.6 (1.1–2.4)*
Able to use toilet independently							
Yes	6	2	226	94	73	91	1.0
No			13	4	7	9	0.6 (0.2–2.0)

\* $P < 0.05$  (variables significantly associated with past falls). —, Calculation not possible due to only one participant being diagnosed with Parkinson's Disease; mKICA, modified Kimberley Indigenous Cognitive Assessment tool; MMSE, Mini-Mental State Examination; mPHQ-9, modified Patient Health Questionnaire.

and depression using the modified Patient Health Questionnaire (mPHQ-9) [15,16].

Past falls were assessed by asking the question: 'Have you had any falls in the last year and if so, how many falls have you had?' Falls were defined as 'an unexpected loss of balance resulting in coming to rest on the floor, the ground, or an object below knee level' [17].

Study participants were each asked to nominate a contact person. Each consenting contact person completed a 60-minute interview with questions mirroring those asked through participant interviews. This was used as a method of providing information for questions participants were unable to answer themselves. Additional questions were included in the contact person interviews investigating observed participant functional decline and/or changes to behaviour.

#### Statistical analysis

Study participants were divided into two groups: those who had reported one or more falls in the past year and those who had not reported any falls in the past year. Sociodemographic characteristics, health conditions and ability to perform activities of daily living (ADL) were compared between the groups.

A number of categorical and continuous variables were grouped due to small participant numbers. Modified Poisson regression was used to estimate relative risk (RR) [18], with all variables adjusted for age and sex. Variables significantly associated with past falls ( $P < 0.2$ ) from the initial regression analysis were included in the initial multivariable model, and a backward elimination strategy was used for variable selection. Variables with  $P > 0.2$  were systematically removed from the model to estimate mutually adjusted RR. There were minimal

missing data in each individual variable (Table 1) apart from BMI, so a complete-case analysis was done for each individual variable (and age and sex) in the minimally adjusted models and similarly for the mutually adjusted model.

SAS 9.4 with SAS/STAT 14.1 was used to perform all statistical analysis.

#### Ethics

The study was approved by the Aboriginal Health and Medical Research Council (AHMRC; 615/07), the University of New South Wales Human Research Ethics Committee (HREC 08003) and NSW Population and Health Services Research Ethics Committee (AU RED Ref: HREC/09/CIPHS/65; Cancer Institute NSW Ref: 2009/10/187).

All aspects of the study were guided by an Aboriginal Reference Group, which included older people and prominent Aboriginal people from medicine, academia and public policy, who were otherwise independent of the study [10].

#### Results

From a total of 546 eligible potential participants, 336 (62%) individuals participated in the study. Of the 210 individuals who did not participate, 123 refused, 31 could not be contacted, 11 moved away, nine passed away prior to data collection and 36 were unable to be interviewed due to other reasons. As described previously [10], there were no significant differences in sociodemographic characteristics between individuals who participated in the interviews and those who did not.

The 336 study participants had a mean age of 67 years (SD 6.3), the majority were female (59%) and resided in regional areas (58%).

Of the 114 people who agreed to take part in the study as contact persons, 38 (33%) were the daughter of a participant and 27 (24%) were the spouse of a participant. Nearly all contact persons (98%) reported knowing the participant well or very well.

#### People who had experienced a fall

Self-reported fall data were missing for 21 (6%) participants, who were older (mean age of 74 years, SD 8.9) and more likely to have cognitive impairment (50% of participants who had missing fall data were cognitively impaired). Fall data for 10 of these participants were provided through interviews held with nominated contact people.

Of the 330 participants with reported fall data, 48 (15%) reported one fall in the past year, and 37 (11%) reported two or more falls in the past year (Table 1). People who had experienced a fall were predominantly female (72%), had a mean age of 66 years (SD 5.8), were more likely to reside in regional areas (63%) and had a BMI within the 'obese category' (49%). Three falls (4%) resulted in fracture injuries to the leg, arm, hip and/or back. Contact person interviews for 10 participants who were unable to self-report falls data showed half to have experienced a fall in the previous 12 months.

#### Risk factors for falls

Associations between past falls and self-reported exposure to 22 possible predictor variables are shown in Table 1. After adjusting for age and sex, 8 of 22 possible predictor variables were significantly associated with an increased risk of falls.

After adjusting for age and sex, the risk factor with the largest RR was the use of three or more medications (RR = 3.7, 95% CI 1.25–2.4), followed by macular degeneration (RR = 2.0, 95% CI 1.2–3.2), moderate/severe depression (RR = 1.9, 95% CI 1.3–2.9), history of stroke (RR = 1.9, 95% CI 1.3–2.9), inability to do own housework (RR = 1.8, 95% CI 1.2–2.7), female sex (RR = 1.7, 95% CI 1.1–2.7, adjusted for age), osteoarthritis and/or inflammatory arthritis (RR = 1.6, 95% CI 1.1–2.7) and inability to do own shopping (RR = 1.6, 95% CI 1.1–2.4).

In multivariate analyses (including sex) after systematically excluding non-significant factors via a backward elimination process, the inability to do own housework (RR = 1.9, 95% CI 1.2–3.0,  $P > 0.01$ ) and the presence of osteoarthritis and/or inflammatory arthritis (RR = 1.8, 95% CI 1.0–3.2,  $P = 0.03$ ) remained significantly associated with past falls.

## Discussion

It is well documented that health services developed specifically for Aboriginal and Torres Strait Islander people provide better access and can be more effective in addressing the unique needs of this population [19]. Falls can have a

severe impact on the health and well-being of an older person, potentially leading to long-term hospitalisation or permanent placement in residential care. To older Aboriginal and Torres Strait Islander people, this translates to removal from home country and community. It is important to understand which falls risk factors are particularly significant for this population to provide relevant fall prevention services in response.

Within this study of Aboriginal people aged 60 years and older, 23% of participants experienced one or more falls within the year preceding data collection. The proportion of people reporting falls in this study is lower than the proportion previously reported by Aboriginal and Torres Strait Islander people aged 45 years and older in WA, where 32% of the study population experienced at least one fall within a one-year period [7]. Similar methods of participant recruitment and data collection were used in both studies. Differences in study outcomes may be due to the greater proportion of older participants included in the WA study (25 participants aged 80+ years) having poorer memory, potentially causing recall bias [20]. Further, fall-related hospitalisation rates and mortality rates are higher for older people living in rural and remote areas than in urban areas, potentially contributing to the differences in fall rates reported between studies [21]. Within the general Australian population, approximately 30% of people aged 65 years and older fall at least once per year [22]. Of all falls reported through this study, 4% resulted in a fracture injury. This is comparable to reports from the general population, where fractures are an outcome of approximately 5% of all falls [23].

Multiple factors were associated with an increased risk of falls. This study showed women were more likely to experience a fall than men (RR = 1.7 and 1.2, respectively), similar to previous studies in the general population [6]. Within the general population, women experience higher rates of falls than men due to their greater exposure to a number of falls risk factors, including a higher likelihood of past stroke, nutritional risk and the consumption of one or more alcoholic drinks per week [24].

Activities of daily living investigate an individual's ability to live independently and care for themselves [25]. Previous studies have linked an inability or a lack of confidence in performing ADLs to impaired mobility and an increased risk of falls among older people [26]. Within this study, an inability to do one's own housework was associated with a 1.9 times increased risk of falls in multivariate analyses (95% CI 1.2–3.0,  $P = 0.0067$ ). Of the seven ADLs included in data collection, housework is considered one of the most physically demanding activities, possibly explaining its stronger association with past falls in our population.

In multivariate analyses, study participants who reported osteoarthritis and/or inflammatory arthritis had a 1.8 times



greater risk of experiencing a fall than those without (95% CI 1.0–3.2,  $P = 0.0256$ ). Similar outcomes have been reported for the general population aged 70 years and above, where arthritis in the knees and hips both increased fall risk (RR = 1.4 and 1.7, respectively). Arthritis can damage cartilage, ligaments and bone, leading to pain, often in the knee, hip or back. Avoiding movement to prevent pain can lead to muscle deconditioning and a loss of strength [27], increasing a person's likelihood of experiencing an injurious fall.

### Strengths and limitations

This study collected information on a wide range of social, medical, physical and environmental factors associated with the health and well-being of older Aboriginal people in NSW. Consultation, consent and partnership were established with each Aboriginal community prior to participant recruitment. Local Aboriginal researchers were employed and trained to support recruitment. As has been reported elsewhere [10], assessments were piloted prior to the study and procedures or instruments adapted according to community feedback to ensure their appropriateness for this population. In addition, community guidance groups consisting of three to six local older people were created at each study site to provide ongoing feedback on study processes to the project team.

Limitations of this study include the retrospective collection of falls data from participants, leading to a high potential for recall bias, particularly with a one-year look-back period. Further recall bias may have been introduced through the self-report of several falls risk factors. No existing studies were identified which used prospective data collection methods to investigate fall rates among older Aboriginal and Torres Strait Islander people. It would be beneficial to trial methods of prospective falls data collection often used in the general population with Indigenous groups. A potentially suitable method may be the use of daily calendars for recording falls [28]. The study was not representative of the national Aboriginal and Torres Strait Islander population, limiting the generalisability of its outcomes. The cut-off points used to classify cognitive impairment and dementia have relatively low sensitivity within the older Aboriginal and Torres Strait Islander population. Participants with cognitive impairment and/or dementia were more likely to be missing falls data and were therefore more likely to be excluded from this analysis. Both these factors may have contributed to the null findings of cognitive impairment and/or dementia as a risk factor for falls.

### Clinical implications and directions for future research

Falls risk factors for older Aboriginal people identified in this research are similar to those identified in the general older people by previous research. Due to variations in comparison study populations and differences in selection criteria, this finding is only suggestive and requires further investigation. Many fall risk factors were found to be more

prevalent within the Aboriginal and Torres Strait Islander population than within the general population; however, fall rates remained similar between both groups. Higher rates of comorbid conditions may cause activity levels to be lower among older Aboriginal and Torres Strait Islander people, providing fewer opportunities for a fall to occur. Additionally, past falls may have been underreported by study participants due to falls data being collected retrospectively through both this study and the closest comparable study conducted in WA [7]. This highlights the need for a large-scale prospective study in this area.

Further research is needed to fully understand the fall risk factors in Aboriginal people and establish optimal fall prevention programs. Further investigation using prospective fall reporting is required to further examine differentials in fall rates in Aboriginal and Torres Strait Islander people.

### Conclusion

Falls were shown to affect approximately one-quarter of the Aboriginal study population aged 60 years and older. These factors identified to be associated with falls are known to also increase falls risk in the general population. The engagement of Aboriginal and Torres Strait Islander health and community services is necessary for identifying effective and acceptable approaches to addressing the high-priority falls risk factors identified through this study. Future research conducted in partnership with Aboriginal organisations investigating acceptable approaches to addressing falls risk factors in community settings would be of great value.

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# Fall-related hospitalisations of older Aboriginal and Torres Strait Islander people and other Australians

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**The known** Falls are the leading cause of injury-related hospitalisations of Aboriginal people in New South Wales.

**The new** The patterns of injury and outcomes of fall injury hospitalisations of older Aboriginal people were different to those of other older Australians. A higher proportion of Aboriginal patients had been hospitalised for fall-related non-fracture injuries; their hospital stay was shorter and 30-day mortality lower. The age-standardised rate of fall-related injury hospitalisations was greater for Aboriginal than for non-Indigenous people.

