

Review of physical activity among Indigenous people

Caitlin Gray¹, Rona Macniven² and Neil Thomson¹

1. Australian Indigenous HealthInfoNet 2. University of Sydney

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Preface

This review of physical activity among Indigenous Australians has been prepared by the Australian Indigenous HealthInfoNet as a part of our contributions to 'closing the gap' in health between Indigenous people and other Australians by making relevant, high quality knowledge and information easily accessible to policy makers, health service providers, program managers, clinicians, researchers and the general community.¹ The review is an example of the HealthInfoNet's translational research [1], defined as 'comprehensive applied research that strives to translate the available knowledge and render it operational' [2, p1794].

1 The term Indigenous is used in this review to refer generally to the two Indigenous populations of Australia – Australian Aboriginal people and Torres Strait Islanders.

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The main purpose of the review, which follows the model of narrative reviews/syntheses [3], is to provide an authoritative, up-to-date review of the physical activity of Indigenous people that (1) is a valuable overview for people working in the area; and (2) assists in the development/refinement of policies, strategies and programs.

Research for the review involves the collection, collation, and analysis of a wide range of relevant information, including both published and unpublished material. Sources include the full range of relevant literature, including journal articles and other relevant publications, the vast majority of which are accessible via the HealthInfoNet's Australian Indigenous HealthBibliography. This bibliography, with more than more 20,000 entries, captures all relevant journal articles, books, book chapters and reports (including the 'grey' literature).

As well as the relevant journal literature, the HealthInfoNet's reviews draw on important government reports, particularly those produced by the Australian Bureau of Statistics (ABS), the Australian Institute of Health and Welfare (AIHW) and the Steering Committee for the Review of Government Service Provision (SCRGSP), and reports in the *Aboriginal and Torres Strait Islander health performance framework* series. These reports, prepared by the Australian Health Ministers' Advisory Council (AHMAC) in 2006, 2008, 2011 and 2012, are accompanied by substantial detailed analyses, which are accessible on the AIHW website. The HealthInfoNet's reviews also draw on information from the main administrative data collections (such as the birth and death registration systems and the hospital inpatient collections) and national surveys. Information from these sources has been published mainly in government reports, particularly those produced by the ABS and the AIHW.

After providing the context of physical activity, the body of the review outlines the extent of physical activity levels among Indigenous people, provides an overview of the various contributing factors (including attention to the links with the prevention of chronic disease), considers management and rehabilitation, summarises a number of relevant policies and strategies, and provides some brief concluding comments. Rather than commence with an executive summary, the review is preceded by a section devoted to 'Key facts', which presents the summarised information in a more concise form.

Further information about the physical activity of Indigenous people is accessible from the relevant section of the HealthInfoNet's website (www.healthinfonet.ecu.edu.au), which provides access to: the complete Indigenous-specific literature; details of policies and strategies, programs and projects, and organisations involved in the area; and databases of health promotion and health practice resources. The section also contains a plain language version of this review.

We welcome your comments and feedback about the review.

Neil Thomson, Director, on behalf of the HealthInfoNet team

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Key facts

Indigenous population

- At 30 June 2011, the estimated Australian Indigenous population was 669,736.
- NSW had the highest number of Indigenous people (208,364, 31% of the total Indigenous population);² the NT had the highest proportion of Indigenous people in its population (30% of the NT population is Indigenous).
- In 2011, the majority of Indigenous people lived in cities and towns; around one quarter of Indigenous people lived in remote or very remote areas.
- The Indigenous population is much younger than the non-Indigenous population.

Physical activity levels

- According to the 2008 *National Aboriginal and Torres Strait Islander social survey* (NATSISS), almost two-thirds (64%) of Indigenous children aged 4-14 years had taken part in some form of physical activity or sport in the previous 12 months. Indigenous males (aged 4-14 years) were slightly more likely to have taken part in physical activity than were Indigenous females (aged 4-14 years), 65% and 63% respectively.
- Almost one-third (30%) of Indigenous people aged 15 years or older reported in the 2008 NATSISS that they had taken part in some form of physical activity or sport in the previous 12 months. Participation levels were higher among Indigenous males (38%) than among Indigenous females (23%).
- Information from the 2004-2005 *National Aboriginal and Torres Strait Islander health survey* (NATSIHS) revealed that three-quarters (75%) of Indigenous people reported sedentary (very low or no physical activity) or low levels of physical activity. This level was 1.5 times higher than that found among non-Indigenous people. Indigenous females reported higher levels of being sedentary than did Indigenous males (51% compared with 42%). Being sedentary was also more common in the older age groups: 45-54 years age group – 83%; and 55 years and over – 85%.

Factors contributing to physical activity levels

- The many barriers Indigenous people face to engagement in physical activity include: cultural; historical; geographical; and socioeconomic factors.
- Many Indigenous people reside in rural and remote areas; environmental challenges such as locality, terrain and climate can influence participation levels and can have socioeconomic considerations. Reduced availability, frequency and access to programs, cultural suitability and population to health worker ratio can also have an impact.

² The acronyms used for states and territories in this review: New South Wales (NSW), Victoria (Vic), Queensland (Qld), Western Australia (WA), South Australia (SA), Tasmania (Tas), Australian Capital Territory (ACT) and Northern Territory (NT).

Physical activity and chronic disease

Based on the findings from national surveys:

- In 2003, physical inactivity accounted for 6.6% of the overall disease burden in Australia, and 8.4% of the burden among Indigenous people.
- Links between various risk factors (smoking, alcohol consumption, poor diet, and physical inactivity) and chronic disease are well established. There are complex causal relationships between these factors and chronic disease; and chronic disease may also be caused by, or be a complication of, one or more other diseases.
- In 2004-2005, of all Indigenous people living with cardiovascular disease (CVD), almost two-thirds (58%) were physically inactive, a level 1.6 times that of the non-Indigenous population. Physical inactivity accounted for 30% of the disease burden of CVD in the Indigenous population compared with 24% of the disease burden of CVD of the total population in Australia.
- For Indigenous people living with diabetes, over two-fifths (42%) have multiple chronic diseases. The burden of diabetes among Indigenous people attributable to physical inactivity is almost one-third (31%).
- Physical activity can protect against cancer independently, as well as through its contribution to weight control. Evidence for the benefits of physical activity is strongest for colon cancer in men and breast cancer in women. Physical inactivity accounts for 5% of the burden of cancer among Indigenous people.

Costs of physical inactivity

- The cost of reduced life expectancy and quality of life due to physical inactivity (as measured by disability adjusted life years (DALYs)) is 8,032 DALYs, 8.4% of the total for Indigenous people compared with 6.6% of the total for non-Indigenous people.

Health benefits of physical activity

- Increased physical activity can reduce conditions of overweight and obesity (further risk factors for chronic disease) through increased cardiorespiratory and muscular fitness, and in conjunction with good nutrition, it can lead to a healthier body mass and composition.
- Physical activity, in particular aerobic exercise and strength training, can improve social and emotional wellbeing, which can lead to reductions in depression, stress and anxiety. Involvement in physical activity can also reduce social isolation and increase feelings of wellbeing.
- Benefits of physical activity can also include those of the musculoskeletal system, involving a reduction in injury and falls as well as protection against conditions of bone health such as osteoporosis and arthritis. Physical activity can increase the mobility and flexibility of joints and maintain and improve muscle mass, strength and power, as well as improvements to overall posture and balance.

