

Reduce Inactivity

» *Get Moving*

A review of potential strategies.



February 2008



Reduce Inactivity, Get Moving:

A review of potential strategies

February 2008

Department of Health and Human Services
Population Health



Acknowledgements

The DHHS acknowledges the significant contribution of work that Dr Jo Salmon has provided to this report.

Dr Jo Salmon
Centre for Physical Activity & Nutrition Research
School of Health Sciences, Deakin University
August 2006

Premier's Physical Activity Council
Department of Economic Development

Published 2007
Copyright Department of Health and Human Services Tasmania.
Permission to copy is granted provided the source is acknowledged.

This document can be downloaded from <http://www.dhhs.tas.gov.au>

Reduce Inactivity, Get Moving:

A review of potential strategies

February 2008

GLOSSARY

Community Health Centres (CHC)
Department of Premier and Cabinet (DPAC)
Department of Health and Human Services (DHHS)
Department of Infrastructure, Energy and Resources (DIER)
Department of Primary Industries, Water (DPIW)
Department of Tourism, Arts and Environment (DTAE)
Department of Education (DoE)
Department of Justice and Industrial Relations (Justice)
Local Government Association of Tasmania (LGAT)
Tasmanian Chamber of Commerce and Industry (TCCI)
Tasmanian Chronic Disease Prevention Alliance (TCPDA)
University of Tasmania (UTAS)

“Best Buys” is a term used to identify evidence based intervention strategies which, when rated against specific criteria such as level of evidence, effect size, reach, feasibility, cost, sustainability and social determinants, translates to a return on investment.

Contents

EXECUTIVE SUMMARY	7
BACKGROUND	7
OBJECTIVE	7
METHODOLOGY	8
RESULTS	8
SUMMARY AND RECOMMENDATIONS	9
OBJECTIVE	12
BACKGROUND	12
THE RELEVANCE OF PHYSICAL ACTIVITY TO POPULATION HEALTH	12
NATIONAL CHILD AND YOUTH, AND ADULT PHYSICAL ACTIVITY RECOMMENDATIONS	14
CURRENT PHYSICAL ACTIVITY LEVELS IN AUSTRALIA	14
TASMANIAN CONTEXT	16
TASMANIA TOGETHER	17
IDENTIFYING HIGH RISK GROUPS	18
PHYSICAL ACTIVITY ACTION PLANS IN OTHER COUNTRIES	19
METHODOLOGY	20
LITERATURE SEARCH	20
LEVEL OF EVIDENCE	20
STRATEGIES FOR REDUCING INACTIVITY IN TASMANIA	21
POPULATION BASED APPROACHES	21
SETTINGS BASED APPROACHES	22
TARGET GROUP APPROACHES	24
REDUCING SEDENTARY BEHAVIOUR	25
HOW CAN WE ENSURE INTERVENTIONS ARE EFFECTIVE?	26
POPULATION BASED APPROACHES	30
<i>SUPPORTIVE ENVIRONMENTS</i>	30
INTERVENTION 1 – WHOLE OF POPULATION PHYSICAL ENVIRONMENTAL INTERVENTIONS (BUILT AND NATURAL)	30
INTERVENTION 2 – BUILT ENVIRONMENTS - STAIRWELL INTERVENTIONS AND POINT-OF-DECISION PROMPTS	33
<i>COMMUNICATION</i>	34
INTERVENTION 3 – COMMUNICATION - MASS MEDIA LINKED WITH MULTI-STRATEGY COMMUNITY INITIATIVES (COMMUNITY-WIDE)	34
INTERVENTION 4 – COMMUNICATION - MASS MEDIA CAMPAIGNS	35

SETTINGS-BASED APPROACHES	36
INTERVENTION 5 – SETTINGS - SCHOOL-BASED CURRICULUM INTERVENTIONS TO INCREASE CHILDREN’S PHYSICAL ACTIVITY	36
INTERVENTION 6 - SETTINGS - SCHOOL-BASED CURRICULUM PLUS ENVIRONMENTAL INTERVENTIONS TO INCREASE CHILDREN’S PHYSICAL ACTIVITY	37
INTERVENTION 7 - SETTINGS - AFTER-SCHOOL INTERVENTIONS	39
INTERVENTION 8 - SETTINGS - FAMILY-SETTING INTERVENTIONS TO INCREASE CHILDREN’S AND ADOLESCENTS’ PHYSICAL ACTIVITY	40
INTERVENTION 11 - SETTINGS - COMMUNITY-BASED WALKING INTERVENTIONS	45
INTERVENTION 12 –SETTINGS/ENVIRONMENTS - ACTIVE TRANSPORT INTERVENTIONS	47
INTERVENTION 14 - SETTINGS - PRIMARY CARE PHYSICAL ACTIVITY INTERVENTIONS	51
INTERVENTION 15 - SETTINGS - USE OF PRIMARY CARE SETTINGS FOR PHYSICAL ACTIVITY INTERVENTIONS	53
INTERVENTION 16 - SETTINGS - CHURCH-BASED INTERVENTIONS	54
TARGET GROUP APPROACHES	55
INTERVENTION 17 - INCREASING PHYSICAL ACTIVITY AMONGST WOMEN	55
INTERVENTION 18 - HOME-BASED, GROUP-BASED & EDUCATIONAL STRATEGIES AMONG OLDER ADULTS	57
INDIVIDUAL APPROACHES	61
INTERVENTION 20 - LIFESTYLE VERSUS STRUCTURED PHYSICAL ACTIVITY INTERVENTIONS	61
INTERVENTION 21 - PRINT, WEB, TELEPHONE-ASSISTED AND FACE-TO-FACE PHYSICAL ACTIVITY INTERVENTIONS	62
INTERVENTION 22 - AUTOMATED TELEPHONE SYSTEMS	64
REDUCING SEDENTARY BEHAVIOUR	65
INTERVENTION 23 - REDUCING SEDENTARY BEHAVIOUR IN CHILDREN AND ADOLESCENTS	65
SUMMARY AND RECOMMENDATIONS	66
REFERENCES	69

EXECUTIVE SUMMARY

Background

Physical activity can play a key role in the prevention and management of many chronic health conditions whilst also having a positive effect on mental health and wellbeing, social connectedness, enhancing community safety and decreasing greenhouse gas emissions through active transport options such as walking and cycling.

Physical inactivity is an established risk factor for six of the seven National Health Priority Areas (NHPAs) - arthritis and musculoskeletal conditions, asthma, cancer, cardiovascular health, diabetes mellitus, injury prevention and mental health (Commonwealth Government 1996), and also associated with overweight and obesity and type 2 diabetes that are at risk of reaching epidemic proportions in Australia.

Tasmania experiences high levels of these chronic health conditions compared with other parts of Australia (DHHS, 2005), as well as higher levels of inactivity. The National Health survey (2004/05) suggests that the proportion of Tasmanians not achieving the moderate or vigorous levels of physical activity required for health benefits was 69%. This has been consistent since the 1989/90 data collected (69.6%) demonstrating that there has been no change in this important level of physical activity for the past 15 years.

A number of strategies are already underway to address Tasmania's levels of inactivity. The Tasmanian Government established the Premier's Physical Activity Council (PPAC) in 2001 to provide a coordinated and committed approach to the promotion of physical activity, and in 2005 PPAC led the development of the *Tasmanian Physical Activity Plan (2005-2010) - LIVE LIFE get moving*. The plan sets the direction for Tasmania in achieving the vision of *All Tasmanians participating in regular physical activity as part of their everyday life*. It highlights the need for evidence based interventions and outlines recognised approaches to achieve long term change in attitudes and behaviour. The plan has 4 goals around the themes of participation, people, places and policy.

This report – *Reduce Inactivity, Get Moving: A review of potential strategies* - aims to support the *Tasmanian Physical Activity Plan* by providing information on a range of effective strategies based on best available evidence and cutting-edge research. It aims to promote discussion and raise awareness of what strategies can be used across a wide range of settings and the important role that all sectors can play in this process. By narrowing the gap between research and practice it also seeks to encourage people to evaluate the impacts and outcomes of other interventions/programs they are also involved in, to further build this body of knowledge.

Objective

The objective of this review was to identify evidence-based physical activity interventions relevant to the Tasmanian population. The purpose is to focus on interventions that show positive and sustainable changes in **physical activity levels**, acknowledging that some interventions also have additional effects on other behaviours and attitudes such as self esteem, confidence and social connectedness.

Methodology

A review of the evidence relating to physical activity was first commissioned in 2003 by the Department of Health and Human Services (DHHS), The Tasmania *Together* Health and Wellbeing Cluster and PPAC. An update of the review was subsequently undertaken in 2005-6 by Dr Jo Salmon. A further review of environmental interventions was then undertaken by Dr Kelly Shaw (Specialist Medical Advisor, Population Health) in 2007.

The research process included a literature search, categorisation of intervention approaches and evaluation of the level of evidence using the National Institute of Health rating scale. This rates interventions with an “A” – “D” level of evidence with each level indicating the strength of evidence for the effectiveness, or ineffectiveness, of an intervention. The effect size, reach, feasibility, sustainability, relative cost of interventions, and effect on social determinants of health were also identified wherever possible.

Results

Four broad groups of intervention approaches were identified:

1. Population-based approaches :
 - supportive environments;
 - communication; and
 - settings-based approaches;
2. Target group approaches, especially population groups with special needs;
3. Individual approaches; and
4. Reducing sedentary behaviour.

In reviewing the interventions a range of **‘Best Buys’** for Tasmania have been proposed. ‘Best Buys’ is a term used to identify evidence based intervention strategies which when rated against specific criteria such as level of evidence, effect size, reach, feasibility, cost, sustainability and social determinants translate to a return on investment.

It is important to note that further evaluation was planned for some of the interventions at the time of compiling this report which may have precluded the inclusion of some programs in the best buys, such as ‘after school’ programs.

In reviewing each intervention strategy, government departments with the potential to play key roles in the promotion of physical activity have also been identified.

Executive Summary

Proposed 'Best Buys' to focus our efforts on in Tasmania

Approach	Intervention Type	Intervention number*
Population based - environment	Whole of Population	1
Population based - environment	Built (stairwell, point of decision)	2
Population Based - communication	Mass media linked with community based strategies	3
Population based - settings /environment	School-curriculum and environment	6
Population based - settings /environment	Worksites- behaviour modification and environment	10
Population based - settings /environment	Active transport	12
Population based - settings	Primary Health Care- exercise specialist delivers	15
Target Groups	Home based older adults	18
Reducing sedentary behaviour	Reducing sedentary behaviour in children and adolescents	23

What needs more evaluation or has mixed results

Approach	Intervention Type	Intervention number*
Population based - settings	Family	8
Population based - settings	Intergenerational	9
Target Groups	Low socio-economic status, minority, disability, indigenous	19
Target Groups	Women	17
Individual	Lifestyle versus structured physical activity	20
Individual	Print, web, phone assist and face-to-face	21
Population based - settings	Primary Health Care practitioner delivers	14
Population based - settings	Church based (community)	16
Population based - settings	Community based walking groups	11
Population based - settings /environment	Walking School Bus	13

- *Note: the intervention numbers have no relation to any form of priority or ranking*

Summary and Recommendations

- The evidence from the physical activity literature indicates that international and Australian studies promoting physical activity demonstrate that **no single approach** has succeeded in initiating and sustaining widespread long-term physical activity behaviour. Thus, the delivery of **a range** of effective, feasible and sustainable (at least 6-months behaviour change) interventions to promote physical activity is most likely to significantly impact on physical activity in whole populations over the **long term**.
- To date, most physical activity interventions have focused on the individual, and without supportive environments it has been argued that physical activity behaviour is less likely to be maintained. There is emerging evidence that **environmental interventions** can be effective in increasing physical activity in populations.

Executive Summary

- The most successful physical activity promotion strategy for the state of Tasmania will be one that **incorporates many sectors** (eg, transport, environment, health, sport and recreation, education, justice), and adopts a number of concurrent approaches that also **link with nutrition and mental health and enhance overall health and wellbeing**. However, without a coordinated approach the likelihood of making a significant impact on public health will be reduced.
- A **coordinated cross sector approach** offers the greatest potential for implementing the National Physical Activity guidelines. The Premier's Physical Activity Council provides an excellent vehicle for achieving this coordination through the '*Live Life Get Moving, Tasmanian Physical Activity Plan 2005-2010*' and its implementation plan.
- Importantly, the selection of physical activity intervention approaches for Tasmania should be made on **the basis of the needs** of the State's population (eg, older adults, women, or low socioeconomic status groups may be a particular focus).
- **Formative research is recommended** for identifying barriers and enablers in specific communities for the development of tailored strategies targeting that population. It is important to adequately consult and engage the community at this early stage.
- **Building the capacity of the workforce** through the development of skills in the area of program development and management (including planning, implementation and evaluation of projects) is important.
- **Use theories and models** to intervene effectively, and to make informed judgements about how to measure the success of interventions. The most successful and effective interventions in the physical activity literature are those that have utilised a theoretical framework for behavioural change (King, Stokols et al., 2000; Salmon et al., 2000). Programs that are implemented should **be well evaluated** to ensure that resources and efforts of all involved are maximised.
- **Have realistic expectations**. There is **no quick fix** solution to the current chronic health crises we are witnessing in Australia. To **arrest** the acceleration of overweight and obesity and type 2 diabetes that has occurred in this country in the last 10-15 years will take long-term multi-strategy and inter-sectoral approaches so a **long term commitment** is required.
- **Use the best evidence available**, 23 evidence-based intervention strategies were identified from reviews or from new evidence in the physical activity literature. It is important we strive to implement programs that we know have been shown to make a positive change in physical activity levels (or incorporate evaluation into programs to build the evidence).
- This review has identified categories of intervention that are both effective and evidence-based. However, intervention strategies that have potential but lack evidence should also be considered for inclusion as physical activity initiatives. For example, interventions showing promise that should be mentioned include **interventions that incorporate web, print and/or telephone-assisted** strategies. However, more developmental work

Executive Summary

and pilot studies need to be undertaken before such strategies can be recommended for wide scale implementation.

- While this list should not preclude other strategies identified in this document from being implemented and evaluated, it is recommended that the **proposed 'Best Buys' should take priority.**
- Finally, to effectively action these recommendations, it is critical that all levels of government move beyond policies and make a **firm commitment**, including adequate resources for the planning, implementation, evaluation, follow-up and sustainability of the projects as this is a long term process.

OBJECTIVE

The objective of this brief was to identify evidence-based physical activity interventions relevant to the Tasmanian population; it was not intended to be a systematic review, but rather a selective review. The purpose is to focus on interventions that show positive and sustainable changes in physical activity levels, acknowledging that some interventions also have an effect on other behaviours and attitudes such as self esteem, confidence and social connectedness.

Four types of intervention approaches were identified, recognising there is some overlap between intervention types:

1. Population-based approaches
 - supportive environments,
 - communication
 - settings-based approaches
(Eg, schools, families, worksites, community, transport, health services, churches);
2. Target group approaches, especially population groups with special needs (eg, women, children, older adults, low socioeconomic status, minority groups);
3. Individual approaches (eg, behavioural modification, stages of change); and
4. Reducing sedentary behaviour.

The effect size, reach, feasibility, sustainability, relative cost of interventions, and effect on social determinants of health were also identified wherever possible. Examples of current or previous initiatives existing in Australia were identified where known. The relevance of each intervention strategy to particular government sectors or organisations has also been identified.

BACKGROUND

The relevance of physical activity to population health

The benefits of physical activity to social, mental, and physical health and wellbeing are well recognised. Adults who are regularly physically active have a decreased risk of morbidity and premature mortality from cardiovascular disease (CVD), type 2 diabetes, osteoporosis and osteoarthritis, breast and colon cancers, and overweight and obesity (USDHHS, 1996). Regular physical activity also confers a number of psychological benefits including increased mental performance and concentration; improved mood, sleep and energy levels; and decreased tension, stress levels, anxiety, hostility and depression (USDHHS, 1996).

Conversely, participation in sedentary behaviour such as television viewing, has been found to be independently related to increased risk of overweight and obesity (Cameron et al., 2003; Salmon, Bauman et al., 2000) and it is more likely to be linked with reports of an unhealthy diet (high consumption of savoury and sweet snacks and soft drinks, low consumption of fruit and vegetables) among children (Salmon et al., 2006).

Physical activity has been shown to be important across the lifespan. Although evidence of physical activity tracking from childhood to adulthood is weak, there is evidence that inactive children are more likely to become inactive adults (Kelder et al., 1994); and that inactive children have higher

Report Description and Preamble

risk profiles for coronary heart disease, type 2 diabetes and other chronic lifestyle diseases (Cheung & Richmond, 1995).

In addition, a recent prospective cohort study found that childhood television viewing is associated with overweight, poor fitness, smoking and raised cholesterol in adulthood (Hancox et al., 2004). There is also cross-sectional evidence of changes in physical activity levels throughout the lifespan, with activity slowly declining during childhood, sharply declining during young adulthood (post secondary school), and declining again in mid-age when career and family demands are at a premium (Sallis, 2000).

In Australia, physical inactivity is one of the top five factors that affect the level of disease and its impact (burden) in our community (AIHW, 2006) as shown below.

Table 1. Proportion of disease burden attributed to selected determinants of health (per cent)

Determinant	Males	Females	Persons
Overweight	8.8	8.3	8.6
Tobacco smoking	9.5	6.1	7.9
High blood pressure	7.5	7.0	7.3
Physical inactivity	6.5	6.8	6.7
High blood cholesterol	6.5	5.7	6.1
Alcohol harm	5.3	2.2	3.8
Alcohol benefit	-1.6	-2.1	-1.8
Occupational exposures	2.6	1.3	2.0
Illicit drugs	2.6	1.2	1.9
Lack of fruit/vegetables	1.9	1.0	1.4
Intimate partner violence	n.a.	2.1	1.0
Child sexual abuse	0.3	1.3	0.8
Unsafe sex	0.4	0.6	0.5

n.a. Not Available

Note: Attributable disability – adjusted life years (DALYs) as a proportion of total DALYs. One DALY equals one year of healthy life lost through premature death or living with disability due to illness or injury. Data are provisional at the time of writing.

Source: AIHW: Begg et al. in press.

The most significant public health gains will be from shifting the inactive and low active to moderate levels of physical activity as illustrated by Figure 1 below (Pate et al., 1995). The graph shows that more health benefits are achieved by A (moving people from very low activity to low/moderate activity levels results in a steeper curve i.e. big benefit) compared with C (moving people from active the very active results in a gradual curve i.e. small benefit).

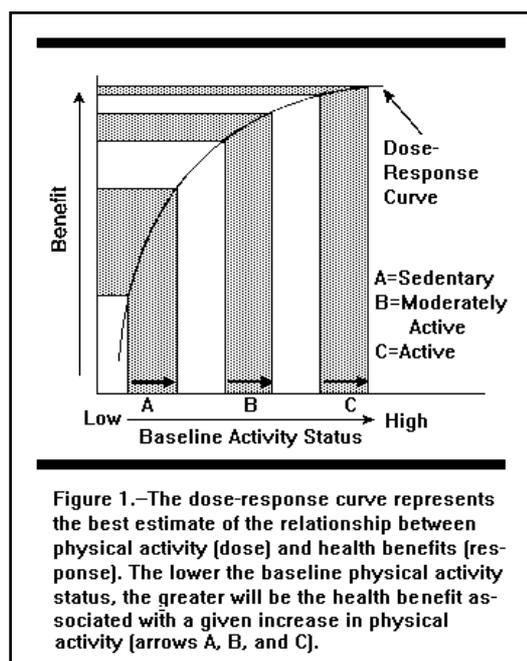


Figure 1.

Source: Pate et al., 1995

National child and youth, and adult physical activity recommendations

In 1999, the Australian government endorsed *Physical Activity Guidelines for Adults* suggesting that all adults accumulate at least 30-minutes of moderate-intensity physical activity on most, if not all, days of the week (Commonwealth Department of Health and Aged Care, 1999). Moderate-intensity can be defined as three times the metabolic equivalent of rest, and approximates a 'brisk walking pace'. The 30-minutes of physical activity can be accumulated in three 10-minute bouts throughout the day.