**The implications** Different approaches may be required to prevent and treat fall-related injuries to older Aboriginal people.

Falls are responsible worldwide for 5–8% of all hospitalisations of people aged 65 years or more; hip fracture is the most common injury.<sup>1,2</sup> In Australia, fall injury hospitalisations are less prevalent (2.7% of hospitalisations), with injuries to the hip or thigh being the most common.<sup>3</sup> Falls are the leading cause of injury hospitalisations for Aboriginal and Torres Strait Islander people in New South Wales.<sup>4</sup> The number of fall-related injuries to older Aboriginal Australians increased from 2007–08 to 2010–11 by an average of 10.2% per year; the average annual increase for all older Australians was 4.3%.<sup>3</sup>

Severe fall injuries in older people are associated with reduced mobility, loss of independence, and, for some, the need to enter residential care.<sup>5</sup> For older Aboriginal people, this potentially entails being separated from home country, community, and culture. Despite the growing rates of fall injury among older Aboriginal Australians, little is known about their injury profile, hospitalisation characteristics, or outcomes, or about whether they differ from those of the older Australian population overall.

In this study, our aim was to compare the socio-demographic characteristics and type of injury sustained, use of hospital resources and rates of hospitalisation by injury type, and survival following fall injuries to older Aboriginal people and non-Indigenous Australian people hospitalised for fall-related injuries.

## Methods

### Data source and linkage

Two data sources were linked for this study: the NSW Admitted Patient Data Collection (APDC), and death records from the NSW Register of Births, Deaths and Marriages. The APDC is a census of all admitted patient services provided by all 428 NSW hospitals, of which 55% are public.<sup>6</sup> Details of each hospitalisation are coded

## Abstract

**Objectives:** To compare the socio-demographic characteristics and type of injury sustained, the use of hospital resources and rates of hospitalisation by injury type, and survival following fall injuries to older Aboriginal people and non-Indigenous Australian people hospitalised for fall-related injuries.

**Design:** Population-based retrospective cohort data linkage study.

**Setting, participants:** New South Wales residents aged 50 years or more admitted to a public or private NSW hospital for a fall-related injury during 1 January 2003 – 31 December 2012.

**Main outcome measures:** Proportions of patients with defined injury types, mean hospital length of stay (LOS), 30-day mortality, age-standardised hospitalisation rates and age-adjusted rate ratios, 28-day re-admission rates.

**Results:** There were 312 758 fall-related injury hospitalisations for 234 979 individuals; 2660 admissions (0.85%) were of Aboriginal people. The proportion of hospitalisations for fall-related fracture injuries was lower for Aboriginal than for non-Indigenous Australians (49% v 60% of fall-related hospitalisations;  $P < 0.001$ ). The major injury type for Aboriginal patients was non-fracture injury to head or neck (19% of hospitalisations); for non-Indigenous patients it was hip fractures (18%). Age-adjusted LOS was lower for Aboriginal than for non-Indigenous patients (9.1 v 14.0 days;  $P < 0.001$ ), as was 30-day mortality (2.9% v 4.2%;  $P < 0.001$ ). For Aboriginal people, fall injury hospitalisations increased at an annual rate of 5.8% (95% CI, 4.0–7.7%;  $P < 0.001$ ); for non-Indigenous patients, the mean annual increase was 2.5% (95% CI, 2.1–3.0;  $P < 0.001$ ).

**Conclusions:** The patterns of injury and outcomes of fall injury hospitalisations were different for older Aboriginal people and other older Australians, suggesting that different approaches are required to prevent and treat fall injuries.

according to the Australian modification of the International Statistical Classification of Diseases and Related Problems, 10th revision (ICD-10-AM).<sup>7</sup> Probabilistic linkage of the data extracts was performed by the NSW Centre for Health Record Linkage (CHeReL, <http://www.cherel.org.au>). As 95.4% of the NSW Indigenous population is Aboriginal,<sup>8</sup> this population is referred to as “Aboriginal” in this article.

### Case selection

We included all 234 979 cases of people aged 50 years or more who were admitted to a NSW hospital for a fall-related injury between 1 January 2003 and 31 December 2012. Fall injury cases were identified by an ICD-10-AM principal diagnosis code of S00–T75 or T79, and a principal external cause code of

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W00–W19. Defining “older” in this study as being at least 50 years of age allowed us to directly compare our results with data published by the Australian Institute of Health and Welfare (AIHW).

Indigenous status is coded for each hospital episode of care in the APDC dataset. A person was classified as Aboriginal if they were listed as Aboriginal or Torres Strait Islander in the hospitalisation record for a single episode of care, at least once if there had been two episodes of care, or at least twice if there had been three or more episodes of care. This algorithm is recommended when linking data for Aboriginal and Torres Strait Islander peoples in NSW population datasets, to minimise the effects of reporting, administrative and coding errors.<sup>9</sup>

Age was categorised into 5-year brackets. Comorbidities contributing to the Charlson Comorbidity Index were identified with a validated ICD-10 coding algorithm,<sup>10</sup> including a 12-month look-back period.<sup>11</sup>

Hospital length of stay (LOS) was defined as the number of days between the dates of admission and of final discharge from the health system. Hospitalisations comprising multiple contiguous episodes of care for an injury were counted as one hospital stay. Records with an unusually long LOS (more than three standard deviations above the mean) were excluded as reflecting atypical care practices or possible coding errors.<sup>12</sup>

Thirty-day mortality was defined as death from any cause within 30 days of admission to hospital following a fall-related injury. Twenty-eight day hospital re-admission was defined as admission to any hospital in NSW for any cause within 28 days of discharge.

**Statistical analysis**

Differences between Aboriginal and non-Indigenous older Australians in the proportions of type, mechanism, and place of injury were compared in  $\chi^2$  tests. Mean LOS (with 95% confidence interval [CI]) was calculated, and adjusted for age and sex differences by linear regression; the significance of differences between Aboriginal and non-Indigenous older Australians in mean LOS was assessed in *t* tests. Thirty-day mortality was calculated for each of the two populations. Age-standardised hospitalisation rates were calculated by dividing the number of hospitalisations in each 5-year age bracket by the NSW population in that age group for the corresponding year, with direct standardisation against the 2001 Australian standard population.<sup>13</sup> The age-standardised rate ratio (SRR) comparing the rates for Aboriginal and non-Indigenous older Australians was calculated (with 95% CI), assuming a Poisson distribution. We assessed the statistical significance of changes in admission rates over time by negative binomial regression analysis. All statistical analyses were performed in SAS Enterprise Guide 6.1 (SAS Institute).

**Ethics approval**

Ethics approval for the study was obtained from the NSW Population and Health Service Research Ethics Committee and the Aboriginal Health and Medical Research Council (reference, HREC/13/CIPHS/49).

**1 Demographic and injury characteristics for fall-related injury hospitalisations of people aged 50 years or more, New South Wales, 2003–2012**

	Aboriginal Australians	Non-Indigenous Australians	P
Number of hospitalisations	2660	310 098	
Sex (women)	1458 (54.8%)	207 166 (66.8%)	< 0.001
Age group (years)			< 0.001
50–54	549 (20.6%)	16 127 (5.2%)	
55–59	418 (15.7%)	18 827 (6.1%)	
60–64	382 (14.4%)	20 623 (6.7%)	
65–69	324 (12.2%)	22 007 (7.1%)	
70–74	296 (11.1%)	28 021 (9.0%)	
75–79	231 (8.7%)	41 636 (13.4%)	
80–84	210 (7.9%)	58 942 (19.0%)	
85–89	157 (5.9%)	58 968 (19.0%)	
≥ 90	93 (3.5%)	44 947 (14.5%)	
Number of comorbidities (Charlson Comorbidity Index)			< 0.001
0	1476 (55.5%)	177 195 (57.1%)	
1–2	886 (33.3%)	107 076 (34.5%)	
≥ 3	298 (11.2%)	25 827 (8.3%)	
Fractures			
All fractures	1304 (49.0%)	186 469 (60.2%)	< 0.001
Fracture of head and neck	48 (1.8%)	7405 (2.4%)	0.050
Fracture of trunk	288 (10.8%)	36 678 (11.8%)	0.11
Fracture of arm	389 (14.6%)	54 747 (17.7%)	< 0.001
Fracture of hip	263 (9.9%)	57 097 (18.4%)	< 0.001
Fracture of leg	281 (10.6%)	27 489 (8.9%)	0.002
Fracture injury, other	35 (1.3%)	3053 (1.0%)	0.08
Non-fracture injuries			
All non-fracture injuries	1356 (51.1%)	123 629 (39.8%)	< 0.001
Non-fracture injury to the head and neck	491 (18.5%)	43 040 (13.9%)	< 0.001
Traumatic brain injury	128 (4.8%)	12 301 (4.0%)	0.026
Non-fracture injury of the arm	199 (7.5%)	19 375 (6.2%)	0.009
Non-fracture injury of the trunk	191 (7.2%)	15 502 (5.0%)	< 0.001
Non-fracture injury of the leg	308 (11.6%)	29 558 (9.5%)	0.003
Non-fracture, other	39 (1.5%)	3853 (1.2%)	0.30
Mechanism of fall			
Fall on same level (low trauma)	1395 (52.4%)	174 224 (56.2%)	< 0.001
Fall involving furniture (low trauma)	190 (7.1%)	21 269 (6.9%)	0.56
Fall from one level to another (high trauma)	372 (14.0%)	41 798 (13.5%)	0.45
Other/unspecified	703 (26.4%)	72 807 (23.5%)	< 0.001
Place of injury			
Home	1257 (47.3%)	150 328 (48.5%)	0.21
Residential care institution	201 (7.6%)	56 752 (18.3%)	< 0.001
Public area	350 (13.2%)	37 071 (12.0%)	0.06
Other/unspecified	852 (32.0%)	65 947 (21.3%)	< 0.001
Re-admitted to hospital within 28 days*	434 (16.6%)	35 063 (11.5%)	< 0.001

\* Excludes hospitalisations with date of discharge after 3 December 2012. ♦

## Results

There were 312 758 fall-related injury hospitalisations for people aged 50 years or more during the 10-year study period (234 979 individual patients), 2660 of which (0.85%) were of Aboriginal people, of whom 2434 (91.5%) were admitted to public hospitals; the proportion of Aboriginal people admitted to private hospitals was lower than for non-Indigenous patients (2.1% *v* 8.5%;  $P < 0.001$ ).

### Cohort and injury characteristics (Box 1)

Most fall-related injury hospitalisations were of women (55% of Aboriginal patients, 67% of non-Indigenous patients); 74% of hospitalisations of Aboriginal people were of people under 75 years of age, as were 34% of hospitalisations of other older Australians.

The proportion of hospitalisations for fall-related fracture injuries was lower for Aboriginal than for non-Indigenous Australians (49% *v* 60% of fall-related hospitalisations;  $P < 0.001$ ), particularly with respect to fall-related hip fractures (10% *v* 18%;  $P < 0.001$ ).

The proportion of hospitalisations for fall-related non-fracture injuries was correspondingly higher for Aboriginal than for non-Indigenous Australians (51% *v* 40%;  $P < 0.001$ ), particularly for non-fracture injuries to the head and neck (19% *v* 14%;  $P < 0.001$ ).

