

Evidence review: Addressing the social determinants of inequities in physical activity and related health outcomes

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Evidence Review:

Addressing the social determinants of inequities in physical activity and related health outcomes

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Overview

Physical activity is a key contributor to good physical and mental health. In Australia and other developed nations, physical activity, sedentary behaviours and associated health outcomes are socially distributed, such that those who are more advantaged (typically, individuals with higher education levels; higher incomes; higher status occupations; living in more affluent neighbourhoods; and less likely to be from a cultural or ethnic minority group) are more likely to be regularly physically active and less likely to experience adverse health outcomes associated with inactive lifestyles than their less advantaged peers. There are also inequities in physical activity participation according to other social stratifying characteristics such as gender (with women generally less active than men), disability and Aboriginality.

The aim of this report is to provide an overview of the current evidence base and highlight promising approaches for promoting equity in physical activity behaviours at each level of ‘Fair Foundations: The VicHealth framework for health equity’ in a format that will support policymakers and practitioners in the State of Victoria and across Australia.

Fair Foundations: The VicHealth framework for health equity

The VicHealth Framework ‘Fair Foundations: The VicHealth framework for health equity’ was released in October 2013 as a planning tool for health promotion policy and practice in Victoria. The Framework identifies three layers of influence and entry points for action in the social determinants of health: Socioeconomic, political and cultural contexts; daily living conditions; and individual health-related factors (Figure 1). The current review is one of a series of eight, commissioned by VicHealth to support the use of the Framework and guide relevant policy and practice.

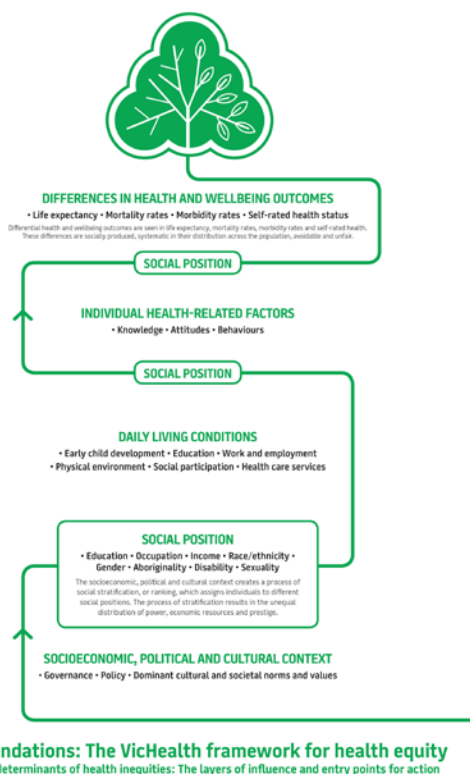


Figure 1. Fair Foundations: The VicHealth framework for health equity

Background

The social distribution of physical activity, sedentary behaviours and related health outcomes

Physical activity has a number of important health benefits, including reduced risk and morbidity associated with cardiovascular disease, overweight and obesity, high blood pressure, type 2 diabetes, some cancers, osteoporosis and musculoskeletal impairments (Bauman, 2004; Jeon, Lokken, Hu, & Van Dam, 2007; Kohl, 2001; Wolin, 2009). Regular physical activity is also associated with improved mental wellbeing, including a reduced risk of depression (Dunn, Trivedi, & O'Neal, 2001; Teychenne, Ball, & Salmon, 2008; Teychenne, Ball, & Salmon, 2010; U.S. Department of Health and Human Services, 1996). Despite these known benefits, the majority of Australian adults (57%) did not meet the recommendations of 150–300 minutes per week of moderate intensity physical activity in 2011–12 (Australian Bureau of Statistics, 2013c). More recent guidelines suggest that Australian adults (18–64 years) should be accumulating 150–300 minutes of moderate intensity physical activity or 75–150 minutes of vigorous intensity physical activity, or an equivalent combination of both, per week. Those guidelines also recommend minimising the amount of time spent in prolonged sitting (i.e., being sedentary), and breaking up long periods of sitting often (Australian Government Department of Health, 2014). Physical activity and sedentary behaviour guidelines for children (5–12 years) and young people (13–17 years) recommend accumulating at least 60 minutes of moderate to vigorous intensity physical activity every day, limiting the use of electronic media to two hours or less per day, and breaking up long periods of sitting as often as possible (Australian Government Department of Health, 2014). More than half (60%) of Australian children aged 5–17 years average the recommended 60 minutes of moderate to vigorous activity per day; however, just 19% of those children meet the recommended 60 minutes every day (Australian Bureau of Statistics, 2013b).

It was estimated in 2012 that physical inactivity accounted for 6.3% of the burden of coronary heart disease, 7.8% of type 2 diabetes, 11.2% of colon cancer and 10.1% of all-cause mortality in Australia (Lee et al., 2012). In terms of economic costs, the direct healthcare-related costs of physical inactivity were estimated at \$1.5 billion in 2006–07 (Medibank, 2007). In 2008, once estimates of lost productivity and shorter life expectancy as well as direct healthcare costs were considered, the total costs associated with physical inactivity were estimated at \$13.8 billion (Medibank, 2008).

Physical activity and sedentary behaviours and associated health outcomes are socially distributed in Australia and other developed countries. This section of the report describes the social distributions of physical activity and sedentary behaviours and associated health outcomes, noting which groups show lower participation rates. Evidence on potential determinants of these social distributions is described in the following section, 'The social determinants of physical activity and sedentary behaviours'.

In general, Australians who are more socially advantaged are more likely to be regularly physically active and less likely to experience adverse health outcomes associated with inactive lifestyles than their less advantaged peers. Typically, social disadvantage is indicated by measures such as a low level of education; low income; low occupational status; or living in a socioeconomically disadvantaged neighbourhood. Certain population groups – including people of minority ethnic or cultural backgrounds, Aboriginal or Torres Strait Islander people, and people living in rural or remote localities – are more likely to experience social disadvantage than others.

Physical activity can be categorised according to domain, including leisure-time, transport, incidental, occupational, and household. The distributions and determinants of these domains differ. The primary focus of this review is on discretionary physical activity, i.e., leisure-time physical activity (active recreation, active play and sport) and physical activity for transport (active travel such as walking or cycling). Where possible, these specific forms of physical activity are considered separately in this report, since the determinants of different types of activity, and inequities in these behaviours and their determinants, differ. However, it should be noted in some instances that this is not possible, for example where studies do not distinguish between these different forms of activity (e.g., several of the ABS reports described in the following sections assess 'sport', 'physical activity' or 'active recreation' together; a number of empirical articles or reviews do not break down physical activity into domains; certain interventions or policies impact both leisure-time and transport-related activity and the specific domain is not always reported – e.g., see Bogota case study on page 18).

The social distribution of physical activity

A number of indicators of social disadvantage have been linked with physically inactive lifestyles. For example, the likelihood of meeting physical activity recommendations has been shown to increase with education level and household income, and decrease with remoteness and area-level socioeconomic disadvantage in Australian adults (Australian Bureau of Statistics, 2013b). Evidence from numerous developed countries has shown that higher socioeconomic position (measured by social class, income, education, area of residence or asset-based indicators) is positively associated with leisure-time or moderate-vigorous activity among adults (Gidlow, Johnston, Crone, Ellis, & James, 2006). The associations are not as consistently observed among children or adolescents. For example, Australian Bureau of Statistics (ABS) data show that the proportion of Australian children aged 2–17 years meeting physical activity recommendations does not change across levels of remoteness, socioeconomic disadvantage, or household income (Australian Bureau of Statistics, 2013b). Internationally, parental education and family income show indeterminate associations with physical activity in children and adolescents (Biddle, Atkin, Cavill, & Foster, 2011). Other studies in the UK, Australia and the US have shown that children and adolescents who reside in neighbourhoods of low socioeconomic status (SES) (Brodersen, Steptoe, Boniface, & Wardle, 2007; Ziviani et al., 2008) and those whose families are experiencing socioeconomic disadvantage (R. E. Lee & Cubbin, 2002; Woodfield, Duncan, Al-Nakeeb, Nevill, & Jenkins, 2002) tend to participate in lower levels of physical activity and participate less frequently in organised sports compared with high SES youth. Potential explanations for the inconsistent social gradients in physical activity participation among youth are explored in the following section on social determinants. While evidence on social inequities in physical activity among youth is mixed, these inequities are more consistently observed by early adulthood.

Gender, Aboriginality, and having a disability can be considered other social stratifying characteristics that are also predictive of physical activity participation. Numerous studies and reviews of the literature demonstrate that male gender is positively associated with physical activity and sport participation; women are less active than men throughout the lifespan (Troost, Owen, Bauman, Sallis, & Brown, 2002; Van Der Horst, et al., 2007). Potential determinants of these gender inequities are described in the next section on social determinants.

Indigenous Australians are less likely to be physically active than non-Indigenous Australians (Australian Bureau of Statistics, 2008; Pink & Albon, 2008). Less than one-third (30%) of Aboriginal and Torres Strait Islander people aged 15 or over reported that they had participated in sport or physical activities in the 2008 National Aboriginal and Torres Strait Islander Social Survey, a survey of more than 13,300 Indigenous Australians (Australian Bureau of Statistics, 2009b). Among children,

74% of Indigenous children aged 4–14 years were physically active for at least 60 minutes every day. In more recent data from the 2012–13 Australian Aboriginal and Torres Strait Islander Health Survey, in non-remote areas in 2012–13, 62% of Indigenous Australians aged 15 years and over reported being sedentary or exercising at low levels (Australian Bureau of Statistics, 2013a).

Some evidence demonstrates that children and adults with a disability are at increased risk of physical inactivity (Bodde & Seo, 2009; Centers for Disease Control and Prevention, 2005), although this is not unequivocal. For example, in Australia, in 2010, 68% of adults with a disability reported participating in sport or physical recreation activities, lower than the 79% of people without a disability. However, differences were less marked among the younger adult age groups, with no significant difference between the disabled and non-disabled population in participation for those aged under 45 years (Australian Bureau of Statistics, 2012). Varying participation rates across studies investigating physical activity and disability may be partly related to heterogeneity in the nature and severity of the disability. For example, different studies have reported that young people with an intellectual disability are more, equally, or less active than their peers without an intellectual disability (Frey, Stanish, & Temple, 2008). These variations highlight the need for physical activity programs to take into account the specific participation levels, needs and barriers of the target population.

While social inequities in leisure-time physical activity are well established, at least by adulthood, data from Australia and elsewhere show that social inequities in transport-related physical activity are somewhat less consistent. Some studies show similar inequities in this domain (Ball et al., 2007), while others show the reverse (Beenackers et al., 2012; Turrell, Haynes, Wilson, & Giles-Corti, 2013). For example, in a Victorian study, Ball and colleagues showed a graded positive relationship between women's education level and the likelihood of participating in both leisure-time walking, and walking for transport (Ball et al., 2007); on the other hand, Turrell et al. (2013) found that residents of disadvantaged neighbourhoods walked more for transport than those from more affluent neighbourhoods. These mixed findings may be due to differing local contexts or urban designs across localities, since transport-related physical activity is strongly linked to urban features, including street connectivity and proximity to facilities, and such features are related to neighbourhood disadvantage in complex ways across locations (Turrell et al., 2013). These findings attest to the importance of context-specific research, and caution against generalising findings from other countries or even states and localities to the Victorian context. Among youth, Victorian data showed no association of either family or neighbourhood social disadvantage with active commuting to school among children (Timperio et al., 2006) or with changes in active commuting among children or adolescents over a two-year follow-up period (Hume et al., 2009).

The social distribution of sedentary behaviours

This review also focuses on sedentary behaviours. These are a group of behaviours typified by low energy expenditure, such as sitting, driving, watching television, and other screen behaviours such as watching DVDs, playing video or computer games, or surfing the internet (Pate, O'Neill, & Lobelo, 2008). While the health risks associated with sedentary behaviour are similar to those associated with lack of physical activity (e.g., increased risk of obesity, cardiovascular disease, and type 2 diabetes) (Proper, Singh, van Mechelen, & Chinapaw, 2011), they have been shown to be independent of physical activity (Healy et al., 2008). The study of sedentary behaviours is a relatively new field of investigation, having really only emerged since around 2000 (Owen, Leslie, Salmon, & Fotheringham, 2000). Nonetheless, growing evidence suggests that certain sedentary behaviours also follow a social gradient. For example, a systematic review has identified that employment status and a higher education level have been associated with decreased television viewing in adults (Rhodes, Mark, & Temmel, 2012). Similarly, a review of correlates of television viewing among youth

(18 years and younger) found that parental income and education level are both negatively associated with children's television viewing (Gorely, Marshall, & Biddle, 2004). The social distribution of sedentary behaviours in younger children (up to five years of age) is not as evident; parental education shows indeterminate associations with sedentary behaviour and television viewing in preschool-aged children (Hinkley, Salmon, Okely, & Trost, 2010), while maternal education and household income show unclear associations and maternal employment and paternal education show no associations with screen time in children under 36 months (Duch, Fisher, Ensari, & Harrington, 2013).

As with physical activity, gender, ethnicity, and having a disability may be considered social stratifying characteristics that are predictive of sedentariness. Sedentary behaviour, however, does not seem to differ by gender in the same way as physical activity; studies consistently find no association between sedentary behaviour or television viewing and gender in adults, children and infants (Duch et al., 2013; Gorely et al., 2004; Rhodes et al., 2012).

While ethnicity/race shows unclear associations with sedentary behaviour in adults (Rhodes et al., 2012), young people from ethnic minorities have been shown to watch more television than white youth (Gorely et al., 2004), and in children under 36 months ethnicity shows strong associations with increased levels of screen time (Duch et al., 2013). In Australia, more Indigenous people aged 15 years and over report being sedentary than non-Indigenous people (51% compared to 33%) (Australian Institute of Health and Welfare, 2011a). The majority (66%) of Indigenous children aged 5–14 years spend more than two hours per day watching television, thereby exceeding the current recommendations (Australian Bureau of Statistics, 2011b).