Introduction

Physical activity is important for all Australians, particularly in the prevention, management and treatment of chronic conditions, and for social and emotional wellbeing [4-6]. Chronic health conditions, including cardiovascular conditions, endocrine conditions (such as diabetes), and certain cancers [7], account for 70% of the observed difference in the burden of disease between the Indigenous and non-Indigenous populations [6]. Modifiable risk factors, particularly behavioural determinants such as physical activity, can help to reduce the extent and impact of these conditions, and assist in the prevention, management and treatment of disease [8]. The levels and impacts of physical inactivity are greater for Indigenous people than they are for other Australians. Physical inactivity has been cited as the second leading cause of disease burden in Australia [9], and the third leading cause of disease burden for Indigenous people [10].

Physical activity is defined as 'any bodily movement produced by skeletal muscles that requires energy expenditure' [11]. Physical activity has an important role to play in the health outcomes of Indigenous people. To date, limited information has been available on the levels of participation in physical activity in the Indigenous population, and even less on the cultural implications of physical activity within an Indigenous context [12, 13]. Varying definitions and understandings of what constitutes physical activity can result in different survey responses, leading to an under or over-estimation of the extent of physical activity levels across population groups [14, 15]. Some Indigenous people have a very different view of physical activity to the 'westernised' concept [16, 17], and this difference can impact on self-reported levels of activity as well as the ability to make comparisons between population groups.

The *National Physical Activity Guidelines for Australians* recommend moderate physical activity on most, preferably all, days of the week to improve health and reduce the risk of chronic disease and other conditions [18, 19]. For children, at least 60 minutes of activity is recommended, and, for adults, at least 30 minutes is recommended; these time periods can be in blocks of activity or accumulated throughout the day in short bursts [19]. The amount of sedentary behaviour should also be limited to no more than one hour at a time, with the exception of sleeping.

As noted above, low levels of physical activity have been shown to increase the risk for cardiovascular disease (CVD), type 2 diabetes, certain cancers, depression and other social and emotional wellbeing conditions, overweight and obesity; and it can also lead to a weakened musculoskeletal system [4, 18, 19].

In Australia, the costs of physical inactivity to healthcare, productivity and mortality are high [20]. There are no estimates of the cost for Indigenous people, but given their relatively high levels of physical inactivity, and the greater levels of chronic disease and other conditions, it is likely to be a significant burden.

This review focuses on physical activity levels among Indigenous people, the impact of low levels of physical activity on chronic conditions, and other health considerations. The review also summarises different forms of participation, and the barriers to participation for Indigenous people. Importantly, the review also includes information on physical activity policies and strategies, and considers how culturally appropriate interventions and health promotion could lead to improvements in physical activity levels and subsequently the overall health of Indigenous people.

Context of physical activity among Indigenous people

The current health status of Indigenous people is linked to the social inequalities they have experienced over time [21]. With particular reference to physical activity levels, it is evident that the active lifestyles and roles Indigenous people once held were disrupted by the dispossession associated with European colonisation. The health disadvantages can be viewed as historical in origin [22], but they continue through contemporary social foundations and are reflected in the various 'social determinants of health' [23].

Until the late 18th century, Australian Indigenous people had largely a hunter-gatherer lifestyle [22]. This lifestyle incorporated the day-to-day physical activity involved with finding renewable food and resources, sustaining the spiritual connection to country, and maintaining familial and cultural practices.

Many Indigenous people experienced a diverse environment of extreme climate and varying terrain, and it was not uncommon for large groups of people to move periodically to areas where access to food and water were attainable, depending on season and location [24]. This lifestyle incorporated the physical activity of moving across the land as well as sourcing and obtaining the required resources. Indigenous people used renewable natural resources from the land at a level for sustenance, rather than producing surplus through rigorous agriculture or industrialisation. This meant that physical activity was required on an ongoing basis to identify and procure the necessary food resources.

With the arrival of the Europeans from 1788, the lifestyles of Indigenous people were forced to change with the gradual spread of the European settlers [22, 24]. The agricultural practices introduced by the settlers progressively took the natural resources away from many Indigenous people and displaced them from their lands. This dispossession meant that many Indigenous people had to rely on the provision of food by the Europeans.

Physical activity levels and nutrition were greatly impacted by these changes to the roles of Indigenous people [24]. Physical activity had been encompassed in the cultural lifestyle, but it now became a separate westernised concept. Reduction in the physical activity levels of Indigenous people over time, combined with poor nutrition practices associated with dispossession, became

embedded in the social foundations and determinants of health. This has contributed to the development of chronic conditions, such as CVD and diabetes, as well as other health conditions (such as being overweight or obese), particularly in the last half century or so.

The social determinants of health incorporate a holistic view of health on a broad scale [25]. This can be seen as fitting with the traditional Indigenous perspective of health, which incorporates life, land, environment, physical body, community, relationships and law [26]. The importance of recognising this holistic approach to health is evident when considering specific health aspects, such as physical activity levels. For some Indigenous people, the concept of physical activity is not understood in the same way as other Australians [16, 17]. The activities of the traditional Indigenous lifestyle, involving hunting, gathering, and participation in other customary activities, were vital, interwoven aspects of life [17]. These historical roots form part of the contemporary values of many Indigenous people; from this, it can be seen why engaging in an individual activity, such as physical activity, to benefit only oneself and in isolation from family or community, may be seen as inappropriate.

Physical activity (including activities like group fitness classes or walking groups) continues to not be seen by many Indigenous people as a separate, measurable concept in the same way as it is by non-Indigenous people [17]. This has implications for the assessment of physical activity, as well as the implementation and evaluation of specific interventions among Indigenous people. At a statistical level, self-reported measures could inaccurately record the level of physical activity for Indigenous people, as the westernised definition and measurements of physical activity used may differ from Indigenous concepts. Interventions targeting physical activity for Indigenous people risk failure if they are based on westernised views of physical activity rather than taking account of Indigenous concepts of physical activity.

Guidelines

Guidelines for physical activity in Australia, developed by the Australian Department of Health and Ageing, outline the minimum levels of physical activity required in order to achieve health benefits [19]. The national guidelines are written for different age groups but do not acknowledge different cultural backgrounds.

There is recognition of the benefits of physical activity in the prevention and management of chronic disease [27, 28], but the scientific background report [29] on which these guidelines were developed was written over a decade ago and has not been updated. The 1999 report recognised the need for these guidelines to be adapted for different population groups for them to be beneficial [29, 30].

The *National Physical Activity Guidelines* for Australians do not yet incorporate guidelines for Indigenous people, but research,

although limited, has been conducted in this area to ascertain the levels of knowledge and suitability of these guidelines [12, 13, 31]. The overall recommendations should stay the same for Indigenous people, but the type of physical activity, communication and dissemination of the recommendations may differ [32]. While the physiological factors are the same, the historical, cultural and environmental factors differ. A specific focus on Indigenous people that takes into account the cultural issues and acknowledgment of the social determinants of health could allow for further inclusion of the Indigenous population. Examples of mainstream activities, such as taking the stairs instead of the lift, may not be relevant to some Indigenous people, whereas a focus on family activities or more traditional activities may be more relevant.