The home was the most common place of injury for both Aboriginal and non-Indigenous patients (47% *v* 48% of hospitalisations;  $P = 0.21$ ). The proportion of hospitalisation records listing place of injury as "other/unspecified" was higher for Aboriginal than for non-Indigenous patients (32% *v* 21%;  $P < 0.001$ ). A smaller proportion of hospitalisations of Aboriginal patients resulted in re-admission within 28 days (12% *v* 17% of non-Indigenous patients;  $P < 0.001$ ).

### Length of hospital stay

The mean LOS for a fall injury was 9.1 days for Aboriginal people and 14.0 days for non-Indigenous Australians. LOS was shorter for Aboriginal people for all injury types, with the exception of hip fracture and traumatic brain injury, where there was no difference (Box 2). The rate of self-discharge from hospital was higher for Aboriginal people than for non-Indigenous patients (3.4% *v* 0.6%;  $P < 0.001$ ).

### Mortality within 30 days of hospital admission

The proportion of hospitalisations followed by death within 30 days of admission was lower for Aboriginal than for non-Indigenous patients (2.9% *v* 4.2%;  $P < 0.001$ ); 30-day mortality for traumatic brain injuries in Aboriginal patients was less than half

that for other older Australians (7.8% *v* 16.2%;  $P = 0.010$ ). There was no statistically significant difference in mortality following hip and other fracture injuries. The small number of deaths of Aboriginal people precluded statistical adjustment for sex and age (Box 3).

### Age-standardised hospitalisation rates

The age-standardised hospitalisation rate for all fall-related injuries was higher for Aboriginal than for non-Indigenous patients overall (SRR, 1.17; 95% CI, 1.11–1.23,  $P < 0.001$ ); however, the difference in annual rate was statistically significant only for 2010 and 2011 (Box 4). Age-standardised hospitalisation rates for hip fracture were similar for Aboriginal people and non-Indigenous patients (SRR, 0.91; 95% CI, 0.79–1.05;  $P = 0.19$ ), but for patients with traumatic brain injury the rates were higher for Aboriginal patients (SRR, 1.27; 95% CI, 1.24–1.30;  $P = 0.026$ ). Hospitalisation rates for both populations increased over time, but the increase was greater for Aboriginal patients (Box 4).

For Aboriginal people, fall injury hospitalisations increased during 2003–2011 at an annual rate of 5.8% (95% CI, 4.0–7.7%;  $P < 0.001$ ); for non-Indigenous patients, the mean annual increase was 2.5% (95% CI, 2.1–3.0;  $P < 0.001$ ). Age-standardised rates of hospitalisation of Aboriginal people for fall-related fractures increased at a faster rate (annual increase, 3.0%; 95% CI, 0.5–5.6%;  $P = 0.020$ ) than for other older Australians (annual increase, 0.7%; 95% CI, 0.3–1.1%;  $P = 0.001$ ). The rates of hospitalisation for fall-related non-fracture injuries were similar for both populations, but the rate of increase was greater for Aboriginal people (Aboriginal, 9.2%; 95% CI, 6.9–11.5%;  $P < 0.001$ ; non-Indigenous, 5.6%; 95% CI, 4.6–6.7%;  $P < 0.001$ ).

## Discussion

Most fall-related injury hospitalisations of Aboriginal people were of people under 75. This is consistent with results from previous research in NSW which found that 61% of Aboriginal people hospitalised for fall injuries were 50–64 years old, compared with 23% of non-Indigenous patients.<sup>14</sup> For all-cause hospitalisations nationally, 14% of separations of Aboriginal people were for patients aged 65 years or more, compared with 42% of separations for other Australians.<sup>15</sup>

A lower proportion of Aboriginal than of non-Indigenous people admitted to hospital with a fall-related injury had a fracture injury. This difference, particularly marked for hip fractures, may be linked to higher levels of obesity in the Aboriginal population. An elevated body mass index is reported to increase bone mineral density of the femoral neck in older people, protecting it from fracture.<sup>16</sup> Excess fat around the hip also absorbs and diverts

### 2 Length of hospital stay for fall-related injury hospitalisations of people aged 50 years or more, New South Wales, 2003–2012

Injury type	Mean length of stay (95% CI), days			Mean length of stay (95% CI), adjusted for age and sex, days		
	Aboriginal Australians	Non-Indigenous Australians	<i>P</i>	Aboriginal Australians	Non-Indigenous Australians	<i>P</i> *
All fall-related injuries	9.1 (8.5–9.6)	14.0 (13.9–14.0)	0.001	9.5 (9.3–9.7)	13.7 (13.7–13.7)	< 0.001
Hip fracture	25.6 (23.0–29.2)	26.5 (26.3–26.6)	0.89	25.0 (24.8–25.3)	26.5 (26.5–26.5)	< 0.001
All other fractures	9.9 (9.0–10.8)	13.7 (13.6–13.8)	< 0.001	9.2 (8.9–9.6)	13.8 (13.8–13.8)	< 0.001
Traumatic brain injury	9.6 (7.1–12.8)	12.8 (12.6–13.2)	0.43	10.4 (10.0–10.8)	12.9 (12.9–12.9)	< 0.001
All other non-fracture injuries	4.4 (3.9–4.9)	7.1 (7.0–7.2)	0.006	4.8 (4.7–4.9)	7.1 (7.1–7.2)	< 0.001

**3 Thirty-day mortality for fall-related injury hospitalisations of people aged 50 years or more, New South Wales, 2003–2012**

Injury type	Aboriginal Australians	Non-Indigenous Australians	P
Number of hospitalisations	2660	310 098	
All fall-related injuries	76 (2.9%)	13 034 (4.2%)	< 0.001
Hip fracture	18 (7.9%)	4535 (6.8%)	0.50
All other fractures	22 (2.2%)	2995 (2.4%)	0.70
Traumatic brain injury	10 (7.8%)	1988 (16.2%)	0.010
All other non-fracture injuries	26 (3.1%)	3495 (2.1%)	0.041

energy in the event of an impact.<sup>17</sup> Rates of obesity are higher among older Aboriginal people, affecting 75% those aged 55 years or more (*v* 59% of non-Indigenous Australians).<sup>17</sup> The substantial burden of early onset chronic health conditions in Aboriginal populations, coupled with high mortality at younger ages,<sup>18</sup> may mean that those who survive to a higher age are the healthiest and strongest members of their population, resulting in fewer hospitalisations for health conditions associated with ageing, such as hip fracture.

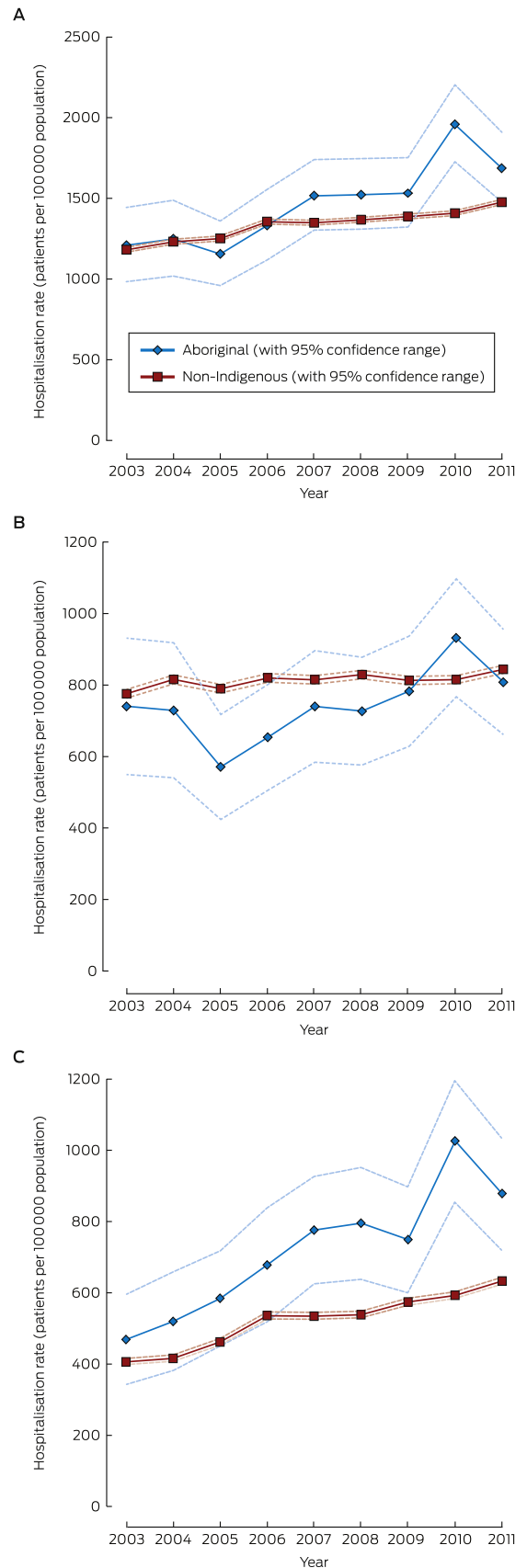
The proportion of fall-related non-fracture injury hospitalisations was higher for Aboriginal than for non-Indigenous patients, particularly non-fracture injuries to the head and neck. This type of injury after a fall suggests that neuroprotective reflexes which usually cause the person to break their fall with their arms are impaired.<sup>19</sup> An earlier study reported that the rate of head injuries leading to hospitalisation (81% of which were caused by falls) was 1.7 times as high for Aboriginal people aged 60 years or more than for other older Australians.<sup>20</sup>

Hospital LOS was shorter for all injury types for Aboriginal patients than for non-Indigenous patients. A number of factors make hospitalisation traumatic for Aboriginal people and therefore favour an earlier discharge, including separation from family and community networks, communication and language barriers, and the fear of dying away from home country.<sup>20,21</sup> This raises questions about the appropriateness of mainstream health care settings for providing care to Aboriginal people. A small proportion of Aboriginal patients discharged themselves from hospital (3.4%), but this was unlikely to have markedly influenced the overall LOS for this group.

We found that the frequency of death within 30 days of admission was lower for older Aboriginal patients than for non-Indigenous patients. The age distribution of hospitalised patients with a fall injury may have contributed to this finding, with younger Aboriginal people recovering more rapidly than older and frailer non-Indigenous patients.

We also found that hospitalisation rates for fall injuries increased about twice as quickly for Aboriginal people as for other older Australians. This is consistent with the findings of a nationwide study of people aged 65 years and older that reported fall-related injury hospitalisations of Aboriginal people increased during 2007–2011 at 2.4 times the rate for non-Indigenous Australians.<sup>22</sup> The treatment-seeking behaviour of Aboriginal and non-Indigenous Australians are strikingly different: Aboriginal people use admitted patient services in public hospitals at four times the rate of other Australians, but are admitted to private hospitals less frequently.<sup>23</sup> Past experience of discrimination and communication problems are reported to deter Aboriginal people from

**4 Age-standardised fall-related injury rates of hospitalisation of people aged 50 years or more, New South Wales, 2003–2011\***



\* Data for 2012 were excluded because Indigenous population data were not available to use for the denominator. ♦

contacting mainstream health services.<sup>20</sup> Fifty-two Aboriginal Community Controlled Health Services (ACCHSs) operate in NSW,<sup>24</sup> many of which have the clinical facilities to treat less severe fall-related injuries. These services potentially offer older Aboriginal people an alternative to the hospital system for treatment.

### Strengths and limitations of the study

This is the first study to specifically investigate fall injury hospitalisations and outcomes for older Aboriginal people in NSW. Its population-based nature maximised its statistical strength, and the relatively long study timeframe allowed temporal changes to be assessed. Drawing on information from all hospitalisation records for each individual increased the likelihood that all Aboriginal patients were identified.