There is little current knowledge around how sedentary behaviour habits differ for adults and children with a disability. ABS data do, however, show that Australians aged 15–64 with a severe or profound disability are more likely to do very low level or no exercise, compared to those without a disability (43% compared to 31%) (Australian Institute of Health and Welfare, 2010). A small study in the United States found that while there were no differences in screen time between children with an intellectual disability and those without, there were differences in the correlations between physical activity and screen time between groups, suggesting there may be differences in sedentary behaviour patterns for children with an intellectual disability (Foley & McCubbin, 2009).

The social distribution of health outcomes associated with physical inactivity and sedentary lifestyles

Social inequities in physical activity and sedentary behaviours are of concern, as they parallel and are most likely a key contributor to social inequities in physical inactivity-related health outcomes, including obesity, cardiovascular disease, type 2 diabetes, certain cancers, musculoskeletal conditions such as osteoporosis and osteoarthritis, and mental illness (Bauman, 2004; Jeon et al., 2007; Kohl, 2001; Teychenne et al., 2008; Wolin, 2009). For example, several reviews of the international literature show that obesity – a consequence of physical inactivity and sedentary behaviours – is more prevalent in minority and low socioeconomic groups across all ages (Ball & Crawford, 2005) (Wang & Beydoun, 2007). Further reviews have found low socioeconomic status in early life and the accumulation of negative socioeconomic conditions during the life-span both have detrimental impacts on cardiovascular risk (Pollitt, Rose, & Kaufman, 2005). Similarly, low socioeconomic position is associated with an increased risk of type 2 diabetes in high-income countries (Agardh, Allebeck, Hallqvist, Moradi, & Sidorchuk, 2011), and with all-cause mortality (Mustard & Etches, 2003), which are both also linked with physically inactive lifestyles.

Physical inactivity is also associated with increased risk of developing certain types of cancer, including colon cancer (Wolin, 2009), the incidence of which also shows a marked socioeconomic gradient (Doubeni et al., 2012). Low levels of physical activity also predispose individuals to musculoskeletal conditions, including osteoarthritis and osteoporosis (Vuori, 2001). While osteoarthritis has been reported to be more common among disadvantaged social groups (Jørgensen et al., 2011), osteoporosis does not show consistent variations in incidence across social groups in Australia defined, for example, by country of birth or socioeconomic position (Australian Institute of Health and Welfare, 2011b). Physical activity is protective against poor mental health, with most evidence having focused on depression – a condition that is also more common among socially disadvantaged groups (Lorant et al., 2003).

The social determinants of physical activity and sedentary behaviours

The causes of social inequities in physical activity and sedentary behaviour rates are not yet completely understood. They are likely complex, rooted in broad structural and contextual factors, as well as in individual and interpersonal factors (Sallis & Glanz, 2009). This is because physical activity participation and sedentary behaviours are multifactorially determined, with influences across individual, social and broader environmental domains. These social determinants can be grouped according to the levels of influence specified within the Fair Foundations Framework.

Socioeconomic, political and cultural determinants of physical activity and sedentary behaviours

At the broadest level, socioeconomic, political and cultural determinants can influence participation in physical activity and sedentary behaviours. For example, physical activity opportunities can be shaped by policies governing urban design and neighbourhood development, such as the establishment of safe, aesthetically pleasant and walkable neighbourhoods (Sallis & Glanz, 2009). A large body of observational evidence and reviews attests to correlations of physical activity with urban design and neighbourhood environmental features (Ding, Sallis, Kerr, Lee, & Rosenberg, 2011; McCormack & Shiell, 2011). One key component of urban design is land-use mix, which has an inverse association with physical inactivity in both children and adults. In areas where residences and commerce are co-located, there is greater utilitarian walking (e.g., to commute to work or to run errands). Conversely, in areas where there are distinct residential and commercial zones, commuting distances tend to be longer and, consequently, car travel is more prevalent than active transport (Frank et al., 2006).

Dominant or pervasive social or cultural norms relating to physical activity may also be key determinants of physical activity behaviours. Every society has expectations about how its members should and should not behave, and individuals' behaviour is shaped by what people around them consider appropriate or desirable.

Several dominant norms and values in Australia may influence social position, daily living conditions, and individual attitudes and behaviours in relation to physical activity. Australia is strongly identified as a sporting nation, with sport having long been a defining and dominant feature of Australian culture. Australians' attitudes to sport have been influenced by the historical development of sport in European and Indigenous culture (Hede, Russell, & Weatherby, 2011). Australia's pride in sporting achievement helps to explain the priority that Australian governments place on funding and promoting sport, for example by governments investing in sport; schools having government-funded compulsory sport physical education; and the attraction of and participation in key international sporting events (e.g., the Australian Open, the Bledisloe Cup, the Ashes and the Sydney to Hobart Yacht race). Sports spectatorship at such events is a popular activity among Australians, with 43% of the Australian population aged 15 years and over reporting that they had attended a sporting event during the 12 months prior to interview in 2009–10 (Australian Bureau of Statistics, 2010b). Australia reveres its sporting heroes, and for example celebrates these idols via the Sport Australia Hall of

Fame. Sports and outdoor activities are also generally valued in Australia, due to the mild climate and abundance of natural features such as beaches and parks.

Unfortunately, national prevalence rates of inactivity indicate that these norms and values do not translate into physically active lifestyles for many Australians. Norms differ across social groups within societies, and hence it may be that certain social groups hold different norms relating to physical activity than others. However, there is little empirical evidence on how such variations in norms across social groups might translate into variations in physical activity or sedentary behaviours.

An example of an emerging change in normative behaviour related to physical activity in Australia is the emergence and rising popularity in recent years of the personal trainer, and changes in models of personal training and gym use. According a 2012 report prepared by Deloitte Access Economics for Fitness Australia (Deloitte Access Economics, 2012), the peak body for fitness industry professionals, there are approximately 30,000 people in Australia reporting their trade as fitness trainers, or about one per 750 of the population. The report estimates that as many as 5.4 million Australians will require fitness training services by 2020 compared with 3.3 million now. This rise may reflect changing norms around the value of physical activity for health among the population as a whole, and for particular subgroups (e.g., training for older adults, or those requiring weight loss or rehabilitation), rather than primarily at elite sporting levels. The fitness industry has substantially evolved from the 1980s model in which gyms were places for well, fit people to pump iron and work out, to a more holistic concept of fitness. In 2009–10, 14.0% of Australians were estimated to have participated in aerobics, fitness and gym activities (Australian Bureau of Statistics, 2010a), up from 12.6% in 2005–06. Including Pilates, weight training and yoga, the total participation rate was 18.3%.

While the rise of the personal trainer movement has potentially improved the recognition and value ascribed to physical activity among many Australians, it is unlikely to impact participation equitably, given the associated financial costs of personal trainers, and economic barriers faced by socially disadvantaged groups. ABS data show that people whose weekly household income was in the highest quintile reported a physical activity participation rate of 81%, whereas the rate for people in the lowest quintile was 48% (Australian Bureau of Statistics, 2010a). It is plausible that the costs of participation in sports or physical activities (sports registration costs, facility fees, uniforms and equipment) may comprise a barrier to low-income groups. One Perth study, which mapped the costs of physical activity facilities across areas of different levels of socioeconomic disadvantage, showed that it was more expensive to participate in facility-based activities in low socioeconomic areas than in more advantaged areas (Arbel, Wood, Howat, & Giles-Corti, 2009). However, numerous studies have suggested that financial costs may not pose a critical barrier to physical activity participation (Ball, Salmon, Giles-Corti, & Crawford, 2006; Trost et al., 2002).

Gender norms relating to physical activity among men and women in Australia have been well documented (Hede et al., 2011). Sports participation, particularly, has been dominated by men, and this may partly explain gender differences in sporting and physical activity participation. Traditional gender norms suggest that men should be more muscular and powerful and that women be smaller, weaker and beautiful. Historical barriers to women's participation in sport have include the perceptions of appropriate 'ladylike' behaviour; the belief that excessive exertion was bad for women's health; the view that women's bodies should be concealed; and club membership rules restricting participation. Although many of these norms have today been challenged, the subordinate role of women in sport continues to be reinforced by practices such as the lesser government funding and prize money allocated for women's sports; restricted membership of certain sports clubs; and the continuing inequitable allocation of lesser media coverage to women's sports relative to men's. Rates of spectating also vary by gender. For example, the ABS reported in 2011 that 50% of men attended a sporting event in the past 12 months, compared with 37% of women. This disparity was also the case for most of the top ten spectator sports, such as Australian Rules, rugby league and motor sports (Australian Bureau of Statistics, 2011a).

There is evidence that Indigenous Australians experience unique social, cultural and economic barriers to participation. One example of a unique cultural barrier is negative community norms/perceptions of exercising alone. Spending time with family and loved ones is an important part of Aboriginal culture. Exercising alone for personal benefit may prevent a person from spending time with family and loved ones, and this may be perceived as shameful. However, exercising to recover from a diagnosed illness is viewed as important, because the person owes it to their loved ones to get better (Better Health Channel, 2014).

For some people with a disability, barriers in the built environment limit their ability to participate fully in community life. For others the barriers are social and attitudinal – that is, norms relating to the abilities of people to participate in activity. It has been noted that these barriers prove the most difficult to overcome (National People with Disabilities and Carer Council, 2009), and there is not strong empirical evidence of the most effective ways to challenge these norms in order to promote more active lifestyles.

It is difficult to link national, social or cultural norms to physical activity participation, for a number of reasons. In particular, countries with different social norms about physical activity also differ in regard to many other aspects which may also explain differing physical activity rates. For example, rates of cycling among adults in the Netherlands, Germany and Denmark are tenfold in comparison with those in the US and UK (Pucher & Buehler, 2008). While these differences are often attributed to widespread cycling infrastructure in the Netherlands, Germany and Denmark, cultural norms may also play a role. For example, unlike in the US and UK, where cycling is more popular among males who ride expensive, technologically advanced bicycles for fitness training, cycling is prevalent among all age groups and genders in the Netherlands, Germany and Denmark, with Dutch, German and Danish cyclists often riding on low-cost bicycles for utilitarian and leisure trips, without wearing lycra cycling clothes or helmets (Pucher & Buehler, 2008). The contribution of norms as opposed to infrastructure, or other contextual factors, in explaining these cross-country variations is not clear.

While the effects of widespread normative social influences on physical activity and sedentary behaviour have not been well established in the empirical literature, some research has linked physical activity behaviour among both children and adults to social norms at more localised levels, albeit in observational studies (Ball et al., 2006; Mitra, 2013). For example, simply knowing of or observing others being active in the local neighbourhood was associated with more leisure-time physical activity and walking for leisure and transport among women from socioeconomically disadvantaged neighbourhoods (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010). Social norms may influence parental decisions on whether their child walks or cycles to school, or is driven there instead, according to US and Canadian research, respectively (McMillan, 2005; Mitra, 2013). Observing others engaging in particular physical activity behaviours may help shape the perception that these are normative or desirable behaviours, and hence encourage the same behaviour in others. Such findings suggest changing norms related to physical activity behaviours may be a salient target for future interventions.

Daily living conditions as determinants of physical activity and sedentary behaviours

At the next level of the Framework, and shaped by those broader factors within the socioeconomic, political and cultural environments, daily living conditions also influence participation in physical activity and sedentary behaviours. Key physical activity determinants at this level include social support for activity from family, friends, peers or health professionals; and access to physical activity opportunities within schools, workplaces, and other key settings in which individual live, work and play (Carron, Hausenblas, & Mack, 1996).

Lack of support or encouragement for active lifestyles is also a key barrier to physical activity participation. In the first observational study to investigate factors contributing to educational disparities in walking (Ball et al., 2007), less social support from family helped to explain the lower

likelihood of walking for transport among less educated Victorian women, whereas less social support from friends contributed to the lower likelihood of walking for leisure.

In a nationally representative sample of US adolescents (Gordon-Larsen, Nelson, Page, & Popkin, 2006), those living in lower SES and high-minority neighbourhoods had reduced access to physical activity facilities, and this was associated with decreased moderate-to-vigorous physical activity and increased overweight. While this was an observational study, it suggests that inequality in availability of physical activity facilities may contribute to ethnic and SES disparities in physical activity and overweight patterns in this sample.

Individual health-related determinants of physical activity and sedentary behaviours

Both structural factors (socioeconomic, political and cultural contexts), as well as the daily living conditions to which individuals are exposed, play a role in influencing individual-level factors that are determinants of physical activity. These include motivation, self-efficacy, perceived barriers (such as cost of lack of time), and physical activity history and skills (Burton, Turrell, & Oldenburg, 2003; Sherwood & Jeffery, 2000; Trost et al., 2002). These individual-level factors are all likely to play some role in explaining social inequities in physical activity and sedentary behaviours.

The reasons for the lack of consistent observed social inequities in physical activity among childhood are not well understood, but schooling may well play a part. There are some documented differences in attention given to physical education and sport across schools of varying levels of deprivation (Carlson et al., 2014; Department for Education, 2013), with UK and US evidence showing that more deprived schools had lower participation rates. However, physical education or sport is mandated in schools in Australia and other countries, and hence all children attending school, regardless of social position or characteristics, are exposed to at least some level of physical activity. Consequently, observed social differences in physical activity or sporting participation may be minimal, and not emerge until, as adolescents, many individuals leave the only structured forms of physical activity and sport in which they participate. At this point, other intrinsic or extrinsic factors, including social factors and their determinants as noted in the VicHealth Fair Foundations Framework, may become more important predictors of participation.

It is important to recognise that determinants of adoption of physical activity may be different to determinants of maintenance/adherence (Sherwood & Jeffery, 2000). For example, parents may be motivated to encourage their children to walk or cycle to school rather than travel by car on designated days such as Walk Safely to School Day (Pedestrian Council of Australia, 2014), when the health and environmental benefits of active transport are promoted by schools. Often, however, this active transport is not sustained and parents, over time, resume driving, particularly if they suspect other families are no longer using active transport, according to New Zealand-based research. (Tranter & Pawson, 2001).