Box 1: Physical activity guidelines

Very young children

Birth to 1 year

Physical activity should be encouraged from birth, particularly supervised floor-based play [19]. Once infants are mobile they should be encouraged to be as active as possible in a safe, supervised and nurturing play environment.

Minimising long periods of inactivity is recommended for infants, with the exception of sleeping they should not be kept inactive for more than one hour at a time [19].

1 to 5 years

Toddlers (1 to 3 years) and pre-schoolers (3 to 5 years) should be physically active every day for at least three hours, spread across the day [19]. Active play is the best way for young children to be physically active.

In addition, children younger than 2 years of age should not spend any time watching television or using other electronic media such as television and computer games; and for children 2 to 5 years of age these activities should be limited to less than one hour per day. In general, minimising long periods of inactivity is recommended for toddlers and pre-schoolers, with the exception of sleeping they should not be kept inactive for more than one hour at a time [19].

Children

Australian children aged 5 to 12 years are recommended to have 60 minutes of a combination of moderate and vigorous physical activity every day [19]. Moderate activities for children can include walking, riding a bike or active play, and vigorous activities can include activities of a greater intensity, such as football, netball, running and swimming. The recommendations place importance on a variety of activities and the limited use of electronic media (such as television and computer games).

Adolescents

Young Australians aged 12 to 18 years are recommended to have at least 60 minutes of physical activity every day [19]. This amount can be achieved with short sessions of activity throughout the day, but it is recommended that this includes activities of moderate intensity (such as walking), and vigorous intensity (such as running, swimming, training for sport).

Adults

It is recommended that adults have at least 30 minutes of physical activity every day [19]. This can be a combination of shorter activities, such as two periods of 15 minute activities, for example one in the morning and one in the afternoon. The guidelines also suggest that adults think of all body movement as a benefit and incorporate as much active body movement they can every day: an example of this is walking instead of using the car, or taking the stairs instead of the lift.

Older Australians

The recommended amount of physical activity for older Australians is at least 30 minutes on most, if not all, days at a level of moderate intensity [19]. They should do some form of physical activity that is easily manageable and suitable for their capability, despite age, weight, health concerns or abilities. This can be achieved through being active every day in as many ways possible incorporating fitness, strength, balance and flexibility. Older people who are new to starting physical activity or those who have not been active in a while should start at a manageable level and gradually work towards the recommended amount. Older people who regularly participate in a physically active lifestyle are encouraged to carry on in a manner suited to their capabilities, provided they follow recommended safety procedures and guidelines.

People living with chronic conditions

Physical activity is necessary to maintain a healthy lifestyle and prevent chronic conditions, but considerations also need to be given to the physical activity requirements for people living with chronic conditions [19]. Living with a chronic disease can impact on a person's ability to participate in the recommended levels of physical activity. This is an area that needs further development in terms of addressing physical activity.

Physical activity levels among Indigenous people

The two most recent detailed sources of information on the physical activity levels of Indigenous people are the *National Aboriginal and Torres Strait Islander social survey, 2008* (NATSISS) and the *National Aboriginal and Torres Strait Islander health survey, Australia, 2004-05* (NATSIHS)[4, 5]. See Box 2 for further information relating to key sources for this review.

Box 2: Key sources and data limitations

The comparison of the physical activity levels of Indigenous people and non-Indigenous people should be viewed with a degree of caution, partly because of the likely conceptual differences, and partly because the information may be derived from different sources. Caution should also be applied when comparing recent estimates of Indigenous people's participation in physical activity with those from previous sources. This is for a number of reasons. First, improvements to data collection methods over time (including better identification of Indigenous people) may lead to increased accuracy [4]. Second, survey questions can be worded differently over time: this may lead to different interpretations of questions, impacting on responses. And, third, survey

questions can be open to interpretation: Indigenous people's concepts of physical activity may be different from the concepts incorporated in the questions and this may result in inaccurate responses.

The 2004-2005 NATSIHS was conducted in remote and non-remote areas; however specific data for physical activity for Indigenous people living in remote areas is not available. Therefore limitations related to the geographical context should be realised as approximately 27% of Indigenous people in the study lived in remote or very remote areas and have differing demographic characteristics than those living in non-remote areas [5]. Another difficulty in comparing the two population groups is the age structure. The Indigenous population is younger overall than the non-Indigenous population. As a result, measures that don't take account of this difference (known as 'crude' measures) do not enable accurate comparisons between Indigenous people and non-Indigenous people. A procedure known as standardisation adjusts health measures (such as rates) to minimise the effects of the differences in the age structures of the Indigenous and non-Indigenous populations. [33, 34].

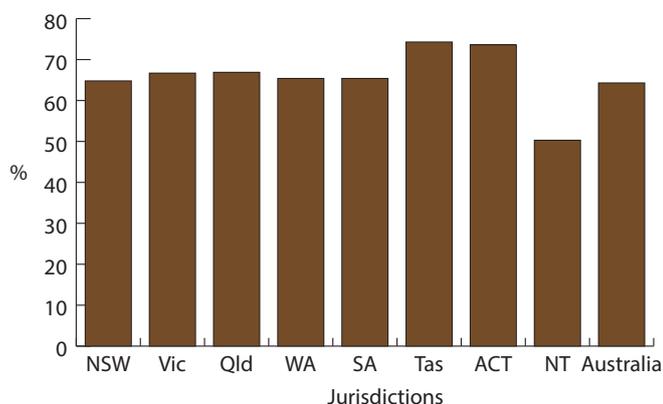
The source information for figures 1 and 2 and tables 1 to 3 was derived from specialised tables of the *National Aboriginal and Torres Strait Islander social survey, 2008* (NATSISS) [Derived from 35] sourced from the Australian Bureau of Statistics (ABS) and were subject to statistical analysis.

Substantial cultural information has been drawn upon from the *Aboriginal perspectives on physical activity in remote communities: meanings and ways forward* [17]. The research in this report was conducted in consultation and collaboration with community members and service providers in remote communities in the Northern Territory. The source uses qualitative exploration of Indigenous perspectives to guide culturally appropriate promotion of physical activity.

For children, information collected in the 2008 NATSISS reveals that almost two-thirds (64%) of Indigenous children aged 4-14 years had taken part in some form of physical activity or sport in the 12 months prior to the survey [Derived from 35]. Almost three-quarters (74%) of Indigenous children in this age-group had been physically active for at least 60 minutes on every day in the week before the survey, and only 3% had not had any activity [4].

Indigenous males (aged 4-14 years) were slightly more likely to participate in physical activity than were Indigenous females (aged 4-14 years), 65% and 63% respectively [Derived from 35]. Indigenous children living in major cities were most likely to participate in physical activity (68%), compared with those living in inner/outer regional areas (65%) and remote/very remote areas (58%). The greatest proportions of children participating in physical activity were seen in Tas (74%), and the lowest proportions in the NT (50%) (Figure 1) [Derived from 35].

Figure 1. Proportions (%) of Indigenous children aged 4-14 years who participated in physical activity, by state and territory, Australia, 2008



Source: Derived from Australian Bureau of Statistics, 2011 [Derived from 35].