The National Child and Youth Physical Activity Recommendations were endorsed by the Health Ministers in July 2004 (Commonwealth Department of Health and Ageing, 2004). There were two components to the recommendations:

1. all children and youth engage in a minimum of 60 minutes (up to several hours) of at least moderate-intensity physical activity every day; and
2. all children and youth spend no more than two hours per day in electronic entertainment media (television viewing, computer games and Internet), particularly during daylight hours.

Current physical activity levels in Australia

Data from the Australian Institute of Health and Welfare suggest that there have been declines in the proportion of the adult population sufficiently active (i.e. meeting physical activity guidelines) for to gain health benefits (Armstrong et al., 2000). Currently in Australia, 15% of adults are completely sedentary and 57% of adults are insufficiently active for health benefits (Bauman et al., 2002). The Active Australia Survey has been used to assess the proportion of adults meeting the National Physical Activity Guidelines and includes items that assess walking for transport or recreation, and moderate and vigorous-intensity leisure-time physical activity. Other domains of

physical activity that may be useful to assess, but are not included in current Australian population prevalence estimates are household physical activity, occupational physical activity, and transport-related physical activity.

Very little is known about the prevalence of physical activity among children and adolescents in Australia. A study of NSW adolescents found that 20% of students in Grades 8 and 10 engaged in only low levels of physical activity according to adult physical activity recommendations (Booth et al., 2002). The Australian Bureau of Statistics reported that 49% of Australian children aged between five and eleven years were involved in 'club organised' sport (ABS, 2000). Between 1985 and 2001, Melbourne children's regular (>5 trips/wk) walking to or from school declined from 37% to 26%, and the proportion of children cycling to or from school at least once per week declined from 20% to 8% (Salmon et al, 2005). Other Australian data suggest only 42% of children who lived within a 10-minute walk from school travelled to school by foot, and 81% of all trips made by children aged 5-9 years and 62% of those made by children aged 10-14 years were by car (Seaton & Wall, 2001).

A study of approximately 1200 Melbourne school children used the latest technology to assess children's movement and found that while most children achieved the current physical activity recommendations for children and youth, the levels of activity among 10-12 year olds was half that of 5-6 year olds (Telford et al., 2005). However, that same study found that 61% boys and 57% girls watched more than two hours of television per day. A further study of 1560 school children, also from Melbourne, found that 77% of children in that study watched television for more than 2 hrs/day (Salmon et al., 2006). Thus, although many children may be achieving part of the current physical activity recommendations, it appears that activity declines dramatically with age, and that more than half of children fail to meet the sedentary recommendation component of the guidelines.

Tasmanian context

Tasmania has low population density with over 30% of the population living in towns with less than 2000 inhabitants. In 2004, 14.3% of people in Tasmania were 65 years of age or older (this was 10.5% in 1984). If the current trends continue, this is projected to almost double by the year 2021 (ABS, 2002). During the same period the proportion of youth and children (14 years and under) could decrease from 21% to just 14% and 34-38% of couples will not have children. In 2003, 13% of people in Tasmania were aged between 15-24 years. In 2001, 3.5% of people in Tasmania were identified as having an Indigenous origin (Aboriginal or Torres Strait Islander).

Multicultural Tasmania reports that approximately 11% of Tasmania's population was born overseas. Over 80 nationalities are represented, and approximately 150 languages are spoken in the State. In the last five years in particular, there has been steady increase in the numbers of migrants and humanitarian entrants coming to Tasmania. In the ten years to 1998-99, for example, Tasmania averaged approximately 540 migrants per year. During the 2004-05 financial year 1,183 migrants came to settle in Tasmania, compared with 996 in 2003-04, 802 in 2002-03 and 669 on 2001-02. Numbers are expected to continue increasing. Currently, Tasmania receives the highest portion of refugee arrivals per capita compared with other States and Territories. Over the last two financial years, numbers have exceeded 400, and this pattern is expected to continue in 2005-06. The majority of these refugees have been from Africa. Over the next few years, Tasmania is likely to continue to accept refugees in need of resettlement.

This census snapshot of Tasmania provides some insights into strategies, settings and groups that may be important targets for physical activity interventions.

According to the National Physical Activity Guidelines (NPAG) moderate (brisk walking, cycling) and vigorous (netball, football, aerobics, jogging) activity levels improve indicators of health (such as blood pressure, blood cholesterol and body weight) (DoHAC 1999). The National Health Survey (NHS) provides Tasmania data on physical activity every five years. The results of the NHS can not be fully expressed in terms of the NPAG because NHS collects data relating to sport, recreation and fitness only, and does not collect data on incidental physical activity (eg. gardening) or activity associated with work. However, it does suggest that in 2004/05 the proportion of Tasmanians not achieving moderate/vigorous levels of physical activity was 69%. This has been consistent since the 1989/90 data collected (69.6%) and other NHS in between demonstrating that there has been no change in this important level of physical activity for the last 15 years. Additionally, there was a statistically significant slow but steady increase in sedentary behaviour for 18-24 years in particular (ABS, 2006).

In the 2001 population census, 8.4% of employed persons in Tasmania walked, cycled or caught public transport to work (ABS, 2001). In 2004-05, the National Health Survey showed that nearly half (47%) of Tasmanians surveyed did not walk for exercise and of those who did, 17% walked less than 30 minutes in duration.

Tasmanian Premier's Physical Activity Council

The Premier's Physical Activity Council (PPAC) was established in June 2001 to provide a co-ordinated approach to addressing the issue of physical activity in Tasmania and encourage more Tasmanians to be active as a regular part of their lifestyle. Membership of the Council is inter-sectoral and includes the following government and non-government organisations: Tasmanian General Practice Divisions Ltd., Unions Tasmania, Local Government, Sport and Recreation Industry, State Government through the Department of Premier and Cabinet, the Department of Health and Human Services, Department of Education, Department of Economic Development - Sport and Recreation Tasmania, the National Heart Foundation - Tasmania Division, the University of Tasmania, and community and employer representatives. The Secretariat of PPAC is provided through Sport and Recreation Tasmania within the Department of Economic Development.

In 2005 PPAC led the establishment of the *Tasmanian Physical Activity Plan (2005-2010) - LIVE LIFE get moving*. Development of the plan involved a lengthy consultation process including regional forums held in Kingston, Sorell, St Helens, Launceston, Burnie, Queenstown, King Island and Flinders Island. The plan sets the direction for Tasmania in achieving the vision of *All Tasmanians participating in regular physical activity as part of their everyday life*. It highlights the need for evidence based interventions and outlines recognised approaches to achieve long term change in attitudes and behaviour. The plan has 4 goals around the themes of participation, people, places and policy and 16 strategies to achieve these goals.

Goals include:

- Goal 1. - Participation - Tasmanians with personal skills and knowledge that enable participation in regular physical activity
- Goal 2. - People - Communities that work collaboratively to create physical activity opportunities for all Tasmanians
- Goal 3. - Places - Supportive built and natural environments that encourage active communities
- Goal 4. - Policy - Integrated policy and planning that maximise physical activity opportunities for all Tasmanians.

While PPAC is coordinating the implementation of the plan, the active participation of key government and non-government organisations in the implementation process is essential.

Tasmania Together

Tasmania *Together* is a community-owned 20-year vision for the state of Tasmania that was developed following extensive community consultations and then launched in 2001. It initially resulted in a plan outlining 24 goals and 212 benchmarks which were reduced to 12 goals and 143 Benchmarks following the first 5 year review that was carried out at the end of 2006. The revised goals and revised benchmarks that relate to physical activity include –

GOAL 4: ACTIVE HEALTHY Tasmanians with access to quality and affordable health care services

Standard 1: Improve Tasmanian health through promotion and support of healthy lifestyle choices.

Indicator 1.2: Percentage of population who do not do enough exercise to avoid chronic disease.

Indicator 1.3: Proportion of children (5-14) participating in organised sport.

The development of the 'Tasmanian Physical Activity Plan (2005-2010): LIVE LIFE *get moving*' for the state closely links and reinforces many of the community, democratic, and environmental goals under *Tasmania Together*, for example:

- Goal 1. A reasonable lifestyle and standard of living for all Tasmanians.
- Goal 2. Confident, friendly and safe communities.
- Goal 5. Vibrant, inclusive and growing communities where people feel valued and connected.
- Goal 8. Open and accountable government that listens and plans for a shared future.
- Goal 11. Built and natural heritage that is valued and protected.
- Goal 12. Sustainable management of our natural resources.

The *Tasmania Together* Health and Wellbeing Cluster has a lead role in overseeing and reporting on the benchmarks related to health and wellbeing, many of which are related to Goal 4, and the common risk factors for many chronic diseases of smoking, nutrition, physical activity, and mental health. Other benchmarks monitored through this cluster also address prevention and the facilitation of supportive communities and partnerships that make healthier choices possible and easier. The Cluster provides a whole of government approach and supports the implementation of state policies that have the potential to influence health and wellbeing. A cross agency working group in partnership with PPAC has also been established (2007) to address the issue of planning for Active Communities focusing on the role that planning and infrastructure can play in enhancing physical activity, and several pilot projects are also underway, auspiced through the cluster, evaluating different interventions aimed at enhancing physical activity.

Identifying high risk groups

Identifying those most at risk of inactivity is important for the development of targeted physical activity programs aimed at those groups. Those most likely to be inactive during their leisure-time include: women, married women (particularly those with children), adults aged 30 years or older (particularly the middle aged 'slump' - 40-50 years of age), those with less than 12-years of education, indigenous adults in the population, and those who do not speak English at home (Bauman et al., 2002).

Key political drivers

There are several key political drivers that underpin strategic directions in physical activity and include international (Ottawa Charter, Jakarta declaration and Bangkok Charter), national (Be Active Australia, Healthy Weight 2008 and Healthy Weight for Adults and Older Australian's), and local strategic directions ('Tasmanian Physical Activity Plan (2005-2010): LIVE LIFE *get moving*', *Tasmania Together* and the Tasmanian Food and Nutrition Policy).

Other evidence based documents that support this report include:

- *Getting Australia Active II* (August 2004)
This document updated the evidence presented in *Getting Australia Active* (2002). The review used multiple electronic databases (NIH, PubMed, Medline, Current Contents, CINAHL, Psyclit) and evidence based directories (Cochrane, DARE). The focus was on population

based studies rather than evidence from clinical or small scale trials. More than 200 recent articles were considered for the review.

- *Creating Healthy Environments – a review of links between the physical environment, physical activity and obesity* (October 2005)

The technical component of this report is based on a selective review of determinants and interventions studies from published and unpublished sources. It used a systematic process to obtain references, search the literature (from 2000-2005) and summarise the results. Published literature was sourced using electronic databases (MEDLINE, CINAHL, DARE/EBM, AVERY, PSYCHLIT and PUB MED).

Physical activity action plans in other countries

Many countries around the world have developed physical activity action plans and statewide and national strategies. Below are just a few examples:-

- Canada:- In 2003 the Canadian government resolved to increase participation in physical activity nationally by 10 percentage points by 2010. In addition to current physical activity prevalence, a monitoring and surveillance report identified examples of current strategies by governments in Canada and encapsulated what strategies work for promoting physical activity nationally (Cameron et al., 2004; www.cflri.ca).
- United States of America: The government has a national physical activity objective described in 'Healthy People 2010' (<http://www.healthypeople.gov/>).
- United Kingdom:- 'Choosing Activity' is the Government's national physical activity plan to coordinate departments and organisations to promote physical activity nationally. These strategies include "school PE and sport and local action to encourage activity through sport, transport plans, the use of green spaces and by...providing advice to individuals on increasing activity through the use of pedometers" (http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPolicyAndGuidanceArticle/fs/en?CONTENT_ID=4105354&chk=ixYz2B). An update review of evidence of effectiveness has also recently been published by the Health Development Agency in the UK (www.hda.nhs.uk/evidence).

METHODOLOGY

A review of the evidence relating to physical activity was first commissioned in 2003 by the Department of Health and Human Services, the Premier's Physical Activity Council and the Health and Well Being Cluster. Dr Jo Salmon, Deakin University, completed this report (*Reducing Inactivity in Tasmania, a review of the potential strategies*). An update of the review was subsequently undertaken in 2005-6 by Dr Jo Salmon. A further review of environmental interventions was then undertaken by Dr Kelly Shaw, Population Health DHHS. This report compiles this update together with other reports identifying evidence in this area to establish a range of common recommendations. The research process is outlined in the following sections.

Literature search

A comprehensive search of the research literature was conducted (to March 2006) using the computer-based databases MEDLINE, PUBMED, PSYCHLIT, CURRENT CONTENTS, SOCIAL SCIENCE INDEX, THE COCHRANE LIBRARY, and SPORTS DISCUS. Manual searches of the reference lists of recovered articles and the authors' extensive personal files were also conducted. The search targeted systematic reviews and recent primary research articles. The key words used in the computer searches were physical activity, exercise, sport, walking, active transport, sedentary, television viewing, obesity, prevention, type 2 diabetes, children, adolescents, youth, adults, older adults, seniors, promotion, initiatives, strategies, interventions, and randomised controlled trials. The annual subject and author index of relevant journals in the field of physical activity and health that were not included in the databases listed above were also examined. The update of the review included a search for papers that have reviewed physical activity or sedentary behaviour intervention studies and were published after 2003. In addition, newly published studies since 2003 that were not included in review papers were also identified. Evidence was coded using the National Institutes of Health categories.

Level of evidence

For the purpose of evaluating the level of evidence for the effectiveness, or ineffectiveness, of a physical activity intervention, the evidence-based methodology used by the National Institutes of Health and by a consensus panel on dose-response issues relating to physical activity was applied (NIH, 1998; Kesaniemi et al., 2001). This approach is consistent with the NHMRC Quality of Evidence rating scale, but was regarded as more suited for the particular purposes of the report.

Category A: Evidence is from endpoints of well-designed randomised controlled trials (RCTs), or trials that depart minimally from randomisation that provide a consistent pattern of findings in the population for which the recommendation is made. Category A, therefore, requires substantial numbers of studies involving substantial number of participants, or meta-analyses of RCTs.

Category B: Evidence is from endpoints of intervention studies that include only a limited number of RCTs, post hoc or subgroup analysis of RCTs. In general, Category B pertains when few randomised trials exist, when they are small in size, the trial results are somewhat inconsistent, or when the trials were undertaken in a population that differs from the target population of the recommendation.

Category C: Evidence is from outcomes of uncontrolled or non-randomised trials, or from observation studies.

Category D: Expert judgement is based on the synthesis of evidence from experimental research described in the literature and/or derived from clinical experience or knowledge that does not meet the above-listed criteria. This category is used only in cases where the provision of some guidance is deemed valuable, but an adequately compelling scientific literature addressing the subject of the recommendation was deemed insufficient to justify placement in one of the other categories (A through C).

STRATEGIES FOR REDUCING INACTIVITY IN TASMANIA

Physical activity intervention strategies will be categorised into the following types:

1. Population-based approaches – creating supportive environments and communication-based approaches and settings-based approaches (schools, families, worksites, community, transport, health services, churches),
2. Target group approaches – eg. women, older adults, low socioeconomic status, and minority groups,
3. Individual approaches – lifestyle versus structured physical activity interventions, print, web, telephone-assisted and face-to-face physical activity interventions, and
4. Reducing sedentary behaviour – in children and adolescents.

For all of the intervention modes, the levels of evidence relevant to particular target groups (eg. children, older adults, low socioeconomic status) were identified wherever possible (Categories A to D). The effect size, reach, feasibility, sustainability, relative cost of interventions, and effect on social determinants of health were also identified wherever possible. Examples of current or previous initiatives existing in Australia were identified whenever possible. Relevance to particular government sectors has also been noted.

I. Population based approaches

Supportive environments and communication

Literature from the past decade suggests the need for supporting environmental and policy interventions. These types of interventions have considerable potential for promoting physical activity, because they are designed to have an impact on large groups and populations (Sallis et al., 1998). Changes in policy and the environment have also been shown to support and sustain changes in individual behaviour (Farquar, 1978). Despite this, few published studies of environmental and policy interventions exist. Previous studies using these interventions have mainly been directed towards smoking cessation and the reduction of cardiovascular risk factors.

Environmental and policy interventions aimed at increasing physical activity at a population level have only recently emerged in the scientific literature. Therefore, most of the population approaches for reducing inactivity that are described in this section are a Category C or D level of evidence. Nevertheless, absence of proof does not mean the initiative does not have potential and there is consensus in the physical activity public health research field that these may be worthwhile approaches. It is more important that these interventions with limited evidence are evaluated well to build the evidence.

A recent review paper on lessons to be learnt from tobacco control initiatives and how we might apply these to the prevention of obesity in the population suggests that the key elements of tobacco control were: “(1) clinical intervention and management, (2) educational strategies, (3) regulatory efforts, (4) economic approaches, and (5) the combination of all of these into comprehensive programs that address multiple facets of the environment simultaneously.” (Mercer et al., 2003, p.1073S). While many of these approaches have not been systematically trialled in the physical activity field, “regulatory” or policy initiatives have much potential for impacting on physical activity in large portions of the population. In addition to environmental and policy interventions, mass media linked to community-based initiatives have also been shown to be effective. However, there is consistent evidence that mass media alone (ie, without the links to community programs) will not result in increases in physical activity in the population.

Settings based approaches

Physical activity promotional strategies are often delivered within a defined setting. A setting is typically a geographical area or institution containing a large ‘captive’ audience whereby health messages could be efficiently delivered (Sallis & Owen, 1999). However, it can also be a cultural or contextual setting, for example, the family setting. Behaviour settings can be defined as the social and physical situations in which behaviours take place, by promoting and sometimes demanding certain actions and by discouraging or prohibiting others (Owen et al., 2001). It is obvious that some settings specifically promote physical activity (eg, sports fields, gymnasiums, bicycle trails) whilst others discourage, restrict, or prohibit activity (for example, computer workstations, highways and domestic living areas). The development of a settings approach to health promotion, and health promotion practice, is now firmly established in conceptual frameworks that set out the determinants of health, strategies for improving health, and specific goals and targets for guiding health promotion efforts (Glanz, 1996). This has led to more strategic thinking about settings for physical activity promotion. There are a number of settings that are relevant to physical activity including: communities, worksites, schools, transport, families, and healthcare settings.

a) School settings

In most industrialised countries, schools are the primary institution with responsibility for promoting physical activity in young people. The potential of physical education classes reaching all students makes schools an important resource to consider, with the school environment being instrumental in influencing youth physical activity patterns (Simons-Morton et al., 1991). In addition to physical education lessons, children have physical activity opportunities through free play before, during and after school, and also through active

transport to and from school. Curriculum-based and environmental strategies in schools appear to have the most efficacy in that setting.

b) Family settings

An increasing number of studies have incorporated a focus on families as important settings for physical activity interventions. Many of these have combined school, community and family approaches and the effectiveness of these will be presented. The small number of studies in family settings only showed promise.

c) Worksite settings

A common setting for the promotion of physical activity is the worksite. The majority of the Australian adult population spend up to 8 hours per day at work (ABS, 1995) and spend at least 50% of their life working (Klein, 2005). In the workplace, a large proportion of adults are grouped in the one location, providing a conducive environment for the development of peer-support networks. Hence, the workplace represents a convenient and potentially influential environment to foster and encourage physical activity (Shepard, 1996).