There is evidence that at all three levels, these physical activity determinants are socially patterned, and the social distributions in physical activity determinants are likely to contribute to social inequities in physical activity participation. For example, Australian-based observational studies show that people who have lower levels of education, lower incomes or live in socioeconomically disadvantaged neighbourhoods, have poorer access to neighbourhoods supportive of physical activity, less social support for physical activity and lower levels of self-efficacy to be physically active, and these factors help to explain the lower levels of physical activity participation (both leisure-time and transport-related) among disadvantaged individuals (Ball et al., 2007; Burton et al., 2003).

It is clear that disparities in sports and recreational facilities exist according to neighbourhood-level SES. For example, a study of public open space in neighbourhoods of low and high SES in Victoria found little variation in the number of playgrounds or leisure facilities according to SES. However, public open space in high SES neighbourhoods were of higher quality than in low SES neighbourhoods in terms of amenities and aesthetics, such as picnic areas, foliage (provision of shade), water features, walking and cycling paths (Crawford et al., 2008). In general, low SES areas are less likely than high SES areas to have well-maintained sports facilities or to have a volunteer base to run or support sports programs or clubs in Australia (The Smith Family, 2013).

Other observational studies indicate differences across social groups in more proximal determinants of physical activity. For example, one study examining disparities in SES and related health outcomes among adolescents reported that while time constraints were a reported barrier to physical activity for adolescents of both high and low SES, the cause of these time constraints varied according to SES. High SES youth cited other structured activities (e.g., music lessons) as imposing time constraints, while low SES youth reported that time constraints were related to family obligations (e.g., chores, cooking, supervision of younger family members), according to a Canadian-based study (Humbert et al., 2006).

Such observational studies, and more so the intervention and evaluation studies presented in this review, indicate that promoting physically active lifestyles among all social groups will require addressing the underlying determinants of physical activity behaviours with actions at all three levels of influence. This will require multi-sectoral action and policy approaches to facilitate physical activity via the collaboration and coordinated actions of not only health, but also non-health sectors of federal, state, and local governments and NGOs, including but not limited to education, sports and recreation, communities, housing, transport, urban designers, the police service and workplaces. Key insights into potential best bets for action, based on available evidence to date, are presented in the subsequent review and sections that follow.

Report aims and objectives

The aim of this report is to summarise the nature and quality of the evidence on social determinants of inequities in physical activity, with a view to identifying promising approaches to promoting equity in physical activity and related health outcomes at each layer. The review will also identify key gaps in the evidence base and make recommendations for future research priorities to address these, as well as identifying future research or data collection needs. The short time frames, broad scope and rapid nature of this review preclude a comprehensive systematic literature search. Rather, the focus of this expedited review was on the identification of key evidence-based recommendations and entry points for action, with illustrative examples, to address the social determinants of inequities in physical activity and related health outcomes.

Methods

Review strategy

The literature review involved the following four phases:

- i) An analysis was undertaken of key existing evidence syntheses and recommendations for the promotion of physical activity and reduction of sedentary behaviours in the general population. An equity lens was applied to these recommendations, with

consideration given to evidence on the potential for differential outcomes of the recommended actions across social groups;

- ii) A search of the published peer-reviewed literature using a pre-defined search strategy across nine bibliographic databases and citation indices; Medline, PsychINFO, SportsDISCUS, CINAHL, Scopus, Web of Science, Cochrane Library, Global Health, and Embase (see Appendix 1 for the full search strategy and terms);
- iii) Hand searches of the reference lists of articles identified in the above search; and
- iv) Grey literature searches of websites of key relevant organisations and utilisation of Google Scholar. Key included: World Health Organization; Australian Federal and State Government departments; Robert Wood Johnson Foundation; Public Health England (report on socioeconomic inequalities in diet and physical activity); US Government Departments and US Environmental Protection Authority; US collaborative health promotion organisations; and key Australian organisations, institutions and research centres, including VicHealth and the National Heart Foundation of Australia.

The search focused on identifying relevant review papers, interventions, policies and program evaluations, with a concentration on the Australian context. Interventions and approaches that could be applied to the Australian context were also included. Papers reporting on correlations and observations between social determinants were excluded, as were theoretical and conceptual papers.

The initial search, using the terms detailed in Appendix 1, was conducted by one reviewer. A review of all titles was conducted independently by two researchers. All titles included by either researcher were included in the abstract screen phase. Abstract screening and review, and data extraction from full papers, were conducted by all four reviewers independently. The numbers of papers and reports identified and screened at each step are shown in Figure 2 below.

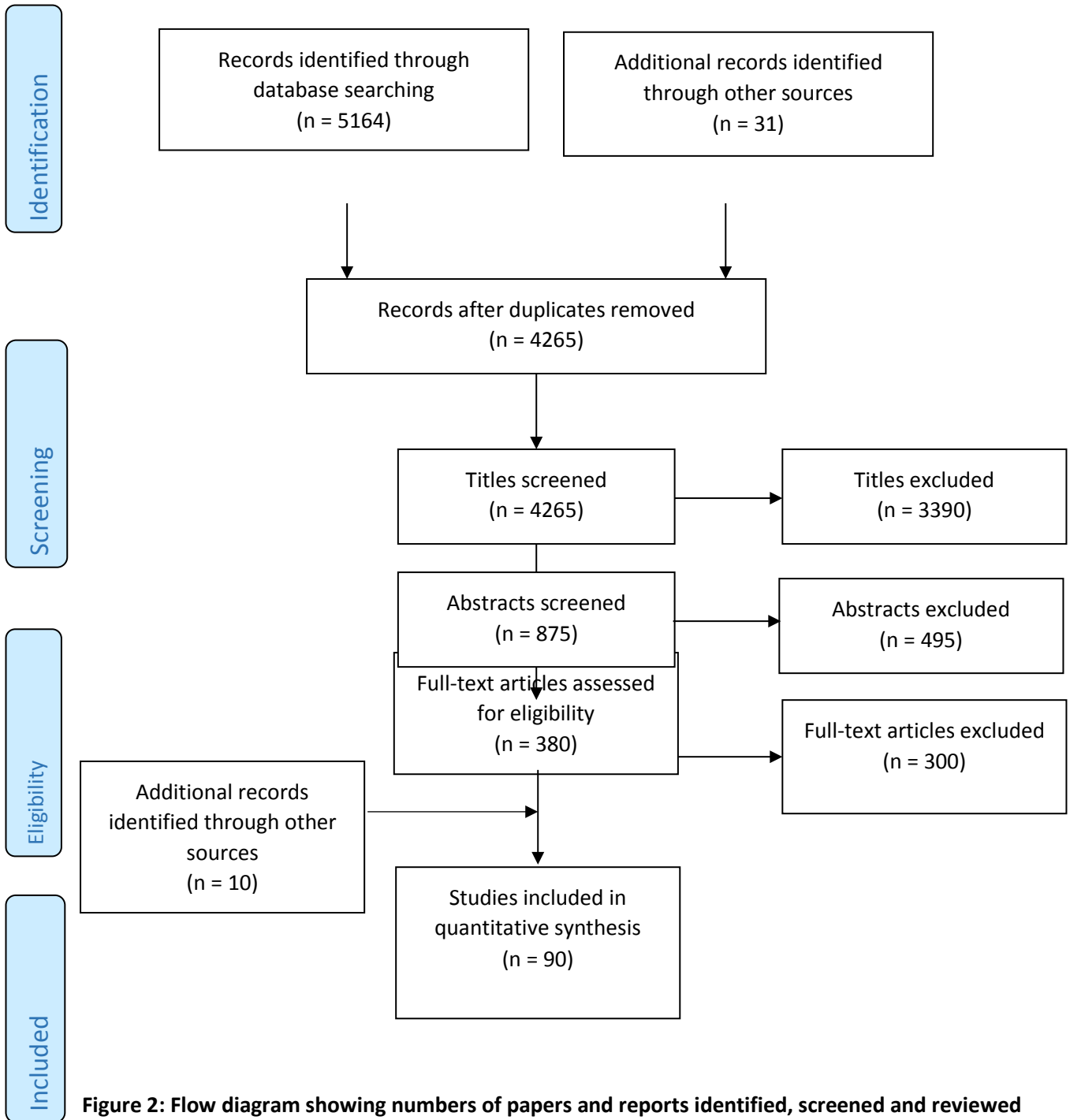


Figure 2: Flow diagram showing numbers of papers and reports identified, screened and reviewed for Phase ii of the review strategy (described on page 14)

What can be done to address the social determinants of physical activity?

We present this section in two main parts. Firstly, we report on an analysis of existing syntheses and recommendations for increasing physical activity or reducing sedentary behaviours in the population generally, noting that these for the most part do not consider socially disadvantaged groups specifically. We apply an equity lens to these existing recommendations, reporting on the potential for differential effects across social groups. In most cases, there is no empirical evidence on differential effectiveness, hence consideration is given to the potential differential impact based on known determinants and barriers to physical activity across social groups, and how these recommendations might be implemented in an equity-sensitive manner.

Secondly, we report on results of our review of the literature resulting from the search described on pages 13 and 14, identifying evidence which does relate to intervention effectiveness in varied social groups.

1. Current evidence syntheses

Physical activity: current evidence syntheses and recommendations

The evidence base on effective interventions for promoting physical activity and reducing associated health outcomes has been summarised in several syntheses and recommendation documents, including those of the US Center for Disease Control and Prevention (Centers for Disease Control and Prevention, 2001, 2011; Heath et al., 2006; Kahn et al., 2002; Zaza, P.A., & Harris, 2005); the United Kingdom National Institute for Health and Clinical Excellence (NICE Public Health Collaborating Centre – Physical Activity, 2006); and the recommendations of the National Heart Foundation’s Blueprint for an Active Australia – currently being updated (National Heart Foundation of Australia, 2009). Collectively, the evidence is strongest and supports recommendations for action in eight main areas, described below.

A key point identified in our analysis of existing syntheses, as well as in these reviews themselves, is that **evidence is still limited on the impact of recommended actions on the social determinants of, or social inequities in, physical activity and sedentary behaviours**. Relatively little is known about the differential impact that physical activity or sedentary behaviour interventions, such as those described in existing evidence syntheses, might have across social groups.

ii) Recommendations from existing syntheses that fit within the ‘Socioeconomic, political and cultural context’ layer of the Fair Foundations Framework

Community-wide campaigns

Community-wide campaigns are typically large-scale, highly visible, multicomponent campaigns involving multiple sectors and partnerships that deliver messages via media such as television, radio and newspapers. Unlike mass media campaigns, these campaigns also include other components, such as community events; support groups; physical activity counselling; and risk factor screening and education at worksites, schools and community health centres. They also include policy and environmental changes, such as the creation of new walking paths, or the opening of school facilities for public use. A review of 10 community-wide campaigns conducted in various countries showed they were effective in increasing the proportion of people who were physically active (Zaza et al., 2005). These results are consistent with those of a more recent review, which highlighted, however, that the effectiveness of community-based campaigns in increasing physical activity among

disadvantaged groups was much less well studied and that evidence for impacts among these groups was less consistent (Bock, Jarczok, & Litaker, 2014).

Best practice example: An example of an effective community-wide campaign includes Wheeling Walks, in West Virginia, USA. Wheeling Walks was a theory- and media-based community campaign that uses paid media/advertising, as well as worksite programs and other public health education campaigns implemented by doctors and other health professionals in the community, to encourage walking among sedentary older adults. Results showed that, relative to comparison participants, more of those individuals who walked less than 10 minutes a day at baseline reported being active walkers at 3-month follow-up. Increases in self-reported active walking were maintained at 12-month follow-up for participants who were sedentary at baseline (see http://www.wheelingwalks.org/WW_TrainingManual/TM_index.asp for a detailed report on the campaign and advice on how to implement similar campaigns).

Potential challenges/problems with implementing community-wide campaigns include:

Differential effects across social groups are not known; since they are multicomponent, it is not known which particular strategies are most effective/necessary; they are resource-intensive and expensive; there appears little data on cost-effectiveness.

Equity considerations: Differential effects across social groups are unknown. One advantage of these approaches is that campaign messages can be tailored to fit the needs of specific populations such as disadvantaged social groups. These approaches should be applicable to diverse communities and populations, including different ethnic or socioeconomic groups, if adapted to the needs of the target population (e.g., bilingual campaign materials and staff; materials prepared at appropriate reading level for the target population; campaigns adapted to the local physical setting). They also might be applicable in other settings that could be viewed as communities, such as workplaces that employ a large proportion of socially disadvantaged individuals.

If such a campaign were implemented at a national level, this could be an example of initiatives aimed at shifting dominant societal and cultural norms on a large scale – i.e., action at the broadest level of the Fair Foundations **Framework (Socioeconomic, political and cultural context)**. Campaign actions, however, would also reflect and influence the other two layers of the Framework, through making changes to daily conditions where physical activity can occur (e.g., new paths or facilities), and through increasing knowledge, awareness and attitudes related to physical activity.

Transportation policies and practices

Transportation policies and practices can promote physical activity, both for active transport and for leisure, for example, by improving infrastructure, incentives or safety to encourage walking or cycling, or public transport as an alternative to automobile use. Potentially, these approaches can shift perceived norms about the environment and travel behaviour, with flow-on effects to physical activity norms (e.g., the normative nature of active commuting).

Most of the evidence relating to the effects of transportation policies and environmental design/modification is derived from observational studies, since it is often not feasible to apply a controlled research design to investigate the impacts of these initiatives on physical activity. However, existing interventions that target these policies and designs show promise in terms of both effectiveness and sustainability (Kahn et al., 2002; NICE Public Health Collaborating Centre – Physical Activity, 2006; Pucher, Dill, & Handy, 2010). It should be noted that the intervention evidence in this area is limited by a small number of studies, and methodological issues including lack of appropriate control sites (e.g., only 3 of 26 studies reviewed by NICE (NICE Public Health Collaborating Centre – Physical Activity, 2006) had appropriate controlled designs).