Almost one-third (30%) of Indigenous people aged 15 years or older reported to the 2008 NATSISS that they had taken part in some form of physical activity or sport in the previous 12 months [Derived from 35]. Participation levels were higher among Indigenous males (38%) than among Indigenous females (23%), and levels decreased with age for both sexes – from around 44% for the 15-24 years age-group to around 10% for the 55 years and over age-group (Table 1) [Derived from 35].

Table 1. Proportions (%) of Indigenous people aged 15 years and over who participated in physical activity, by sex and age group, Australia, 2008

	15-24	25-34	35-44	45-54	55+	All ages
Male	53	41	34	23	12	38
Female	36	22	24	13	8	23
Persons	44	31	29	18	9	30

Source: Derived from Australian Bureau of Statistics, 2011 [35].

The participation levels were highest for people living in major cities for both sexes (33%), followed by inner/outer regional areas (29%), and remote and very remote areas (28%) (Table 2) [Derived from 35].

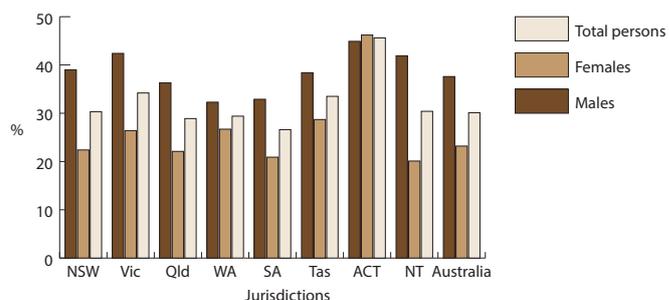
Table 2. Proportions (%) of Indigenous people aged 15 years and over who participated in physical activity, by sex and geographical area, Australia, 2008

	Major cities	Inner/outer regional area	Remote/very remote area	Total areas
Male	40	37	36	38
Female	27	23	19	23
Persons	33	29	28	30

Source: Derived from Australian Bureau of Statistics, 2011 [35].

Of all the states and territories, the highest participation levels were seen in the ACT (46%) and the lowest levels were found in SA (27%); differences in proportions for Indigenous males and Indigenous females were greatest in the NT where Indigenous males participated over twice as much as Indigenous females (42% compared with 20%) (Figure 2) [Derived from 35].

Figure 2. Proportions (%) of Indigenous people aged 15 years and over who participated in physical activity, by sex and state and territory, Australia, 2008



Source: Derived from Australian bureau of statistics, 2011 [Derived from 35].

Of all Indigenous people 15 years and older that took part in the survey, around 90% identified their status as Aboriginal, around 5% identified as Torres Strait Islander, and around 5% identified as both Aboriginal and Torres Strait Islander [Derived from 35]. The participation levels of physical activity of each of these groups were similar: Aboriginal people (30%), Torres Strait Islanders (33%), and Aboriginal and Torres Strait Islander people (32%) (Table 3) [Derived from 35]. Participation levels varied between the sexes: those who identified as Torres Strait Islanders had the highest levels of participation for males, and the lowest for females.

Table 3. Proportions (%) of Indigenous people aged 15 years and over who participated in physical activity, by sex and Indigenous status, Australia, 2008

	Aboriginal	Torres Strait Islander	Aboriginal & Torres Strait Islander	All persons
Male	37	46	41	38
Female	23	18	24	23
Persons	30	33	32	30

Source: Derived from Australian Bureau of Statistics, 2011 [35].

Earlier information from the 2004-2005 NATSIHS reveals three-quarters (75%) of Indigenous people living in non-remote areas reported sedentary (very low or no physical activity) or low levels of physical activity [5]. After age adjustment, the level of being sedentary was 1.5 times higher for Indigenous people living in non-remote areas than for their non-Indigenous counterparts [36] (Table 4).

Table 4. Proportions (%) of Indigenous people aged 15 years and over who participated in some form of physical activity, by sex, Indigenous status and Indigenous:non-Indigenous ratios, Australia, 2004-2005

	Indigenous	non-Indigenous	Ratio	All persons
Sedentary (non-remote areas)	51	33	1.5	38
Low levels of activity	27	36	0.8	23
Moderate to high levels of activity	21	31	0.7	30

Source: Australian Bureau of Statistics, 2006 [5].

Indigenous females reported a greater proportion of sedentary activity levels than did Indigenous males (51% compared with 42%) [36]. The highest levels of sedentary or low levels of activity were reported among the older age-groups, including 45-54 years (83%) and 55 years and over (85%). The highest levels of moderate to high physical activity levels were reported for age-groups 15-24 years (32%) and 25-34 years (27%).

Additionally, Indigenous people reported higher proportions of sedentary or low activity levels than non-Indigenous people across all states and territories. The highest sedentary/low levels for Indigenous people were seen in NSW (78%) and Tas (70%) (Figure 3) [36].

Between 2001 and 2004-2005, levels of being sedentary among Indigenous people aged 15 years and older increased from 37% to 47% [36]. The disparity between Indigenous people and non-Indigenous people in being sedentary also increased between 2001 and 2004-2005 from 11% to 18%.

Factors contributing to physical activity levels among Indigenous people

Indigenous people face many barriers to their engagement in physical activity, perhaps more so than the general population. These barriers can be cultural (such as the perceptions of health, inclusion of family or community, and concepts of time or structure), geographical (such as physical location, environment, terrain and climate), and socioeconomic (including resources, accessibility, transport and costs) [16, 17, 37]. These barriers can limit the impact of interventions aimed at increasing physical activity among Indigenous people. Historical factors have played an influential role in the current status of physical activity levels and the prevalence of chronic disease among Indigenous people. Current cultural

complexities need to be respected in the development of policies, strategies, and prevention, management, and treatment initiatives to increase the participation of Indigenous people in physical activity and reduce the associated burden of chronic diseases [38].