Nevertheless, problems with correctly identifying Aboriginal people presenting to health services are likely to have led to underestimating the number of Indigenous patients. An AIHW report released in 2010 noted that 11% of Indigenous people were not identified correctly in their hospitalisation records; however, the level of Indigenous identification increased by 8% in NSW public hospitals between 2005 and 2010.<sup>25</sup> This may have contributed to the increase in injury hospitalisation rates being greater for Aboriginal than for non-Indigenous people. The APDC is considered a reliable data source, and is routinely monitored and checked for data quality, but minor discrepancies may be caused by coding, clerical and data conversion errors.

Further research is needed to determine how hospital services could more appropriately care for older Aboriginal people. Our results could inform the design and implementation of fall prevention programs for Aboriginal communities, as we identified specific risk factors associated with falls by older Aboriginal people.

### Conclusion

We found different patterns of injury for older Aboriginal people and other older Australians. Fall injury hospitalisation rates rose more rapidly during 2003–2011 for Aboriginal people than for other older people. The difference may have been influenced by the use of Aboriginal-specific health services instead of the general hospital system, historical under-reporting of Aboriginal status on presentation to medical services, and changes in reporting practices.

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**Competing interests:** No relevant disclosures.

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# Fall prevention services for older Aboriginal people: investigating availability and acceptability

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## Key points

- There is a gap in the availability of fall prevention programs that are specifically designed for, and delivered to, older Aboriginal people in New South Wales, Australia
- Limited funding, a lack of available Aboriginal staff and communication difficulties between health services are thought to contribute to this problem
- Experienced service providers report that, to be effective and acceptable, a fall prevention intervention for older Aboriginal clients needs to be evidence based, flexible, community-oriented and social, held in a familiar and culturally safe location and delivered free of cost

## Abstract

**Background:** Falls and fall-related injury are emerging issues for older Aboriginal people. Despite this, it is unknown whether older Aboriginal people access available fall prevention programs, or whether these programs are effective or acceptable to this population.

**Objective:** To investigate the use of available fall prevention services by older Aboriginal people and identify features that are likely to contribute to program acceptability for Aboriginal communities in New South Wales (NSW), Australia.

**Methods:** A questionnaire was distributed to Aboriginal and mainstream health and community services across NSW to identify the fall prevention and healthy ageing programs currently used by older Aboriginal people. Services with experience in providing fall prevention interventions for Aboriginal communities, and key Aboriginal health services that delivered programs specifically for older Aboriginal people, were followed up and staff members were nominated from within each service to be interviewed. Service providers offered their suggestions as to how a fall prevention program could be designed and delivered to meet the health and social needs of their older Aboriginal clients.

**Results:** Of the 131 services that completed the questionnaire, four services (3%) had past experience in providing a mainstream fall prevention program to Aboriginal people; however, there were no programs being offered at the time of data collection. From these four services, and from a further five key Aboriginal health services, 10 staff members experienced in working with older Aboriginal people were interviewed. Barriers preventing services from offering appropriate fall prevention programs to their older Aboriginal clients were identified, including limited funding, a lack of available Aboriginal staff,



and communication difficulties between health services and sectors. According to the service providers, an effective and acceptable fall prevention intervention would be evidence based, flexible, community-oriented and social, held in a familiar and culturally safe location and delivered free of cost.

**Conclusion:** This study identified a gap in the availability of acceptable fall prevention programs designed for, and delivered to, older Aboriginal people in NSW. Further consultation with older Aboriginal people is necessary to determine how an appropriate and effective program can be designed and delivered.

**Terminology:** The authors recognise the two distinctive Indigenous populations of Australia: Aboriginal and Torres Strait Islander people. Because the vast majority of the NSW Aboriginal and Torres Strait Islander population is Aboriginal (95.4%)<sup>1</sup>, this population will be referred to as 'Aboriginal' in this manuscript.

## Introduction

Australia's Aboriginal and Torres Strait Islander population is ageing. In 1996, 2.8% of Australia's total Aboriginal and Torres Strait Islander population was aged 65 years and older, but this proportion is predicted to more than double to 6.5% by 2026.<sup>2</sup> As this older age group grows in size, so too does the burden of age-related health conditions among Aboriginal and Torres Strait Islander people.

Falls significantly affect the health of older people living in Australia, with approximately one-third of people aged 65 years and older experiencing at least one fall each year.<sup>3</sup> Fall-related injury is the leading cause of injury-related hospitalisations for Aboriginal people in New South Wales (NSW)<sup>4</sup>, predominantly affecting women aged 65 years and older, and men aged 60–64 years.<sup>5</sup> Fall injury rates increased by an average of 10.2% per year for older Aboriginal people from 2007–08 to 2010–11, compared with a 4.3% average annual increase for older non-Aboriginal Australians.<sup>6</sup>

Multiple fall prevention programs are now being run in community settings across Australia.<sup>7</sup> However, it is uncertain whether older Aboriginal and Torres Strait Islander people are accessing these programs, and whether the programs are effective or acceptable for this population.

Previous studies have described difficulties with promoting the uptake of fall prevention services in other populations.<sup>8</sup> This has been attributed to the embarrassment associated with falling among older age groups, and a lack of an individual's awareness of their personal ability to decrease their risk of falling. There are further concerns relating to the acceptability of mainstream health services for older Aboriginal and Torres Strait Islander people, with past experiences of discrimination and communication difficulties potentially deterring them from using the services.<sup>9</sup>

This study aimed to describe fall prevention services being delivered in NSW, and investigate their use by

older Aboriginal people. A key goal of this research was to investigate how a fall prevention program could be developed that is culturally acceptable and appealing for older Aboriginal people.

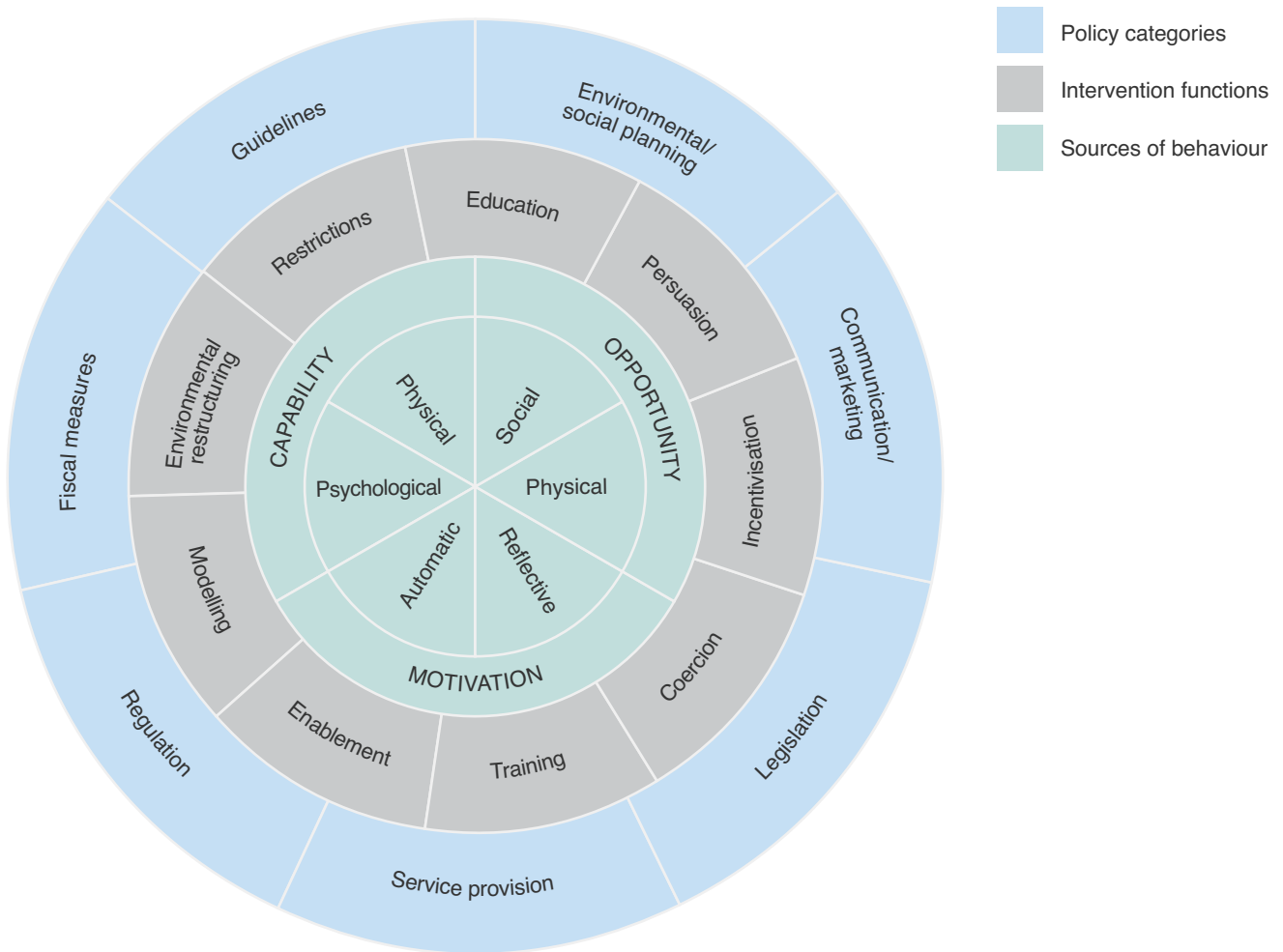
## Methods

A questionnaire investigating the use of both healthy ageing services and fall prevention services by older Aboriginal people was distributed using email and fax to Aboriginal and mainstream health and community services operating in NSW. Initial services were identified during a meeting with the Clinical Excellence Commission NSW Falls Co-ordinator Collaborative in April 2014. The project team identified additional services through online healthcare service databases such as Australian Indigenous HealthInfoNet, Aboriginal Medical Service directories and NSW Government chronic care contact lists. A total of 628 emails containing a hyperlink to the online questionnaire were sent during a 2-week period, and 27 paper-based questionnaires were faxed to services on request. Services were encouraged to forward the questionnaire to relevant contacts.

Services that indicated any experience in providing fall prevention programs specifically for older Aboriginal people were contacted by telephone by two researchers (CL and JC) to gain additional information on their structure and operation. An interview invitation was extended to staff members who worked predominantly with older Aboriginal clients at each service.

For each service provider who consented to be interviewed, the project team followed up by phone or in person. A structured interview guide was used, based on the framework of the behaviour change wheel (BCW).<sup>10</sup> The BCW (Figure 1) investigates how elements of health policy and features of health services influence client interactions with health services, and can be used to inform a "more efficient design of effective interventions".<sup>10</sup>

**Figure 1.** Behaviour change wheel



The interview questions explored the ability of health services to deliver appropriate fall prevention programs to Aboriginal people, and aimed to identify intervention features that would be beneficial and appealing to older Aboriginal people. Both researchers confirmed when new ideas and insights ceased to be provided through the interviews, indicating that data saturation had been achieved. Each interview was audiotaped and transcribed verbatim, with transcripts checked for accuracy and coded in QSR NVivo 10 software.

The responses were analysed thematically, where codes based on the BCW framework were assigned to sections of each interview transcript.<sup>11</sup> This paper reports responses in accordance with both STROBE and COREQ reporting guidelines.<sup>12,13</sup>

All aspects of the study were overseen by an Aboriginal steering committee, ensuring the study was run in a culturally appropriate way and that study goals remained relevant. Ethical approval was granted by the Aboriginal Health and Medical Research Council of NSW Ethics Committee (1010/14).