Workplace physical activity programs often recruit up to 20-30% of the work force, and these are mainly white-collar workers, who are better educated, more active and more aware of health issues than non-participants (Lovato & Green, 1990). It is therefore important to understand the barriers and enablers for particular worksites and employees, ensuring a tailored and more relevant approach, and using a variety of strategies that reaches all levels of the workforce beyond white collar workers.

d) Community settings

The term 'community' refers to local groups of people, whole cities, or even whole nations. The Ottawa Charter for Health Promotion (1986) emphasises that health for all requires strengthening community action with people to enable them to take greater control over the determinants of their health. The growing epidemic of lifestyle diseases has facilitated large-scale evaluations of community-based approaches; these have highlighted population-wide education and have also included changes in community organisations, environmental changes and incentives (Bracht, 1990). A review of studies within community settings that targeted increased physical activity among older adults (see intervention 18), found 19 of the community-based intervention studies reviewed were successful in achieving behavioural and/or physiological changes, four of the studies had mixed results, and two of the studies showed no effect (King, Rejeski & Buchner, 1998). Since the release of the US Surgeon General's Report on Physical Activity (USDHHS, 1996), there has been an increased focus on walking interventions. Many of these interventions are taking place in the community and transport settings.

e) Transport settings

The transport setting can be defined as where infrastructure exists for people to actively commute by foot, bicycle, or by public transport ("active transport"). There are not many systematically evaluated active transport initiatives in the literature, however, as for the

walking in community settings approaches described above, there are a number of new initiatives involving walking for transport that will be summarised.

f) Primary health care settings

Primary health care settings can play a useful role in the delivery of physical activity initiatives for primary prevention to the general patient population and for secondary prevention to the clinical population. In the US, every person in the population averages two visits per year to a primary care facility (Simons-Morton et al., 1998). Health care settings may include hospitals, general medical practices, community health centres, and other specialist medical centres. Physical activity programs have been delivered in these settings by physicians, health practitioners (eg, physiotherapists), and nurses. Four systematic reviews of the primary health care setting have been published and the findings synthesised. There is increasing evidence of the efficacy of primary care settings to promote physical activity among adults and among youth, using a variety of strategies from individualised counselling to computerised assessment.

g) Church settings

Interventions in church settings have the advantage of potentially impacting on multiple domains of health including physical, mental and spiritual health. Spiritual health may be defined as an inherent human quality involving a belief in something greater than the self, and a faith that positively affirms life (Miller, 1995). Furthermore, using the church as a setting for behaviour change has the advantage of operating within an existing social support structure.

Church support groups have been shown to be valuable in assisting individuals to initiate and maintain behaviour change (Lasater et al., 1997). This setting has only been recently studied for the promotion of physical activity, and although only four published studies were located (2 from the US and 2 from Australia), it may be useful to consider this setting for physical activity interventions in Tasmania, particularly among women and older adults.

2. Target group approaches

There are many individual and group differences that influence the effective delivery of physical activity interventions. In addition, from a public health perspective, targeting those most at risk of being inactive makes good sense in terms of maximising public health impact. Descriptive epidemiology studies consistently identify the following groups as being more likely to be inactive: women, older adults, middle-aged adults, low socioeconomic status, and culturally and linguistically diverse groups. In Australia, coming from culturally and linguistically diverse backgrounds (CALD) was a major factor associated with inactivity, with 59% of people surveyed from culturally diverse backgrounds shown to be 'inadequately active' in comparison to 49% of the general population (Bauman et al., 1996). In addition, an increasing number of intervention studies have focused on older adults with, or at risk of (eg, elevated levels of HbA1c, or impaired glucose tolerance) type 2 diabetes, acknowledging that such groups may require strategies tailored to their particular needs. As the evidence is presented primarily as population, settings, and individual approaches, there is substantial overlap where often all of these approaches have been applied to various target groups. Therefore, only target groups where there have been systematic reviews or where there is accumulated evidence of intervention strategies have been identified in this document.

3. Individual approaches

Public health strategies identify the need to reduce physical inactivity through changes to both individual behaviour and the environment (King et al., 1995; Sallis et al., 1998). However, most physical activity research has concentrated on increasing physical activity by changing individual behaviour (Dishman & Sallis, 1994). Individual approaches focus largely on specific biological, cognitive and behavioural variables that may influence physical activity patterns. Psychological approaches contribute to health promotion by providing invaluable research and practice on individual differences, motivation, learning, attitudes, and behaviour change (Matarazzo et al., 1984). To intervene effectively, and to make informed judgements about how to measure the success of interventions, health professionals must have an understanding of the role of the individual in health behaviour (Glanz et al., 1996). Individual strategies have employed a variety of approaches. Several of these include:

- goal setting (King, Taylor, Haskell, et al. 1988)
- decisional balance (Marcus & Stanton, 1994)
- stage of change (Marshall et al., 2003)
- relapse prevention training (Kau & Fischer, 1974)
- stimulus control strategies (Blair et al., 1986)
- social support (King, Haskell, Taylor, et al. 1991)
- self-efficacy and decision-making (Marcus, Bock, Pinto, et al. 1998).

4. Reducing Sedentary Behaviour

While the focus of this document is primarily on promoting increased physical activity, it is important to identify that given the rapid advances in technology and the known health risks, the reduction of sedentary behaviour should also be a deliberate and key strategy in the prevention of chronic disease. The one should lead naturally to the other, but the increase in body movement is not necessarily a measurable outcome, and different types of interventions and strategies may be applied. A growing body of evidence suggests that sedentary behaviour, in particular recreational pursuits such as television viewing, Internet and computer use, may have independent health effects on child and adult health. That is, independent of reported physical activity levels, adults who spend excessive amounts of time in sedentary behaviours are at increased risk of overweight or obesity (Salmon et al 2000), newly diagnosed type 2 diabetes or impaired glucose tolerance (Dunstan et al., 2004), and metabolic syndrome (Dunstan et al., 2005).

There is also evidence of consistent associations between TV viewing and weight status of children (Dietz, 2001). While children have not had the required 'exposure' to sedentary behaviours to demonstrate associations with other adverse health effects, high television viewers are more likely to be overweight/obese, less likely to engage in organised physical activity, and more likely to report an unhealthy diet (high consumption of savoury and sweet snacks and soft drinks, low consumption of fruit and vegetables) (Salmon et al., 2006). The Australian Physical Activity Recommendations for Children and Youth endorse spending no more than 2 hours/day in recreational electronic media use (TV viewing, electronic games, computer/Internet), particularly during daylight hours (www.healthyaactive.gov.au). Therefore, efforts to reduce the amount of time that children and adults spend watching television or videos or using a computer/Internet, particularly if linked with increases in physical activity, could result in substantial decreases in many chronic health conditions and unhealthy lifestyle behaviours.

HOW CAN WE ENSURE INTERVENTIONS ARE EFFECTIVE?

Use of theories and models

To intervene effectively, and to make informed judgements about how to measure the success of interventions, health and community workers must have an understanding of how health behaviours are adopted and sustained, and the motivating and constraining factors that influence change. There are many behavioural theories and models that have been developed to help us understand this process, and some theories are applied more frequently than others. This document does not identify for each intervention the theoretical models that have been applied, but this does not mean that they are not an important contributor to the successful implementation of the approach. The most successful and effective interventions in the physical activity literature are those that have utilised a theoretical framework for behavioural change (King, Stokols et al., 2000; Salmon et al., 2000).

The most commonly applied theories in physical activity intervention studies include: Social Cognitive Theory (Bandura, 1986); Stage of Change Theory or Trans-Theoretical Model (Prochaska & Marcus, 1994); Theory of Reasoned Action and Planned Behaviour (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980); Ecological Models (Stokols, 1996); and Social Marketing Theory. Most of the individual approaches identified in the previous section are constructs from the theories identified here. To implement an intervention strategy using an atheoretical approach (eg, designing and implementing an intervention that is not grounded in behaviour change theory) will most likely result in the failure of the initiative.

Have realistic expectations

There is **no** quick fix solution to the current chronic health crises we are witnessing in Australia. To **arrest** the acceleration of overweight and obesity and type 2 diabetes that has occurred in this country in the last 10-15 years will take long-term multi-strategy and inter-sectoral approaches. Planning and investment needs to be beyond the term of any government for prevention to have a chance of showing positive health outcomes. In consideration of the lessons learnt from tobacco control (Mercer et al., 2003), to **reverse** the current health trends may take 20 years or more. The interventions proposed below are based on best available evidence, and where evidence is scarce or non-existent, evidence from observational studies has been drawn on. It is often said that these intervention approaches are “not rocket science”. This is very true. Behaviour change is *much more* sophisticated, complex and unpredictable than rocket science and if people behaved as predictably as rockets then the solutions would be relatively simple!

A modified example of the complexities of behaviour change has been illustrated in Figure 2 (Bauman, Sallis et al., 2002). In basic science the causal pathway between a particular factor ‘D’ (eg, increasing physical activity), the physiological change at the cellular level ‘E’, and the disease outcome ‘F’ is relatively straightforward (Figure 2). However, in explaining behaviour change (ie, the cause-effect link between the physical activity program ‘B’ and change in physical activity behaviour ‘D’), there are many other factors that need to be considered. Bauman et al. define a **mediator ‘M’** as “an intervening variable that is necessary to complete a cause-effect link between an intervention program and physical activity” (2002, p.8). To give an example, an intervention might result in increased social support, which in turn might lead to increased physical activity. An intervention might also vary in its effectiveness if there are factors that moderate the behaviour

change (**moderators 'A'**). For example, the physical activity environment (eg, access to facilities, footpaths, safety) may moderate the effect of the intervention, so that those with a positive physical activity environment (A1) may have more success with the intervention compared to those with a negative environment (A2).

Finally, there are **confounders ('C')** that are associated with the outcome (ie, physical activity behaviour change) as well as with the intervention program. For example, socioeconomic status may be a confounder where people of different SES may respond differently to the intervention program and the effect of the program may also differ by SES.

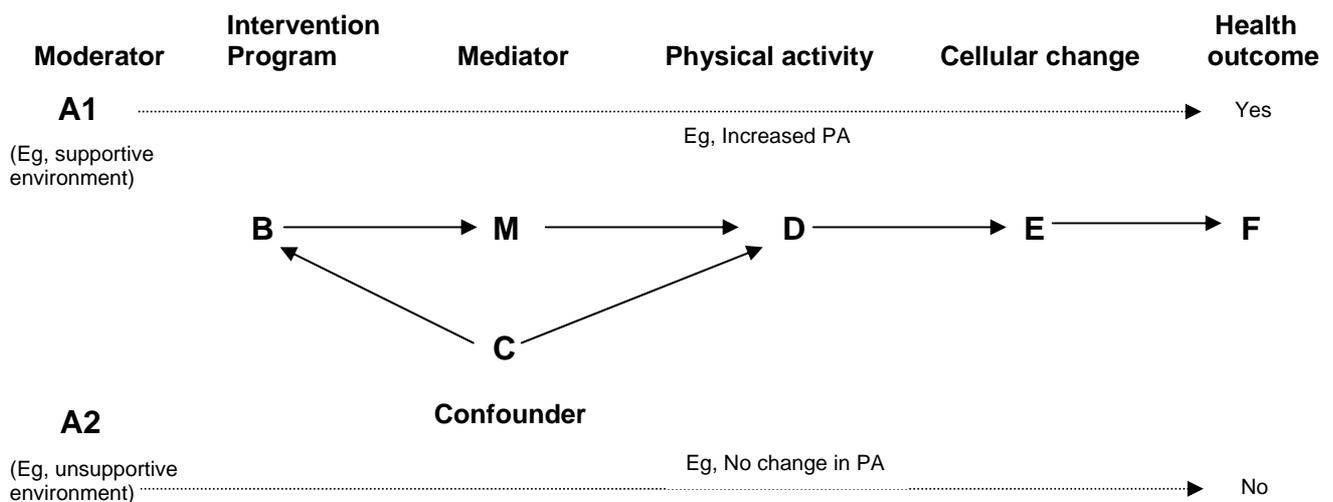


Figure 2. Pathways of change. Relationships between intervention programs, moderators, mediators, confounders and physical activity behaviour change (adapted from Bauman, Sallis et al., 2002).

Use the best evidence available

Based on the framework below (Figure 3), 23 evidence-based intervention strategies were identified from reviews or from new evidence in the physical activity literature. An effort has also been made to identify which may be the 'best buys' for Tasmania to initiate in the next 5-10 years.

This was based on the review criteria as follows:

- Level of evidence (categories A-D)
- Effect size
- Reach
- Feasibility
- Cost
- Sustainability
- Social determinants

Not all of the 23 identified intervention strategies were effective and feasible. However, the interventions proposed as 'best buys' have been shown to be effective and are seen as feasible for Tasmania.

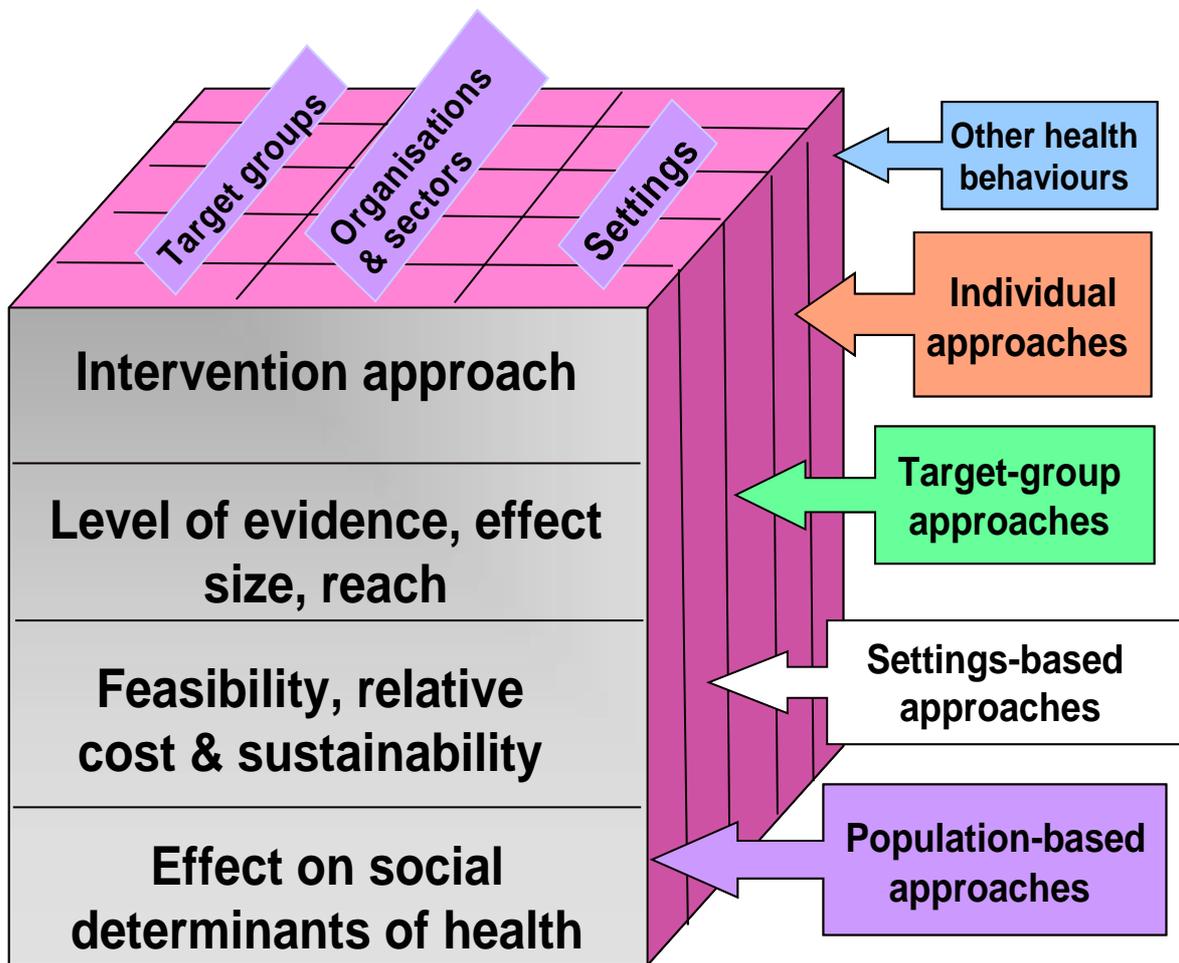


Figure 3. Framework for intervention approaches.

List of Strategies that were reviewed for Reducing Physical Inactivity in Tasmania

The reviewed intervention strategies and strategies in general are grouped as follows*:

POPULATION BASED APPROACHES – INTERVENTIONS 1 – 16

Supportive Environments

1. Physical environment interventions
2. Stairwell interventions and point-of-decision prompts

Communication

3. Mass media and linked with multi-strategy community based initiatives (community-wide)
4. Mass media campaigns

Settings based

5. School-based curriculum interventions to increase children's physical activity
6. School-based environmental interventions to increase children's physical activity
7. After-school interventions to increase child and youth physical activity
8. Family-setting interventions to increase children's physical activity
9. Intergenerational interventions
10. Worksite behavioural and environmental interventions
11. Community-based walking interventions
12. Active transport interventions
13. Walking school bus
14. Primary care physical activity interventions
15. Use of primary care settings for physical activity interventions
16. Church-based interventions

TARGET GROUP APPROACHES – INTERVENTIONS 17 - 19

17. Increasing physical activity amongst women
18. Home-based, group based and educational strategies among older adults
19. Low socio-economic status, minority, disability and indigenous groups

INDIVIDUAL APPROACHES – INTERVENTIONS 20 - 22

20. Lifestyle versus structured physical activity interventions
21. Print, web, telephone-assisted and face-to-face physical activity interventions
22. Automated telephone systems

REDUCING SEDENTARY BEHAVIOUR – INTERVENTIONS 23

23. Reducing sedentary behaviour in children and adolescents

POPULATION BASED APPROACHES

SUPPORTIVE ENVIRONMENTS

Intervention I – Whole of population physical environmental interventions (built and natural)
--

Reviews

A large body of evidence was identified that assessed the effect of whole of population physical environmental interventions on physical activity levels. Sallis et al (1998) reviewed studies that employed an environmental intervention to promote physical activity. A second review by Sallis et al. (2004) summarised findings from the health, urban planning and transportation literature on active transportation and found that levels of walkability were found to be associated with utilitarian trips, but not walking for exercise; land use mix, density, footpaths and street lighting were associated with active transport; that there are reasonably consistent associations between physical activity and high population density, mixed land use and street and urban form connectivity and there are also reasonably consistent associations for physical activity and accessibility of physical activity facilities; and lesser evidence for accessibility of recreation facilities. Similarly, a review by Trost et al. (2002) examined ten studies and showed positive associations between physical activity and environmental access, aesthetics, safety and urban [versus rural] location.

A review by Badland and Schofield (2005) was a narrative review of the relationship between urban form and physical activity. It showed that urban density and mixed land use were associated with walking patterns among residents. Perceived and objective measures of safety were also associated with physical activity, and injury-reducing designs such as traffic calming and pedestrian access and availability influence walking patterns. Cunningham and Michael (2004) conducted a narrative review that included the relationship between built environment and physical activity in older adults. For older adults, safety and aesthetic features of the environment were related with physical activity. Humpel et al. (2002) investigated environmental factors associated with adults' participation in physical activity and found that accessible cycle paths, local parks, density of shop facilities, awareness of and satisfaction with facilities, safe footpaths and a safe, friendly and attractive neighbourhood were positively associated with physical activity. A review by Lee and Moudon (2004) was a narrative review on the physical environment and its relationship to physical activity, using a theoretical framework from an urban planning perspective. It found associations between physical activity participation and the quality of pedestrian and bikeways, population density and mixed residential use, accessible destinations and freely available facilities.

A systematic review by Ogilvie et al. (2004) assessed the influence of walking or cycling infrastructure on physical activity. Four urban interventions assessed the impact of improving cycling networks on physical activity. One found a positive change in walking or cycling, and three found no change or a negative change. One intervention assessed restricting access of cars to particular areas and demonstrated an increase in walking with this intervention. One study assessed traffic restraint or calming and found no significant benefit from this intervention. A review by Owen et al. (2004) showed that environmental attributes were reasonably consistently

related to walking behaviours, but that these correlates varied by the 'type or setting for walking' being examined, and also varied by gender.

A narrative review was conducted of neighbourhood features and walking and cycling for transport (Saelens et al. 2003). It showed that neighbourhoods with a high population density, good land use mix, high connectivity and good provision of walking and cycling facilities are more likely to encourage walking and cycling for transportation. No difference between high and low walkable neighbourhoods for recreation.