Acknowledging this, there is some support for several intervention approaches in this category for promoting increased walking and cycling. These approaches include traffic calming methods; the creation of multi-use trails (walking, cycling); road closures or restrictions on use; road user charges (tolls: see also economic instruments); cycling infrastructure; and the creation of safe routes to school.

Best practice example: The Case Study on Bogota (box below) provides an example of a multicomponent approach targeting public transport policy that has been used in a number of sites around the world.

Case Study. Transport policy: Ciclovía Recreativa in Bogota, Colombia

One of the more successful transformations of the urban environment and transportation policy to promote active living comes from Bogotá Colombia, a model which has now been replicated around the world. Bogotá is home to the world's largest *Ciclovía Recreativa*, a free community-based program in which streets are closed temporarily to motorised transport, allowing exclusive access to walkers, runners, rollerbladers and cyclists, for recreation, sports or transport activity.

The program began in the early 1970s with an event called Ciclovía (bike-way), which closed several major streets and allowed families to walk and cycle around without cars. This event grew into a permanent part of city life of Bogota, with weekly street closures on Sundays from 7 am to 2 pm. Currently, Ciclovía involves a circuit of 121 kilometres of main avenues, which are closed every Sunday and holiday (72 events per year, from 7 am to 2 pm). Estimates suggest that there are 600,000 to 1,400,000 participants each Sunday and around 2 million people using it every week.

In addition to the car-free streets, other transport and urban design policy implemented included the reclaiming of public space (e.g., converting parking spaces to attractive public open space); improving public transport; promoting active transport and implementing vehicle restriction measures. Streets were improved with trees, benches, improved lighting and links to communities.

Factors leading to the initiative's success include political will, public support, financial resources and human capacity to retrospectively transform public spaces. The model has now served as an inspiration for many other cities around the world, with estimates that similar programs are reported in 1500 cities (Montes et al., 2012).

Evaluation: The Ciclovía programs clearly attract many participants. However, whether or not they have improved population physical activity levels or decreased sedentary behaviours is unclear. Empirical evidence on effectiveness is limited (Sarmiento et al., 2010), although one study indicated that women who participate in Ciclovía events are seven times more likely to be physically active than those who do not (Gomez, Mateus, & Cabrera, 2004), and there is evidence that the approach is cost-beneficial in some sites (Montes et al., 2012). Differential effectiveness across social groups is unknown.

Potential challenges/problems with implementing transport policy include: Policy/infrastructure changes can be costly and take time to implement. They require political will, public support and substantial resources.

Equity considerations: Limited evaluation of the Bogota program below showed that the approach was promising for low and middle SES groups. However, it attracted a greater proportion of men as participants than women. In general, across the transport intervention literature, there is insufficient

evidence on which to draw conclusions about the differential effect of transport policy interventions on physical activity across social groups.

ii) Recommendations from existing syntheses that fit within the 'Daily living conditions' layer of the Fair Foundations Framework

Create neighbourhood environmental designs to promote active living

The physical design of communities can provide sustainable environments that support physical activity. Examples of public policy that might support more active lifestyles include policies to increase or enhance public open space/green space; establish or improve footpaths or lighting; create or refurbishing playgrounds; and zoning that encourages mixed land use. While the majority of evidence relating to these environmental approaches is derived from observational studies (e.g., linking urban design to physical activity), there is a growing evidence base to support the case for changes to neighbourhoods or streetscapes to promote physical activity (Heath et al., 2006).

Best practice example: The refurbishment of the green public open space in the socioeconomically disadvantaged neighbourhood of Rosebud West, Victoria, represents one of few 'natural experiments' that have been evaluated for impact on physical activity among both children and adults, and shown a positive impact (Tester & Baker, 2009; Veitch, Ball, Crawford, Abbott, & Salmon, 2012).

Potential challenges/problems with implementation: Changing the built environment requires political and public support and a substantial investment in public infrastructure; public health gains may not emerge for many years.

Equity considerations: Environmental approaches to promoting active lifestyles are appealing as they can be implemented across environments to reach those who may be at risk of inactivity due to their social position. However, there remains little empirical evidence on the differential effects of these approaches in promoting physical activity or reducing sedentary behaviours across social groups.

Create or enhance access to places for physical activity combined with informational outreach activities

These approaches involve representatives from multiple sectors, including government, workplaces and communities who work to create opportunities for physical activity in local neighbourhoods. These approaches combine both environmental and individual components, and hence fit into both of the upper layers of the VicHealth Fair Foundations Framework. Individual components may include education and training, risk factor screening and support or buddy systems. Environmental components may include the creation of walking trails, the building of exercise facilities or the enhancing of access to existing nearby facilities.

Best practice example: Wheeling Walks is also an example of this approach (see above, under 'Community-wide campaigns').

Potential challenges/problems include: Since they are multicomponent, it is not known which particular strategies are most effective/necessary; and resource-intensive and expensive. It appears that little data on cost-effectiveness has been gathered.

Equity considerations: This intervention approach has reportedly been effective in a range of population groups, including disadvantaged ethnic or socioeconomic groups (Kahn et al., 2002; King,

Carl, Birkel, & Haskell, 1988; Lewis et al., 1993) (see Kahn et al., 2002 for further review). These approaches can be applied in settings with a high proportion of socially disadvantaged individuals, such as workplaces, health clinics or other settings in disadvantaged neighbourhoods.

Provide socially supportive groups and interventions in community settings

Intervention strategies to promote physical activity might also address changing the social, as opposed to the physical, environment. Providing social support groups for different physical activities can be relatively simple interventions that require little resource, and that can be implemented in different settings in schools, workplaces and communities.

Social support interventions in community settings focus on fostering new or strengthening existing social networks that provide supportive relationships for physical activity behaviour change. Intervention components can include setting up a 'buddy' system, making 'contracts' with others to be active, peer or professional coaching, walking or other groups that provide companionship and support while being physically active or discussion groups to share support and help address barriers to participation. Participants can be connected with other participants and program staff members to monitor progress and receive encouragement. Peer-based interventions have been shown in systematic reviews of randomised controlled trials to increase physical activity (Webel, Okonsky, Trompeta, & Holzemer, 2010).

Example: While not formally evaluated for its impact on physical activity, an Australian example of such an initiative is the National Heart Foundation Walking Groups, which has had widespread success in terms of participation numbers, having engaged more than 22,000 walkers nationwide (<http://www.heartfoundation.org.au/active-living/walking/Pages/welcome.aspx>).

Potential challenges: Relies on presence/willingness of supportive others to commit and maintain commitment to the buddy/contract/group. Cost-effectiveness is not known.

Equity considerations: Given the consistency of evidence of effectiveness of these approaches across differing settings and populations, the applicability to diverse social groups is promising, as long as the approach is appropriately tailored to local needs. This approach shows particular promise and salience among disadvantaged groups (see V. Cleland & Ball, 2013), described on page 33.

Physical education for school children

School-based physical education (PE) interventions may involve policy or curriculum changes aimed at increasing the amount of time children are active at school. It may involve additional classes or longer class time allocated for PE, increasing the time that children are active within classes, or enhanced teacher training. Evidence reviews show that PE-based approaches have been shown to be effective for increasing physical activity and fitness among children across a range of social groups (Kahn et al., 2002).

Example: PE-based approaches have been successfully trialled and evaluated in Australia (Vandongen et al., 1995).

Challenges/problems: PE is currently mandated in schools in Australia. Barriers to increasing the level of PE may reside within school systems, and be related to the crowded curriculum within schools and pressure to achieve academic outcomes, possibly at the expense of PE. Additional staff, training or equipment may be required.

Equity considerations: Physical education for the promotion of physical activity has been shown to be effective with diverse populations (e.g., among different ethnic and socioeconomic groups, boys

and girls, elementary and high school students) and in diverse settings (e.g., rural, urban) (Kahn et al., 2002).

iii) Recommendations from existing syntheses that fit within the 'Individual health-related factors' layer of the Fair Foundations Framework

Point-of-decision prompts

These include signs posted by escalators or lifts to encourage people to choose to use stairs instead, usually by including information about the health or weight loss benefits of using the stairs. There may also be enhancements to the stairwell, including music or artworks, although these do not seem necessary for effectiveness (Kahn et al., 2002).

Example: There are many examples, in different settings, including shopping malls, train and bus stations, airports, office buildings and healthcare settings; see Soler et al. (2010) for a detailed review. For instance, Andersen et al. (2006) demonstrated that a culturally sensitive sign to promote stair use in subway stations was effective in increasing stair use among both Caucasian and African American commuters.

Challenges/problems: Can take time to implement and maintain signage. While effective in promoting stair use, their impact alone on overall physical activity is unlikely to be substantial.

Equity considerations: Point-of-decision prompts appear equally effective for promoting physical activity among men and women, across ethnic minority groups (as long as they are appropriately tailored) and in a range of different settings (Kahn et al., 2002; Soler et al., 2010). These approaches may not be effective for people with a disability that precludes or restricts stair use.

Individually-tailored behaviour change

Behaviour change strategies can be tailored to an individual's specific physical activity preferences, barriers, social contexts and readiness for change. Strategies include teaching behavioural skills such as goal-setting, helping people incorporate physical activity into their daily routines, support for creating social support networks or using existing social networks, self-monitoring and reinforcing behaviour through self-reward, problem-solving and addressing barriers.

Example: Ball et al. (2005) describe an effective Victorian-based example of this approach, involving a tailored, print and telephone-mediated physical activity intervention.

Problems: These initiatives do not directly address environmental, policy or other structural barriers to physical activity.

Equity considerations: This intervention approach has been found to be effective with diverse populations (e.g., among different racial/ethnic minority and socioeconomic groups) and in diverse settings (e.g., communities, workplaces, schools, health and fitness settings) (Kahn et al., 2002). These approaches may be more likely to show long-term effects, particularly among socially disadvantaged groups, when complemented by environments and policies that support individual behaviour change.

Reducing sedentary behaviours: current evidence syntheses and recommendations

Research into sedentary behaviours as a public health issue is in its infancy. Consequently, there is relatively little evidence available from appropriately designed studies on best practice approaches

to reducing sedentary behaviours, and the differential effects of different strategies for reducing sedentary behaviours across social groups are not known.

Much sitting among adults occurs in three domains: the workplace, leisure and transport. Sitting is particularly common in office environments, especially where computer-based work prevails. However, advances in manufacturing, robotics, and heavy equipment have led to increasingly less manual workplaces, and sitting is now common in other types of occupations, such as transport (drivers, pilots) and trades where manual work has become increasingly automated (e.g., crane/bulldozer drivers, factory workers).

Unlike the physical activity literature, because of the recency of the study of sedentary behaviours, there are no comprehensive evidence syntheses of 'best practice for reducing sedentary behaviours'. In a VicHealth report on potential strategies/recommendations to reduce workplace sitting behaviours, Healy et al. (2012) identified four key approaches that showed promise in reducing workplace sitting: increasing the number of breaks from sitting time; implementing strategies around postural change; focusing on ergonomic changes to individual workspaces; and altering the built design of the broader workplace. However, that review noted that all studies to date focused on office workers; few used valid measures of physical activity/sedentary outcomes; and there was no indication of the potential differential effectiveness of strategies across social groups.

Evidence syntheses on differential effects of physical activity interventions

A recent report for the World Health Organization (Loring & Robertson, 2014) noted that 'few obesity interventions have been evaluated for their effectiveness in low socioeconomic groups'. The evidence on differential effectiveness of interventions for modifying physical activity/sedentary behaviour is also sparse.

Two recent evidence syntheses have attempted to directly answer the question of the differential impact of different intervention approaches across social groups (both reviews focused on socioeconomic position). In a recently published review of the differential impact of 14 obesity prevention interventions by socioeconomic position, interventions that were primarily based on information provision directed at individual behaviour change were shown to be largely ineffective in socioeconomically disadvantaged participants. In contrast, approaches that were more effective in disadvantaged participants included community-based strategies or policies aimed at structural changes to the environment (Beauchamp, Backholer, Magliano, & Peeters, 2014).

Another recent paper reported on the differential effectiveness by socioeconomic position of 26 Dutch obesity-related lifestyle interventions, judged by secondary subgroup analyses of effects in high and low socioeconomic groups (Magnée et al., 2013). For 15 studies there were no differential effects across socioeconomic groups. Seven lifestyle interventions were less effective in low SES groups; however, four were more effective in low SES groups. Those more successful among low SES groups tended to be conducted in the community setting. Programs in a workplace setting, mainly implemented in companies with high proportions of white-collar workers, showed either neutral effects (n=4) or higher effectiveness in high SES groups (n=2). Studies conducted in the individual setting mainly consisted of providing (computer-) tailored feedback. These studies either had no differential effects (n=5) or were more effective among the high SES group (n=2).

In this second stage of the current review, a literature search was undertaken to identify primary studies or reviews that explicitly investigated the effectiveness of interventions or programs targeting physical activity or sedentary behaviours among, or in populations including, socially disadvantaged groups (see search strategy on pages 13 and 14). A summary of all the reviews and

primary studies included in this review is presented in Appendix 1, organised according to the three layers of the VicHealth Framework. Some studies were not easily classified, in that they were settings-based or multicomponent interventions involving actions across multiple levels of the Framework. In these cases, a consensus decision was made within the review team based on the major focus of the intervention. Similarly, reviews of the literature often focused on interventions across multiple layers. In these cases, reviews are presented in a separate 'review' section in Appendix 1.

2. Literature review results: promising approaches for addressing the social determinants of inequities in physical activity and sedentary behaviours

Socioeconomic, political and cultural context

Participation in physically active and sedentary behaviours is determined not only by proximal factors such as individual motivations and local environments, but also by broader socioeconomic, political and cultural contexts. Such factors include policies and legislation that contribute to inequities in the distribution of physical activity and sedentary opportunities and determinants, such as 'walkable' neighbourhoods, crime rates, or material resources that support greater recreational choices. Dominant social norms about the role and value of physical activity can also be considered as important structural determinants.