## Results

A total of 131 services responded to the questionnaire (overall response rate of 44%; Figure 2). All NSW Local Health Districts were represented, including metropolitan (28% of responses), rural and regional areas (60%) and services available state-wide (12%).

From all completed questionnaires, 121 of 131 respondents (92%) were unaware of any fall prevention services that were specifically run for Aboriginal people in their area. Only 4 of 131 services (3%) reported that they had provided a mainstream fall prevention program specifically for Aboriginal people. Additionally, 107 of 131 respondents (82%) were not aware of whether Aboriginal people attended mainstream fall prevention programs.

The project team followed up with the four services (two Aboriginal services and two mainstream services) that reported providing fall prevention interventions for Aboriginal communities. Each service had previous experience in offering fall prevention programs to older Aboriginal people, but no programs were being offered at the time of data collection. The past programs had either been run by external parties who no longer had a

relationship with the service, or by staff who had since left the service. Little information was available about past program content, delivery or outcomes.

A further five Aboriginal services that delivered healthy ageing programs specifically for older Aboriginal people living in the community were also followed up. Ten service providers were nominated from within the nine services to be interviewed.

The 10 interviewed service providers were from a variety of backgrounds, each experienced in working with older Aboriginal people in a healthcare context. All service providers reported falls as a major health issue for their older Aboriginal clients, and service providers from Aboriginal health services stated that many older clients had never attended a program specifically for fall prevention. The five mainstream fall prevention service providers that were interviewed reported they were unsure of how to promote their programs to local Aboriginal communities, whereas the five service providers working in Aboriginal health were unsure about where to refer older Aboriginal clients to fall prevention interventions being run in the general community.

The interview data were analysed within the BCW framework. Certain themes covered a number of BCW categories, demonstrating the complex relationships between client perspectives, health service functions and the influence of health policy. Direct quotes that best corresponded to these themes were taken from transcripts and used as subheadings to aid in interpreting the data.

The following BCW categories were not acknowledged by service providers:

- Policy categories – legislation
- Intervention functions – coercion, incentivisation, restrictions and modelling
- Sources of behaviour – capability (both physical and psychological).

This potentially indicates that these areas are less relevant for program design and delivery in this context.

### Reasons for older Aboriginal people not accessing existing fall prevention programs

#### “A lot of clients won’t go to mainstream programs”

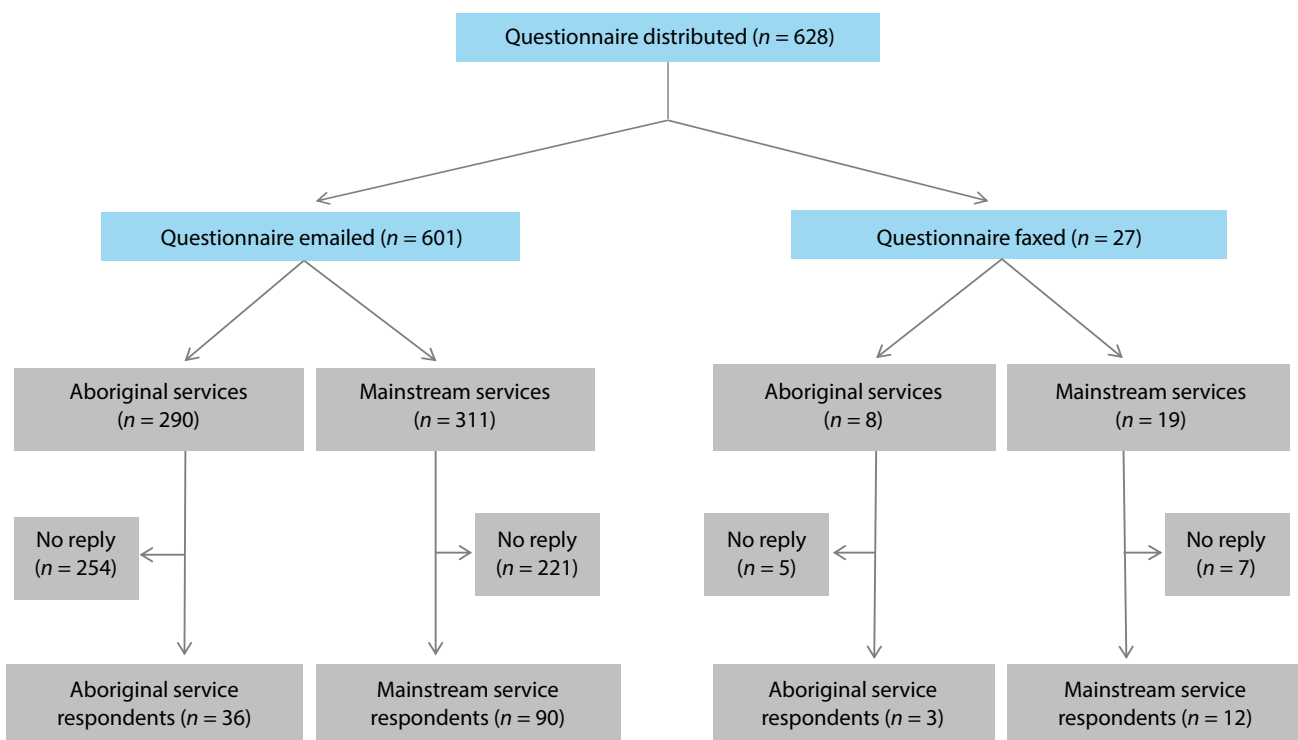
Two staff members from Aboriginal services and two staff members from mainstream services discussed that their older Aboriginal clientele felt uncomfortable with accessing mainstream programs. Trust in local, well-known, familiar Aboriginal services gave clients confidence to trial new programs there.

*Most of our clients come here because they don't feel safe in the mainstream exercise class. They just don't feel comfortable. (Aboriginal services coordinator)*

#### “In reality, falls are not a huge consideration for most people”

Three service providers from mainstream services reported that many of their clients did not see the benefit

Figure 2. Questionnaire distribution and responses



of attending a fall prevention program, because they did not consider falls as a personal health concern. Despite this, all service providers observed falls as having a significant health impact on their older Aboriginal clients.

*Clients don't believe it's an issue for them, especially with the over 50 group, it's not an issue, until they have a fall. (Exercise physiologist)*

### “We need to make our Aboriginal community aware of what's available”

The majority of service providers reported that their older Aboriginal clients were unaware of existing fall prevention classes being available and were therefore missing out on the opportunity to attend classes. It was suggested that this could be the result of poor health promotion between Aboriginal and mainstream services, or gaps in fall prevention education for health service providers.

### Service provider perspectives for developing a successful Aboriginal fall prevention program

#### “You have to acknowledge the importance of cultural safety”

All Aboriginal service providers said it was necessary to integrate a fall prevention program for older Aboriginal people into existing, well-established and trusted Aboriginal organisations. The combination of a known community venue with familiar staff and previously used transport options were thought to encourage program use, particularly with older people. Additionally, promotion and referral to the program would be possible through other programs at each service.

*If [the program] comes here, our clients will come, because they already come here. They're not going to source [the program] somewhere else. (Service coordinator)*

#### “It's a social occasion for participants”

The Aboriginal service providers reported that relationships built between participants and program staff during the course of other Aboriginal healthy ageing programs acted as motivation for ongoing attendance.

*A client might have been told [to use the program] 10 times but then they just decide to come because their friend is coming. (Exercise physiologist)*

Socialising among participants was additionally reported as a good educational tool, with both physical and mental health benefits.

*All people can meet in a group and share similar stories and similar experiences. I think it can be a very valuable tool. (Occupational therapist)*

### “Aboriginal groups need Aboriginal instructors”

The Aboriginal service providers viewed both Aboriginal staff members and Aboriginal instructors as more capable of relating to Aboriginal clients, which contributed to creating a culturally safe environment.

*You need to have somebody that knows where [our Aboriginal clients] are coming from because they're not going to come and see a person that has no clue. (Registered nurse)*

Additionally, through employing Aboriginal people from the local community, an immediate familiarity exists between participants and staff. Local staff were thought to remain in their roles for longer periods of time, preventing frequent staff turnover.

*[If we use] Aboriginal fitness leaders, people will come to the program because they're supporting the community and vice versa. (Accredited exercise physiologist)*

### “We need to meet the criteria”

One staff member from an Aboriginal service and one staff member from a mainstream service stated concern that the programs' validity and effectiveness in reducing falls risk should not be compromised in the effort to ensure the programs are culturally appropriate.

*We want to maintain and completely acknowledge the importance of cultural appropriateness, we also want to ensure best practice – evidence-based best practice isn't lost in trying to be too entirely culturally appropriate. (Aboriginal health service manager)*

Interviewees discussed the need for formally trained staff with the skills to adjust the programs' content and delivery method to suit participants while maintaining its effectiveness.

### “Flexibility is a big thing”

The inflexibility of many previous mainstream health programs had left staff from both mainstream and Aboriginal services unable to adjust or modify the programs to meet the specific needs of their older Aboriginal clients, which differed to those of the general older Australian population, leading to poor participant engagement.

*The community [need to] understand it, so that they can relate to it, they can familiarise with it. (Aboriginal care coordinator)*

## Support required for delivering a successful fall prevention program to older Aboriginal people

### “Limited money, limited time, limited resources”

Service providers working in Aboriginal health organisations identified high client numbers, coupled with a lack of funding, staff and resources, as major barriers to providing culturally appropriate Aboriginal fall prevention programs. Funding was seen as necessary to train and employ Aboriginal staff for program delivery, and for ensuring program sustainability.

*I guess it's our vision if we were able to source funding – this is something we would look at – developing our programs. (Aboriginal health service manager)*

Cost was reported as a barrier to clients accessing health services. Program fees were identified as particularly troublesome for older people, who often relied on aged care pensions. Costs associated with client transport to and from health services added another barrier, particularly in widely distributed communities.

### “Competing priorities”

Despite the availability of many effective and frequently used Aboriginal community health services, staff from Aboriginal services reported that a lack of communication between the services and the lack of emphasis placed on fall prevention was thought to cause clients who are at a high risk of falling to be overlooked for receiving fall prevention assistance.

*I guess when people get caught up in that medical model where you've got multidisciplinary teams from different angles looking at different things there. Falls is probably not even a huge consideration in reality. (Aboriginal health service manager)*

Within Aboriginal services, there was uncertainty as to which service providers were responsible for assessing and referring at-risk patients to fall prevention programs, or delivering appropriate fall prevention advice. There was confusion not only between mainstream and Aboriginal services, but also between providers from different health disciplines.

Themes repeatedly discussed by the service providers during the interviews were included in a program design template, also developed by Susan Michie as an element of her BCW framework (Figure 3).<sup>14</sup> A concise program outline was generated using the interview data, highlighting how a fall prevention program could be structured for older Aboriginal people, from the perspective of the service providers.

## Discussion

Participation in fall prevention programs by older people has been reported to be typically less than 50%<sup>15</sup>, and can be often as low as 10%.<sup>16</sup> A qualitative study by Yardley et al. in 2006 found that older people disengaged from fall prevention programs for a number of reasons. Many participants did not view themselves as being at risk of falling, and others associated falls with embarrassment. Most commonly, participants were not aware of their ability to reduce their own risk of falling.<sup>8</sup> The service providers in the current study mentioned most of these reasons when discussing fall prevention and their older Aboriginal clients. The unfamiliarity of mainstream programs for Aboriginal people was an additional deterrent to accessing available programs.