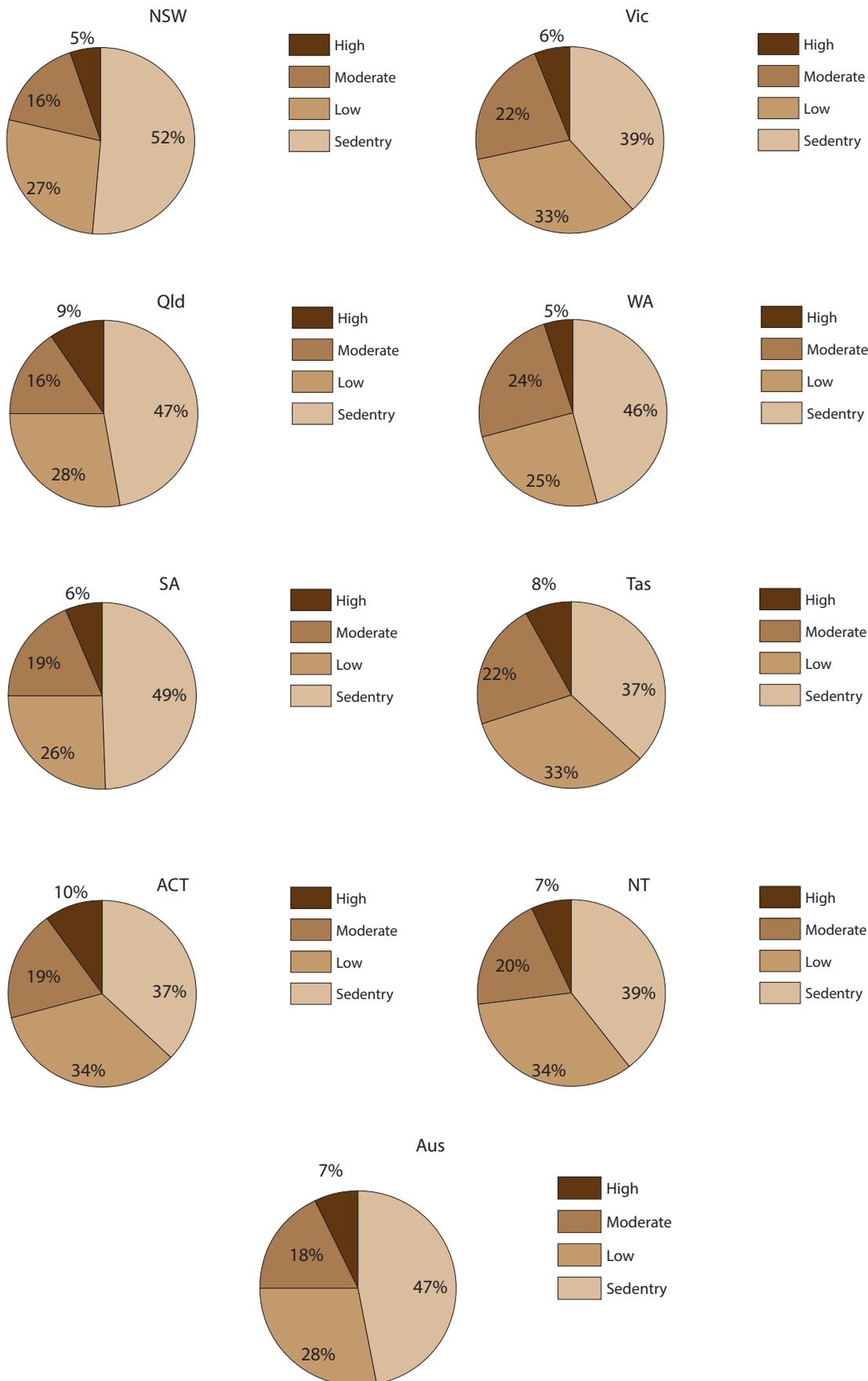
As noted above, health is conceptualised holistically by Indigenous people to encompass all things vital in a person’s life including land, body, community, relationships, environment, and law. Physical activity is therefore not considered a separate behaviour by some Indigenous people, but incorporated into the overall lifestyle [17]. Cultural complexities associated with physical activity can include feelings of shame – exercise can be seen as an activity that only benefits an individual rather than a family or community as a whole – this can be an additional barrier to physical activity for Indigenous people [16, 17, 38]. Mainstream physical activity programs may not always be appropriate, social structures can create challenges for participation, such as mixing between skin groups and gender; conversations between people in certain relationships may also be prohibited. Generally, programs should be gender focused, targeting males and females separately.

For some Indigenous people, concepts of space, time and activities differ from those for most non-Indigenous people.³ Non-Indigenous people organise these according to westernised measurable systems such as date, time and place, but it has been reported that some Indigenous people also use natural cues, such as seasonal timing and the nature of the environment [17]. Therefore, physical activity guidelines that specify regular frequency, duration and types of activity can be inappropriate for some Indigenous people. Culturally inclusive ways of incorporating physical activity (such as caring for country, and offering culturally inclusive school activities) developed in consultation with Indigenous communities [39, 40] could be more relevant and have increased likelihood of success. It is important to note that some components of the Indigenous population are relatively transient, which also makes regular and sustainable participation in programs and treatment more difficult.

Perceptions regarding local practitioners or health workers can also influence physical activity levels through reduced program participation. There may be a fear of doctors and other authorities among some Indigenous people, due to their roles and associations with governments in the period of the stolen generation [17]. The labels of staff and programs such as ‘Chronic disease screening officer’ or ‘Physical activity program’ may limit participation due to stigma or other forms of cultural inappropriateness [17]. The term ‘healthy lifestyle’ is more acceptable, so staff titles and activities such as ‘Healthy lifestyle worker’ and ‘Healthy lifestyle checks’ may be preferable. Confidentiality issues may also be a further barrier, particularly the perceived lack of anonymity and confidentiality in communities or instances of family members working at local health services.

³ It is beyond the scope of this review to go into further detail about cultural perspectives of physical activity; for more information in this area please see Thompson, 2009 [17].

Figure 3. Physical activity levels of Indigenous people aged 15 years and over, by state and territory, 2004-2005



Source: Australian Institute of Health and Welfare, 2011 [36].

Environmental challenges, such as geographical locality, terrain and climate can influence program participation and can have socioeconomic considerations [33]. This is important as many Indigenous people reside in areas other than major cities, around one-quarter in areas considered remote/very remote. These factors can greatly affect the levels of physical activity among Indigenous people due to reduced availability and frequency of services and access to programs in remote areas, the cultural suitability of exercise programs, road access, population to Indigenous health worker and registered nurse ratios [16].

Factors such as age, gender, cultural group and socio-economic status can influence individual engagement with services, literacy levels and English as a second language may also have an impact [16]. Health itself is a low priority for some Indigenous people, particularly women who may place a higher focus on their family than themselves. A lack of awareness about existing services and the cost of services can also be a further barrier. A lack of perception about physical inactivity as a risk factor for chronic disease could also reduce awareness about the need for physical activity, therefore contributing to the lower levels among the Indigenous population [16].

Physical activity and chronic disease

Physical activity can impact health and wellbeing in many ways. Most importantly, all-cause mortality has been shown to have a strong correlation with levels of physical inactivity [28]. Physical inactivity is linked with various types of chronic disease, such as CVD, stroke, type 2 diabetes, and some cancers [8]. Physical activity is protective in terms of the musculoskeletal system, maintaining a healthy bodyweight, and reducing depression and the risk of dementia. Being physically active can also aid in prevention and/or reduction of injury [28], osteoporosis [27], and arthritis. Other biomedical risk factors, such as high blood pressure (hypertension), high blood cholesterol, and excess high density lipoprotein, are associated with low levels of physical activity [32, 41].

Links between physical activity and the prevention of chronic disease

The links between various risks factors, such as tobacco smoking, alcohol consumption, poor diet, physical inactivity, and chronic disease, are well established [8]. There are many complex causal relationships between these factors and chronic disease [8], and chronic disease may also be caused by, or be a complication of, one or more other diseases. For example, 42% of Indigenous people with diabetes have multiple chronic diseases [42].

Risk factors cannot be viewed in isolation, however, as they can work synergistically with other determinants to influence the prevalence of chronic disease. Addressing risks factors for the most prevalent condition, CVD, can have the effect of reducing the risk

of other conditions that share these risk factors [41, 43]. In 2003, physical inactivity accounted for 6.6% of the overall disease burden in Australia [9], and 8.4% of the burden among the Indigenous people [10].