Addressing this layer of the VicHealth Framework is politically, logistically and economically challenging, because such changes typically require a combination of political will; public support; substantial financial and human resources; and time. Perhaps consequently, this review identified relatively little evidence of programs or interventions that had targeted these structural determinants.

Initiatives aimed at shifting dominant social and cultural norms

Social norm change movements aim to change people's behaviour indirectly through creating a social environment and legal climate in which the undesirable behaviour becomes less preferred and convenient, and the healthy behaviour becomes the norm. Social norm change has been effective in addressing health concerns such as tobacco use (California Department of Health Services/Tobacco Control Section, 1998).

Research that has directly evaluated shifts in cultural and social norms relating to physical activity and sedentary behaviours as a result of programs or interventions is lacking. Speculatively, several of the approaches described in this review, such as community-wide campaigns, mass media campaigns or widescale transportation policy changes, may help to shift social norms and, particularly, attitudes related to physical activity and sedentary behaviours, given their high visibility and potential to involve large proportions of the population. However, there is a dearth of empirical evidence on the direct impact of such approaches on changing dominant social norms and values related to physical activity and sedentary behaviour.

One example of a national initiative that attempted to change pervasive gender norms around physical activity participation was the 1999 National Policy on Women and Girls in Sport, Recreation and Physical Activity 1999–2002, prepared by the Australian Sports Commission. This outlined the government's policy to change the sporting culture so that women and girls would be encouraged and supported in sport and physical activity. The policy document advocated removing participation barriers and developing greater opportunities for women to participate in sport. Its

recommendations included having more women in policy-making positions in sporting and media organisations, and using media promotion of influential role models to increase opportunities for women. Other potential suggestions for promoting more gender-equitable participation include incentivising increased representation of women on sporting boards through government funding of sporting bodies.

Changes to long-held norms about gender roles are slow to effect, but there are markers of progress. For example, as attitudes to gender roles and stereotypes related to physical activity change, there have been changes in the variety of sports offered to girls and boys. It is becoming more common, for example, for girls to participate in rugby league and Australian Rules football and for boys to play netball (Hede et al., 2011). Such changes are likely to have come about from a combination of social and systems changes, some of which may be attributable to policies or initiatives such as the 1999 National policy. However, existing evidence does not permit conclusions that specific actions or policies have led directly to specific changes in norms that then impact on physical activity or sedentary behaviours. This is an area in which further research could be useful.

Collaborative governance/partnership approaches

One potential model of collaboration in governance for physical activity promotion was the early whole-of-government approach implemented in 1996–2002 in NSW. In May 1996, the Premier established the NSW Physical Activity Task Force to develop a comprehensive strategic plan for the promotion of physical activity in NSW. Every government department was instructed to promote physical activity, with a particular focus on policy and environmental change. While the Taskforce achieved key outcomes, including the collaborative development of a strategic plan, and jointly auspiced initiatives such as a mass media campaign, it is unfortunately difficult to evaluate such state-wide approaches in terms of impacts on behaviour change, and no evaluation was undertaken to examine resulting changes in physical activity. Nonetheless, the Taskforce led to the establishment of the subsequent Premier's Council for Active Living (Premier's Council for Active Living NSW, 2012), which achieved a number of key outcomes that might be considered evaluative markers of success, including overseeing the development of a NSW BikePlan, and the development of a framework for local councils to create supportive environments for active living. In addition, aspects of the Taskforce's approach were adopted by the national physical activity Active Australia initiative.

Other similar state-wide government approaches have been implemented in Western Australia (Be Active WA; <http://www.beactive.wa.gov.au/>), South Australia (Premier's Be Active Challenge, South Australia; <http://www.pbac.sa.edu.au/Home.aspx>) and Tasmania (Get Moving Tasmania; (<http://www.getmoving.tas.gov.au/>)). Again there have not been comprehensive direct evaluations of these; such evaluations are challenging due to their scale, multiple components and complexities of assessing against appropriate control sites. The potential effects of these approaches can be indirectly examined via regular physical activity monitoring or surveillance surveys over the period of implementation. For example, such monitoring in WA indicated that physical activity participation among adults in 2009 was higher than that in 1999 or 2002. While this may be attributable in part to strategies implemented as part of Be Active WA, this cannot be established conclusively.

In the US, the Central California Regional Obesity Prevention Program (CCROPP) provides another potentially useful policy/environmental change model that has been subject to some evaluation (Schwartz et al., 2010). This program aimed, among other actions, to promote safe places for physical activity, and support community and youth engagement in local and regional efforts to change nutrition and physical activity environments for obesity prevention. CCROPP has reportedly been successful in creating a community-driven policy and environmental change model for obesity

prevention with local and regional elements in low-income, disadvantaged ethnic and rural communities. The model has made progress in improving physical activity environments, through partnerships, community mobilisation, and engaging and influencing policymakers. Other US-based collaborative governance partnership models detailed in Appendix 2 have also shown success in improving proximal social and environmental determinants of physical activity, including park refurbishments, bicycle and pedestrian infrastructure and policies, and improved safety in local communities (e.g., <http://www.sustainablecommunities.gov/aboutUs.html#2>; <http://www.partnershipph.org/projects/heac>).

Another example of governance and policy actions ('Socioeconomic, political and cultural context' layer of the Framework) involving partnerships that would lead to enhanced opportunities for physical activity ('Daily living conditions' Framework layer) is policy around the sharing of government, school and community facilities for physical activity. Barriers to, and recommendations around, facility sharing among governments and schools (both public and private) have been summarised previously, for example by VicSport, the Victorian peak body for sport and active recreation (VicSport, 2009). Recommendations included that the Victorian Government continue to support the shared use of government school facilities, through simplifying the process (e.g., by providing shared use agreement templates, best practice models and a standardised costing scheme) and through committed funding to support sport facility development and upgrades within schools. Some evidence suggests that such facility partnerships can be successful in meeting the sporting and leisure needs of both the wider community and school students, including in socioeconomically disadvantaged communities. For example, Tauranga City Council and Merivale Primary School formed a partnership to develop the 'Merivale Action Centre' to meet the indoor active recreation needs of the school and the local Merivale Community (Sport and Recreation New Zealand, 2011). The Merivale community, which is drawn from a predominantly lower socioeconomic area, was identified as having limited access to active indoor recreation space. A partnership between the school and local council led to the development of a multi-purpose facility that was accessible by the community and youth for active recreational programs. Evaluation data showed that the facility was used by the school, surrounding schools and a wide variety of community sporting groups; community use had almost doubled, to 1467 hours, between 2005 and 2009; patronage increased from 10,145 in 2005/2006 to 17,261 in 2008/2009. Given that disadvantaged neighbourhoods may lack access to facilities, this represents a promising approach to maximising existing facility use in these neighbourhoods particularly.

The Australian Sports Commission, through its Indigenous Sport Program, is aiming to improve the participation rates of Aborigines and Torres Strait Islanders in sport and recreation. Evaluations of programs (Australian Sports Commission and University of Queensland, 2012) are largely descriptive and exploratory and focused on social outcomes rather than physical activity, but suggest that these are promising approaches for engaging Aboriginal people in forms of physical activity. The program details, including implementation considerations and recommendations, are provided at <http://www.ausport.gov.au/participating/indigenous/resources/research>.

Economic instruments

While there is a reasonable body of evidence examining the impact of economic instruments – such as taxes, subsidies and other fiscal policies – on diet, in contrast relatively few studies have examined economic or fiscal approaches for promoting physical activity or sedentary behaviour change, and consequently there is much less evidence to support economic incentives for these behaviours (Shemilt et al., 2013). The investigations that have been reported have not tended to consider an equity perspective, or differential impacts according to social disadvantage. However, given that financial factors are closely linked with income and material resources, economic policies and instruments have the potential to impact on socioeconomic (particularly income-related) inequities in physical activity/sedentary behaviour participation and hence they are considered here.

Taxes or tax exemptions are one example of an economic instrument that might promote physical activity or discourage sedentary activity. An example of this is a tax that penalises individuals financially for behaviours that reduce physical activity or increases sedentary behaviours, such as driving. Two primary studies assessed congestion charges (taxes) in Sweden (Bergman, Grijbovski, Hagströmer, Patterson, & Sjöström, 2010). While evidence was somewhat inconclusive, and social inequities in impact were not reported, there was some suggestion that a road tax might increase physical activity and decrease sedentary time (Bergman et al., 2010).

One example of an incentivisation health promotion program (from a middle-income country, but included given the relative dearth of evidence for economic approaches) is the Vitality program, run by South Africa's largest private health insurer, Discovery Health, with over 2.5 million beneficiaries. Wellness activities of the program include health-risk assessments, subsidised gym memberships and smoking cessation or weight-loss programs with many incentives, including cash back on purchases of healthy foods. Evaluation data (Lambert & Kolbe-Alexander, 2013) suggest that those members who engaged in the program more intensively increased participation in fitness-related activities, and subsequently had lower healthcare expenditure. However, more than two-thirds of members did not make meaningful use of the gym benefit, suggesting that the incentives may not be sufficient to promote activity. Further research is underway to determine if the incentive magnitude or framing may be modified for greater impact.

Economic incentives for activity may also be incorporated as part of broader programs to promote activity (e.g., subsidised or low-cost council-run facilities); however, there is a dearth of evidence evaluating the impact of such initiatives on physical activity or sedentary behaviours, or inequities in these behaviours.

Given this lack of research evidence, but potential promise for addressing determinants, future trials of economic incentives are warranted. These could include a range of options, covering individual incentives, policy changes, and incentives for businesses or schools. Novel economic approaches that could be trialled to encourage physical activity could involve tax deductions for individuals or employers for money spent on physical activity programs and supplies; tax deductions for employers who purchase standing desks for employees; a physical activity voucher or 'stamp' program for low-income individuals to access programs or equipment; incentives for retailers that give discounts to customers wearing pedometers; incentives for gyms or recreation clubs to offer programs and services that target a broader range of people from different social groups; or policies to support PE in schools, such as the requirement that a certain allocation of the budget be devoted to PE and other physical activity programs at school (Pratt, Macera, Sallis, O'Donnell, & Frank, 2004).

A review of the use of economic instruments to promote physical activity in Canada (von Tigerstrom, Larre, & Sauder, 2011) similarly noted that there is a lack of evidence to date on the impact of economic instruments in effecting physical activity or sedentary behaviour change. Inherent challenges with such approaches, such as cost, have also been flagged. This is an area in need of further empirical assessment to establish effectiveness and cost-effectiveness.

Daily living conditions

The conditions into which people are born, live, work and play impact on their opportunities for physical activity participation. Initiatives aimed at improving these conditions that may be relevant to physical activity promotion may focus on access to and quality of early childhood settings such as childcare/preschool, education, workplaces, and local neighbourhoods. Our review identified no published physical activity-related evaluations that have directly intervened on these levels in order to redress inequalities in living conditions; however, a number of studies have focused on these settings in attempts to promote physical activity or reduce sedentary behaviours. This evidence is presented in Appendix 2 and summarised below.

One observation about the majority of settings-based initiatives described in this review is that they are multicomponent approaches. That is, they typically combine environmental-level supports (such as provision of equipment for activity) with social support (such as teacher/employer endorsement/support for activity/reduced sedentariness) and also individually targeted education/health promotion. As such, it is not possible to determine exactly which component(s) lead to behaviour change. Nonetheless, the success reported in a number of the reviewed studies, including those targeting disadvantaged individuals and communities, suggests that such multicomponent settings-based approaches are promising in terms of promoting active lifestyles and potentially reducing inequities in physical activity and sedentary behaviours.

Early childhood settings

Playgroups, childcare centres, kindergarten and early parents' groups are all settings that may influence young children's active play and sedentary time. Centre-based early childhood settings, such as preschools and childcare centres, represent a promising setting for physical activity promotion, since they provide access to a large proportion of preschool-aged children (3–5 years). For example, it is estimated that 95% of children attend either a full-day preschool or long day-care service in the year prior to school entry (Australian Bureau of Statistics, 2009a). Despite this potential, Australian childcare services often lack a physical activity policy or staff trained in physical activity; just under a third of services allow children to participate in non-active screen-based recreation daily (Wolfenden et al., 2010).

Hesketh and Campbell (2010) reported on results of a systematic review of obesity prevention interventions in early childhood, across a range of settings. Most of the studies identified were conducted in the preschool/childcare setting, or at home. Half (12 studies) targeted socioeconomically disadvantaged children, though some of these targeted diet rather than physical activity or sedentary time. That review concluded that many of the studies reported in the preschool/childcare setting showed no evidence of effect on behaviours that contribute to obesity despite, in many cases, strong study designs. The authors noted that most of these preschool/childcare-based studies lacked a parental component, suggesting that during these early childhood years, parental involvement is important and perhaps vital in bringing about lasting changes in physical activity or sedentary behaviours in young children.

Modifying the policy and built environments within childcare settings is another potential approach for promoting more active play and reducing sedentariness in early childhood, yet there is little evidence of the effectiveness of such approaches to date. A recent Australian study (Finch et al., 2012) reported on an intervention that aimed to influence the adoption of multiple policies and practices to promote physical activity in centre-based childcare services. The intervention led to increases in the prevalence of intervention services with a written physical activity policy, with policy referring to placing limits on small screen recreation, and with staff trained in physical activity, but it was not successful in changing all policies/practices targeted, it did not measure the impact on children's physical activity or sedentary behaviours, and it did not report on differential social effects.

One study in Belgium (De Coen et al., 2012) showed that a preschool-school-based intervention had a promising effect in the low SES community of reducing excess weight gain among young children, but there was no impact observed on physical activity or screen time.