Individual studies not incorporated into reviews

Three studies incorporated major structural changes to the environment such as: 14 new recreation centres in Belfast, Nth Ireland (Roberts et al., 1989); increased bicycle trails, increased access to exercise equipment and facilities, and policy changes in a US military complex (Linenger et al., 1991); and increased facilities, signposting, and advocacy to local government to improve safe commuting routes (Vuori et al., 1994). The study by Roberts (1989) reported a slight increase in physical activity participation among young adults, however, all of these interventions reported only small effects in behaviour change. The study by Linenger (1991) found increases in fitness among the intervention group compared to the controls. The study by Vuori (1994) reported a 7% increase in active commuting.

A recent Australian study assessed the impact of a rail trail (conversion of an unused railway line into a recreational walking and cycling trail) on walking and cycling (Merom et al., 2003). Researchers found that the trail was used more frequently by cyclists (9%) than pedestrians (3%), and that cyclists within 1.5km increased cycling time by 12 mins/wk and those living 1.5-5km away decreased their cycling by 14 mins/wk. Kahn et al. (2002) reviewed 10 studies that evaluated the effectiveness of providing access to fitness facilities or community centres, and walking trails. They found that this approach has resulted in median increases in aerobic capacity (5%), energy expenditure (8%), physical activity levels (3%), and those reporting 3-or-more physical activity sessions/wk (48%). An overview of the UK National Cycle Network, which involved linking of new and existing paths that are free of motorised traffic with traffic calmed roads across the UK, has successfully linked 8,000 km of trails and aims to increase this to 16,000 km by 2005 (Lawlor et al, 2003). More than 1,000 individual projects are included in the network and includes such initiatives as new road crossings and bridges, signage, traffic free paths up to 10 km long, and access to cycle paths in new housing developments. The UK National Cycling Network is not yet evaluated, however, it has the potential to increase short active transport journeys (<0.5 mile) in addition to increasing recreational cycling and walking (Lawlor et al, 2003).

Target group/setting: Adults, youth, community and low SES areas.

Level of evidence: Category C

Effect size: It is not possible to meaningfully assess effect size from the above approaches due to the diversity of subjects, settings and interventions assessed. However, results demonstrate that a physical environment with urban features that enable safe, accessible physical activity participation is associated with increased physical activity levels.

Reach: All people who might engage with these environments; whether for recreation or for transport purposes.

Feasibility, relative cost, and sustainability: Major infrastructure changes are expensive, and as a physical activity intervention this is a high cost approach. The total cost of the UK National Cycle Network from 1995 to 2000 was £210 million, with hundreds of partners involved. However, a recent cost-benefit analysis of physical activity through constructing and maintaining five walking/cycling trails in Nebraska found that, although the average construction cost for each trail was \$1.35 million, for every \$1 investment in walking/cycling trails there was a \$2.94 direct medical benefit (cost-benefit ratio 2.94) (Wang et al., 2005). The sustainability of this type of physical activity initiative is, however, unknown.

Effect on social determinants of health: Unknown; although the UK National Cycling Network has identified the importance of social benefits through improvements to the environment, particularly among those in low SES areas.

Examples of interventions in Australia: The Sydney Light Rail Study is an environmental intervention study being conducted by Prof Adrian Bauman (Uni NSW) and Dr Michael Booth (Sydney Uni). In a personal communication with Dr Michael Booth (20.8.03), the initial findings suggest that: "Walking declined among all groups (including Controls) which we think was a post-Olympic effect. The decline was significantly smaller among those who lived 1-1.5 km from a light rail terminal, compared with controls and those who lived 0-1 km from a terminal." Unfortunately, participants "compensated by reducing other moderate and vigorous activities so their total activity did not change." Dr Booth also added that a longer follow-up period was probably needed.

Key Stakeholders: LGAT, DIER, DPAC, DHHS, DTAE

Intervention 2 – Built environments - stairwell interventions and point-of-decision prompts

There have been several studies that have assessed the effectiveness of altering or raising the awareness of the stairwell environment on physical activity (Sallis et al., 1998). In this report, any intervention on the built environment has the potential to reach large proportions of the population and thus is categorised as a population based approach. Foster and Hillsdon (2004) reviewed 16 interventions promoting stair use. Stairwell studies have used approaches such as:

- increased awareness of stairs
- use of signs (eg, healthy heart messages)
- banners on stair risers
- increased aesthetics of stairs (posters, lighting)
- music in stairwell
- artwork in stairwell

Point-of-decision prompts have also been used in the form of signs and maps to promote walking in community-based walking interventions (see Intervention 11, Ewing-Garber et al., 2001).

Target group/setting: Adults, youth, children, community settings, worksite settings.

Level of evidence: Category C

Effect size: All studies used a simple pre-post study design and just one study included a control condition (Foster & Hillsdon, 2004). It is recommended that appropriate evaluation methods are used to assess the effectiveness and efficacy of all future environmental initiatives. Most studies found initial doubling of stair use (6-8% at baseline to 12-16%), this declined after signs removed but remained higher than baseline. Banners on the stair risers (placed on the vertical edge of each step, so they are visible when walking up the stairs) appear to be more effective than posters in promoting stair use and in terms of sustainability.

Reach: All people who engage with these environments (eg, workplaces, shopping centres, railway stations, other public buildings).

Feasibility, relative cost, and sustainability: Moderate-high feasibility and relatively low cost. A small number of studies reported sustained increases in stair use, for example, Kerr et al. (2001a) reported a two-fold increase in stair use over three months, and after six months stair use was 29% higher than it was at baseline.

Effect on social determinants of health: Unknown

Examples of interventions in Australia: Unknown

Key Stakeholders: Most government departments that connect with workplaces and public buildings (eg, shopping centres)

COMMUNICATION

Intervention 3 – Communication - mass media linked with multi-strategy community initiatives (community-wide)

The literature on physical activity mass media recommends that mass media initiatives should be implemented concurrently with other underpinning community-based initiatives. Only one recent study was located that evaluated the effect of a mass media campaign supported by community-based activities (Reger et al., 2002). That study incorporated a mass media campaign (television, print, radio, internet - more than 170 ads/stories were delivered over an 8 wk period); and underpinned the campaign with worksite programs, physician prescription for walking, and public health education programs. A recent review of community-wide campaigns identified ten studies that utilised diverse media in addition to social support, risk factor screening, community events, and policy changes (Kahn et al., 2002).

Target group/setting: Older adults in community settings, adults in worksites, primary care (GP) settings.

Level of evidence: Category C

Effect size: A 23% increase in walking was observed in the Reger et al (2002) study. Kahn et al. (2002) report a median increase of 4% in physical activity participation; and a median increase of 16% in energy expenditure. Of the ten studies reviewed, only one failed to report an increase in physical activity.

Reach: 90% of those in the intervention community reported being aware of the campaign (81% recalled news stories; 76% recalled TV ads; only 32% recalled radio ads; and 5% were aware of educational programs being conducted in their local community; Reger et al., 2002).

Feasibility, relative cost, and sustainability: Obviously the delivery of this type of intervention is a higher cost than mass media alone. Although the strategies appear feasible, the sustainability was not reported. The Kahn et al. (2002) review suggests that the more successful campaigns were the ones with “community buy-in,” however; they generally also require well-trained staff and sufficient resources to adequately implement the campaign.

Effect on social determinants of health: Kahn et al. (2002) argue that these type of campaigns should have a positive effect on social capital as they often involve whole communities, however, they do not report evidence of this.

Examples of interventions in Australia: 10,000 Steps Rockhampton is a whole-community, multi-strategy, multi-level physical activity intervention project that linked social marketing with other community based strategies that had a strong emphasis on community consultation and engagement. The evaluation showed a reduction of physical activity levels in the control community and no change in physical activity levels of the intervention community. Additionally, there was a 5% increase (not statistically significant) in the number of women who were deemed active in the intervention community two years post intervention. Furthermore, the project successfully initiated community ownership of the project through consultation and engagement in the development phase, enabling the process to be sustained (Brown et al., 2006).

Key Stakeholders: DPAC, DHHS, DIER, LGAT, General Practice Tasmania, TTCL, SRI, OSR

Intervention 4 – Communication - mass media campaigns

This intervention strategy typically involves a physical activity campaign targeted at the adult population. Delivery of the campaign commonly uses several forms of media. For example: television, radio, print, internet, community events, sign postings, and product labelling. A review of 15 mass media campaigns assessed awareness, knowledge and attitudes to physical activity, intentions to be active, and increases in physical activity (Cavill & Bauman, 2004). Findings demonstrated the median awareness of the campaign message was 70%. Increases in knowledge or attitudes to physical activity were reported by three of the six campaigns that measured these constructs. Of the seven campaigns that included measures of intentions to increase physical activity, just three reported increases in intentions with the remainder reporting no change or a decrease. All campaigns reviewed assessed physical activity pre- and post-campaign; five campaigns reported increases in physical activity, the remaining ten reported no change. A review by Finlay (2005) reported in the Cochrane Library reviewed studies that investigated the effectiveness of mass media interventions in the promotion of physical activity. Findings suggest that mass media interventions are effective in increasing message recall, physical activity knowledge, and in changing short-term physical activity, particularly for walking behaviour.

Target group/setting: Adults/target groups. Some campaigns specifically target 'at risk' groups, eg, young mothers, older adults, people who are in the 'pre-contemplation' stage of behaviour change (see link to WA Premier's Physical Activity Taskforce below).

Level of evidence: Category C

Effect size: Small effect in behaviour change, but will increase awareness and knowledge.

Reach: Usually between 60-70% of those surveyed report being aware of the campaign, so the reach is extensive.

Feasibility, relative cost, and sustainability: Feasibility is high, but given that the effect on behaviour change is so small, the sustainability is low. The cost relative to reach is reasonable, particularly if the desired outcome is awareness raising, and increasing physical activity knowledge and beliefs. However, whether these strategies reach key target groups most in need is unknown.

Effect on social determinants of health; Unknown

Examples of interventions in Australia: Several mass media campaigns are running in various States and nationally: Western Australia 'Find 30' - movie clips are available online to download (website below); the South Australian statewide 'Be Active-Play Again' campaign (Williams, 2005) targeting 8-12 year old children; the national 'Go for 2&5™ Campaign' was launched 28th April 2005 as part of the national physical activity and healthy eating campaign targeting children and families; the national 'Get Moving' campaign promoting the child and youth physical activity recommendations was launched 3rd February 2006. The national advertisements can be viewed on the Healthy Active government website (see useful links below).

Key Stakeholders: The national campaign promoting physical activity to children and youth was launched in February 2006. Support at the State level and links to community programs would strengthen the campaign effects.

SETTINGS-BASED APPROACHES

Intervention 5 – Settings - School-based curriculum interventions to increase children’s physical activity

Stone et al. (1998) reviewed 22 school-based studies. Most interventions utilised individual behaviour change strategies (eg, self-efficacy), focused on social influences, and incorporated the program into the academic and PE curriculum.

Target group/setting: Children, youth and young adults, school setting.

Level of evidence; Category B

Effect size: Effect size was varied - minimal in most studies, moderate in just nine of the 22 studies. The strongest evidence exists for primary school students, and for school environmental interventions (see Intervention 6 below).

Reach: High in the target group.

Feasibility, relative cost, and sustainability: Feasibility and cost varies by intervention, but those interventions that can be incorporated into the school curricula should have minimal costs and be more feasible. The sustainability of these interventions is not commonly reported, however, one Norwegian study did show a lasting effect even after 12-years (Klepp et al., 1993).

Effect on social determinants of health: Many studies focused on the social influences of physical activity.

Examples of interventions in Australia: The Gold Medal Project (Okely & Booth, in progress) is a fundamental motor skills (FMS) intervention being conducted in NSW; Switch-Play (Salmon, Crawford, Ball & Booth, 2005) was a 4-arm RCT that examined the effectiveness of reducing sedentary behaviour versus improving FMS on 10-yr old children’s physical activity and healthy weight maintenance. School-based interventions are also in progress in the Barwon region, Victoria, as is the Move Well Eat Well program in Tasmania.

Key Stakeholders: DoE, DHHS

Intervention 6 - Settings - School-based curriculum plus environmental interventions to increase children's physical activity

Several school-based studies have also incorporated strategies to promote physical activity in other settings (eg, family, community). Fewer studies have focused solely on environment change in the school setting. One environmental school-based intervention in the UK involved painting the school playground with fluorescent markings, each based on a school curricular theme (eg, snakes and ladders, hopscotch, a castle, a clock face, etc.) (Stratton, 2000). Sallis et al. (2003) conducted a large RCT ('M-SPAN') that employed policy, environmental and social marketing techniques to promote physical activity and healthy eating in schools. One UK study ('APPLES') employed a "whole-of-school" approach to obesity prevention that included policy changes and a health promoting school environment (Sahota et al., 2001). A 6-year intervention in primary schools in Greece incorporated a curriculum approach, PE lessons, teacher training, meetings and support with parents and families (Manios et al., 2002). A large US study targeting American-Indian children ('The Pathways Study') included curriculum changes, PE lessons, and parental involvement (Caballero et al., 2003). In Australia, the 'Move it, Groove it' intervention trained classroom teachers in PE delivery and created supportive healthy environments (Van Beurden et al., 2003).

Target group/setting: Children, adolescents, school setting, family setting, community setting.

Level of evidence: Category B

Effect size: The UK playground markings intervention reported a 10% and 5% increase in physical activity during recess and lunch respectively in the intervention schools compared to the controls (Stratton, 2000). In the US study, policy and environmental strategies were effective in increasing physical activity among boys but not girls (Sallis et al., 2003). In the "whole of school" UK study, no significant differences in physical activity or sedentary behaviour between intervention and control groups was found (Sahota et al., 2001). The long-term schools intervention in Greece reported significant increases in physical activity over a 6-year period among children in the intervention vs control schools (Manios et al., 2002). The Pathways Study found higher knowledge and self-reported activity among children in intervention compared to control schools (Caballero et al., 2003). The Australian intervention was associated with a non-significant 4.5% increase in moderate- to vigorous-intensity activity and a significant 3% increase in vigorous activity during PE lessons. This translates to a gain of <1 minute of physical activity for an average 21-minute lesson (Van Beurden et al., 2003).

Reach: High among the target group.

Feasibility, relative cost, and sustainability: The playground markings intervention demonstrated high feasibility and relatively low cost. Sustainability of effect of markings unknown. The US school policy and environmental intervention was high cost and there were limitations in the feasibility of these approaches in some schools. The multi-setting interventions, particularly the Greek study, showed evidence of high sustainability over many years as well as being effective in increasing physical activity, although cost is unknown.

Effect on social determinants of health: Unknown

Examples of interventions in Australia

'Move it Groove it' (Van Beurden et al., 2003) and 'ACE Kids' (McCabe et al., 2006) was completed by researchers at Deakin University and aimed to increase self-esteem, body image and physical activity among primary school children. The 'ACE kids' intervention resulted in increases in physical activity, and boys in the intervention group showing reduced levels of body dissatisfaction over time compared to boys in the control group. The 'Move Well Eat Well' pilot intervention in Tasmania has gained another 4 years of funding and an evaluation report is being finalised.

Key Stakeholders: DoE, LGAT, OSR, DHHS, DPAC

Intervention 7 - Settings - after-school interventions

Although the after-school period has been identified as a critical window for promoting child and adolescent physical activity, very little evidence is available as to the effectiveness of interventions targeting this period of the day. One study in the US ('Active Winners'), was originally designed to incorporate an intensive summer and after-school physical activity program with newsletters for families, formation of committees to improve school environments, and newspaper articles and physical activity promotion at local events (Pate et al., 2003). However, all the time and effort of the intervention staff was required to implement the after-school program, thus the other components were not fully implemented. (NB. see also Intervention 8 –Family-setting interventions, several of these were conducted in the after-school period, but had strong family components so were not included here).

Target group/setting: Children, youth, school, family and community settings.

Level of evidence: Category C

Effect size: There were **no** significant differences in physical activity. Analysis of physical activity by attendance groups (ie, low, moderate, high program attendance) revealed no difference in program effectiveness between groups; indicating no dose-response relationship between program attendance and the outcome variables. It is important to note also, that program attendance in the after-school component was very poor, with just 5% of participants attending half the sessions.

Reach: Potential reach is all children and youth in schools, however, the US study suggests that few children may engage in the program.

Feasibility, relative cost, and sustainability: The feasibility of the intervention reviewed is low (the after-school component was intensive and required a lot of staff time and resources). The cost would be moderate to high, particularly if extra staff are required to run the program outside of school hours. Sustainability is unknown.

Effect on social determinants of health: There were significant group differences in social influences on physical activity with girls in the intervention group scoring lower than girls in the control group.

Examples of interventions in Australia: In 2005 the Federal Government committed \$90 million over four years to establish an after school physical activity programme known as *Active After School Communities*. An evaluation framework has been developed, and results from this will add valuable information as to the impact of this type of intervention.

Key Stakeholders: DoE, LGAT, DHHS, TTCL, DPAC, Justice, OSR, SRI

Intervention 8 - Settings - family-setting interventions to increase children's and adolescents' physical activity

Most of the studies in family-based settings offered families, and parents in particular, educational group-based sessions on children's health and physical activity. A Canadian study focusing specifically on the family setting distributed a HeartSmart Family Fun Pack to families with 6-12 yr olds (Cookson et al., 2000). Kahn et al. (2002) reviewed 11 studies that focused on the family setting to increase children's physical activity. Many of these studies delivered the program in combination with school or community-based approaches and the authors concluded that it was not possible to differentiate the independent effects and thus the effectiveness of the family-based approach. A 3-year Finnish family-based intervention (Saaklahti et al., 2004) provided parents information and concrete suggestions on how, when and where to encourage their child's physical activity (meetings, demonstration sessions, presentations). A series of pilot studies in the US (the 'GEMS' studies) targeted physical activity of adolescent girls, many of which were family-based initiatives (Story et al., 2003; Baranowski et al., 2003; Beech et al., 2003; Robinson et al., 2003).

Target group/setting: Children, youth, family settings, community settings.

Level of evidence: Category B

Effect size: The Canadian study found that the proportion of families reporting active play once a day or more had significantly increased from 28% at pre-test to 55% at post-test (Cookson et al., 2000). In the Finnish study, children in the intervention spent more time playing outdoors than children in the control group, and play in the high-activity category increased with age in the intervention group compared with the control group (Saaklahti et al., 2004). Of the four GEMS pilot studies, three showed promise with non-significant increases in activity in the intervention groups. The least successful GEMS study was the intervention incorporating summer day camp, which does not appear to be a popular strategy among participants.

Reach: Moderate. Most family-based studies accessed families through the school environment, but also incorporated sessions in community centres and home visits.

Feasibility, relative cost, and sustainability: Feasibility and cost varies by intervention, however, engaging families is challenging. The Canadian study was found to be feasible and "user-friendly" for families and low cost to distribute (Cookson et al., 2000). The summer camp and Internet intervention strategies did not appear to be popular among participants (Baranowski et al., 2003); however, after-school activities such as dance classes for mothers and daughters were well received (Robinson et al., 2003). Many of these strategies were intensive requiring home visits. Sustainability was not reported.

Effect on social determinants of health: Potential is promising, but generally not reported.

Examples of interventions in Australia: Although delivered in the school setting the Switch-Play study (Salmon et al., 2005) was implemented in the family setting. 70% of all behavioural contracts to switch off the TV were signed by parents indicating good engagement in this aspect of the study. The 'Home Grown' pilot intervention was conducted amongst families in Tasmania with a focus on nutrition, physical activity and psychological aspects. Small behaviour changes were apparent in the qualitative 12 month follow up, however the evidence based process was not transferable to the

Interventions I-23

general population and seems to be suitable for a niche sector of the community. The evaluation did provide information about the barriers and enablers for families to make lifestyle changes from the whole family and a full report is available.

Key Stakeholders: DoE, TTCL, LGAT, Justice, OSR, DPAC, DIER.