Cardiovascular disease

The main diseases of the cardiovascular system, which incorporates the heart and circulation, and are most influenced by physical activity, are coronary (ischaemic) heart disease (CHD) and stroke [9, 41, 44]. Physical inactivity is an important contributor to the risk of developing CVD, particularly CHD, heart failure and stroke [5]. Australians who are physically inactive are twice as likely to die from CHD as those with regular physical activity [41]. Physical activity has been linked with favourable cardiovascular and metabolic disease risk profiles [32]. It has also been linked with significant physical and psychological improvements in people with CVD [45].

Based on self-reported results from the 2004-2005 NATSIHS, of all Indigenous people living in non-remote areas who reported having CVD, 58% were physically inactive [5, 44]. After adjusting for age, males and females had similar levels of inactivity. Physical inactivity increased with age, and almost three-quarters of people aged 65 years and over who had CVD were sedentary. Indigenous people were 1.6 times more likely than non-Indigenous people to be physically inactive. Indigenous people reported greater levels of physical inactivity than non-Indigenous people across all age groups; this was particularly high for the 45-64 years age groups, with levels almost twice as high.

Physical inactivity accounts for 30% of the disease burden of CVD in the Indigenous population (the other main contributors are tobacco smoking (33%), high body mass (31%) and high blood cholesterol (31%)) [46]. In comparison, physical inactivity accounts for 24% of the disease burden of CVD of the total population in Australia [41].⁴

The benefits of regular physical activity are not only linked to a reduced risk of developing CVD, but in reducing some of the other associated risk factors (such as type 2 diabetes, bodyweight, hypertension, high levels of total blood cholesterol and high-density lipoprotein [5]. Physical activity improves blood cholesterol and blood pressure [28]; positive changes to these factors can lead to overall improvements to cardiovascular health.

Type 2 diabetes

Physical activity can assist in the prevention and management of type 2 diabetes [16, 18, 19, 27, 28]. It can reduce the likelihood of developing diabetes and also help to reverse high sugar levels. Physical activity is also an important intervention in

4 In Australia, the direct health cost attributable to physical inactivity for CHD and stroke was over \$570 million per annum in 2007/08; this accounts for over a third of the total gross cost [20]. Figures are not available for Indigenous people specifically, but, given their high levels of CVD and physical inactivity, the impact is likely to be considerable.

the maintenance of diabetes. The burden of diabetes among Indigenous people attributable to physical inactivity is 31% (63% of the burden is attributable to high body mass) [46]. Significant physical and psychological improvements in people with type 2 diabetes have also been linked with physical activity [32, 45].

Cancer

Physical activity can protect against cancer independently as well as contributing to weight control [27, 28]. Evidence for the benefit of physical activity is strongest for colon cancer in men and breast cancer in women. Physical activity has also been linked with significant physical and psychological improvements in people with cancer [45, 47]. The effects have been beneficial before, during and after treatment, leading to reductions in fatigue and stress, and improvements to fitness and muscle function.

Physical inactivity accounts for 5% of the burden of cancer among Indigenous people, following tobacco (35%) and alcohol (6%) [46]. Modifiable risk factors, including physical inactivity, contributed to 49% of the total burden of cancer among Indigenous people.

Comorbidity

The potential positive effects can be seen when taking a focus on co-morbidity. For example it is reported that psychosocial stress can be associated with the risk of developing cancer, particularly breast cancer. Physical activity has been reported to be effective in directly reducing the risk of cancer; however it is also reported as being an effective measure in directly reducing psychosocial stress, which in turn can reduce the risk of developing cancer. The multifaceted correlations between physical activity, social and emotional wellbeing and cancer highlight the potential for great opportunities in reducing the risk of chronic diseases [45].

Further correlations include the links between physical activity, endogenous sexual hormones, and the risk of breast cancer; as well as physical activity, adiposity and levels of estrone; and also physical activity, body mass, and insulin correlated with the risk of developing cancer including breast, colorectal, prostate and lung [45].

Further examples include the multifaceted links between physical activity, chronic diseases and their risk factors. For example physical activity is directly related to a reduction in the risk of cardiovascular disease, but it is also a correlating factor in the reduction of CVD risk factors such as blood cholesterol and blood pressure, which can lead directly to overall improvements to CVD [28, 45].

Physical activity in the management and treatment of chronic disease

Physical activity is important not only in the prevention of chronic disease [48], but can also benefit people with established disease (see 'Treatment services', below).

Physical activity can have a major role to play in the rehabilitation of diseases and the quality of life of people with existing chronic diseases [45]. Physical activity can lead to improvements in social and emotional wellbeing and physical functioning, factors which can affect people with cancer. It has been reported that physical activity can have a positive effect and is a safe treatment option that can lead to improvements in fatigue, depression, body mass, fitness and physical functioning which can improve the quality of life for those with cancer. There is also evidence to suggest that those who took part in regular physical activity reduced their risk of mortality from this disease by half when compared with those who did not engage in physical activity [49].

Physical activity is important in the management and treatment of existing CVD and in the rehabilitation follow up of CVD events in people with clinically stable CVD. It has been reported that physical activity can improve quality of life for people with CVD and is recommended as part of a standard treatment program [45]. Physical activity is further beneficial in that it can lead to improvements in oxygen consumption which is a measure of functional capacity in people with CVD [45]. It can also benefit: physiological functioning such as improved walking mobility for stroke survivors; reduce the symptoms of CVD such as angina symptoms and shortness of breath; improve quality of life; improve coronary risk profile such as blood pressure and triglyceride and high-density lipoprotein cholesterol concentrations; and lower mortality for those who survived acute myocardial infarction [50-53]. For people with CVD, it is suggested that the greatest benefit is seen among those who were the least active before beginning physical activity, and that benefits can be seen even in low levels of participation [50]. Physical activity was also associated with recurrent cardiac events reduced by around 30%, and hospital readmissions around 25% lower in those completing regular physical activity [52].

Effective treatment and management of type 2 diabetes should include regular physical activity as it can improve glycaemic control independent of its effect on body mass, which may lead to a reduction in diabetes medication and improve the control of blood pressure [54]. As part of the glycaemic control, physical activity has been reported to positively affect the sensitivity of muscle and liver insulin and the uptake and utilisation of glucose in the muscles. Physical activity in those who have type 2 diabetes can lead to improvements in lipid profile, body mass and blood pressure and can positively correlate to thromboembolic state [54]. Overall, this can lead to a reduced risk of CVD, particularly important for those people with diabetes, as their risk of CVD events are twice as high as those who do not have type 2 diabetes. Physical activity has an important role to play in the prevention of both CVD and total mortality for those people with diabetes [55]. The development of long term complications associated with diabetes such as neuropathy, retinopathy, and nephropathy can be prevented or delayed by the introduction of regular physical activity, and, as

with other chronic conditions above, physical activity can lead to quality of life for those with diabetes through improvements to social and emotional wellbeing, and the reduction in the risk of developing other chronic diseases [54].

Costs of physical inactivity

Reduced physical activity levels have overall costs to the community, both financial and in terms of health (such as death and disability). The only information enabling comparison of these costs between Indigenous and non-Indigenous people is the cost of reduced life expectancy and quality of life due to physical inactivity, which is measured through disability adjusted life years (DALYs). For Indigenous people, physical inactivity was responsible for 8,032 DALYs, 8.4% of the total, with a rate of 16.9 per 1,000; in comparison, physical inactivity was responsible for 6.6% of the total DALYs for non-Indigenous people at a rate of 3.1 per 1,000 (the Indigenous:non-Indigenous rate ratio is 5.4) [46].⁵

Other health benefits of physical activity

Apart from reducing the risk of developing chronic disease, participation in physical activity can lead to other health benefits, as well as social, environmental, and economic benefits [27, 56]. Physiologically, these include improvements to the circulatory system, musculoskeletal system, and changes to areas of the brain that can influence social and emotional wellbeing [32, 57].