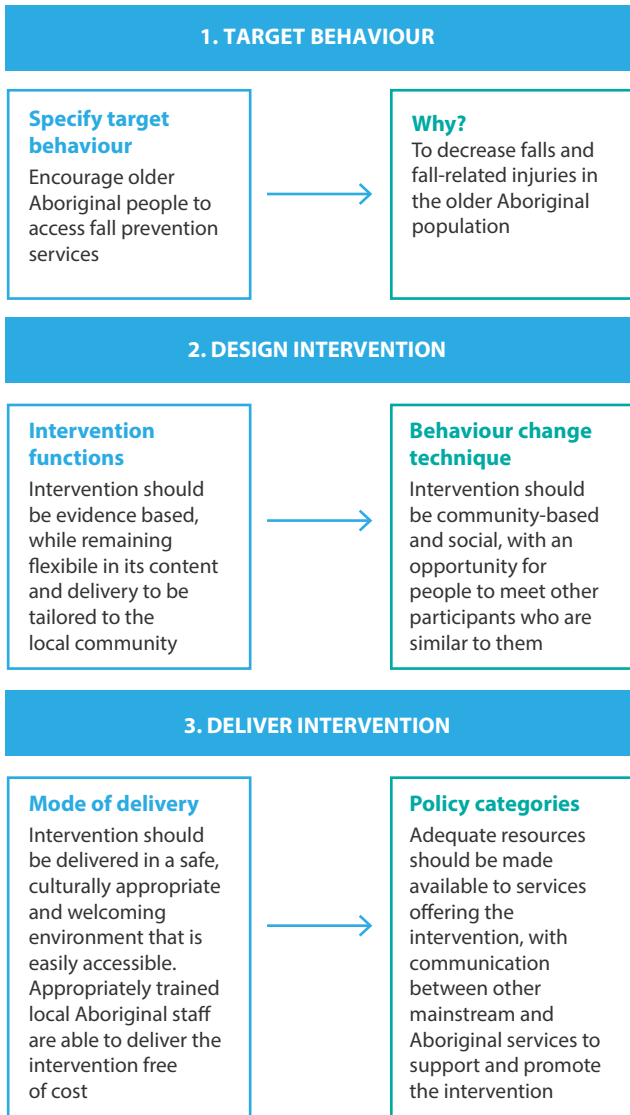
Funding difficulties have been a long-standing obstacle for Aboriginal services in offering long-term health programs, and these are not unique to aged care. Public Aboriginal health funding can originate from a range of federal, state and territory sources.<sup>17</sup> As many Aboriginal services offer a variety of programs, funding for one service often comes from numerous grants and funding schemes that can be “overlapping and unclear”.<sup>18</sup> Additionally, the majority of these grants are only short to medium term. The ambiguity of funding sources and a lack of funding security put strong restrictions on the type and number of programs that Aboriginal services are able to offer. As mentioned by the Aboriginal service providers, fall prevention is not often viewed as a priority in the Aboriginal aged care setting, and therefore frequently misses out on funding allocation.

Multiple studies have shown low use of mainstream healthcare services by Aboriginal people.<sup>19</sup> Fee-charging health services are rarely accessed by Aboriginal people. Of all Aboriginal health expenditure, 72% is attributed to public hospital care, and free-to-use community and health services.<sup>19</sup> Currently, nearly all fall prevention programs in NSW charge an attendance fee, ranging from a donation to \$22 per session.<sup>7</sup>

Communication difficulties and a history of discrimination within mainstream health services have left many Aboriginal people (particularly from older generations) hesitant to use Western health services and programs.<sup>20</sup> Staff who have not received cultural competency training, coupled with a high staff turnover rate in many public services, creates an unfamiliar environment to older Aboriginal clients, making trust difficult to establish between clients and health workers.<sup>21</sup>

Employing Aboriginal staff in health services has positive effects on service use by the local Aboriginal community and on patient satisfaction with the service.<sup>22</sup> Aboriginal health staff are rare, with only 4891 Aboriginal and Torres Strait Islander people working in the health industry nationwide in 2006, comprising 1.0% of Australia's total health workforce.<sup>23</sup> The content and delivery of an exercise-based fall prevention program must meet very specific guidelines to guarantee the

**Figure 3. Program design template**



program's effectiveness.<sup>24</sup> As a result, allied health professionals or fitness instructors with extensive experience in working with older adults are ideal candidates to run such programs. However, such roles would be difficult to fill from the existing Aboriginal health workforce, where only 54 Aboriginal and Torres Strait Islander physiotherapists were registered in Australia in 2006, representing 0.4% of the total national physiotherapist workforce.<sup>23</sup>

### Strengths and limitations

The health and community services questionnaire documented fall prevention and healthy ageing programs across the state, focusing on their use by older Aboriginal people. Although we were not able to contact every service in NSW, the use of snowball sampling and referrals from key stakeholders (involved in fall prevention and/or Aboriginal aged care) assisted the project team in identifying and making contact with key organisations.

Responses to the questionnaire were received from services located in metropolitan, rural and regional areas, reflecting a broad reach of the questionnaire. Despite this, there was a differential response rate between Aboriginal services (response rate of 13%) and mainstream services (response rate of 33%). Because both groups differ in meaningful ways, this may have introduced nonresponse bias to the study.

No rigorous follow-up was performed and no payments for time were offered for participation in the study, potentially contributing to the relatively low response rate. It was anticipated that services with specific interest or experience in fall prevention for older Aboriginal people would respond to the questionnaire. Despite this, because of the low response rate, the results of this study cannot be used to provide a definitive picture of fall prevention services for Aboriginal people in NSW.

Future research investigating the views of older Aboriginal people towards fall prevention and healthy ageing is needed to inform the content and delivery of an appropriate fall prevention intervention. The project team investigated this through Yarning Circles held with older Aboriginal community members, in a separate study.<sup>25</sup>

### Conclusion

This study identifies a gap in the availability of fall prevention programs specifically designed for, and delivered to, older Aboriginal people in NSW. A variety of mainstream fall prevention programs are delivered across the state; however, there were multiple barriers to attendance by older Aboriginal people, with a lack of cultural competency highlighted as a key factor. Although service providers working in Aboriginal services felt that fall prevention programs would benefit their older Aboriginal clientele, limits on funding, difficulties in communication between existing health services and a lack of available Aboriginal health staff prevented them from being able to offer appropriate programs. Further consultation with older Aboriginal people is necessary to determine how an acceptable and effective program can be designed and delivered.

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## Competing interests

AT has received payment for lectures from Exercise and Sports Science Australia.

## Author contributions

CL prepared the manuscript, assisted in developing the study tools, conducted interviews and led data analysis. JC conducted interviews, assisted with data analysis and assisted in drafting the manuscript. LK, CS, AT and RI assisted in developing the study tools and assisted in drafting the manuscript. TB and LL assisted in identifying appropriate services to contact for the study and assisted in developing the study tools. RI oversaw the study.

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RESEARCH ARTICLE

Open Access



# Yarning about fall prevention: community consultation to discuss falls and appropriate approaches to fall prevention with older Aboriginal and Torres Strait Islander people

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## Abstract

**Background:** Fall related injury is an emerging issue for older Indigenous people worldwide, yet few targeted fall prevention programs are currently available for Indigenous populations. In order to inform the development of a new Aboriginal-specific fall prevention program in Australia, we conducted community consultation with older Aboriginal people to identify perceptions and beliefs about falls, and to identify desired program elements.

**Methods:** Yarning Circles were held with Aboriginal and Torres Strait Islander people aged 45 years and over. Each Yarning Circle was facilitated by an Aboriginal researcher who incorporated six indicative questions into each discussion. Questions explored the impact of falls on Yarning Circle participants, their current use of fall prevention services and investigated Yarning Circle participant's preferences regarding the design and mode of delivery of a fall prevention program.

**Results:** A total of 76 older Aboriginal people participated in ten Yarning Circles across six sites in the state of New South Wales. Participants associated falls with physical disability, a loss of emotional well-being and loss of connection to family and community. Many participants did not use existing fall prevention services due to a lack of availability in their area, having no referral provided by their GP and/or being unaware of fall prevention programs in general. Program elements identified as important by participants were that it be Aboriginal-specific, group-based, and on-going, with the flexibility to be tailored to specific communities, with free transport provided to and from the program.

**Conclusions:** Older Aboriginal people reported falls to be a priority health issue, with a significant impact on their health and well-being. Few older Aboriginal people accessed prevention programs, suggesting there is an important need for targeted Aboriginal-specific programs. A number of important program elements were identified which if incorporated into prevention programs, may help to address the rising burden of falls.

**Keywords:** Indigenous, Aboriginal and Torres Strait Islander, Fall prevention, Ageing, Yarning circles

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## Background

Community consultation is important in the planning and implementation of community-based health programs [1]. It allows for communication between community members, program developers and funding bodies, ensuring community-based health programs address the issues affecting the health and wellbeing of local populations. Community consultation has shown to be particularly valuable in the development of health programs for Indigenous populations worldwide [2]. Consultation not only allows for programs to respond to the unique needs and priorities of Indigenous populations, but importantly, allow Indigenous people to become active partners in identifying key problems and solutions for themselves and their communities [3], facilitating self-determination.

Falls and fall-related injury are becoming a growing concern for global Indigenous populations as they age [4–6]. For Australia's Aboriginal and Torres Strait Islander population, fall injury rates have increased by an average of 10.2% per year from 2007 to 08 to 2010–11, compared to a 4.3% average annual increase for other older Australians [7]. Falls are now the second most common cause of injury for all Aboriginal and Torres Strait Islander people in Australia [8], with the highest fall-injury rates reported for females aged 65 years and above, and males aged 60–64 years [9]. For older people, there is a high likelihood that a fall can cause injury, potentially resulting in significant functional decline or even permanent disability [10]. Experiences of past falls can also lead to an increased fear of falling, preventing people from performing daily tasks and limiting their independence [11].

Despite high and rapidly increasing fall-injury rates, there is little knowledge about the impact of falls in Aboriginal and Torres Strait Islander people in Australia, or in older Indigenous people worldwide [12]. Further, while there are a variety of fall prevention programs currently run in community settings, it is uncertain whether these programs are accessed by older Indigenous people or whether they are effective or acceptable for these populations. Previous research has shown that successful health programs implemented in Indigenous communities have different content, structure and methods of delivery than those developed for the general population [13]. Indigenous leadership and community ownership of health programs ensures they answer to local community needs, can be modified readily to suit changing community priorities and are run corresponding to local belief systems and practices [14, 15].

Yarning Circles are a method of storytelling, education and preserving cultural knowledge, used for thousands of years by Indigenous people in Australia,

Canada and North America [16]. 'Research Topic Yarning' is well-documented and has been previously used to gain community input for the design/delivery of community-based health programs for Indigenous populations [17, 18]. It is compared to a semi-structured interview and described as 'a yarn with a purpose' [19]. It enables researchers to learn from the stories and experiences of Yarning Circle participants in relation to a specific issue or question.

Within this study, Yarning Circles were used by our team of Indigenous and non-Indigenous researchers to explore three key areas: 1) investigate the impact of falls on the health and wellbeing of older Aboriginal and Torres Strait Islander people; 2) assess the level of existing knowledge older Aboriginal and Torres Strait Islander people have on fall prevention; and 3) to identify desirable elements of a fall prevention program from the perspective of older Aboriginal and Torres Strait Islander people.