Intervention 9 - Settings - Intergenerational interventions

A small number of studies have assessed the effectiveness of promoting physical activity across generations, particularly in women. Two US studies incorporating 2-3 generations of adolescent girls and women have been assessed by the same research team (Ransdell et al, 2001; Ransdell et al, 2004). A mother-daughter physical activity program in the US (Ransdell et al., 2001) offered organised activity sessions and also targeted increases in physical activity outside of the intervention (walking to stores, stairs, plus additional exercises 1-2days/wk, walking, cycling, rollerblading) and ran for 12 weeks. A further intervention, Generations Exercising Together to Improve Fitness (GET FIT), involved three generations of women, adolescent girls and their mother and grandmother (Ransdell et al, 2004). This initiative was primarily home-based with the intervention (HB) group meeting face-to-face for a two hour instruction session on two occasions; a control group performed their usual activity. HB participants were provided materials and a graded program to take home including a self-monitoring log, pedometers, a calendar of recommended activities and photographs of strength training and stretching exercises. The program ran for 6 months (NB. several of the US GEMS studies in the family-setting interventions incorporated mother-daughter strategies).

Target group/setting: Adolescent girls, women and older women, home and community settings.

Level of evidence: Category C

Effect size: In the mother-daughter initiative, physical activity did not change over time, although daughters did record a greater increase at post-intervention than their mothers (Ransdell et al., 2001). In the GET FIT study flexibility (days/wk) increased 305% in HB group and decreased 15% in control group. Pedometer steps/day increased 37% in HB group and decreased 13% in the control group.

Reach: Moderate; 65% of group-based sessions at the university were attended; 73% of the recommended activity bouts at home were completed in the GET FIT intervention.

Feasibility, relative cost, and sustainability: The home-based GET FIT study was better received by participants than the earlier group-based intervention. The cost of delivery of such a program could be contained if existing community-based activities or sports are incorporated. Sustainability is unknown.

Effect on social determinants of health: The social support component of inter-generations is potentially strong; however, these components were not assessed in this study.

Examples of interventions in Australia: Unknown

Key Stakeholders: DoE, TTCL, LGAT, Justice, OSR, DPC, DIER.

Intervention 10 – Settings/environment - Worksite behavioural and environmental interventions

Dishman et al., 1998 conducted a systematic review of worksite programs to assess their efficacy in increasing physical activity levels among employees. In this review, worksite interventions employed educational strategies (eg, print or video), individualised exercise programs and/or on-site group programs, and behavioural modification techniques (Dishman et al., 1998). Overall, worksite interventions in 26 studies involving more than 9000 workers (Dishman et al., 1998) showed a mean effect size r of 0.11 (range of r from -0.1 to 0.8), or an increase in success rate from 50% to 56%. Although this does not appear substantial, Dishman reports that this “is equivalent to increasing physical activity or fitness among 6 people per 100, a response that could reduce the risk for cardiovascular morbidity and overall mortality to a meaningful degree” (1998; p.348).

A review by Engbers et al., 2005 summarised the evidence of worksite interventions that targeted environmental changes in and around the workplace to promote physical activity. Strategies included: encouraging use of stairs; a walking track being built outside the company; exercise equipment and space; and a “red-line route to promote lunch walking”. Physical activity improvements were demonstrated in several of the studies; however, most were methodologically weak and unable to demonstrate that the effect was due to the intervention. Nevertheless, the authors conclude that worksite programs must “aggressively pursue environmental factors, which might alter the workplace “culture” to become more health conscious”.

A systematic review of the effectiveness of worksite physical activity programs on physical activity levels was conducted by Proper (2003). The review assessed 15 RCTs and 11 non-randomised trials. The authors concluded that there was strong evidence for a positive effect of worksite physical activity programs on physical activity levels.

Target group/setting: Men, women, low skilled workers, worksites.

Level of evidence: Category A

Effect size: It is difficult to summarise the impact of worksite interventions on physical activity levels because of the diversity of interventions assessed. However, worksite physical activity programs appear to be able to increase physical activity levels in participants, particularly when comprehensive, multi-component approaches that include education, employee and peer support for physical activity, incentives and access to facilities are included.

Reach: As with other settings inhabited by large numbers of people (eg, schools), the potential for a high level of reach exists.

Feasibility, relative cost, and sustainability: These programs are often not efficacious, particularly among low skilled workers. The cost varies widely by the strategy employed, with organisational/environmental changes costing the least per person and individual approaches costing the most (in terms of labour, time, etc). Sustainability was not reported.

Effect on social determinants of health: Potentially high, typically not reported.

Interventions I-23

Examples of interventions in Australia: Gomel et al., 1993; Veitch et al., 1998; Good Fuel for Police, PPAC worksite demonstration projects are underway in Tasmania

Key Stakeholders: PPAC, UTAS, TCCI, LGAT, and any departments, organisations or industries likely to have large groups of workers in their sector.

Intervention II - Settings - Community-based walking interventions

Lamb (2002) conducted a RCT of a community walking intervention. No difference in total physical activity levels was observed between participants in a community-walking group versus those who received advice on physical activity only. However those who participated in the walking group were more likely to undertake moderate intensity activity than those who received advice only.

A UK walking initiative (“Sonning Common Health Walks”) involved using volunteers to lead regular nature walks in the local natural environment (Bird & Adams, 2001). Since April 1996-2000, the Sonning Common Health Walks have had more than 16,000 people participate in 1724 walks.

Another UK walking initiative, “Walking the Way to Health” targets recreational walking using a combination of volunteer leaders, information about where to walk, and improvements to the environment to make it safer and more attractive for walking (Ashcroft, 2001).

A US walking initiative has adapted a strategy trialled successfully in Ireland (“Slí ná Slainte – Path to Health”) that involves installation of walking paths close to existing footpaths located near residences and worksites (Ewing-Garber et al., 2001).

In Bunbury, Western Australia, regular twice-monthly community walks lead by volunteers and health professionals have been operating since November 1998 (Collins et al., 2001). The Bunbury walks have had between 30-70 participants in each walk (twice a month between November 1998-2001) for a total of 270 individuals.

A walking study in South Australia that is also not yet evaluated (“Stepping Out”) involves a community based walking initiative for older adults (Angle & Watkins, 2001) and includes a resource kit for health professionals, recruitment of community volunteer leaders and distribution of resource manuals.

The “Just Walk It” intervention (Queensland) coordinated groups and leaders within the local community to participate in regular walks (Foreman et al., 2001). There was an average of 10 people per group and on average 8 walks/wk were completed.

“10,000 Steps Rockhampton” is a whole-community, multi-strategy, multi-level physical activity intervention project that linked social marketing with other community based strategies that had a strong emphasis on community consultation and engagement (Brown et al., 2006).

Target group/setting: Adults and older adults, community setting.

Level of evidence: Category B

Effect size: The effectiveness of the community walking interventions is not known at this time as evaluations of programs assessing most interventions have not been completed. “10,000 Steps Rockhampton” evaluation showed a reduction of physical activity levels in the control community and no change in physical activity levels of the intervention community. Additionally, there was a 5% increase (not statistically significant) in the number of women who were deemed active in the intervention community two years post intervention. Furthermore, the project successfully

initiated community ownership of the project through consultation and engagement in the development phase, enabling the process to be sustained. This process has potential for any physical activity intervention but requires further evaluation (Brown et al., 2006). The 3 year “Walk-it Bunbury” project was evaluated using pre-post test phone survey, intercept surveys and community participation in project related activities (as well as some other process measures that were collected). The project results showed that the project was successful in raising and promoting awareness in the project group and gaining community support for the program. An increase of 15 minutes of walking per week from pre to post test was apparent in both the intervention and comparison community, with no change in moderate, vigorous, active transport or gardening activities.

Additionally they were not as successful as they had hoped in engaging the intervention community with only 6% reporting participation in a project related event. They did state that signage and access to walking paths were important components of the project (Uni of WA, 2003).

Reach: Being a community-based initiative there is potential to reach a moderately high proportion of the population. Some participants were recruited through health care facilities (eg, hypertension, cardiac and diabetic clinics) and some through word of mouth and local media advertising.

Feasibility, relative cost, and sustainability: With volunteers assisting in the running of most of these interventions, the cost would be contained. All the initiatives appear to be highly feasible, however, sustainability is unknown.

Effect on social determinants of health: Very high

Examples of interventions in Australia: “10,000 steps Rockhampton” Prof Wendy Brown, University of Queensland; Foreman et al., 2001; Collins et al., 2001; Angley & Watkins, 2001. “Walk it Bunbury”, Western Australia; the National Heart Foundation of Australia has the “Just Walk It” program operating in the ACT, NSW, NT, QLD and SA, and aims to increase walking in the community by walking regularly as part of a group. In Queensland there are currently 4500 participants from 75 towns and cities. Community walking programs such as this could be used to provide support and ongoing opportunities for those who participate in the Get Walking Tasmania walk week.

Key Stakeholders: TTCL, LGAT, OSR, DPAC, DHHS, DIER, Justice, DTAE.

Intervention 12 – Settings/environments - Active transport interventions

Sallis (2004) conducted a review of studies of the relationship between active transport and physical activity. An RCT by Mutrie (2002) assessed whether self-help interventions delivered via written materials increase active commuting. The 'Walk in to Work Out' program in the UK involved written self-help information guidelines (Mutrie et al., 2002). A Western Australian TravelSmart Workplace walk to work initiative assessed an educational strategy versus educational approaches plus a volunteer environmental leader based at the worksite for three hours per week (Baudains et al., 2001). TravelSmart WA have also assessed a community based individualised marketing strategy to increase transport related walking, cycling and public transport use as an alternative to car trips (John, 2001). The TravelSmart Victoria WalkSmart program aims to encourage employees to walk all or part of the way to work and includes a pedometer and a website for monitoring daily steps (<http://www.travelsmart.vic.gov.au/>). Active transport initiatives in Australia that target children include the Safe Routes to School program that has been operating throughout Victoria since 1990 (Delaney et al., 2004). A recent review of the effectiveness of interventions in promoting a population shift away from cars to more active forms of transport (Ogilvie et al., 2004) reviewed the evidence from 22 studies. Strategies reported included: commuter subsidies, infrastructure development (eg, new railway station), mass media campaigns, and engineering measures (eg, new cycling routes, lower car speed limits).

Target group/setting: Adults, children and youth, worksite and community settings.

Level of evidence: Category B

Effect size: The review conducted by Sallis (2004) found that walking and cycling infrastructure, when combined with interventions to promote active commuting, are related to more transport-related walking / cycling trips. The RCT conducted by Mutrie (2002) demonstrated a 100% increase in walking for active commuting but no increase in cycling. At 12 months, 25% of the intervention group were still actively commuting. The UK initiative found that at 6-months follow-up, the written self-help materials resulted in the intervention group being two times more likely to increase walking to work, and at 12-months 25% of the intervention group were still regularly walking to work (Mutrie et al., 2002).

The WA workplace initiative showed a 3% increase in walking to work among those in the volunteer environmental intervention group compared to those in the education-only group (0.13% decrease) (Baudains, et al., 2001). The WA marketing strategy achieved sustained (2 years) increases in cycling for transport from 2% mode choice (% of trips/person/day) at baseline to 4% post-intervention, and sustained increases in walking for transport from 12% at baseline to 15% 12-months later (John, 2001).

A pilot study of the WalkSmart program involving business with >100 employees along St Kilda Rd, Melbourne has found that the number of staff driving to work has declined by between 6-11% (<http://www.travelsmart.vic.gov.au/>).

The Safe Routes to School program has been found to be associated with an 18% decrease in casualty crash frequency of primary-school aged pedestrians and cyclists, however, it is not known if this decline may in part be due to decreased numbers of children walking and cycling to or from school. The UK review of the active transport literature found evidence that targeted behaviour change programs can be effective in motivated sub-groups with the largest study reporting a shift

of 5% of all trips at the population level (Ogilvie et al., 2004). However, mass media campaigns, and engineering measures were not so effective.

Reach: As the initiatives were undertaken in community and worksite settings there is potential to reach a moderately high proportion of the population or to affect large numbers even if the uptake is relatively small.

Feasibility, relative cost, and sustainability: All approaches described appear to be feasible, however, the cost per head for these initiatives would vary with the marketing strategy being more cost-effective than the educational worksite programs. Sustainability appeared to be acceptable in all these strategies.

Effect on social determinants of health: Interventions in the worksite setting would have a potentially high impact on the social determinants of health; however, no evidence is reported.

Examples of interventions in Australia: Baudains, et al., 2001; John, 2001; Safe Routes to School, Delaney et al., 2004; TravelSmart WA and TravelSmart Victoria. TravelSmart Victoria offers the WalkSmart and CycSmart programs to local communities and businesses. DIER are piloting Travelsmart at the University of Tasmania during 2006, results available 2007. Hobart and Glenorchy City Council (HCC and GCC), Tasmania, received joint funding to build a cycleway on a disused railway line from the Cenotaph in Hobart to Claremont. A cycle track was also developed on the Eastern shore through Clarence Council. Some usage data has been collected. HCC recorded an average of 317 cyclists per week day and 211 cyclists per day on the weekend, May- June 2006 (compared to 253 cyclists per week day and 656 cyclists per day on the weekend, July-September 1996). These figures can not be directly compared as 2006 data was collected at the beginning of winter (shortest days) and the 1996 data in spring (days are longer and warming up). No data has been collected on the Eastern Shore cycle track as it is disjointed at present but the local council has recently committed funding to bridge the gaps in the cycleway to make a continuous path to the City.

Key Stakeholders: DIER, DHHS, LGAT, Justice, DTAE.

References &/or useful links:

Mutrie et al., 2002; Baudains et al., 2001; John, 2001 ; Ogilvie et al., 2004; Delaney et al., 2004; <http://www.travelsmart.vic.gov.au/>

Intervention I3 – Settings/environments – Active commuting to school

Evidence has shown that walking to and from school is a significant contributor to children's overall physical activity levels (Cooper et al., 2003). A series of observational studies have assessed the effect of active commuting to school as a means for increasing children's physical activity levels (Ziviani 2004; Siriard 2005; Kerr 2006). Walking school bus - an intervention strategy that involves increasing the number of children walking to and from school, usually with two adult volunteer supervisors (a "driver" and "conductor") is also currently being assessed as an intervention to increase children's physical activity levels. Such programs should be viewed as a mechanism of behavioural change, not as a permanent solution for all children walking or cycling to school. WSB in particular should ideally be supplemented with other active transport initiatives in the school and broader community (eg, safe routes, traffic calming, school infrastructure and policies, crossing patrols, and cycling and pedestrian skills training).

Target group/setting: Primary school aged children, school and transport setting.

Level of evidence: Category C

Effect size: The observational study by Sirard (2005) demonstrated that active commuting to elementary school is associated with approximately 24 additional minutes of moderate-to-vigorous physical activity per day. The observational study by Kerr (2006) assessed the association between active commuting to school and environmental and parental concerns. Findings demonstrated that both parent concerns and the built environment were associated with children's active commuting to school. The observational study by Ziviani (2004) demonstrated that parent perception of the importance of physical activity, parents' individual history of transport to school, and distance from school determine children's involvement in walking to and from school. The effectiveness of WSB interventions is currently unknown (Salmon, 2005).

Reach: Most children in metropolitan or regional areas. Children in rural areas may live too far away from school to benefit from a walking school bus, although there has been some suggestion in more remote communities of the school bus stopping a set distance from school and the children walking the remainder of the distance. In addition, Cycling Trains are being implemented in outer-suburban and rural areas.

Feasibility, relative cost, and sustainability: Feasibility is moderate-high. There is a high reliance on volunteers, or funds to pay "drivers" and "conductors" to supervise children walking to school. Anecdotal evidence suggests that in some areas (eg, low SES areas) recruitment of volunteer parents is challenging, thus impacting on potential sustainability. This strategy is more likely to be sustainable as it becomes a part of the school culture (eg, SunSmart, supervised school crossings).

Effect on social determinants of health: There is high potential for a significant impact on the social health of the participating children, the volunteers, and the community itself. Malone (1999) describes the significant social benefits of community child and youth involvement in the planning and use of public and private spaces. Unpublished data suggest significant effects in perceptions of being able to spend more time with and have fun with friends for those in WSB schools compared with control schools (Salmon, 2005).

Examples of intervention in Australia: In many states and internationally there are established WSB programs running for some time now. The Victorian WSB initiative is coordinated by VicHealth and has recently been 'rolled out' to 33 LGAs in the State. Tasmania's Department of Education has developed guidelines for schools to implement walking buses but the effect has not been evaluated.

Key Stakeholders: DoE, DHHS, Tasmania Police, DIER (Roads and Transport), LGAT, TTCL, DTAE

References or useful links:

Tasmania's Youth Transport Strategy <http://www.youthaffairs.tas.gov.au/transport.htm>

Malone, 1999; Salmon J. (2005). Walking to school: benefits, barriers & impacts. VicHealth Walking School Bus Symposium, Melbourne Town Hall, May 20, 2005.

Centre for Transport Studies, University College London:

- www.cts.ucl.ac.uk/research/chcaruse/
- www.casa.ucl.ac.uk/capableproject/

http://www.dft.gov.uk/stellent/groups/dft_localtrans/documents/page/dft_localtrans_022858-12.hcsp#P319_50367

<http://www.portphillip.vic.gov.au/walking.html#L4>

<http://www.dpi.wa.gov.au/travelsmart/schools.html>

<http://www.walkingbus.com/>

Intervention 14 - Settings - Primary care physical activity interventions

Reviews

These intervention approaches are undertaken in the primary care setting with the program being delivered by primary health care practitioners including: GPs, nurses, physiotherapists, etc. A systematic review was conducted by Eden (2002) of the effect of counselling by clinicians on physical activity levels. Insufficient evidence was available to assess effectiveness. Lawlor (2001) conducted a systematic review of the effect of physical activity advice given in routine primary care consultations. Results demonstrated that, across the eight trials assessed (that included 4747 participants) advice alone provided in routine primary care consultations is not an effective means of producing sustained increases in physical activity.

On the basis of a review of six randomised trials, Ashenden et al. (1997) concluded that the outcomes from interventions of this type were variable, but generally positive. Eaton et al. (1998) suggested that the evidence for the effectiveness of primary care interventions was modest. Eight studies from the US, the UK and New Zealand, found physical activity was increased in the short term, but that, even with repeated interventions, the long-term effects of these interventions were weak.

Simons-Morton et al. (1998), examined 12 international studies and also concluded that short-term changes in physical activity were possible, but that evidence was lacking of longer-term maintenance. Strategies that contribute to the effectiveness of these initiatives include: behavioural approaches, multiple contacts, supervised exercise programs, provision of equipment, and on-going intervention (Glasgow et al., 2002).

A more recent update review of 12 studies published since 1999 that focused only on physical activity interventions in primary health care services found short-term (under 6 months) effects on physical activity with brief and intensive interventions producing short-term increases in activity (Smith, 2004).

Consensus of the literature appears to be that short-term changes in physical activity can be achieved in a brief intervention via the GP setting; however, other strategies and support from other sectors (eg, community, family) may be required to sustain change. Morgan (2005) examined the effectiveness of exercise-referral schemes in nine studies.

Clinical Trials

Smith (2000) conducted a controlled trial of the effect of active prescriptions (prescribed by a general practitioner) on physical activity levels. Prescriptions alone were found to be ineffective in increasing physical activity levels.

Taylor (1998) conducted a RCT of the effect of referral of patients by GPs to physical activity programs run by a leisure centre. Loss to follow-up of 59% in the intervention group (compared with 31% of the control group) means that results of the trial are unable to be appropriately assessed.

Harland (1999) conducted a RCT comparing the effect of brief intervention or intensive motivational interviewing, with or without financial incentives, and no intervention by GPs on

physical activity levels. Motivational interviewing was effective, particularly when combined with financial incentives in the short term but not in the long term (12 months). Brief interventions were not effective.

Hillsdon (2002) conducted a RCT of physical activity promotion in primary care. Results demonstrated that physical activity promotion in primary care was not effective in increasing physical activity levels.