Musculoskeletal system

Particular benefits of physical activity to the musculoskeletal system include a reduction in injury and falls and can also protect against the development of conditions relating to bone and joint health (such as osteoporosis and arthritis), and aid in the maintenance of these conditions [27, 32, 57]. Physical activity can increase the mobility and flexibility of joints, and maintain and improve muscle mass, strength, power and intrinsic neuromuscular activation, as well as improvements to overall posture and balance. Physical activity can also achieve reductions in pain, fatigue, stress, tiredness and muscle tension as well as increase muscle strength, posture and balance. Physical activity which includes bone loading activities can increase bone mineral content and bone mass density [32]. The risk of a hip or vertebral fracture decreases with regular physical activity. In older adults with poor mobility the risk of falls is reduced by around 30%, however there is no evidence for

5 The overall direct net cost of physical inactivity in Australia has been estimated at \$719 million per annum [20]. In 2008, the number of deaths due to physical inactivity was estimated at more than 16,000, and the direct mortality cost was calculated to be in excess of \$3.8 billion in 2007-08. In 2003, physical inactivity was the fourth highest ranked risk factor, with 174,431 DALYs. The total economic cost of physical inactivity in Australia in 2008 has been estimated at over \$13.8 billion.

older adults who are not at risk of falls [32].

Social and emotional wellbeing

Physical activity can improve social and emotional wellbeing, in particular aerobic exercise, which increases the heart rate and strength training programs that can reduce the symptoms of depression [27]. Associations are also seen between physical activity and feelings of wellbeing, and lowered levels of stress and anxiety [32, 57]. Physical activity is a potential remedy for reducing social isolation; activities with a social component are a source of social support.

Nutrition

Physical activity and nutrition both play a key role in maintaining a healthy weight [58]. Healthy eating in combination with physical activity maintains a healthy weight and serves as a protective factor against chronic disease.

Overweight and obesity

Conditions of overweight and obesity are caused by energy imbalances from inadequate levels of physical activity and poor diet [58]. Overweight and obesity are further risk factors for chronic disease. Health benefits of physical activity are increased cardiorespiratory and muscular fitness which can lead to a healthier body mass and composition [32, 57].

Management and rehabilitation

Prevention initiatives

There are a number of initiatives which aim to prevent chronic disease among Indigenous people through promoting physical activity as part of a healthy lifestyle, often together with improving other lifestyle factors such as alcohol, diet and tobacco behaviours. Types of initiative can include walking groups, swimming, dancing, aerobics classes, caring for country activities and organised sports programs. Many of these initiatives anecdotally report increased physical activity among participants. However, initiatives often face challenges in their implementation and better evaluation is needed [12]. A recent review of the peer-reviewed literature found only five published studies reporting results of programs to increase physical activity, four of which involved physical activity together with nutrition. One successful initiative, based in the Kimberley, WA, found diet and physical activity intervention resulted in increased physical activity and improved diet and blood sugar levels but no improvements in weight or diabetes prevalence [59]. Sustainability of the program and involvement of local Aboriginal people were also key successes of the program. Since this review was published however, findings from other programs appear promising, a lifestyle program to prevent and treat diabetes improved physical activity and diet in 101 urban Indigenous Australians [60]. In four remote

northern WA communities, positive changes were documented in knowledge about food, nutrition, exercise and disease and altered attitudes and behaviours related to dietary and exercise patterns in a community driven diabetes program [61]. Two further studies currently occurring may also show positive outcomes [62, 63].

Provision for culturally-appropriate and Indigenous-led physical activity initiatives for all Indigenous people are important ways of increasing physical activity levels. Increased efforts to implement and evaluate such programs are warranted, focussing on sustainability and ownership of programs by local Indigenous people.

Treatment services

Chronic disease treatment services provide an opportunity to promote physical activity, but access to these services by Indigenous people can be a challenge due to inadequate resources, difficulties of reaching people in remote areas, and the lack of culturally appropriate services. However, some initiatives are successfully overcoming these challenges through community consultation and governance [64] and education initiatives in the primary care workforce [65].

People with chronic diseases, such as CVD, diabetes, kidney disease, cancer, arthritis and asthma, can usually achieve physical and social and emotional benefits from physical activity. However, types of physical activity which can be undertaken vary across condition and by individual, and professionally tailored programs and advice are essential. Cardiac rehabilitation programs are safe and can effectively increase physical activity [66], but cultural barriers to this type of activity among Indigenous people need to be considered [67]. Indigenous-specific programs that incorporate physical activity in chronic disease treatment are recommended.

Policies and strategies

All states and territories have policies and strategies for physical activity, but there is currently no consistent approach across Australia, or specific to physical activity among Indigenous people.

In 1998, *Active Australia*, a national participation framework, was developed by the Australian Government ministers for sport and health and the ministers for sport in all states and territories [68]. It included specific strategies in: public education; physical environments; infrastructure and capacity building; and monitoring. However, the framework was abandoned in 2001-02 before much of the policy actions could be implemented. Physical activity now tends to be solely under the jurisdiction of the state and territory health authorities. There has been no formal national, multi-sectoral physical activity strategy since *Active Australia* around the year 2000.

After the abandonment of the national framework, various strategies, initiatives and programs were developed in states

and territories across Australia. An example of which included the WA Physical Activity Taskforce. The WA Physical Activity Taskforce guided the development and implementation of a whole of community, state-wide physical activity strategy from 2001-2012 [69]. The taskforce involved the departments of sport and recreation, education, health, planning and transport as well as Healthway (the WA health promotion foundation), local government, NGOs and academic groups. The taskforce aimed to provide strategic direction and input into government policy; support physical activity programs in schools, workplaces and the community; conduct research into physical activity participation rates and behaviours; and support the planning of transport and urban environments that make physical activity easier, safer and more fun. In July 2012, the Physical Activity Taskforce had its funding discontinued and ceased to operate. Other states and territories undertook similar paths to the WA example.

The *National Physical Activity Guidelines for Australians* were first developed as part of *Active Australia*, and the Australian Department of Health and Ageing (DoHA) has maintained responsibility for the subsequent development of guidelines for all population age groups [19]. DoHA currently has a banner initiative *A healthy and active Australia* comprising a number of campaigns promoting physical activity: *Measure up* [70], *Swap it don't stop it* [71], *Healthy spaces and places* [72], *Get set 4 life* [73], *Healthy communities initiative (HCI)* [74], *Healthy weight* [75], and *Active after-school communities (AASC) program* [76]. Also at the national level, physical activity is relevant to the Australian National Preventive Health Agency (ANPHA) [77], Australia's first national preventative health agency with the capacity to lead, support and coordinate health prevention and health promotion efforts for the period 2011-2015.