Two obesity-prevention trials targeting infants (Campbell, 2013; Wen et al., 2012) with relevance to social determinants were identified (Victoria, Australia and NSW, Australia). One of these (Cameron et al., 2013; Campbell, 2013) included a large proportion of families of low SES, indicated by low

maternal education. The dietitian-delivered intervention showed promise in reducing children's television viewing, an effect that was equal in families of low and high SES. However, there was no impact on physical activity or BMI. Results of the second study indicated that a nurse-delivered intervention delivered to parents in socioeconomically disadvantaged communities was effective in reducing BMI for children at age 2. It also showed some positive effects on TV viewing time, as well as mothers' physical activity, among this disadvantaged sample.

School settings

Schools show promise as a setting for addressing social inequities in physical activity participation. Importantly, the secondary analyses of three very different school-based physical activity interventions undertaken by De Bourdeaudhuij et al. (2011) suggest that European school-based programs to promote physical activity are unlikely to widen or exacerbate existing inequalities. Other studies based in NSW, Victoria, the Netherlands and North America also support the effectiveness of school-based approaches for increasing physical activity levels, decreasing sedentary behaviours, and/or reducing obesity risk among children or adolescents attending schools in socioeconomically disadvantaged neighbourhoods (e.g., Morgan, Saunders, & Lubans, 2012; Salmon et al., 2011; Vander Ploeg, McGavock, Maximova, & Veugelers, 2014; Wright, Giger, Norris, & Suro, 2013). However, not all school-based studies impact on all outcomes. For example, Lubans, Morgan, et al. (2011) found positive intervention effects for dietary and weight variables but not physical activity in their NSW-based study; van Stralen et al. (2012) found positive effects for sports participation but not outdoor play, TV viewing or computer time among Dutch children.

A literature review conducted by van Sluijs and colleagues (2007) identified three interventions (two of good quality) delivered to children from low socioeconomic backgrounds. All three of those studies reported significant changes in physical activity outcomes. Harrison et al. (2006) reported on a 16-week health education intervention that delivered 10 30-minute lessons on physical activity and decreasing screen time at school, targeting children from areas of substantial social disadvantage in Irish schools. Jurg et al. (2006) reported on JUMP-IN, a Dutch program which included a focus on school sports activity, in-class exercises, an Activity week, and parental information services. Both studies reported significant intervention effects in increasing children's physical activity levels, although longer-term results from JUMP-In showed that while it increased sports participation, it did not impact on outdoor play, or reduce television viewing or computer time (van Stralen et al., 2012).

Evidence suggests that environmental strategies can also increase physical activity after school and to/from school (active transport). For example, an after school physical activity program for adolescents from disadvantaged neighbourhoods in South Africa showed positive effects among the most regular attendees (Lennox & Pienaar, 2013). Most active transport interventions that target children have focused on the school journey. An international review (Chillon, Evenson, Vaughn, & Ward, 2011) of such interventions reported that strategies to encourage active transportation to and from school have included the use of travel coordinators to develop travel plans, safe routes to school, walking school buses and one-off events such as 'Walk Safely to School' days. In total, 14 interventions were identified but because they varied in size, scope and focus, and some had low quality design, the most effective intervention strategies could not be determined clearly. Among the interventions, no changes in overall physical activity levels were observed but self-reported active transport to and from school was shown to increase. This review (Chillon et al., 2011) also identified factors associated with children's increased active transportation to and from school. Shorter walkable distances between home and school were identified as an enabling factor, and were associated with higher rates of active transport. Interventions tended to be more effective if they aimed to increase active transport to school, specifically, rather than target broader health

outcomes, and if they were multi-setting (involving parents, schools and local communities) rather than single-setting initiatives (Chillon et al., 2011). The above review did not report socioeconomic disparities in intervention setting or effectiveness (Chillon et al., 2011).

One particular intervention to promote children's active transport on the school journey on a regular basis is the Walking School Bus (WSB). For example, a WSB program has been shown to be a promising intervention that led to increases in the numbers of children walking to school among urban, low-income elementary school students in Seattle, USA (Mendoza, Levinger, & Johnston, 2009). The 'bus' comprises a group of children who walk together to school along a set route, led by an adult 'driver' with an adult 'conductor' at the rear (VicHealth, 2007). Children are picked up or dropped off at 'bus stops' outside or close to their homes. This initiative provides opportunities for regular physical activity not only for children, but also for 'drivers' and 'conductors' who tend to be parent volunteers (Tudor-Locke, Ainsworth, & Popkin, 2001). Whilst the WSB program was first introduced in the late 1990s in the UK and New Zealand (Collins & Kearns, 2005), the program was pilot-tested in Victoria (VicHealth, 2007) between 2001 and 2002. VicHealth (2007) reported that as well as increasing participants' physical activity levels, further benefits included opportunities for social interaction and reduced traffic congestion around schools. Similar benefits were identified by a study of WSBs in Auckland, New Zealand (Collins & Kearns, 2005). However, WSBs were less prevalent in low SES areas compared with high SES areas, due to a lack of volunteer parents. This is of concern as low SES areas have been associated with higher risk of child pedestrian injury (Laflamme & Diderichsen, 2000). Furthermore, not all transportation researchers are in favour of WSB programs. For example, Hillman (2006) argues that such programs promote feelings of irresponsibility among parents if they do not always chaperone their children outside the home, or arrange for another adult to do so. He considers the emphasis of safety initiatives on the school journey, rather than on other local trips, to be too simplistic since children's lives are not only focused on school.

A more recent initiative by VicHealth (VicHealth, 2011) to promote children's active transport was the Streets Ahead program which targeted those living in low SES areas and involved six Local Government Authorities (Bendigo, Brimbank, Cardinia, Darebin, Geelong and Wodonga). Streets Ahead involved children aged 4–12 years and aimed to create supportive environments that increase children's active travel and independent mobility in all aspects of their local community life, not only on the school journey. Various projects were developed and conducted using a range of strategies that included liaising with council for infrastructure change (mainly to improve road safety), school-based programs and activities, and capacity building of community groups to improve social connectedness. Strategies identified as being feasible included the hosting of mother's days and father's days when children were encouraged to walk/cycle to school with their mother or father; the provision of zip ties to attach to helmets to deter swooping magpies in springtime; provision of community maps that identified local routes suitable for walking and cycling; bike maintenance classes for disengaged students; and a frequent rider program which subsequently linked into Bicycle Network's Ride2School Day (VicHealth, 2011). However, controlled evaluation of the impacts on physical activity were not reported.

Given the broad reach of schools to students across all social groups, and the potential promise of several of the strategies described in this section, there is scope for schools to do more to promote physical activity, including in disadvantaged communities. For example, it has been argued that stronger policies are needed to increase the frequency, intensity and duration of physical activity at school (Story, Nanney, & Schwartz, 2009). It has been shown that physical activity can be added to the school curriculum by taking time from other subjects without impairing students' academic achievement. On the other hand, adding time to 'academic' subjects by taking time away from physical education does not enhance grades in these subjects and may be detrimental to health (Trudeau & Shephard, 2008). Schools could also potentially play a role in addressing gender gaps in physical activity, for example through improving physical activity participation of girls at school; improving the physical and cultural safety of spaces for physical activity; and working with

disadvantaged girls and women to remove barriers to their physical activity (Loring & Robertson, 2014).

Workplace settings

While some individual UK-based studies demonstrated success in achieving increased physical activity and/or related health outcomes among workplaces, including those employing socially disadvantaged participants (Ware et al., 2008), evidence from Dutch studies is not unequivocal for the effectiveness of this setting for physical activity promotion among those experiencing disadvantage (Magnée et al., 2013).

One published review examined strategies to reduce workplace sitting (Chau et al., 2010). That review did not find any workplace intervention study in which the primary goal was to reduce sitting, reflecting the recency of this field of research. Of the six studies that were reviewed, none showed significant decreases in sitting time in the intervention group, compared with a control or comparison group. That review concluded that there is a dearth of evidence on the effectiveness of workplace interventions for reducing sitting. While several pilot studies have since been reported (e.g., Alkhajah et al., 2012; Healy et al., 2013; Healy et al., 2012), these have tended to focus on office workers. This was consistent with findings from another unpublished review (Healy et al., 2012), which reported that few existing studies of sitting time use validated measures of sedentary behaviours or physical activity as outcomes; most focused on office workers only; and differential effects across social groups were not reported.

More evidence on approaches to reducing sitting in other occupations and contexts are required. There is no evidence on best practice approaches to reducing social inequities in sitting behaviours.

Healthcare settings

Healthcare settings, and particularly primary care settings such as general practice, represent another setting in which support for increased physical activity and decreased sedentary behaviour could be provided. Examples include the *Green Prescription* in New Zealand in which a primary care professional discusses and 'prescribes' a physical activity goal to the patient, with follow-up support from local sports foundations and exercise specialists. Interventions in healthcare settings vary greatly in their intensity and follow-up. Several systematic reviews of the literature on these approaches (Orrow, Kinmonth, Sanderson, & Sutton, 2012; World Health Organization, 2009) have shown that minimal contact interventions, such as health checks or single visit counselling have typically not been effective, but more intensive approaches supported by targeted information, or coordinated with other stakeholders such as community sports organisations or ongoing mass media campaigns have shown positive effects on physical activity participation. However, effectiveness across social groups is not well established. For example, one review of physical activity promotion in primary care settings (Orrow et al., 2012) showed that, when participant characteristics were reported, most trial participants were white, and socioeconomic characteristics were poorly reported, hence the effectiveness of this approach among those with different ethnic, social and economic characteristics could not be determined.

Community settings

Programs delivered in community have reportedly had mixed effects in terms of reaching and increasing physical activity participation. Some programs, such as the culturally sensitive, theoretically driven, home-based intervention facilitated by community health workers among very disadvantaged neighbourhoods in Texas (Mier et al., 2011), showed positive effects in increasing walking, and reduced depression and stress levels following the program. The Rumbalara Football Netball Club has developed and delivered a number of culturally appropriate physical activity

programs for Aboriginal people of different ages, and has been successful in attracting increasing numbers of players, including both Aboriginal and non-Aboriginal, and both men and women (Doyle, Firebrace, Reilly, Crumpen, & Rowley, 2013). Others, such as the Australian YMCA-led program reported by Azar et al. (2009), showed evidence of increases in perceived activity levels, or in physical activity attitudes/cognitive determinants, but no effect on behaviour change among socially disadvantaged participants.

One novel US community-based approach to address environmental conditions impacting on physical activity and health was Photovoice (Kaiser Permanente, 2005). Community residents are provided with cameras with which to document the barriers to active living in their communities. These are then used as a platform for residents to identify opportunities and advocate for community change. Results to date indicate success in garnering support for elevating the importance of biking and walking in key development decisions, as well as lobbying to have a local park renovated to improve safety and aesthetics.

Other commonly reported intervention approaches that may be categorised under this layer of influence are church-based programs. Church- or faith-based organisations have provided a supportive and accessible setting for delivering health promotion messages, particularly to African Americans in the US. Researchers working with church- or faith-based organisations have found that working within, and being considerate of, the values of the congregation, socially, spiritually and culturally, can help to assist in addressing the under-representation of minority ethnic groups in health promotion programs (Bopp et al., 2009; Wilcox et al., 2007). Often the researchers have worked with a co-ordinator from the church to deliver the program or research. For example, the Health-e-AME project reported by Wilcox et al. (2007), trained church health directors and physical activity co-ordinators to organise and deliver programs within the context of the existing health ministry of the church, also often incorporating spiritual and religious components. This study, and similar church-based interventions, Physical-e-Fit Program (Bopp et al., 2009) and 8 Steps to Fitness (Bopp et al., 2009) and another by Yanek et al. (2001), showed promising results with the use of faith-based methodology, with positive changes in health and physical activity. A number of these have been reported, particularly in the US, some with positive results in terms of increasing physical activity among racial minority groups such as African-Americans (e.g., (Bopp et al., 2009)). The relevance of these studies to the Australian context, however, is unknown.

In Victoria, the PICSAR State and Regional Grants program (VicHealth, 2013) aimed to increase physical activity, increase social connection, and reduce health inequalities to improve community health and wellbeing. The focus was on people with disabilities, Aboriginal Victorians, culturally diverse communities and those from low SES backgrounds. Between 2007 and 2011, VicHealth allocated \$20.4 million of funding to 43 State Sporting Associations (SSAs), nine Regional Sports Assemblies (RSAs) and nine peak agencies representing community organisations across Victoria. Organisations representing a wide spectrum of sports created new opportunities through a range of projects and community partnerships. It was reported that more than 47,000 people participated in PICSAR-funded activities during the four-year program. Success was attributed to a multipronged approach, focused on building the capacity of sports organisations and clubs to engage with priority communities, effective collaborative partnerships, inclusive policies, modified facilities and programs, and training of staff and volunteers. Key to program success was addressing key barriers of the target populations, including cost and transport (e.g., reduced or subsidised fees; providing equipment, uniforms, and buses); language and cultural issues; and accessibility of facilities, particularly for people with disabilities.

There is little evidence about best practice for equitable physical activity promotion in community settings with proven effectiveness among people with disabilities. This is partly because disability is a

broad term, and physical activity capabilities, determinants and likely effective intervention approaches vary according to the type of disability. For example, the literature review identified different descriptive or discussion papers for persons with intellectual disabilities; neurological disabilities; spasticity; chronic pain; and various disease or conditions that cause substantial disability (multiple sclerosis, blindness). While there are one-off examples in the literature of programs that have shown promise, a solid evidence base to inform equitable promotion of physical activity inclusive of people with disabilities is lacking.

There are US-based guidelines for health promotion programs in general, including physical activity promotion, for people with a disability. These are based on expert opinion rather than systematically reviewed evidence, and cover operational, participation, and accessibility recommendations and address the role of people with disabilities in program planning, implementation, and evaluation, accessibility of health promotion programs, and the importance of evidence-based practices, including the use of a theoretical framework to guide health promotion approaches (Drum et al., 2009). The paper reporting on these guidelines notes the challenges of a strict reliance on evidence-based decision making in the field of health promotion among people with a disability. For example, there has been only a limited number of empirically supported research studies published on disability and health promotion, and very few of the theoretical models of health behaviour have been tested among people with disabilities.