Esther (2005) conducted an RCT of the effect of a tailored physical activity intervention delivered in general practice on physical activity levels. No significant intervention effect over time was observed on physical activity level.

Target group/setting: Whole population, although primarily older adults, adults who are overweight, or who have some other chronic health condition are recruited, primary health care settings.

Level of evidence: Category A

Effect size: Modest in the short term, weak in the long term.

Reach: Moderate to high

Feasibility, relative cost, and sustainability: Primary care initiatives appear to be feasible and cost effective, however, the sustainability is unknown. An evaluation of 'Active Script' suggests that although reach of that initiative was modest, among participating GPs the cost of becoming sufficiently active for health gains was approximately \$138 per patient; savings were estimated to be \$3647 per disability adjusted life year (Huang et al., 2004).

Effect on social determinants of health: Unknown

Examples of interventions in Australia: Different strategies for promoting physical activity in the Primary Care setting have been trialled in many states around the country. Porter and colleagues have published outcomes from their GP physical activity intervention in NSW and found significant increases in reported physical activity (Porter et al., 2002). Nancy Huang and colleagues have completed the 'Active Script' trial and published the results, in particular an economic evaluation of the initiative (Huang et al., 2004). More recently the effectiveness of a primary care-based physical activity counselling dissemination trial was conducted as part of the Australian 10,000 Steps Rockhampton project (Eakin et al, 2004). The initiative showed a 31% increase at the population level in the likelihood of recalling GP advice on physical activity in Rockhampton compared with a 16% decrease in the comparison community. The Commonwealth Government is currently funding a more comprehensive primary prevention program called 'Lifescrpts', which is a program targeting healthy eating, physical activity, tobacco and alcohol (based on the SNAP framework). Kinect Australia (incorporating VicFit) is responsible for piloting this program nationally.

Key Stakeholders: General Practice Tasmania, DHHS, LGAT, DPAC.

Intervention 15 - Settings - Use of primary care settings for physical activity interventions

This intervention strategy differs from the previous in that the program is based in the primary health care setting but it is delivered by a person other than a health practitioner. A South Australian GP intervention used a qualified exercise specialist to provide individualised counselling and advice to selected patients attending the clinic (Halbert et al., 2000). The use of interactive computer technology in the primary care setting has also been trialled in the US among adults (Calfas et al., 2002) and adolescents (Patrick et al., 2001). This approach typically involves the patient completing a computerised assessment in the waiting room at the primary care facility, which generates an 'individualised' action plan. The patient then discusses this action plan with the health practitioner. Over a 4-month period, participants then received nothing further (controls), mail only, infrequent mail and telephone, or frequent mail and telephone.

Target group/setting: Adults, adolescents, primary health care settings

Level of evidence; Category C

Effect size: The exercise specialist intervention achieved a sustained increase in physical activity among the intervention group 12-mths after the intervention (Halbert et al., 2000). Among the adults, all groups increased their physical activity supporting the use of computer and practitioner counselling (Calfas et al., 2002). There was no difference in effect based on mode (mail or telephone) or intensity (infrequent or frequent). These findings were consistent with the adolescent population (Patrick et al., 2001).

Reach: Moderate to High

Feasibility, relative cost, and sustainability: Computer generated and practitioner counselling appear to be feasible for adults and adolescents. Cost effectiveness and sustainability are unknown.

Effect on social determinants of health: Unknown

Examples of interventions in Australia: Halbert et al., 2000

Key Stakeholders: General Practice Tasmania, DHHS, LGAT, SRI, OSR.

Intervention 16 - Settings - Church-based interventions

A benefit of the church setting for promoting physical activity is the existing social support structure. Church support groups have been shown to be valuable in assisting individuals to initiate and maintain behaviour change. Two interventions in this setting have been conducted in the US (Yanek et al., 2001; Resnicow et al, 2005) and two studies in Australia (Brown, Lee & Oyomopito, 1996; Jorna, Ball & Salmon, in press). The US studies incorporated a 12-month program among African-Americans (Yanek et al., 2001), and the 'Healthy Body/Healthy Spirit' project involved 16 Atlanta churches randomised to either a comparison, self-help or self-help plus telephone counselling intervention, the latter based on a combination of psychotherapy and behavioural change theories (Resnicow et al, 2005). The Australian study of Greek-Australian migrant women incorporated a 12-week church-based physical activity program run in the church building to make use of existing support groups (Brown, Lee & Oyomopito, 1996). A more recent Australian study, also targeting women, incorporated an 8-week mind, body and spiritually-based health promotion program and aimed at increasing physical activity and promoting mental and spiritual health (Jorna, Ball & Salmon, in press).

Target group/setting: Adults, women, church settings

Level of evidence: Category C

Effect size: Both of the US interventions reported significant increases in physical activity, the Resnicow (2005) study showed sustained increases in physical activity after 12-months. The Greek-Australian migrant women study reported small improvements in exercise heart rate, but no improvements in physical activity (Brown, Lee & Oyomopito, 1996). The study by Jorna and colleagues (in press) reported a 30-minute increase in walking per week (no change in the control group) and a 40-minute per week increase in overall physical activity (no change in the control group).

Reach: Moderate

Feasibility, relative cost, and sustainability: Church-based settings appear feasible for delivering physical activity interventions among adults, particularly women, and have been shown to be feasible among Australians. The cost effectiveness is unknown, but is likely to be moderate at best. The large US study (Resnicow et al, 2005) reported maintenance of effects after 12 months.

Effect on social determinants of health: The recent Australian church-based study that incorporated a holistic approach reported significant improvements in depressive symptoms and in spiritual health among women in the physical activity group compared with the control group (Jorna et al., in press).

Examples of interventions in Australia: Brown, Lee & Oyomopito, 1996; Jorna, Ball & Salmon, in press.

Key Stakeholders: DHHS, LGAT, Community Health Centres, General Practice Tasmania

TARGET GROUP APPROACHES

Intervention I7 - Increasing physical activity amongst women

Two recent Australian intervention studies of women's physical activity have used community-based approaches, such as community walking events, social marketing campaigns and capacity building in local councils (Wen, et al., 2002), as well as increased self efficacy, partner support, social advocacy and capacity building (Miller et al., 2002; NSW Health, 2003).

An intervention from the US employing an individually tailored program "Mom's on the Move" has published the efficacy but not the effectiveness of the intervention (Fahrenwald et al., 2002). [NB. church-based settings also incorporate interventions targeting women]

Target group/setting: Women, community, childcare centres

Level of evidence; Category C

Effect size; The ProActive Mums study (NSW Health, 2003) found the young mothers in the study who were in the combined print materials and educational group were 71% more likely to meet the physical activity guidelines post-intervention compared to the print materials only or control groups. In the other Australian study ("Concord, a great place to be active"), there was a 6.4% reduction in sedentary women in the intervention group compared to the controls (Wen et al., 2002).

Reach: The recruitment of young mothers into physical activity programs through childcare centres has potential for a high level of reach amongst this group.

Feasibility, relative cost, and sustainability; In the ProActive Mums study, it was reported that only 35% of women in the combined group attended the educational session at the Child Health Centre, and of those only 37% reported increasing their physical activity. However, the print materials were well received. The relative cost of the intervention, whilst an individual level intervention, is low intensive and minimal cost. Long-term sustainability has not been reported. The community-based program was multi-strategy, and thus a higher cost per head. However, the reach for the ProActive Mums study is potentially greater than that of the community based intervention.

Effect on social determinants of health: These were high in the ProActive Mums study.

Examples of interventions in Australia: "Proactive Mums" and "Concord, a great place to be active". The Victorian - Women's Participations Program (2002) (developed from the Wisemoves Program, South Australia) was used to develop Victoria's Women Get Active Program after qualitative evaluation showed promise as results indicated a positive behaviour change with respect to physical activity and self esteem, confidence, social connectedness.

Informal research 6 months post program with groups that were still running indicated that most women had sustained their increase in physical activity (this report was unable to be located but relayed through the previous CEO, Dawn Wilcox). Tasmania adopted the WGAP in 2005 and initial evaluation (a mix of quantitative and qualitative) does again show promise with respondents

Interventions I-23

(54 out of 140 women who participated in the program) reporting an improvement in their health, well being and physical activity by the end of the program. Further evaluation is planned to determine if positive changes are sustained and whether the program is effective in Tasmania.

Key Stakeholders: DPAC, DHHS, LGAT, Community Health Centres, General Practice Tasmania.

Intervention 18 - Home-based, group-based & educational strategies among older adults

A paper identifying best practice physical activity programs targeting older adults (Cress et al., 2005) recommended incorporating a multidimensional program that includes “endurance, strength, balance, and flexibility training” for optimal health and functional benefits. A review of 38 physical activity interventions of older adults (defined as ≥ 50 yrs) included up to 57 different intervention strategies that were classified as home-based, group-based, or educational (van der Bij, Laurant, Wensing, 2002).

An earlier review by King et al. (1998) identified short-term and long-term effects of physical activity initiatives among older adults. Most of the approaches in these studies employed individual cognitive behavioural modification strategies. Home-based and group-based interventions were demonstrated to be equally effective in the short-term, however, home-based studies that promoted three physical activity sessions per week were more effective long-term than those promoting more sessions per week or using group-based approaches.

Another review (Conn et al., 2002) assessed the components of physical activity interventions among older adults that had the greatest effect. Authors found an overall effect size of 0.26, which was larger in group-based, self-monitoring, physical activity focused, centre-based, and patient populations. Latham (2003) conducted a meta-analysis of RCTs to assess the effectiveness of strength training for physical disability in older people. The authors found that strength training was an effective intervention for improving physical activity levels in older adults. Ashworth (2005) conducted a meta-analysis of RCTs to assess home versus centre based physical activity programs in older adults. The findings suggested that home-based programs are superior to centre-based programs in adherence to exercise, especially in the long term.

Fuzhong (2005) conducted a cross-sectional study and demonstrated that walking activity was associated with built environment factors such as density of places of employment, household density, green and open spaces and number of street intersections. Perceptions of safety for walking and number of nearby recreational facilities also correlated with walking.

Target group/setting: Older adults, home-based setting, community setting

Level of evidence: Category A

Effect size: It is difficult to evaluate the impact of interventions to improve physical activity levels in older adults because of the diversity of interventions assessed. However, programs appear to be able to increase physical activity levels in participants, particularly in the short term, where retention of participants is high.

Reach: Difficult to estimate, this varies depending on recruitment methods. For example, recruiting broadly through advertising in the community has limited reach; however, recruiting systematically through existing infrastructures or settings (eg, community groups or networks) has more potential for greater reach.

Feasibility, relative cost, and sustainability: One study of recruitment of older frail adults to a physical activity intervention study estimated the cost at US\$300 per individual (Ory et al., 2002).

This did *not* include the cost of the intervention! Other low-intensity interventions, such as home-based, telephone support interventions (Stewart et al., 1997) would have a lower cost than organised group-based interventions where infrastructure and on-going support is required. However, Rejeski et al (1997) successfully trialled a group-based intervention that had meetings that gradually tapered until the group was self-sufficient and able to meet without being facilitated.

Effect on social determinants of health: High

Examples of interventions in Australia: In 2002, Ball, Salmon, Owen and colleagues conducted a joint trial (Melbourne and Brisbane) to assess the feasibility of the telephone-support intervention in Australia among older adults and found it to be highly acceptable (Ball et al., 2005). It was found that those adults receiving print plus telephone support sustained higher levels of walking and overall activity compared with those who received print support only (a difference of 30 minutes per week). Living Longer Living Stronger is an Australian initiative that is coordinated by the Australian Council on the Aging (COTA). It is a strength training program for older adults that facilitates links with community fitness centres. No published evaluation of the effectiveness of this initiative could be located. Lift for Life® is a prevention and treatment strength training program for older adults with or without type 2 diabetes conducted by the International Diabetes Institute (IDI). IDI has federal funding to pilot the initiative nationally in 2006.

Key Stakeholders: DHHS, LGAT, OSR (COTA).

Intervention 19 - Low socio-economic status, minority, disability and indigenous groups

A review of 14 studies (mainly US) identified that there are few that have examined the intervention effects from a program to increase physical activity among those of low socio-economic status (SES), minority populations and disability groups (Taylor et al., 1998). Ten studies focused on low SES and minority populations and four studies on those with a disability. Most interventions were designed using information from the target group and used community advisory panels to maximise recruitment and the relevance of the intervention.

In order for interventions aimed at indigenous populations to be successful in the long-term, they must be developed and implemented by indigenous communities, to ensure they are culturally appropriate (O'Dea, 1991). There have, however, been few studies examining the effects of health interventions on indigenous populations and little is known about the patterns and determinants of physical activity in these sub-populations. Whilst sport scoping projects have been conducted to attempt to identify a way forward for indigenous groups (Cairnduff, 2001), much more research is required.

In Australia, Brown and colleagues (1996) reported that programs tailored specifically for groups of women from cultural and linguistic diversity (CALD) can be effective in modifying cardiovascular risk factors, if an attempt is made to address linguistic and sociocultural barriers to participation. Another Australian study found that women from CALD have poorer cardiovascular health compared to other Australian women, and are less likely to exercise (Lee & Brown, 1998). Women from CALD are also likely to benefit from social support. Conclusions drawn from these two studies support the need for a selection of activities, and the provision of programs in community languages, as important considerations for the recruitment of migrant women for health promotion and community interventions.

A recent review of 23 ethnically inclusive physical activity and healthy eating intervention studies in the US (Yancey et al., 2004) reported that compared to studies of predominantly white European-American samples, these studies placed greater emphasis on involving communities in intervention programs, on “targeting captive audiences; mobilizing social networks; and tailoring culturally specific messages and messengers... and focused more on community than individual norms”.

A cross-sectional study by Brownson (2000) demonstrated that walking trails may be beneficial in promoting physical activity among segments of the population at higher risk for inactivity, particularly women and persons in low socio-economic groups.

Target group/setting: Low SES, minority populations, those with a disability, and indigenous groups.

Level of evidence: Category C

Effect size: Small effects were found in the intervention approaches targeting low SES and minority groups. Interventions targeting those with health disabilities (eg, low back pain, chronic obstructive pulmonary disease, cystic fibrosis) had a moderate effect. The US review of 23 ethnically inclusive physical activity initiatives (Yancey et al., 2004) reported that less than half the

Interventions I-23

studies reported outcome evaluation data, and those that did reported modest effects. However, a small number of studies reported better outcomes among ethnic groups than white participants.

Reach: As immigration and refugee numbers increase, particularly among CALD groups, the potential public health impact is significant.

Feasibility, relative cost, and sustainability: The feasibility of targeted interventions is increased with community advisory panels and information from individuals representing the target group. Sustainability and cost is unknown.

Effect on social determinants of health: This is not reported, but it could be expected to be high.

Examples of interventions in Australia; Brown et al., 1996

Key Stakeholders; DHHS, DPAC, LGAT, Tasmanian Association of Community Houses, TasCOSS.

INDIVIDUAL APPROACHES

Intervention 20 - Lifestyle versus structured physical activity interventions

'Lifestyle' physical activity is defined as: "the daily accumulation of at least 30 minutes of self-selected activities, which includes all leisure, occupational, or household activities that are at least moderate to vigorous in their intensity and could be planned or unplanned activities that are part of everyday life." (Dunn et al., 1998; p. 399). A review of 14 physical activity interventions that employed lifestyle approaches to promoting physical activity reported that most of these interventions used individual face-to-face methods of delivery (Dunn et al., 1998). However, many of these approaches can be delivered by mail, by telephone, or by Internet/email, which increases their potential public health impact. A recent study compared the effectiveness and cost of a lifestyle approach consisting of behavioural skills training versus a structured physical activity intervention consisting of a supervised centre-based program (Sevick et al., 2000).

Target group/setting: Adults, older adults, children, centre-based, home-based, shopping centre, subway, worksite.

Level of evidence: Category B

Effect size: This varied from 78% of participants in a lifestyle intervention meeting physical activity guidelines compared to 85% of participants in a structured program, which was sustained after 12 months. A lifestyle intervention was found to be more effective among older adults (sustained 5.8 physical activity sessions per week) compared to a structured program (2.5 times per week). Long term increases in physical activity from lifestyle programs have been demonstrated among men (57% increase) and among women (36% increase) (Dunn et al., 1998).

Reach: At present lifestyle intervention approaches do not appear to make a significant public health impact because they are mainly delivered at the individual level. However, mail and telephone delivery and environmental changes (eg, stairwells) increase the likely reach of lifestyle physical activity studies.

Feasibility, relative cost, and sustainability; Many of the behavioural modification strategies have been well trialled and are feasible; the environmental components have been less frequently tested, but appear to be feasible and cost-effective. The project ACTIVE assessed the relative cost of a lifestyle versus a structured approach among adults and found that the lifestyle was more cost-effective at 6-mths (US\$46.53 for lifestyle and US\$190.24 for structured per participant per month) and at 24 months (lifestyle US\$17.15 and structure US\$49.31 per participant per month) compared to the structured approach (Sevick et al., 2000).

Effect on social determinants of health; Unknown

Examples of interventions in Australia: Unknown

Key Stakeholders: DHHS, DoE, DIER, LGAT, TTCI, OSR.

Intervention 21 - Print, web, telephone-assisted and face-to-face physical activity interventions

There have been a number of studies that have examined the effectiveness of various delivery techniques to individuals using print media, the web, telephone or face-to-face. The advantage of interventions that focus on individuals is that they can be tailored to the individual's situation or context and are therefore more likely to be effective. Two randomised controlled trials assessing methods of delivery of physical activity programs (Marshall 2003) and Humpel (2004) found that print based programs delivered over an 8 week period result in an increase in physical activity, particularly in people who are sedentary at baseline. Telephone support increases the effect of the program. Web based programs did not result in increased physical activity. Castro (2002) in a review of studies of telephone assisted counselling for physical activity found that telephone-assisted counselling is an effective method for increasing physical activity levels.

The Australian intervention by Marshall et al (2003) found that individuals in a mail-based intervention tailored to their stage of behaviour change were twice more likely to meet physical activity guidelines than controls. The findings from a low versus high delivery intensity mail and/or telephone-assisted program among older adults (Castro et al, 2001) found that those who just received the low-intensity program were more active after 12-mths (4.1 sessions/wk) compared to those who received the high intensity (2.6 sessions). However, adherence among the high intensity group was greater at 24 months. Furthermore, those in the mail only group had better adherence rates than those who received the combined mail and telephone intervention. Castro and King (2002) argue that telephone contact is most effective in the initial stages of the intervention and that the program can be successfully maintained through less-intensive approaches (eg, through mail). Kahn et al. (2002) reviewed 18 individual approaches to promoting physical activity and found a median net increase in time spent in physical activity of 35% and a 64% increase in energy expenditure.

Target group/setting: Adults, older adults, children, community, worksites, primary health care, schools.

Level of evidence: Category A

Effect size: Telephone-assisted and face-to-face physical activity interventions appear to increase physical activity levels in participants. Print-based programs may increase physical activity levels, particularly in sedentary adults. Web-based programs have not been demonstrated to increase physical activity levels.

Reach: Individual, particularly face-to-face, interventions do not have substantial reach in the population; however, the use of print, telephone and the web increases the reach of individual approaches.

Feasibility, relative cost, and sustainability: Individual interventions are typically costly and intensive (particularly face-to-face), however, the delivery of physical activity interventions in settings to groups of individuals (eg, schools, worksites, primary care facilities) and using a variety of media increases the feasibility and decreases the cost of these approaches. The telephone and print approaches have been found to have reasonable sustainability over a 2-4 yr period. Kahn et

al. (2002) report a cost range of US\$0.05-\$3.94 for lifestyle interventions and US\$0.07-\$5.39 for structured interventions.

Effect on social determinants of health: Not presented systematically, however, home-based or web-based intervention delivery would reduce the opportunities to impact on social determinants of health.

Examples of interventions in Australia: Get Mobile – A collaborative pilot study between Deakin University, University of Queensland and Stanford University (Ball et al., 2005). DHS Victoria are using their Better Health Channel to offer a web-based delivery of physical activity to adults in Victoria (<http://www.betterhealth.vic.gov.au>)

Key Stakeholders: DoE, DHHS, LGAT, UTAS, TCCI, DPAC, OSR.