Other physical activity initiatives are encapsulated in preventive health measures including obesity. Additional health promotion programs are run by other organisations such as the National Heart Foundation and Diabetes Australia. Other policy and strategy documents relevant to physical activity are the *National primary health care strategy*, *Australian sport: the pathway to success* [78], *Closing the gap strategy* [79], *National early childhood development strategy* [80] and the *National mental health plan* [81].

In 2008, The Preventative Health Taskforce was established. The first phase (2010-2013) involved the establishment of a National Prime Minister's Council for Active living [82] and the development and implementation of a National Framework for Active Living. Part of this included the COAG *Healthy communities initiative* that aimed to establish a national series of comprehensive five-year intervention trials in 10-12 communities, including Indigenous communities [83].

Specific to Indigenous people, key action area 7 of the *Blueprint for an active Australia* involves the provision of programs and opportunities to increase physical activity levels among Indigenous people. These programs will be developed in accordance with

community needs and culture, and those that are effective will be sustained through funding expansions to other communities. The blueprint aims to ensure that the environment in communities is conducive to safe participation in physical activity, and that participation opportunities are available for Indigenous children at school and at home. The need for research funding and program evaluation is highlighted in the blueprint to gain a better understanding of what is working in the area of physical activity [82].

Most recently the National Preventative Health Taskforce published a report *Taking preventative action* [84] in response to *Australia: the healthiest country by 2020*. In the report they outline recommendations for action in the area of obesity which includes \$161 million to be used to reduce the prevalence of chronic disease risk factors such as a lack of physical activity among Indigenous people [84]. The recommendations also include areas outside of health such as education and infrastructure, to optimise opportunities for the improvement in physical activities levels such as increasing physical activities for children in child-care, pre-school and school settings through the National curriculum.

Concluding comments

Physical inactivity is a major health problem for Indigenous people and it is the third leading cause of disease burden. The levels and impacts of physical inactivity are greater for Indigenous people than they are for other Australians. Chronic disease accounts for almost three-quarters of the observed difference in the burden of disease between the Indigenous and non-Indigenous populations; physical activity can help to reduce the extent and impact of these conditions, and assist in the prevention and management of disease.

The factors contributing to the high levels of physical inactivity and the associated chronic disease burden among Indigenous people are complex. The high levels of behavioural and biomedical risk factors seen among Indigenous people are clearly associated with the high levels of chronic disease, but these factors cannot be seen in isolation; they must be viewed within a social determinants context. The historical, socio-cultural and economic aspects are the upstream factors within which the modification of and the actual impacts of physical inactivity should be viewed.

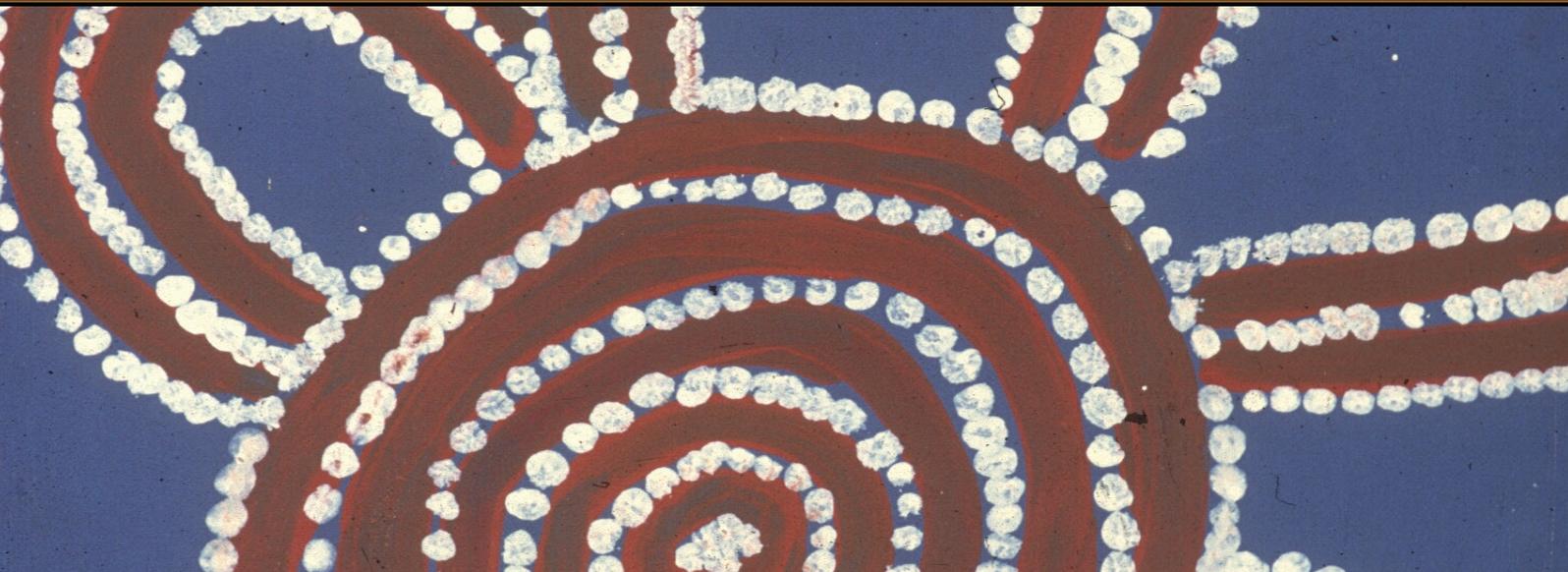
Policies and strategies surrounding physical activity in Australia are not consistent and previous state-based initiatives have now been disbanded. Physical activity guidelines are based on a decade-old scientific report which has not been updated. Recommendations to adapt the communication and dissemination of guidelines for different population groups, including Indigenous people, have also yet to be addressed. Advocacy is needed for a stand-alone physical activity strategy and cross-sectorial leadership.

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Australian Indigenous HealthInfoNet

The Australian Indigenous HealthInfoNet is an innovative Internet resource that contributes to 'closing the gap' in health between Indigenous and other Australians by informing practice and policy in Indigenous health.

Two concepts underpin the HealthInfoNet's work. The first is evidence-informed decision-making, whereby practitioners and policy-makers have access to the best available research and other information. This concept is linked with that of translational research (TR), which involves making research and other information available in a form that has immediate, practical utility. Implementation of these two concepts involves synthesis, exchange and ethical application of knowledge through ongoing interaction with key stakeholders.

The HealthInfoNet's work in TR at a population-health level, in which it is at the forefront internationally, addresses the knowledge needs of a wide range of potential users, including policy-makers, health service providers, program managers, clinicians, Indigenous health workers, and other health professionals. The HealthInfoNet also provides easy-to-read and summarised material for students and the general community.

The HealthInfoNet encourages and supports information-sharing among practitioners, policy-makers and others working to improve Indigenous health – its free on line yarning places enable people across the country to share information, knowledge and experience. The HealthInfoNet is funded mainly by the Australian Department of Health and Ageing. Its award-winning web resource (www.healthinonet.ecu.edu.au) is free and available to everyone.

Director	Professor Neil Thomson
Address	Australian Indigenous HealthInfoNet Edith Cowan University 2 Bradford Street Mount Lawley, WA 6050
Telephone	(08) 9370 6336
Facsimile	(08) 9370 6022
Email	healthinonet@ecu.edu.au
Web	www.healthinonet.ecu.edu.au



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