Public transport, pedestrian and cycling infrastructure in communities

An international review of infrastructure, programs and policy to promote cycling has recognised that a multi-faceted approach is required. This would include a combination of infrastructure and urban planning that supports cycling, programs that promote cycling and policies that aim to restrict car use (Pucher, Dill, & Handy, 2009). In order to rigorously evaluate the impact of new infrastructure on active transport, 'natural experiment' studies are required. For these studies levels of active transport are measured prior to and post construction of infrastructure, so that changes in active transport may be measured and compared with those in a 'control' area where no infrastructure changes have been made. Whilst this research design in the field of active transport is still in its infancy, the findings of some natural experiments have been published recently. Among these is a longitudinal study of walking/cycling infrastructure (including traffic-free bridges and feeder routes) at three sites in the UK that reported sustained use over two years following construction (Goodman, Sahlqvist, & Ogilvie, 2013). However, it was reported that the infrastructure was used mainly for recreational walking rather than for active transport and may have attracted those who already walked/cycled rather than promoting uptake of these behaviours. Furthermore, despite being accessible to a socioeconomically diverse population, the infrastructure appeared to be used more by adults of high rather than low SES (Goodman et al., 2013).

Several major cities, worldwide, have introduced bike-share schemes as a sustainable transport initiative. In London, however, social inequalities were identified in the uptake and usage of the scheme during the nine months following its implementation in 2010 (Ogilvie & Goodman, 2012). In particular, those who used the scheme tended to be males residing in high SES areas where cycling was already pervasive (Ogilvie & Goodman, 2012). While a study of the London bike-share scheme concluded that such schemes have the potential to 'normalise' cycling for transport among the general population rather than being an activity exclusively for lycra-clad athletes (Goodman, Sahlqvist, Ogilvie et al., 2013), the uptake of similar schemes in Australian cities has been poor (Fishman, Washington, & Haworth, 2012). Lack of spontaneity in accessing the scheme is cited as a reason for this, with mandatory helmet legislation in Australia contributing as a barrier to ad hoc cycle trips. Helmet legislation remains a widely debated issue with research suggesting that this has had little impact on reducing head injuries among cyclists (Dennis, Ramsay, Turgeon, & Zarychanski, 2013) and that the legislation discourages cycling among those at lowest risk of injury (Fyhri, Bjørnskau, & Backer-Grøndahl, 2012).

Further social inequities exist regarding accessibility of public transport. In general, inner city residents have greater access to public transport compared with those who live in and beyond the outer fringes of Australian cities (Delbosc & Currie, 2011). This in turn has implications for physical activity because use of public transport has been identified as providing opportunities for incidental exercise (CDC, 2010). For example, a review (Rissel, Curac, Greenaway, & Bauman, 2012) reported that increased physical activity accrued by walking to and from bus/tram stops or train stations has been demonstrated among adults who commute by public transport rather than by car. In particular, public transport users have been reported to accrue 15–26 minutes more walking for transport compared with those who commute by car (Cerin, Leslie, Toit, Owen, & Frank, 2007; Lachapelle & Frank, 2009).

Group-based/social support programs

Two recent reviews of the literature on the effectiveness of physical activity intervention approaches among socioeconomically disadvantaged communities (C. L. Cleland, Tully, Kee, & Cupples, 2012) and socioeconomically disadvantaged women (V. Cleland & Ball, 2013) drew a similar conclusion about peer- or group-based physical activity programs, suggesting these show promise for adults in this target group. Group-based formats may address barriers such as lack of social support that have been reported in other studies among socially disadvantaged individuals (e.g., Ball et al., 2007). Other studies reporting positive effects of group-based exercise classes include group-based exercise programs at neighbourhood community health centres in low-income, predominantly African-American neighbourhoods in the US. For example, the study by Clark, Stump, & Damush (2003) drew participants from two primary care settings affiliated with an urban hospital. Participants were randomly selected to participate in a group-based community exercise program, with the one year review demonstrating positive outcomes for a range of health related measures (i.e., body weight, BMI and exercise self-esteem).

Built environmental initiatives

Many adults prefer unstructured physical activity, with walking the most popular form of physical activity in Australia. However, many community environments – and often those in the most disadvantaged neighbourhoods – are not conducive to safe, pleasant walking (Ball et al., 2006).

Researchers have found many links between the built environment and physical activity among both children and adults. Land development and transportation patterns, proximity of facilities, perceived safety, neighbourhood density, and cyclist- and pedestrian-friendly amenities and other aspects of the physical environment affect physical activity levels. For example, certain development patterns, such as a lack of sidewalks, long distances to schools and the need to cross busy streets, discourage walking and cycling. Eliminating such barriers can increase rates of active commuting. People who have access to safe places to be active, and neighbourhoods that are walkable, are likely to be more active. This is likely to lead to good health and may help avoid obesity, although evidence for the latter is lacking (Sallis & Glanz, 2006). While a vast body of observational evidence attests to the importance of the built environment for activity, and to the relatively less supportive environments in many disadvantaged neighbourhoods, interventions aimed at effecting environmental change are relatively sparse. It is logistically, financially and politically challenging to bring about large-scale environmental change, and also to evaluate the impacts of such using rigorous research designs.

Natural experiments represent a valuable methodology for investigating the impact of such environmental initiatives on behaviour change. Two studies, one US-based and one in Victoria (Australia), using opportunistic natural experimental designs showed that revitalising/refurbishing park space in low-income neighbourhoods had a positive impact on park visitation and physical activity among both young people and adults (Tester & Baker, 2009; Veitch et al., 2012).

Individual determinants of physical activity

The most commonly employed/reported approaches aimed at promoting physical activity at a population level in Australia and internationally involve interventions that are individually targeted, focusing on individual attitudinal and behaviour change. These approaches can be broadly categorised into strategies targeting motivation level; broader cognitive behavioural strategies; and mediated approaches, including those delivered via novel technologies.

International reviews reported a high likelihood that individually focused interventions alone may maintain or even exacerbate social inequities in physical activity participation (Beauchamp et al., 2014). However, they do have a role to play, and some evidence attests to their effectiveness for promoting physical activity behaviours and the intrapersonal determinants of these behaviours among socially disadvantaged individuals, at least in the short term. Long-term maintenance of physical activity after most interventions is poor (Marcus et al., 2006). The success of programs targeting individual determinants of physical activity only may require more intensive contact and long-term dosage over time.

Some individually focused physical activity programs and interventions have specifically targeted socially disadvantaged individuals; the most promising of these have deliberately tailored strategies to meet the unique needs of participants. While there is some evidence of effectiveness for a selected number of these programs/interventions, it is important to note that focusing solely on the most disadvantaged will likely not have a major impact on reducing health inequalities, according to an international review (Marmot, 2010). Other studies report on approaches that have targeted a broader spectrum of participants, but report on differential effectiveness according to indicators of social disadvantage. Both types of studies are included in the summaries below, which are grouped according to their key focus and target.

Motivation-based interventions/counselling

Motivational interviewing (e.g., by primary health care workers in the UK) has been suggested as an effective approach for increasing physical activity and improving its psychosocial determinants among participants of low SES (Hardcastle, Blake, & Hagger, 2012). In Denmark, lifestyle counselling has also been shown to be effective across SES groups in achieving increases in physical activity, or attenuating age- or time-related decreases in physical activity (Aadahl, Huth Smith, Toft, Pisinger, & Jørgensen, 2011). However, motivational techniques are not always effective in achieving increased physical activity among disadvantaged participants. For example, the motivational educational approach employed in the US-based PRAISEDD intervention did not produce changes in physical activity behaviours or their cognitive determinants among low-income African American older adults (Resnick et al., 2009). A US-based intervention combining telephone-delivered motivational interviewing with pedometers (Bennett, Young, Nail, Winters-Stone, & Hanson, 2008) showed little effect on increased physical activity behaviour change among underactive rural adults, but the sample was small, and the intervention did increase self-efficacy for activity.

Pedometers offer an affordable and accessible technology that may be appropriate for increasing motivation for physical activity among socially disadvantaged groups, given that they are simplistic in output and low-literacy friendly, and immediately understandable to end-users. They are effective in promoting physical activity in general populations; however, more needs to be known about effectiveness in socially disadvantaged groups according to a meta-analysis (Tudor-Locke & Lutes, 2009).

Cognitive behavioural approaches

Cognitive behavioural approaches typically involve behaviour change strategies such as intention formation, goal setting, self-monitoring of behaviour or outcomes (e.g., body weight), addressing barriers, and relapse prevention. Such approaches have shown some success in increasing physical activity levels among socially disadvantaged groups (e.g., Burke et al., 2013). While some cognitive behavioural approaches are delivered face-to-face, others are delivered via various media (see mediated approaches for more detail below).

Mediated approaches

There is some evidence supporting the use of mediated approaches (i.e., physical activity promotion support/resources delivered via media such as print, telephone, mass media or web-based/novel technology) in promoting physical activity among socially disadvantaged participants. These approaches are more likely to be successful if they are theoretically grounded, and individually tailored. For example, among school children, a US-based study showed that internet/video-delivered intervention resulted in increased moderate-to-vigorous physical activity participation among participants in low-middle income schools (Frenn et al., 2003). A tailored internet or print-based intervention appeared to lead to long-term (12-month) increases in physical activity and associated process variables among African Americans (Pekmezi et al., 2010), although pilot testing showed that a similar tailored print intervention was not any more effective than a control condition in increasing physical activity among low-income Latino participants (Pekmezi et al., 2009). A US-based tailored, internet-and-email-based intervention aimed at promoting physical activity among ethnically diverse women had a positive effect on walking and moderate-to-vigorous physical activity (Dunton & Robertson, 2008); similarly, a US-based culturally tailored, print-based, Spanish-language intervention was effective in increasing moderate-to-vigorous physical activity among predominantly low-income, less-aculturated Latinas. Such print-based interventions are useful for widespread dissemination, and thus may help address health disparities. Among older adults, a telephone-assisted physical activity promotion program (Hooker et al., 2005) achieved reasonable buy-in from a diverse range of local agencies leading the initiative, and was relatively successful in promoting physical activity among participants, although there were some signs that effectiveness among socially disadvantaged groups who were initially highly sedentary was lower.

Systematic review-based evidence suggests that on the whole, mass media campaigns alone are not effective in promoting increased physical activity (Kahn et al., 2002). They may, however, play a role in promoting increased self-efficacy and/or knowledge/attitudes related to physical activity, and such increases do not seem to overly favour more advantaged groups, according to an Australian/Hawaiian campaign analysis (Thomas, 2012).

Digital/novel delivery approaches

Modern technology provides further examples of mediated approaches to delivering interventions. Some reviews have shown that physical activity interventions delivered via internet (van den Berg, Schoones, & Vliet Vlieland, 2007), mobile devices (Blackman et al., 2013; Fanning, Mullen, & McAuley, 2012) and text messaging (Buchholz, Wilbur, Ingram, & Fogg, 2013) show promise for increasing physical activity, although a recent Cochrane review of mobile-telephone supported interventions suggested that the availability of studies using randomised controlled trials was insufficient to determine if these approaches could influence physical activity or other health behaviours (Vodopivec-Jamsek, de Jongh, Gurol-Urganci, Atun, & Car, 2012). That review also noted that this body of literature does not typically describe the target population or give indications as to the degree to which the study samples are representative of a larger population, and hence

inferences cannot be made regarding who may be likely to benefit from these interventions based on different demographic, economic or behavioural factors. Similarly, it is unclear which subgroups of the population may be more or less likely to engage in internet or mobile-telephone supported (mHealth) physical activity interventions. This is especially important to document given that those studies that did examine sample characteristics relative to the larger population found that nonparticipants were less educated and, if they did engage in the study, had greater difficulty in operating technology. This is a promising area for future research, given the saturation of mobile phone technology across all social groups within Australia, and the potential of such technologies to create tailored, flexible, interactive physical activity programs that meet the specific requirements of the individual user, including those of different socioeconomic or cultural backgrounds, or persons with a disability (Rimmer & Rowland, 2008).

Conclusions and recommendations for future action

Physical activity and sedentary behaviours are inequitably distributed across the population, with socially disadvantaged groups at higher risk of low levels of physical activity and sedentary lifestyles. Physical activity and sedentary behaviours are influenced by a wide range of factors, from proximal individual-level attitudes, behaviours and skills, to features of the social and neighbourhood environments in which we live, both of which are shaped by broader structural factors. These determinants are themselves unequally distributed across social groups. Addressing social determinants of physical activity and sedentariness necessitates attention at these multiple levels. Such efforts cross numerous public and private interests, including multiple levels and jurisdictions of government, major industry players and non-government organisations, and across sectors – including health, recreation, transportation, education, real estate, architecture, the welfare sector, the police, the communication media, the entertainment industry and urban design/planning. A number of experts/reviews/commentators have emphasised the need for collaboration between government/community sectors to be able to promote physical activity with limited resources, and particularly to ensure longer-term sustainability (e.g., Díaz del Castillo, Sarmiento, Reis, & Brownson, 2011). All of these groups need to be engaged to address the social determinants of physical activity and sedentary behaviours and reduce social inequities in these behaviours. Approaches should also be multilevel; comprehensive intervention designs combining individual-level and physical environmental changes have achieved the greatest effects (Yancey, Cole, & McCarthy, 2010), and education and social, environment/policy change should be considered complementary, not exclusively or in isolation. There is a role for lifestyle and behaviour change, but without addressing the upstream determinants (lower two levels of Fair Foundations) such approaches are unlikely to reduce inequities in physical activity participation in the longer term.

Despite this, the majority of evidence identified in the current review focused on approaches targeting behaviour change at the individual level. A smaller body of literature reported on settings-based approaches, which take into account the conditions/places in which people live, learn, work and play. Very little evidence was identified at the broadest level – initiatives aimed at modifying structural components. Based on the literature reviewed, the following recommendations are made for planning/action, and for future research.