Intervention 22 - Automated telephone systems

A small number of studies have trialled the use of automated telephone systems to increase physical activity among individuals (Pinto et al., 2002; Friedman, 1998). This is typically a computer-based telephone counselling system that utilises stage of change theory to individually tailor participants' counsel and advice. Participants use the telephone keypads to respond to questions posed by the automated system. In these studies, the users initiated the telephone calls.

Target group/setting: Adults, older adults, primary health care.

Level of evidence: Category C

Effect size: Significantly more participants in the intervention group increased their physical activity (26%) compared to the controls (20%), however, the difference was not maintained after 6-months (Pinto et al., 2002). A 3-month pilot study of older adults found that at the end of the intervention participants who used the automated telephone service walked for significantly more minutes per week (121 mins) compared to the controls (40 mins) (Friedman, 1998).

Reach; Moderate-high

Feasibility, relative cost, and sustainability: More cost-effective than face-to-face approaches, and the small number of studies that have been conducted indicate high feasibility. However, the sustainability appears to be low and perhaps like the telephone intervention approaches, the automated system is useful for initiating the adoption of physical activity but switching to other strategies, such as mail, might increase sustainability.

Effect on social determinants of health: An automated telephone system would not appear to enhance social determinants of health, but this is unknown at this stage.

Examples of interventions in Australia: Kinect Australia offer an Info-line service for physical activity which is currently being developed as an automated system as well as personalised options [<http://www.vicfit.com.au/>]

Key Stakeholders; DHHS, LGAT, OSR.

REDUCING SEDENTARY BEHAVIOUR

Intervention 23 - Reducing sedentary behaviour in children and adolescents

While no interventions for reducing adult sedentary behaviour have been published, a small number of studies have focused on reducing sedentary behaviour among children. Most of these have been delivered in the school setting (Robinson, 1999; Gortmaker et al., 1999; Salmon et al., 2005), one in the family setting (Epstein et al., 1995), and one in the primary care setting (Ford et al., 2002). Interventions in the school setting have primarily consisted of curriculum-based delivery incorporating behavioural modification principles such as self-monitoring (raising children's awareness of how much TV they watch), behavioural contracting (to reduce TV viewing), teaching children to be 'intelligent' or selective viewers (ie, select the TV program, watch it, then switch it off), and decision making (physical activity alternatives). In the Epstein (1995) intervention families were encouraged to reinforce (reward) their child for reducing time spent in sedentary behaviours and for increasing time spent in physical activity. They attended weekly treatment meetings for 4 months, then 2 monthly meetings for 1 year. In the primary care intervention, parents with children 7-12 years were provided with counselling (5-10 mins) plus a behavioural intervention on setting TV budgets, a brochure for parents for support/assistance, and an electronic TV time manager.

Target group/setting: Children, adolescents, family setting, school setting

Level of evidence: Category C

Effect size: All studies were successful in reducing sedentary behaviour and the Robinson and Gortmaker studies also prevented unhealthy weight gain in children. The primary care study by Ford (2002) was effective in increasing participation in organised sport and playing outside.

Reach: Moderate-high

Feasibility, relative cost, and sustainability: Interventions for reducing children's sedentary behaviour have been shown to be feasible in several different settings. Although not reported, the cost of these strategies would be low (particularly the in the school settings). The family setting approach has had 12-mth follow-up and has been shown to be sustainable. The curriculum-based component of this intervention is currently being tested in a research-to-practice trial in 16 primary schools in the Western suburbs of Melbourne, with the objective being to offer these materials statewide as part of the Victorian Kids Go For Your Life initiative.

Effect on social determinants of health: Unknown. However, cross-sectional studies suggest that those who spend less time watching television spend more time socialising (Salmon et al., 2003).

Examples of interventions in Australia: Switch-Play (Salmon et al., 2005).

Key Stakeholders: DoE, LGAT, DHHS, TTCL.

SUMMARY and RECOMMENDATIONS

- The evidence from the physical activity literature indicates that international and Australian studies promoting physical activity demonstrate that **no single approach** has succeeded in initiating and sustaining widespread long-term physical activity behaviour. Thus, the delivery of **a range** of effective, feasible and sustainable (at least 6-months behaviour change) interventions to promote physical activity is most likely to significantly impact on physical activity in whole populations over the **long term**.
- To date, most physical activity interventions have focused on the individual, and without supportive environments it has been argued that physical activity behaviour is less likely to be maintained. There is, however, emerging evidence that **environmental interventions** can be effective in increasing physical activity in populations.
- The most successful physical activity promotion strategy for the state of Tasmania will be one that **incorporates many sectors** (eg, transport, environment, health, sport and recreation, education, justice), and adopts a number of concurrent approaches that also **link with nutrition and mental health and enhance overall health and wellbeing**. However, without a coordinated approach the likelihood of making a significant impact on public health will be reduced.
- A **coordinated cross sector approach** offers the greatest potential for implementing the National Physical Activity guidelines. The Premier's Physical Activity Council provides an excellent vehicle for achieving this coordination through the '*Live Life Get Moving, Tasmanian Physical Activity Plan 2005-2010*' and its implementation plan.
- Importantly, the selection of physical activity intervention approaches for Tasmania should be made on **the basis of the needs** of the State's population (eg, older adults, women, or low socioeconomic status groups may be a particular focus).
- **Formative research is recommended** for identifying barriers and enablers in specific communities for the development of tailored strategies targeting that population. It is important to adequately consult and engage the community at this early stage.
- **Building the capacity of the workforce** through the development of skills in the area of program development and management (including planning, implementation and evaluation of projects) is important.
- **Use theories and models** to intervene effectively, and to make informed judgements about how to measure the success of interventions. The most successful and effective interventions in the physical activity literature are those that have utilised a theoretical framework for behavioural change (King, Stokols et al., 2000; Salmon et al., 2000). Programs that are implemented should **be well evaluated** to ensure that resources and efforts of all involved are maximised.
- **Have realistic expectations**. There is **no quick fix** solution to the current chronic health crises we are witnessing in Australia. To **arrest** the acceleration of overweight and obesity and type 2 diabetes that has occurred in this country in the last 10-15 years will

Summary and Recommendations

take long-term multi-strategy and inter-sectoral approaches so a **long term commitment** is required.

- **Use the best evidence available**, 23 evidence-based intervention strategies were identified from reviews or from new evidence in the physical activity literature. It is important we strive to implement programs that we know have been shown to make a positive change in physical activity levels (or incorporate evaluation into programs to build the evidence).
- This review has identified categories of intervention that are both effective and evidence-based. However, intervention strategies that have potential but lack evidence should also be considered for inclusion as physical activity initiatives. For example, interventions showing promise that should be mentioned include **interventions that incorporate web, print and/or telephone-assisted** strategies. However, more developmental work and pilot studies need to be undertaken before such strategies can be recommended for wide scale implementation.
- While this list should not preclude other strategies identified in this document from being implemented and evaluated, it is recommended that the **proposed ‘Best Buys’ should take priority**.
- Finally, to effectively action these recommendations, it is critical that all levels of government move beyond policies and make a **firm commitment**, including adequate resources for the planning, implementation, evaluation, follow-up and sustainability of the projects as this is a long term process.

Proposed ‘Best Buys’ to focus our efforts on in Tasmania

Approach	Intervention Type	Intervention number*
Population based - environment	Whole of Population	1
Population based - environment	Built (stairwell, point of decision)	2
Population Based - communication	Mass media linked with community based strategies	3
Population based - settings /environment	School-curriculum and environment	6
Population based - settings /environment	Worksites- behaviour modification and environment	10
Population based - settings /environment	Active transport	12
Population based - settings	Primary Health Care- exercise specialist delivers	15
Target Groups	Home based older adults	18
Reducing sedentary behaviour	Reducing sedentary behaviour in children and adolescents	23

Summary and Recommendations

What needs more evaluation or has mixed results

Approach	Intervention Type	Intervention number*
Population based - settings	Family	8
Population based - settings	Intergenerational	9
Target Groups	Low socio-economic status, minority, disability, indigenous	19
Target Groups	Women	17
Individual	Lifestyle versus structured physical activity	20
Individual	Print, web, phone assist and face-to-face	21
Population based - settings	Primary Health Care practitioner delivers	14
Population based - settings	Church based (community)	16
Population based - settings	Community based walking groups	11
Population based - settings /environment	Walking School Bus	13

Note: the intervention numbers have no relation to any form of priority or ranking

REFERENCES

- Ajzen I, Fishbein M. (1980). Understanding attitudes and predicting social behaviour. Englewood Cliffs, NJ: Prentice Hall.
- Angley L, Watkins T. (2001). Stepping out: a flexible framework for delivering walking opportunities to older persons. Australia: Walking the 21st Century – 20th to 22nd February, Perth, WA.
- Armstrong T, Bauman A, Davies J. (2000). Physical Activity Patterns of Australians. Canberra. AIHW.
- Ashenden R, Silagy C, Weller D. (1997). A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 14: 160-175.
- Ashcroft P. (2001). The UK 'Walking the Way to Health' initiative. Australia: Walking the 21st Century – 20th to 22nd February, Perth, WA.
- Australian Bureau of Statistics (ABS). (2000). Children's participation in cultural and leisure activities. ABS, Canberra.
- Australian Bureau of Statistics (ABS). (1995). The Labor Force Australia. Report No 6203.0. Canberra: Australian Bureau of Statistics.
- Australian Bureau of Statistics (ABS). (2002). 2001 Census: Tasmania (second release). Cat. No. 2046.0.
- Australian Bureau of Statistics (ABS). (2001). Population projections, Tasmania, 1999 to 2021. Cat. No. 3222.6.
- Australian Bureau of Statistics (ABS). (2006). National Health Survey: Summary of Results; State Tables, 2004-05, catalogue number 4362.0
- Australian Institute of Health and Welfare (AIHW) (2006) Australia's Health 2006. Commonwealth Government, Canberra
- Badland, H. and Schofield, G. (2005). Transport, urban design, and physical activity: an evidence based update. *Transportation Research Part D: Transport and Environment*, 10(3), 177-96
- Bandura A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice Hall.
- Ball K, Salmon J, Leslie E, Owen N, King A. (2005). Piloting the feasibility and effectiveness of print- and telephone-mediated interventions for promoting the adoption of physical activity in Australian adults. *Journal of Science & Medicine in Sport* 8: 134-142.
- Baudains C, Styles I, Dingle P. (2001). TravelSmart workplace: walking and the journey to work. Australia: Walking the 21st Century – 20th to 22nd February, Perth, WA.
- Baranowski T, Baranowski JC, Cullen KW, et al. (2003). The Fun, Food, and Fitness Project (FFFP): the Baylor GEMS pilot study. *Ethnicity and Disease* 13(1 Suppl 1):S30-9.
- Bauman A, Bellew B, Owen N, et al. (2001). Impact of an Australian mass media campaign targeting physical activity in 1998. *American Journal of Preventative Medicine* 21: 41-7.
- Bauman A, Bellew B, Vita P, Brown W, Owen N. (2002). Getting Australia active: towards better practice for the promotion of physical activity. National Public Health Partnership. Melbourne, Australia.
- Bauman A, Bellew B, Booth M, Hahn A, Stoker L, Thomas M. (1996). NSW Health Promotion Survey 1994: Towards best practice for the promotion of physical activity in the Areas of New South Wales. NSW Health Department, Centre for Disease Prevention and Health.
- Bauman A, Sallis JF, Dzewaltowski DA, Owen N. (2002). Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, and confounders. *American Journal of Preventive Medicine* 23: 5-14.
- Beech BM, Klesges RC, Kumanyika SK, et al. (2003). Child- and parent-targeted interventions: the Memphis GEMS pilot study. *Ethnicity and Disease* 13(1 Suppl 1):S40-53.

References and Glossary

- Blair SN, Piserchia PV, Wilbur CS, Crowder JH. (1986). A public health intervention model for work-site health promotion. *Journal of the American Medical Association* 255: 921-926.
- Bird W, Adams F. (2001). *Sonning Common Health Walks: a four year review*. Australia: Walking the 21st Century – 20th to 22nd February, Perth, WA.
- Booth M, Okely A, Chey T, Bauman AE. (2002). Epidemiology of physical activity participation among New South Wales school students. *Aust NZ J Pub Health* 26, 371-374.
- Boutelle KN, Jeffery RW, Murray DM, Schmitz MKH. (2001). Using signs, artwork, and music to promote stair use in a public building. *American Journal of Public Health* 91: 2004-6.
- Bracht N. (Ed.). (1990). *Health promotion at the community level*. Newbury Park, CA: Sage.
- Brown WJ, Lee C, Oyomopito R. (1996). Effectiveness of a bilingual heart health program for Greek-Australian women. *Health Promotion International* 11: 117.
- Brown WJ, Mummery K, Eakin E, Schofield G. (2006) 10,000 Steps Rockhampton: Evaluation of a Whole Community Approach to Improving Population levels of Physical Activity. *Jnl Phys Activ & Hlth* 1;1-14.
- Caballero B, Clay T, Davis SM, et al. (2003). Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *American Journal of Clinical Nutrition* 78(5):1030-8.
- Cairnduff, S. (2001), *Sport and Recreation for Indigenous Youth in the Northern Territory: Scoping Research Priorities for Health and Social Outcomes*, Darwin: Cooperative Research Centre for Aboriginal and Tropical Health and Australian Sports Commission.
- Calfas KJ, Sallis JF, Zabinski MF, et al. (2002). Preliminary evaluation of a multicomponent program for nutrition and physical activity change in primary care: PACE+ for adults. *Preventive Medicine* 34: 153-161.
- Cameron C, Craig CL, Paolin S. (2004). *Increasing physical activity: Trends for planning effective communication*. Ottawa, ON: Canadian Fitness and Lifestyle Research Institute.
- Cameron AJ, Welborn TA, Zimmet PZ, Dunstan DW, Owen N, Salmon J, Dalton M, Jolley D, Shaw JE. (2003). Overweight and Obesity in Australia – the 1999-2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab). *Medical Journal of Australia* 178: 427-432.
- Castro CM, King AC, Brassington GS. (2001). Telephone versus mail interventions for maintenance of physical activity in older adults. *Health Psychology* 20: 438-444.
- Castro M, King A. (2002). Telephone assisted counselling for physical activity. *Exercise & Sport Science Reviews* 30: 64-68.
- Cheung LWY & Richmond JB. (Eds) (1995). *Child health, nutrition, and physical activity*. Champaign, Illinois: Human Kinetics.
- Collins F, Norris M, Bain J, McDonnell J. (2001). Monthly community walks – monthly successes. Australia: *Walking the 21st Century – 20th to 22nd February*, Perth, WA.
- Commonwealth Government (1996) National Priority Health Areas. Australian Health ministers Advisory Council. <http://www.aihw.gov.au/nhpa/index.cfm> (accessed on 15/02/2006).
- Commonwealth of Australia, Department of Health and Ageing. (2004). *Australia's physical activity recommendations for children and young people*. Canberra (ACT): Department of Health and Ageing.
- Conn VS, Valentine JC, Cooper HM. (2002). Interventions to increase physical activity among aging adults: a meta-analysis. *Ann Behav Med* 24: 190-200.
- Cookson S, Heath A, Bertrand L. (2000). The HeartSmart Family Fun Pack: an evaluation of a family-based intervention for cardiovascular risk reduction in children. *Canadian Journal of Public Health* 91: 256-9.

References and Glossary

- Cooper AR, Page AS, Foster LJ et al. (2003). Active commuting to school: Are children who walk to school more physically active than those who travel by car? *American Journal of Preventive Medicine* 25:273-6.
- Cress ME, Buchner DM, Prohaska T, et al. (2005). Best Practices for Physical Activity Programs and Behavior Counseling in Older Adult Populations. *Journal of Aging and Physical Activity* 13: 6-74.
- Cunningham, G. and Michael, Y. (2004). Concepts guiding the study of the built environment on physical activity for older adults: a review of the literature. *American Journal of Public Health*, 18(6), 435-43
- Delaney A, Newstead S, Corben B. (2004). Outcome evaluation of the effectiveness of the safe routes to schools program. Monash University Accident Research Centre (MUARC), Report No, 225.
- Department of Health and Aged Care (DoHAC) (1999). National Physical Activity Guidelines for Australians. Commonwealth of Australia, Canberra (ACT): AGPS.
- Department of Health and Human Services (2005) Strengthening the prevention and management of chronic conditions policy framework 2005. Population and Health Priorities DHHS Tasmania.
- Dietz W. (2001). Preventing obesity in children and adolescents. *Ann Rev Public Health* 22:337-53.
- Dishman RK, Oldenburg BO, O'Neal H, Shephard R. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine* 15: 344-61.
- Dishman RK, Sallis JF. (1994). Determinants and interventions for physical activity and exercise. In: Bouchard C, Shephard RJ, Stephens T (Eds.), *Physical activity, fitness and health: International proceedings and consensus statement* (pp. 214-238). Champaign, Illinois: Human Kinetics.
- Dunn AL, Andersen RE, Jakicic JM. (1998). Lifestyle physical activity interventions: History, short- and long-term effects, and recommendations. *American Journal of Preventive Medicine* 15: 398-412.
- Dunstan DW, Daly RM, Owen N, et al. (2005). Home-based resistance training is not sufficient to maintain improved glycemic control following supervised training in older individuals with type 2 diabetes. *Diabetes Care* 28:3-9.
- Dunstan D, Salmon J, Owen N, et al. (2004). Physical activity and television viewing in relation to risk of undiagnosed abnormal glucose metabolism in adults. *Diabetes Care* 27: 2603-2609.
- Dunstan D, Salmon J, Owen N, et al. (2005). Risk of the metabolic syndrome increases with television viewing time and decreases with physical activity. *Diabetologia* 48: 2254–2261.
- Eakin A, Brown W, Marshall AL, Mummery K, Larsen E. (2004). Physical activity promotion in primary care bridging the gap between research and practice. *Am J Prev Med* 27:297–303.
- Eaton CB, Menard LM. (1998). A systematic review of physical activity promotion in primary care settings. *British Journal of Sports Medicine* 32: 11-16.
- Engbers LH, van Poppel NMN, Chin A Paw MJM, van Mechelen W. (2005). Worksite health promotion programs with environmental changes a systematic review. *Am J Prev Med* 29:61–70.
- Epstein L, Valoski A, Vara L, et al. (1995). Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology* 14(2):109-15.
- Ewing-Garber C, Lazar IG, Lapane KL, et al. (2001). Slí Path the Health Walking Routes in Rhode Island: Evaluation of a community-based physical activity environmental change program: preliminary work. Australia: *Walking the 21st Century – 20th to 22nd February*, Perth, WA.
- Fahrenwald NL, Sharma M. (2002). Development and expert evaluation of “Moms on the Move”, a physical activity intervention for WIC mothers. *Public Health Nursing* 19: 423-439.