As the majority of the New South Wales (NSW) Aboriginal and Torres Strait Islander population is Aboriginal (97.2%), this population will be referred to as 'Aboriginal' in this manuscript.

## Methods

### Participants

Invitations to host Yarning Circles were extended to a selection of Aboriginal health and community services across NSW, frequently accessed by older Aboriginal people. These services were identified through consultation with the project's Aboriginal Steering Committee. The study was promoted by posters displayed at each service and through active recruitment by service staff. People interested in participating either registered with service staff or contacted the project's Aboriginal research officer (JC). A greater burden of chronic health conditions affects Aboriginal and Torres Strait Islander people at younger ages when compared to the general population [20]. Due to this, Aboriginal and/or Torres Strait Islander people aged 45 years and above were eligible to register for the study, rather than the cut-off age of 65 years typically used to classify older adults.

### Data collection

Each Yarning Circle was held at a venue and time convenient to participants and host service staff. An Aboriginal facilitator trained in qualitative research methods guided each Yarning Circle (JC), ensuring cultural safety was maintained during each discussion. A research officer was present to take notes and make observations (CL). There was time reserved before the Yarning Circles for the visiting project team to meet with Yarning Circle participants over morning tea, build

rapport and establish a welcoming environment. All Yarning Circle discussions began with both the participants and the project team introducing themselves and sharing their family origins. The facilitator introduced six open-ended questions into each Yarning Circle over time (Table 1) and prompted Yarning Circle participants to continue the discussion when appropriate.

#### Data analysis

Each Yarning Circle ran for between 30 min and 1 h, was audio recorded and transcribed verbatim. Data were managed in NVivo10 (QSR International PTY Ltd) software. Conventional content analysis was used to analyse the transcripts due to the variety of topics addressed in the study which could not be confined to fit within a pre-existing methodological framework [21]. By avoiding the use of preconceived categories for coding data, the core messages that emerged from the Yarning Circles were able to be captured and presented as key findings. Each Yarning Circle transcript was independently and sequentially coded by three researchers, two of whom are Aboriginal (CL, JC, EH). Each researcher repeatedly read all transcripts, immersing themselves in the data. Following coding, discussion and comparison took place, where themes were grouped under broader categories presented in Fig. 1. A senior Aboriginal community spokesperson who was present during multiple Yarning Circles (NJT) reviewed the results, provided feedback and was closely involved with the writing of this manuscript. This manuscript is reported in line with the COREQ (Consolidated criteria for reporting qualitative research) statement, supporting transparency in reporting qualitative research [22].

#### Ethical approval

The study received ethical approval from the Aboriginal Health & Medical Research Council of NSW (AH&MRC) (1084/15). Written consent was given by all study participants for Yarning Circles to be audio recorded and transcribed, with de-identified results permitted to be published.

## Results

A total of 10 Yarning Circles were held with 76 participants (16 males, 60 females) across six sites in Sydney, the Central Coast, Central West and Illawarra Shoalhaven, NSW (Table 2). Each Yarning Circle consisted of 7 to 10 participants. When over 10 participants were present at a site, multiple Yarning Circles were held.

### Impact of falls on older aboriginal people

#### Physical disability

Many Yarning Circle participants shared stories of falling, often with multiple falls reported by one person. Temporary health problems and permanent disabilities that had occurred due to past falls were discussed. One female participant spoke of mobility loss caused by a fall-related leg injury, leading to weight gain and a further loss of balance, recalling that ‘one thing seemed to lead to another’.

“[After my fall] I couldn’t walk the way I wanted to walk to lose the weight. And because I’ve put the weight on, it’s impacted on my health.” (F).

Rehabilitation services required post fall-related injury were reported to be inflexible, too expensive and difficult to access.

#### Loss of emotional wellbeing

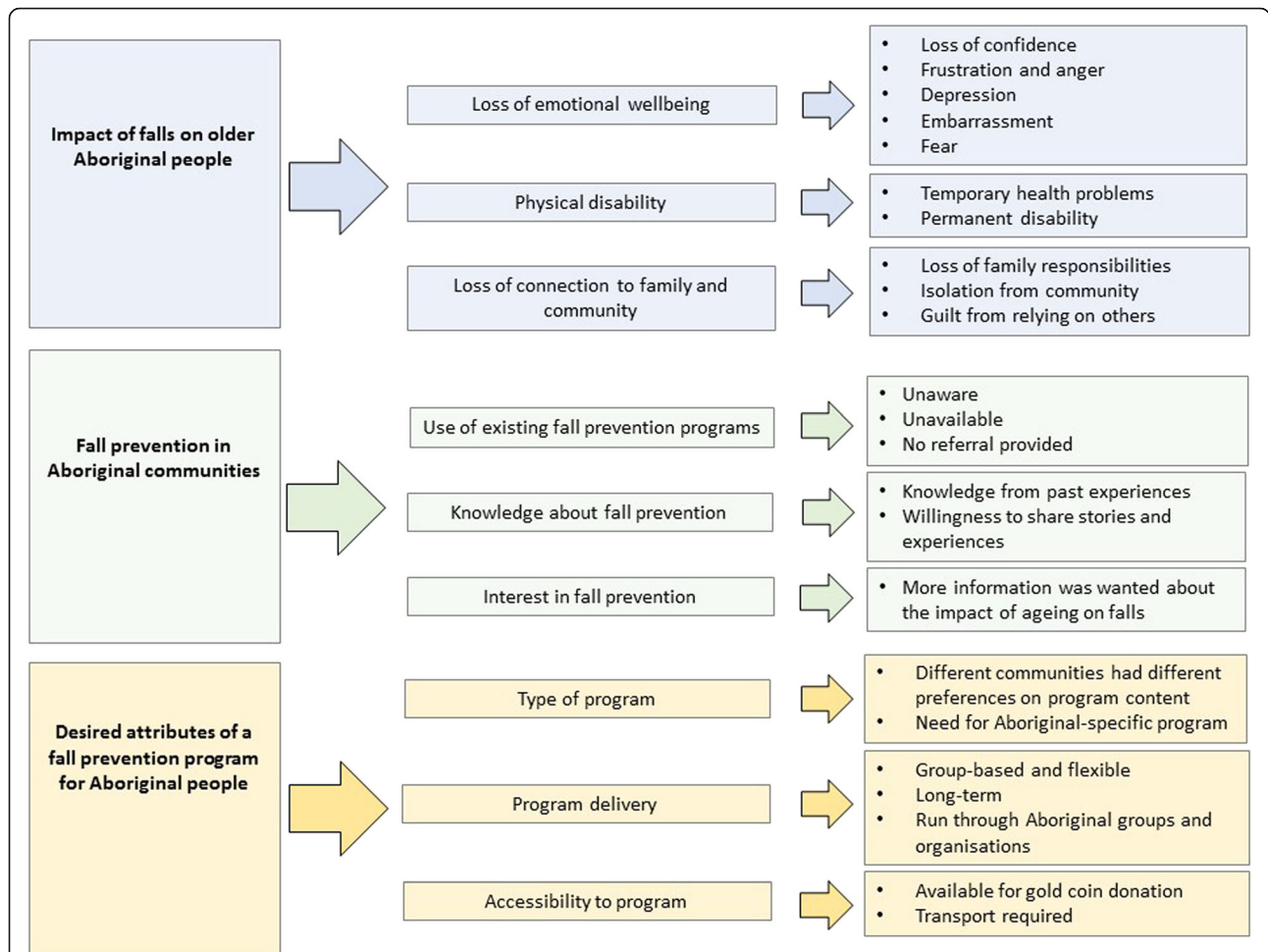
Yarning Circle participants spoke of feeling angry, embarrassed and frustrated after having a fall. They shared stories of losing mobility and/or losing confidence, preventing them from independently performing activities of daily living or being active in the community. This had the potential to lead to isolation and depression.

“It’s pretty frustrating and it makes you angry, makes you sad, you get depressed ‘cause you can’t do what you used to do.” (M).

Some Yarning Circle participants described feeling guilty for relying on family participants to care for them after a fall.

**Table 1** Question guide for Yarning Circles

1.	Has anyone had a fall recently? Can you talk about what happened?
2.	Is it important to find ways to prevent falling?
3.	Are you aware of any fall prevention programs in your community?
4.	Would you attend an Aboriginal-specific fall prevention program if it was available?
5.	Are there any things that would/do stop you from attending a fall prevention program? Do you have any ideas about how these things could be addressed?
6.	<i>[Laminated cards with pictures representing existing fall prevention programs distributed]</i> Are there any parts of these programs that you would like to see incorporated into a falls program for Aboriginal people?



**Fig. 1** Themes which emerged from Yarning Circle transcripts surrounding falls and fall prevention for older Aboriginal people, grouped into broader categories. A summary of the impact of falls on older Aboriginal people, the current status of fall prevention within Aboriginal communities and suggestions for the design and delivery of an appropriate fall prevention program for Aboriginal populations, from the perspectives of older Aboriginal people

“I felt so useless because even when I did eventually come home [following a fall-related hospitalisation] I couldn’t do a lot. It was a horrible feeling because the kids had to come over and bring meals, my brother brought a few meals, and it’s a horrible feeling, horrible.” (F).

**Loss of connection to family and community**

The majority of Yarning Circle participants spoke of acting as carers for their extended families. This was seen as an extremely valued and important responsibility. Those who had experienced health problems due to a fall spoke of feeling uncomfortable in becoming dependant on

**Table 2** Yarning Circle host organisation type, location and number of Yarning Circle participants

Host service type	Location	Number of male participants	Number of female participants
Aboriginal chronic care group	Central Coast	1	9
Aboriginal Medical Service	Central Coast	3	5
Aboriginal community organisation	Central Coast	3	15
Aboriginal chronic care group	Illawarra Shoalhaven	8	14
Aboriginal Land Council	Central West	1	6
Aboriginal community organisation	Sydney	0	11
Total		16	60

their children or siblings for care. Stories were shared of family members overcompensating in supervising a loved one following a fall, further limiting their independence.

“No, I do miss walking. But I’m not to be trusted out alone anymore. So I have keepers.” (F).

A fear of falling was reported to make Yarning Circle participants less likely to try new things. This prevented people from attending social occasions, leading to social isolation and loneliness.

“I think falls shake your confidence. So regardless of whether it’s a minor fall, a major fall or whatever, it can affect your mental attitude to things. So, if it rocks your confidence you’re less likely to try and do other things.” (M).

### Fall prevention in Aboriginal communities

#### *Use of fall prevention programs*

Generally, Yarning Circle participants reported they were unaware of existing fall prevention programs. Few participants spoke vaguely about past involvement in short-term programs run through larger health services however, they were unsure as to why they were referred or how the program was meant to benefit them.

“I went to a falls program that one Wednesday, and all they did was make me stand up and sit down. I refused to do anything.” (F).

#### *Knowledge about fall prevention*

Within each Yarning Circle, participants shared a great deal of knowledge about fall prevention amongst themselves, despite very few having exposure to formal fall prevention education. ‘Lessons had been learnt’ by participants who had previously fallen and were willing to share their experiences with the group. They went on to explain the precautions they now took to prevent further falls.

“You become conscious of it too as far as other people are concerned.” I caught my wife the other day on the rocking chair dusting up [the ceiling]. I said to her, “What are you doing up there?” (M).