Where recommendations are made, these could be considered according to the principles of proportionate universalism (Marmot, 2010). That is, investment should be proportionate to the level of disadvantage, with greatest investment in the most disadvantaged communities. This does not necessarily mean an exclusive focus on the most deprived communities or individuals; focusing solely on the most disadvantaged will not greatly reduce inequalities sufficiently. Rather, an appropriate mix of universal (offered to all) and targeted interventions should be considered, with the caveat that universal services should not widen existing social gradients. In practice,

proportionate universalism may necessitate greater financial, material and staffing resources to be directed towards the more disadvantaged communities, decreasing according to need with increasing level of deprivation. This approach may also help to influence decisions about priorities for action in climates characterised by limited resources.

While not the key focus of this review, there are numerous guidelines in the international literature that provide recommendations relevant to addressing health inequities more generally (e.g., cross-sectoral action; combining universal and targeted approaches; local community involvement; evaluation and monitoring) (Whitehead, Povall, & Loring, 2014). In particular, it should also be noted that program success is enhanced by a thorough assessment of community needs, assets and preferences, and by meaningful community participation and involvement in program development and implementation. Local leadership affects program success (Sharpe, 2003).

General recommendations for planning/action

The following recommendations represent generally agreed guiding principles for action, rather than evidence-based prescriptions of initiatives that have been shown to promote physical activity/reduce sedentariness across social groups.

- Do not assume that what works on the population average will work for everyone. Investigate intervention impacts on different social groups.
- All physical activity/reduced sedentary behaviour intervention actions should include an equity focus and be evaluated to ensure they do not exacerbate existing social inequities in physical activity, sedentary behaviour or associated health outcomes.
- All physical activity/sedentary behaviour interventions should also be evaluated to ensure that they do not lead to unintended consequences. For example, reducing traffic speed in some streets may increase traffic in others, leading fewer people to walk or cycle in those areas.
- Collaborative, inter-sectoral approaches based on promising models should be adopted where possible, given that physical activity and sedentary behaviours are multifactorially determined, and hence action to impact these is more likely to be effective if multiple determinants are targeted. These models can be incorporated in various settings (schools, workplaces, communities).
- Pricing structures for physical activity facilities must, at the very least, not disadvantage people who are already socially disadvantaged.
- Approaches should take into account local needs and circumstances of individuals/communities rather than applying a one-size-fits-all approach.
- Target communities and individuals should be involved in participatory approaches to program planning and implementation of programs tailored to their needs.
- Physical activity resources should be equitably distributed, available, accessible and affordable across all neighbourhoods (advantaged and disadvantaged). The CDC (Centers for Disease Control and Prevention – Division of Community Health, 2013) provide a range of similar health equity considerations.
- Physical activity opportunities should be socially and culturally accessible to people and groups who are more likely to experience disadvantage, such as people from non-English-speaking backgrounds, low-income groups, Indigenous persons, single parents and people with a disability.
- People with disabilities should be involved at all stages of planning and implementing community physical activity programs. These approaches are recommended but warrant further trialling/research:
 - Provide community-based programs to meet the needs of persons with disabilities.

- Ensure that environments and facilities conducive to being physically active are available and accessible to people with disabilities, such as offering safe, accessible and attractive trails for bicycling, walking and wheelchair activities.
- Encourage health care providers to talk routinely to their patients with disabilities about incorporating physical activity into their lives.

Promising intervention entry points/approaches

Recommendations focused within the Socioeconomic, political and cultural context layer of the Fair Foundations Framework

- Multicomponent, appropriately tailored whole-of-community campaigns for promoting increased physical activity and reduced sedentary behaviour (see also layers below; these approaches can potentially address and impact at several layers given their multilevel nature)
- Support/incentives for local and state governments and community organisations in socioeconomically disadvantaged communities to develop policies and practices to promote physical activity programs for individuals across the life course, using existing infrastructure (e.g., active parks programs, walking groups)
- Neighbourhood designs that are walkable and support physical activity. For example, zoning policies that favour walkability; transportation investments in pedestrian and cycling facilities
- Transport policy (e.g., multi-use trails, road closures or restrictions on use) shows promise, although more evidence is needed on the impact of increasing physical activity across social groups.

Recommendations focused within the Daily Living conditions layer of the Fair Foundations Framework

- Multicomponent, tailored, community-wide approaches (also see layer above; these can potentially address and impact at several layers)
- The creation or enhancement of access to places for physical activity (e.g., walking paths, enhancing recreational facilities, shared-use facilities between communities and schools), combined with informational outreach activities (e.g., risk factor screening and support groups)
- Investment in early childhood interventions, such as expert-delivered parent support for obesity preventive behaviours
- Establishment, refurbishment and maintenance of suitable parks in disadvantaged communities
- Multicomponent school-based programs to promote physical activity and reduce sedentary behaviour during and outside of school hours
- Peer- and group-based social support programs that encourage peer support and shared experiences
- Investment in physical education to ensure all schools, including those with a high proportion of disadvantaged students, engage students in at least mandated levels of quality physical education
- Tailored, culturally sensitive point-of-decision prompts to promote stair use in neighbourhoods, workplaces or other settings which attract people from different social groups.

Recommendations focused within the Individual health-related factors layer of the Fair Foundations Framework

- Motivational, cognitive-behavioural and/or mediated individual-level approaches for promoting physical activity are promising if appropriately tailored. Ideally, these would be incorporated as part of a multilevel approach, complemented with broader social and environmental supports.

While these actions are directly focused on physical activity/sedentary behaviour, broader actions aimed at reducing health inequalities in general are also likely to contribute to addressing inequities in physical activity/sedentary behaviour. For example, the Marmot review (Fair Societies, Healthy Lives) identifies six policy objectives for which action is required in order to reduce health inequalities: give every child the best start in life; enable all children, young people and adults to maximise their capabilities and have control over their lives; create fair employment and good work for all; ensure healthy standard of living for all; create and develop healthy and sustainable places and communities; strengthen the role and impact of ill health prevention.

Research gaps

Further action/research needed to inform evidence-based recommendations to promote physical activity/reduce sedentary behaviours and associated health outcomes equitably

The key research gap identified in the review presented here, and noted by many authors of papers and reports included in this review, is that *relatively little is known about the differential impact that physical activity or sedentary behaviour interventions have across social groups, or the most effective ways to promote physical activity/reduce sedentary behaviours equitably*. Establishing this evidence base should be a key priority for informing future efforts to promote active lifestyles equitably. Therefore, the overarching research need is:

- All physical activity/sedentary behaviour interventions, programs and policies to be evaluated to establish their potential differential effectiveness across social groups and impact on social inequities in physical activity and sedentary behaviours.

It should be noted that the short time frame available for the conduct of this review precluded a systematic review of the various literatures that contributed to this report, and while efforts were made to include key reviews and papers, it is possible that some studies were omitted.

Acknowledging this, the review identified a number of additional specific evidence gaps, limitations and needs for future research, as follows.

- Data on the nature and magnitude of social inequities in physical activity and sedentary behaviours related to disability
- Data on the nature and magnitude of social inequities in transport-related physical activity
- Data on the nature and magnitude of social inequities in sedentary behaviour related to ethnicity and Aboriginality
- Data on when and why socioeconomic inequities in physical activity and sedentary behaviours emerge during childhood/adolescence
- Evidence on the relative contributions of determinants at each layer of the VicHealth framework, to explain social inequities in physical activity, sedentary behaviours and associated health outcomes
- Empirical evidence on how social norms relating to sport, physical activity and sedentary behaviour in Australia, and variations in these norms in the general population and across social groups, contribute to variations in physical activity or sedentary behaviours

- Empirical evidence of the most effective ways to challenge norms about physical activity and sedentary behaviour in the Australian population generally, and among specific social groups, to promote more active lifestyles
- Empirical evidence of the most effective ways to challenge norms related to gender, disability, ethnicity and Aboriginality, to promote more active lifestyles.
- Evidence on the effectiveness of changing social norms around related issues, such as environmental impacts of car use, as a means of shifting sedentary to more active commuting behaviours, both in the general population and across social groups
- Empirical evidence on the impact of the financial costs of physical activity on participation across social groups in Australia
- Evidence on the specific components of multicomponent interventions (in communities, schools, workplaces) that are most effective in different social groups
- The impact of economic approaches to promote physical activity/reduce sedentary behaviours and reduce social inequities in these. There are many potential examples here, including:
 - road or congestion taxes to promote active commuting and reduce car use
 - tax deductions for individuals or employers for money spent on physical activity programs and supplies
 - tax deductions for employers who purchase standing desks for employees
 - a physical activity voucher or 'stamp' program for low-income individuals to access programs or equipment
 - incentives for retailers that give discounts to customers wearing pedometers
 - incentives for gyms or recreation clubs to offer programs and services that target a broader range of people from different social groups
 - policies to support PE in schools, such as the requirement that a certain allocation of the budget be devoted to PE and other physical activity programs at school
- Utilise opportunities for natural experiments, for example to examine the impact of new urban planning or transport policies or changes to the physical environment on physical activity levels across social groups
- Investigate methods of promoting better uptake of community bike-share schemes (e.g., addressing barriers around helmet provision) across social groups
- Evidence of the contribution of low-cost (e.g., council-run) facilities to promoting physical activity among disadvantaged social groups particularly
- Evidence on the effectiveness of different policy, environmental and centre-based approaches, combined with parental involvement, for equitably promoting physical activity within childcare, kindergarten, playgroup and other early childhood settings
- Evidence on the effectiveness of healthcare settings for equitably promoting physical activity
- Evidence on the translatability and effectiveness for equitably promoting physical activity within Australia of successful faith/church-based approaches from the US
- More evidence on approaches to reducing screen time and other sedentary behaviours equitably in the general population and across social groups is required. There is no evidence on best practice approaches to reducing social inequities in sedentary behaviours.
- For example, research is needed on the feasibility and effectiveness of the following strategies for reducing sedentary behaviour across social groups:
 - standing desks
 - sitting on a therapy ball instead of a regular office chair
 - sitting and operating a stepping device
 - walking workstations.

- Potential for novel mHealth delivery of tailored intervention support to promote physical activity or reduce sedentary behaviours across social groups
- Evidence is required on best practice approaches to promoting physical activity that are inclusive of people with a disability
- Evidence on best approaches for the translation of efficacious programs into policy/practice
- More evidence is required on the links between interventions/policies, social inequities in physical activity/sedentary behaviours, AND consequently in associated health outcomes. Few studies have demonstrated links from inequalities in the structural/social/individual determinants, through to inequalities in physical activity, through to inequalities in health outcomes. For example, conclusive evidence that changes in the environment will reduce rates of obesity or social inequities in obesity is lacking
- The longer-term effectiveness of programs on inequities in physical activity and sedentary behaviours should be established
- Implementing environmental and policy interventions requires political change, which means the public must support the interventions. At least one study has indicated support for policies to increase physical activity in the US (Brownson, Baker, Housemann, Brennan, & Bacak, 2001); some studies have assessed support for food-related legislation, but the nature of public perceptions and support for physical activity-related environmental or policy change in Australia are not known.

General considerations for research:

- Research should be of high quality, using rigorous designs and methods, ideally randomised or cluster-randomised controlled trials; and utilise validated, ideally objective measurement of physical activity and sedentary behaviours.
- Cost-effectiveness of intervention approaches should be established.
- There should be investment in ongoing health inequalities monitoring and surveillance, to gauge progress towards reducing inequities in physical activity, sedentary behaviours and associated ill health.

Appendices

Appendix 1: Search strategy

The search strategy outlined below was undertaken in the following databases and citation indices: Medline, PsychINFO, SportsDISCUS, CINAHL, Scopus, Web of Science, Cochrane Library, Global Health, and Embase. The search terms were modified slightly according to the parameters of the particular database being searched.

Searches were combined as follows to identify papers in which the terms above appear in article titles, abstracts and/or as keywords:

(a) AND (b) AND [(b) or (d) or (e)] AND (f)

Search terms

a) Physical activity

Physical* activ*
Exercis*
Sedentar*
Physical* Inactiv*
Sport*
Active travel
Active transport*
Active commut*
Walk*
Cycl*
Bicycl*
Active free play
Active play
Active recreation
Sport* Club
Sport* organi?ation*
Incidental activ*
Active Leisure
Screen time

b) Intervention

Intervention
Policy
Program*
Health promotion
Trial
Evaluat*
Review

c) Socioeconomic, political and cultural context

- a. Socio*
- b. Economic*
- c. Education*
- d. School*

- e. Politic*
- f. Policy
- g. Policies
- h. Cultur*
- i. Social*
- j. Environment*
- k. Income
- l. Occupation
- m. Occupational
- n. Social class
- o. Transport*
- p. Infrastructure*
- q. Resource*
- r. Inequalit*
- s. Welfare
- t. Norm
- u. Norms
- v. Value*
- w. Labour
- x. Land use
- y. Housing
- z. Gender
- aa. Race
- bb. Ethnicity
- cc. Aboriginal*
- dd. Disability

d) Daily living conditions

- Income
- Housing
- Poverty
- Neighbourhood
- Neighborhood
- Work*
- School*
- Social protection
- Social network
- Social connection
- Social capital
- Social cohesion
- Social support
- Social trust
- Participat*
- Social determinant*
- Safety
- Crime
- Incivilities
- Pollution
- Litter
- Vandalism
- Traffic
- Sport* equipment

Employment
Employed
Childcare
Walkability
Street connectivity
Park*
Public open space
Green space
Aesthetics
Footpath*
Destination*
Amenit*
Walking path*

e) Individual determinants of physical activity

Knowledge
Attitude
Awareness
Behaviour*
Behavior*
Beliefs
Barrier*
Self-efficacy
Intentions
Perception*
Perceived
Self-regulation
Self-monitoring
Skills
Habit

f) Equity

Affordab*
Access*
Advantage*
Disadvantage*
Availab*
Equit*
Inequit*
Inequalit*
Equalit*
Disparit*

Appendix 2: Literature Review Tables

Appended in separate document, VicHealth Fair Foundations PA evidence review final Appendix 2 tables 2.5.14

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