#### *Interest in fall prevention*

Yarning Circle participants were interested to understand how aged-related changes to their physical ability increased their risk of falling. Some participants spoke of reporting a fall to their GP, but no referral to a fall prevention program being given. Others spoke of long wait times to access regularly run, short-term programs.

“I’m not a faller at all and in the last six months I’ve had two really, really bad falls, and I’ve ended up in hospital on both occasions and I can’t believe that it was me. I’m starting to think that if I don’t start doing something now, it’s going to be worse for me when I do get to that stage where, yeah...” (F).

### Desired attributes of a fall prevention program for Aboriginal people

#### *Type of program*

Different communities voiced different preferences for program content, ranging from dance, Tai Chi to light gym work. There was a consensus that the program shouldn’t be physically demanding, allowing everyone to feel confident in participating.

It was important to Yarning Circle participants that specific issues relating to older Aboriginal people were acknowledged through the program. Participants wanted to show that Aboriginal communities were able take responsibility for their health, in their own way. Each community was enthusiastic to make the program ‘their own’ by tailoring it to their interests and health needs.

“We could stand up and show what we’ve been doing, you know? Advertise it, let people see that we actually are trying to get healthy. That’d show them that we are doing something.” (M).

Aboriginal programs were discussed as more inclusive of all people and as places of less judgement. They were seen as culturally safe and more flexible than programs developed for the general population. People felt relaxed among their own community, where everyone was seen as equal. Others saw Aboriginal programs as an opportunity to learn more about local Aboriginal history and culture, with the potential of meeting other members of their family who they may have not met before.

“I have found, just from my experience that the Aboriginal programs are a lot friendlier, a lot more relaxed, not so rigid, and not so judgmental. And you don’t need that judgmental stuff. You just need people who have the same or similar problems as you that are willing to accept you as you are, and you’re going to find some common ground with being able to help them, and they help you. And I think that’s one of the major differences.” (F).

#### *Program delivery*

Having the program delivered in a group setting was unanimously important to Yarning Circle participants. Participants wanted the group to be friendly, where they had an opportunity to share stories and feelings openly and safely. ‘Getting out of the house’ was associated with

mental health benefits as it presented an opportunity to meet new people. Happiness and emotional wellbeing were seen as important outcomes of the program. Group-based programs were thought to motivate people to return on a regular basis and to introduce challenge via friendly competition between participants.

*“I’d like a group because you can enjoy it and you can have a laugh and a joke or carry-on a bit. It’ll do more good than sitting there trying to do it yourself at home. If it’s up to me to do something at home, I’d say bugger it.” (F).*

Yarning Circle participants wanted the program to be flexible and self-paced, catering to the abilities and needs of the local community. Participants preferred that the program should have no age limit so that partners, children and carers were welcome to attend. It was preferred for the program to be held within existing community groups, ideally through local Aboriginal organisations.

There was a strong preference for an on-going long-term program rather than a short-term program. Yarning Circle participants shared concerns of missing a short-term program due to other family, health or community commitments. It was reported to take time to ‘get used to’ a new program, and to form friendships between program participants. It was also seen as important to follow-up with program participants over the long term.

*“This six weeks or this eight weeks thing, it’s just no good for the Koori [Aboriginal] community because people get sick. People drop out through winter. People drop out for various reasons but they can come back, pick up where they left off and continue on. You can’t offer Koori communities short term fixes because it doesn’t fix anything.” (F).*

#### **Accessibility to program**

The majority of Yarning Circle participants were willing to pay a small fee from AUD\$1 to AUD\$10 to participate in a fall prevention program. It was important for participants to see value in the program; participants wanted to know how the program could benefit them and wanted it delivered by professionally trained staff. Other financial commitments, particularly those surrounding family, were often seen as a higher priority. Despite this, paying a weekly fee to prevent falls was seen as valuable.

*“Well when you think about it in the long run: you’re paying \$5 a week for a group as opposed to not being as strong and having falls. When you have a fall you lose so much independence in the way of washing, drying, all that sort of stuff. Five dollars a week in the scheme of things is not a huge amount.” (F).*

Yarning Circle participants were concerned that issues with transport could leave people who are unable to reach the program independently becoming further isolated. Some people reported to not be physically able or confident to catch public transport, while others had little to no public transport available in their area.

*“We’ve got a lot of older people that want to do these exercise classes but just can’t get to the place whether it be ‘cause they don’t have a licence or do have a licence but don’t have a car, or can’t afford busses.” (F).*

Yarning Circle participants from existing community groups were able to assist each other with transport to a service or a program, highlighting the importance of community cohesion.

#### **Discussion**

The Yarning Circles highlighted concerns around falls and the significant impact falls have on social and community life for older Aboriginal people. The importance of community consultation was demonstrated, with many issues discussed surrounding falls and fall prevention being unique to the older Aboriginal population. In line with previous research [2, 3], a strong and consistent theme that emerged from the Yarning Circles was the need for fall prevention services specifically designed and delivered for Aboriginal people. Yarning Circle participants voiced a strong preference for a group-based program, tailored to suit local interests and health priorities. It was essential that all community members were included and able to participate in the program. The provision of transport as part of the program was considered important and a small donation was viewed as appropriate for program use.

The limited research available investigating falls and fall-related injury in older Indigenous populations suggests different patterns and outcomes of falls when compared to equivalent mainstream populations [23–26]. Despite this, many issues surrounding falls documented from general populations mirror those discussed by Aboriginal Yarning Circle participants. Common issues included sustaining serious injuries that cause chronic pain and disability, a loss of independence, loss of confidence, depression and developing a fear of falling [27–29]. The loss of family and community responsibilities were additional issues discussed by Yarning Circle participants.

The previous uptake of fall prevention programs by other older populations has been reported to be low. Typically, 10–50% of an eligible population participates in fall prevention interventions at a community level [29]. These low rates are associated with people not viewing themselves as ‘at risk’ of falling, or being

unaware that falls are preventable. In previous studies, falls have been associated with a loss of control and seen as an indication of a transition into old age [30]. Previous studies have also documented older people as being very reluctant to discuss falls due to embarrassment. On the contrary, Yarning Circle participants were very willing to discuss personal stories of past falls within each group, listening to each other's experiences with interest and providing suggestions on how to prevent future falls from occurring, or how to manage resulting health issues. A lack of awareness about fall prevention interventions emerged as the predominant reason for Yarning Circle participants not using existing fall prevention programs. Service providers working in Aboriginal aged care within NSW have provided similar feedback, stating that few older Aboriginal clients access fall prevention services as they are unaware they are available [31].

There was unanimous agreement by participants that the program should be Aboriginal-specific, acknowledging issues of particular importance and relevance to older Aboriginal people. Previous studies have identified a number of health and social issues that affect Indigenous populations and mainstream populations differently [32, 33], leading to different areas needing to be prioritised by health services and health programs for Indigenous communities [34]. Yarning Circle participants additionally expressed the need for a program with the flexibility to be customised to suit the diverse range of Aboriginal communities across the state, while remaining evidence-based and effective. Ensuring cultural safety through providing an Aboriginal-specific program was also stated as important by Yarning Circle participants. Previous studies have documented Indigenous people's experiences of discrimination, judgement and communication difficulties when accessing mainstream health services [35–37].

The inclusive, group-based setting requested for a fall prevention program by Yarning Circle participants has previously been identified as an effective approach towards community participation and promoting community ownership of a program [38]. Community ownership has been reported as a key contributor to the success of Indigenous health services and health programs worldwide [39, 40]. Previous successful Indigenous-specific programs delivered in 'safe and supportive group environments' have led to a greater sense of participant well-being and support amongst group members [41]. The request for a long-term, ongoing program is not unique to this study. Many initiatives run in Aboriginal communities are a product of short-term grants which do not get funded in the long term [42]. Similar issues have been reported for the funding of Indigenous health services worldwide [39].

Costs associated with accessing health services have been reported as a barrier to their use by approximately one third of Australia's Aboriginal population [43], particularly when costs are ongoing [44]. Nearly all existing fall prevention programs run in NSW charge an attendance fee ranging from a donation to \$22 per session [45]. Although the majority of Yarning Circle participants agreed that a small donation was appropriate for program use, there were concerns that other community members may not be able to afford this and would therefore be excluded. Transport to and from regular program sessions introduces a secondary barrier to program use, particularly in remote communities. Long distance, poor roads and a lack of public transport cause people living remotely (particularly older people) to have a strong reliance on private and community transport options, which can be expensive and in high demand [46]. Transport availability and cost were highlighted by participants as a concern and ongoing programs would need to address this.

The strengths of this study include the involvement of Aboriginal people in all aspects of study design, participant recruitment, data collection, data analysis and manuscript preparation. To our knowledge, this is the first qualitative study which documents the views of older Indigenous people regarding healthy ageing, worldwide. A greater proportion of women participated in the study than men. This may mean that perspectives from older Aboriginal men may not have been appropriately considered. Furthermore, this study only reflects the views of Aboriginal community members from NSW, Australia. Although the results of this study are anticipated to be generalizable, repetition of this study within different Indigenous populations, both within Australia and internationally, would be valuable for comparison. Nonetheless, there are many similarities in the health and social issues that affect Indigenous populations worldwide and it is anticipated the findings of this study may inform the development of prevention programs for other older Indigenous populations.

## Conclusions

Yarning circles with older Aboriginal people facilitated important discussions of the impact of falls. Many Yarning Circle participants shared stories of falls impacting their health, well-being and connection to family and community. Existing mainstream fall prevention programs were generally not used by Yarning Circle participants due to their lack of availability in certain areas, no referral provided for fall prevention services by GPs and/or being unaware of existing programs. Despite few Yarning Circle participants receiving formal fall prevention education, significant knowledge was shared from past experiences and individual ideas for minimising fall

risk and managing recovery from fall-related injury. Feedback from participants highlighted that an ongoing, Aboriginal-specific, group-based fall prevention program was preferred, that could be run through established Aboriginal organisations with the flexibility to be tailored to specific communities while remaining effective and evidence based. Multiple issues discussed by participants in relation to falls and fall prevention were unique to the older Aboriginal population and were not being met by existing services, highlighting the importance of community consultation, but also Aboriginal leadership and program ownership. The findings of this study will guide the development and implementation of appropriate fall prevention programs for older Indigenous populations worldwide.

#### Abbreviations

AH&MRC: Aboriginal Health & Medical Research Council of NSW; COREQ: Consolidated criteria for reporting qualitative research; NSW: New South Wales

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#### Availability of data and materials

The data used in this study (audio recordings and coded transcripts) is available from the corresponding author on request.

#### Authors' contributions

CL contributed to the development of the study tools, acted as note-taker during all Yarning Circles, coded transcripts and drafted the manuscript, JC contributed to the development of the study tools, facilitated all Yarning Circles discussions and coded transcripts, NJT assisted in facilitating a number of Yarning Circles and played a major role in reviewing the manuscript, EH coded transcripts, AT and CS contributed to the development of the study tools and reviewed the manuscript, RI led the study. All authors read and approved the final manuscript.

#### Ethics approval and consent to participate

The study received ethical approval from the Aboriginal Health & Medical Research Council of NSW (AH&MRC) (1084/15) on the 20th of May 2014. Written consent was given by all study participants for Yarning Circles to be audio recorded and transcribed, with de-identified results permitted to be published.

#### Consent for publication

Not Applicable.

#### Competing interests

The authors declare that they have no competing interests.

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