References and Glossary

- Farquar, J. (1978). The community based model of lifestyle intervention trials. *American Journal of Epidemiology* 108: 103-111.
- Fishbein M, Ajzen I. (1975). *Belief, attitude, intention and behaviour*. Don Mills, New York: Addison-Wesley.
- Ford BS, McDonald TE, Owens AS, Robinson TN. (2002). Primary care interventions to reduce television viewing in African-American children. *Am J Prev Med* 22(2):106-9.
- Foreman R, Brookes L, Abernathy P, et al. (2001). Assessing the sustainability of the “Just Walk It” program model: is it effective and will it enhance program success? Australia: *Walking the 21st Century – 20th to 22nd February*, Perth, WA.
- Foster C, Hillsdon M. (2004). Changing the environment to promote health enhancing physical activity. *Journal of Sports Sciences* 22: 755–769.
- Friedman RH. (1998). Automated telephone conversations to assess health behaviour and deliver behavioural interventions. *Journal of Medical Systems* 22: 95-102.
- Glanz K, Lewis FM, Rimer BK. (Eds.). (1996). *Health behaviour and health education: Theory, research, and practice*. 2nd Edition. San Francisco: Jossey-Bass.
- Glasgow RE, Bull SS, Gillette C, et al. (2002). Behavior change intervention research in healthcare settings: a review of recent reports with emphasis on external validity. *American Journal of Preventive Medicine* 23: 62-69.
- Gomel M, Oldenburg B, Simpson J, Owen N. (1993). Worksite cardiovascular risk reduction: Randomised trial of health risk assessment, risk factor education, behavioural counselling and incentive strategies. *American Journal of Public Health* 83: 1231-1238.
- Gortmaker S, Peterson K, Wiecha J, et al. (1999). Reducing Obesity via a School-based Interdisciplinary Intervention among Youth. *Arch Pediatr Adolesc Med* 153: 409-418.
- Halbert JA, Silagy CA, Finucane PM, et al. (2000). Physical activity and cardiovascular risk factors: effect of advice from an exercise specialist in Australian general practice. *MJA* 173: 84-87.
- Hancox RJ, Milne BJ, Poulton R. (2004). Association between child and adolescent television viewing and adult health: a longitudinal birth cohort study. *Lancet* 364: 257–62.
- Hu FB, Leitzmann MF, Stampfer MJ, Colditz GA, Willett WC, Rimm EB. (2001). Physical activity and television watching in relation to risk for type 2 diabetes mellitus in men. *Arch Intern Med* 161:1542-1548.
- Hu FB, Li TY, Colditz GA, Willett WC, Manson JE. (2003). Television watching and other sedentary behaviours in relation to risk of obesity and type 2 diabetes mellitus in women. *Jama* 289:1785-1791.
- Huang N, Pietsch J, Naccarella L, Sims J (2004). The Victorian Active Script Programme: promising signs for general practitioners, population health, and the promotion of physical activity. *Br J Sports Med* 38: 19-25.
- Humpel, N., Owen, N. and Leslie, E. (2002). Environmental factors associated with adults’ participation in physical activity. *American Journal of Preventive Medicine*, 22(3), 188-99.
- John G. (2001). The effectiveness of the TravelSmart individualised marketing program for increasing walking trips in Perth. Australia: *Walking the 21st Century – 20th to 22nd February*, Perth, WA.
- Jorna M, Ball K, Salmon J. (in press). Effects of a holistic health program on women’s physical activity and mental and spiritual health. *Journal of Science and Medicine in Sport*, Special Issue on Physical Activity Interventions.
- Kahn EB, Ramsey LT, Brownson RC, et al. (2002). The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventive Medicine* 22 (4S): 73-107.
- Kau M, Fischer J. (1974). Self-modification of exercise behavior. *Journal of Behavior Therapy and Experimental Psychiatry* 5: 213-4.
- Kelder SH, Perry CL, Klepp K-I, Lytle LA. (1994). Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviours. *American Journal of Public Health* 84: 1121-6.

References and Glossary

- Kerr J, Eves F, Carroll F. (2001a). Six-Month Observational Study of Prompted Stair Climbing. *Preventive Medicine* 33: 422-427.
- Kerr J, Eves F, Carroll F. (2001b). Encouraging Stair Use: Stair-Riser Banners Are Better Than Posters. *American Journal of Public Health* 91: 1192-1193.
- Kesaniemi YA, Danforth E, Jensen MD, et al. (2001). Dose-response issues concerning physical activity and health: an evidence-based symposium. *Medicine and Science in Sports and Exercise* 6 (suppl): S351-S358.
- King AC, Haskell WL, Taylor B, Kraemer HC, DeBusk RF. (1991). Group vs home-based exercise training in healthy older men and women: A community-based clinical trial. *Journal of the American Medical Association* 266: 1535-1542.
- King AC, Jeffery RW, Fridinger F, Dusenbury L, Provence S, Hedlund SA, Spangler K. (1995). Environmental and policy approaches to cardiovascular disease prevention through physical activity: Issues and opportunities. *Health Education Quarterly* 22: 499-511.
- King AC, Rejeski WJ, Buchner DM. (1998). Physical activity interventions targeting older adults: A critical review and recommendations. *American Journal of Preventive Medicine* 15: 316-333.
- King AC, Stokols D, Talen E, et al. (2000). Theoretical approaches to the promotion of physical activity: forging a transdisciplinary paradigm. *American Journal of Preventive Medicine* 23: 15-25.
- King AC, Birkel CF, Haskell WL. (1988). Increasing exercise among blue-collar employees: the tailoring of worksite programs to meet specific needs. *Preventive Medicine* 17: 357-65.
- Klein, D. (2005) The case for corporate health and well-being programs (<http://www.cch.com.au>).
- Klepp KI, Oygard L, Tell GS, Vellar OD. (1993). The Oslo Youth Study: a 12 year follow-up study of a school-based health education program. In: *Proceedings: health behaviour in adolescents: implications for prevention of coronary heart disease*. Bergen, Norway: University of Bergen: 94-105.
- Lasater TM, Becker DM, Hill MN, et al. (1997). Synthesis of findings and issues from religious-based cardiovascular disease prevention trials. *Annals of Epidemiology* 7(Suppl): S46-S53.
- Lawlor DA, Hanratty B. (2001). The effect of physical activity advice given in routine primary care consultations: a systematic review. *Journal of Public Health Medicine* 23:219-226.
- Lawlor DA, Ness AR, Cope AM, Davis A, Insall P, Riddoch C. (2003). The challenges of evaluating environmental interventions to increase population levels of physical activity: the case of the UK National Cycle Network. *J. Epidemiol. Community Health* 57;96-101.
- Lee C, Brown WJ. (1998). Australian migrant women and physical activity. *ACHPER Healthy Lifestyles Journal* 45: 5-10.
- Lee, C. and Moudon, A. (2004). Physical activity and environment research in the health field: implications for urban and transport planning practice and research. *Journal of Planning Literature*, 19(2), 147-81
- Linenger JM, Chesson CV, Nice S. (1991). Physical fitness gains following simple environmental change. *American Journal of Preventive Medicine* 7: 298-310.
- Lovato CY, Green LW. (1990). Maintaining employee participation in workplace health promotion programs. *Health Education Quarterly* 17: 73-88.
- Malone K. (1999). Growing up in cities as a model of participatory planning and 'place-making' with young people. *Youth Studies Australia* 18: 17-23.
- Manios Y, Moschandreas J, Hatzis C, Kafatos A. (1999). Evaluation of a health and nutrition education program in primary school children of Crete over a three-year period. *Preventive Medicine* 28: 149-159.

References and Glossary

- Manios Y, Moschandreas J, Hatzis C, Kafatos A. (2002). Health and nutrition in primary schools of Crete: changes in chronic disease risk factors following a 6-year intervention programme. *British Journal of Nutrition* 88: 315-24.
- Marcus BH, Bock BC, Pinto BM, Forsyth LH, Roberts MB, Traficante RM. (1998). Efficacy of an individualized, motivationally-tailored physical activity intervention. *Annals of Behavioral Medicine* 20: 174-180.
- Marcus BH, Owen N, Forsyth LH, Cavill NA, Fridinger F. (1998). Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventive Medicine* 15: 362-378.
- Marcus BH, Stanton AL. (1994). Evaluation of relapse prevention and reinforcement interventions to promote exercise adherence in sedentary females. *Research Quarterly for Exercise and Sport* 64: 447-52.
- Marshall AL, Bauman AE, Owen N, et al. (2003). Population-based randomised controlled trial of a stage-targeted physical activity intervention. *Annals of Behavioural Medicine* 25: 194-202.
- Mattarazzo JD, et al. (Eds). (1984). *Behavioral health: A handbook of health enhancement and disease prevention*. New York: Wiley.
- McCabe MP, Ricciardelli LA, Salmon J. (2006). Evaluation of a prevention program to address body focus and negative affect among children. *Journal of Health Psychology: Special Issue* 11:589-598.
- Mercer SL, Green LW, Rosenthal AC, et al. (2003). Possible lessons from the tobacco experience for obesity control. *American Journal of Clinical Nutrition* 77(suppl): 1073S–82S.
- Merom D, Bauman A, Vita P, Close G. (2003). An environmental intervention to promote walking and cycling – the impact of a newly constructed Rail Trail in Western Sydney. *Preventive Medicine* 36: 235-242.
- Miller MA. (1995). Culture, spirituality, and women's health. *Journal of Obstetrics, Gynaecology and Neonatal Nursing* 24: 257-63.
- Miller YD, Trost SG, Brown WJ. (2002). Mediators of physical activity behaviour change among women with young children. *American Journal of Preventive Medicine* 23: 98-103.
- Morgan O. (2005). Approaches to increase physical activity: reviewing the evidence for exercise-referral schemes. *Public Health* 119: 361–370.
- Mutrie N, Carney C, Blamey A, et al. (2002). "Walk in to Work Out": a randomised controlled trial of a self help intervention to promote active commuting. *J Epidemiol Community Health* 56:407-12.
- National Institutes of Health, and National Heart, Lung, and Blood Institute (NIH). (1998). Clinical guidelines on identification, evaluation, and treatment of overweight and obesity in adults: the Evidence report. *Obesity Research* 6:51S-209S.
- Norris SL, Zhang X, Avenell A, Gregg E, Schmid CH, Lau J. (2005). Long-term non-pharmacological weight loss interventions for adults with prediabetes. *The Cochrane Database of Systematic Reviews: Reviews Issue 2* John Wiley & Sons, Ltd Chichester, UK
- NSW Health. (2003). ProActive Mums. Promoting physical activity through childcare centres: a randomised controlled trial. NSW Department of Health.
- O'Dea K. (1991). Westernisation, insulin resistance and diabetes in Australian Aborigines. *The Medical Journal of Australia* 155:258-264.
- Ogilvie, D., Egan, M., Hamilton, V. and Petticrew, M. (2004). Promoting walking and cycling as an alternative to using cars: systematic review. *British Medical Journal*, 329 (7469), 763-7.
- Ory MG, Lipman PD, Karlen PL, et al. (2002). Recruitment of older participants in frailty/injury prevention studies. *Prevention Science* 3: 1-22.
- Ottawa Charter. (1986). *Ottawa Charter for Health Promotion*. Ottawa, Canada: World Health Organisation.
- Owen, N, Humpel, N., Leslie, E., Bauman, A. and Sallis, J. (2004). Understanding environmental influences on walking – review and research agenda. *American Journal of Preventive Medicine*, 27(1), 67-76.

References and Glossary

- Owen N, Leslie E, Salmon J, Fotheringham M. (2000). Environmental Determinants of Physical Activity and Sedentary Behavior. *Exercise and Sport Sciences Reviews* 28, 153-158.
- Pate RR, Pratt M, Blair SN, et al. (1995). Physical activity and public health. A recommendation from the centres for disease control and prevention and the American College of Sports Medicine. *Journal of the American Medical Association* 273: 402-407.
- Pate RR, Saunders RP, Ward DS, et al. (2003). Evaluation of a community-based intervention to promote physical activity in youth: lessons from Active Winners. *American Journal of Health Promotion* 17: 171-82.
- Patrick K, Sallis JF, Prochaska JJ, et al. (2001). A multicomponent program for nutrition and physical activity change in primary care: PACE+ for adolescents. *Arch Pediatr Adolesc Med* 155: 940-6.
- Pinto BM, Friedman RH, Marcus B, et al. (2002). Effects of a computer-based, telephone-counselling system on physical activity. *American Journal of Preventive Medicine* 23: 113-120.
- Porter S, Eccleston P, Vilshanskaya O. (2002). Moving patients towards a more active lifestyle: the GP physical activity project in south eastern Sydney area health service. *Health Promotion Journal of Australia* 13: 178-183.
- Prochaska JO, Marcus BH. (1994). The transtheoretical model: Applications to exercise. In RK Dishman (Ed.) *Advances in Exercise Adherence*. (pp. 161-180). Illinois: Human Kinetics.
- Ransdell LB Dratt J, Kennedy C, O'Neill S, DeVoe D. (2001). Daughters and mothers exercising together (DAMET): a 12-week pilot project designed to improve physical self-perception and increase recreational physical activity. *Women and Health* 33: 101-16.
- Ransdell LB, Robertson L, Ornes L, Moyer-Mileur L. (2004). Generations Exercising Together to Improve Fitness (GET FIT): A pilot study designed to increase physical activity and improve health-related fitness in three generations of women. *Women and Health* 40:77-94.
- Reger B, Cooper L, Booth-Butterfield S, et al. (2002). Wheeling Walks: A community campaign using paid media to encourage walking among sedentary older adults. *Preventive Medicine* 35: 285-292.
- Rejeski WJ, Brawley LR. (1997). Shaping active lifestyles in older adults: a group-facilitated behaviour change intervention. *Annals of Behavioural Medicine* 19: S106.
- Resnicow K, Jackson A, Blissett D, et al. Results of the healthy body healthy spirit trial. *Health Psychol*, 2005; 24(4): 339-48
- Roberts K, Dench S, Minten J, York C. (1989). *Community response to leisure centre provision in Belfast*. London, UK: Sports Council.
- Robinson T. (1999). Reducing Children's Television Viewing to Prevent Obesity. *JAMA* 282, pp. 1561-1566.
- Robinson TN, Killen JD, Kraemer HC, et al. (2003). Dance and reducing television viewing to prevent weight gain in African-American girls; the Stanford GEMS pilot study. *Ethnicity and Disease* 13:65-77.
- Saakslathi A, Numminen P, Salo P, Tuominen J, Helenius H, Valimski I. (2004). Effects of a Three-Year Intervention on Children's Physical Activity from Age 4 to 7. *Pediatric and Exercise Science* 16(2).
- Saelens, B., Sallis, J. and Frank, L. (2003). Environmental correlates of walking and cycling: findings from the transportation, urban design and planning literatures. *Annals of Behavioural Medicine*, 25(2), 80-91.
- Sahota P, Rudolf MC, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *British Medical Journal* 2001;323(7320):1029-32.
- Sallis JF. (2000). Age-related decline in physical activity: a synthesis of human and animal studies. *Med Sci Sports Exerc* 32: 1598-1600.
- Sallis JF, Bauman A, Pratt M. (1998). Environmental and policy interventions to promote physical activity. *American Journal of Preventive Medicine* 15: 379-397.

References and Glossary

- Sallis, J., Frank, L., Saelens, B. and Kraft, M. (2004). Active transportation and physical activity: opportunities for collaboration on transportation and public health research. *Transportation Research*, 38, 249-68
- Sallis JF, McKenzie TL, Conway TL, et al. (2003). Environmental interventions for eating and physical activity. A randomized controlled trial in middle schools. *American Journal of Preventive Medicine* 24: 209-217.
- Sallis JF, Owen N. (1999). *Physical activity and behavioural medicine*. Thousand Oaks, CA: Sage.
- Salmon J, Bauman A, Crawford D, Timperio A, Owen N. (2000). The association between television viewing and overweight among Australian adults participating in varying levels of leisure-time physical activity. *International Journal of Obesity* 24: 600-606.
- Salmon J, Breman R, Fotheringham M, Ball K, Finch C. (2000). Potential approaches for the promotion of physical activity. A review of the literature. Melbourne: Deakin University, School of Health Sciences and The Victorian Health Promotion Foundation.
- Salmon J, Campbell K, Crawford D. (2006). Television viewing habits associated with obesity risk factors: a survey of Melbourne schoolchildren. *Medical Journal of Australia* 184: 64-67.
- Salmon J, Owen N, Crawford D, Bauman A, Sallis JF. (2003). Physical activity and sedentary behaviour: a population-based study of barriers, enjoyment, and preference. *Health Psychology* 22:178-188.
- Salmon J, Timperio A, Cleland V, Venn A. (2005). Trends in children's physical activity and weight status in high and low socio-economic status areas of Melbourne, Victoria, 1985-2001. *Austr NZ J Pub Health* 29:337-342.
- Seaton J, Wall S. (2001). A summary of walking and cycling in the Perth metropolitan region. Australia: *Walking in the 21st Century*. Perth: 15-24
- Sevick MA, Dunn AL, Morrow MS, et al. (2000). Cost-effectiveness of lifestyle and structured exercise interventions in sedentary adults: Results of project ACTIVE. *American Journal of Preventive Medicine* 19: 1-8.
- Shepard RJ. (1996). Worksite fitness and exercise programs: A review of methodology and health impact. *American Journal of Health Promotion* 10: 436-452.
- Simons-Morton DG, Kalfas KJ, Oldenburg B, Burton NW. (1998). Effects of interventions in health care settings on physical activity or cardiorespiratory fitness. *American Journal of Preventive Medicine* 15: 413-430.
- Simons-Morton BG, Parcel GS, Baranowski T, Forthofer R, O'Hara NM. (1991). Promoting physical activity and a healthful diet among children: Results of a school-based intervention study. *American Journal of Public Health* 81: 986-991.
- Smith, B. (2004). Promotion of physical activity in primary health care: update of the evidence on interventions. *Journal of Science and Medicine in Sport* 7: Supplement 67-73.
- Stewart AL, Mills K, Sepsis P, King AC, McLellan BY, Roitz K, Ritter PL. (1997). Evaluation of champs, A Physical activity promotion program for older adults. *Annals of Behavioural Medicine* 19:353-361.
- Stokols D. (1996). Translating social ecological theory into guidelines for community health promotion. *American Journal of Health Promotion* 10, 282-298.
- Stone EJ, McKenzie TL, Welk GJ, Booth ML. (1998). Effects of physical activity intervention in youth: Review and synthesis. *American Journal of Preventive Medicine* 15: 298-315.
- Story M, Sherwood NE, Himes JH, et al. (2003). An after-school obesity prevention program for African-American girls: the Minnesota GEMS pilot study. *Ethnicity and Disease* 13(1):S54-S64.
- Stratton G. (2000). Promoting children's physical activity in primary school: an intervention study using playground markings. *Ergonomics* 43: 1538-1546.

References and Glossary

- Taylor WC, Baranowski T, Young DR. (1998). Physical activity interventions in low-income, ethnic minority, and populations with disability. *American Journal of Preventive Medicine* 15: 334-343.
- Telford A, Salmon J, Timperio A, Crawford C (2005). Quantifying and characterising physical activity among 5-6 yr and 10-12 yr old children: the Children's Leisure Activities Study (CLASS). *Pediatric & Exercise Science* 17: 266-280.
- The Australian College of Paediatrics. (1994). Policy statement: Children's television. *J Paediatr Child Health* 30: 6-8.
- Trost, S., Owen, N., Bauman, A., Sallis, J. and Brown, W. (2002). Correlates of adults' participation in physical activity: review and update. *Medicine and Science in Sports and Exercise*, 34(12), 1996-2001.
- University of Western Australia (2003). Walk0it Bunbury Evaluation report. Health Promotion Evaluation Unit, School of Population Health, January 2003.
- U.S. Department of Health and Human Services (USDHHS). (1996). Physical activity and health: A report of the surgeon general. Atlanta, Georgia: U.S. Department of Health and Human Services, Centres for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion.
- Van Beurden E, Barnett LM, Zask A, Dietrich UC, Brooks LO, Beard J. (2003). Can we skill and activate children through primary school physical education lessons? "Move it Groove it"--a collaborative health promotion intervention. *Preventive Medicine* 36(4):493-501.
- Van der Bij AK, Laurant MG, Wensing M. (2002). Effectiveness of physical activity interventions for older adults: a review. *American Journal of Preventive Medicine* 22: 120-33.
- Veitch J, Clavisi O, Salmon J, Owen N. (1998). Healthy activity for working men. Melbourne: Deakin University.
- Vuori IM, Oja P, Paronen O. (1994). Physically active commuting to work - testing its potential for exercise promotion. *Medicine and Science in Sports and Exercise* 26: 844-850.
- Wang G, Macera CA, Scudder-Soucie B, Schmid T, Pratt M, Buchner D. (2005). A Cost-Benefit Analysis of Physical Activity Using Bike/Pedestrian Trails. *Health Promotion Practice* 6: 174-179.
- Wen LM, Thomas M, Jones H, et al. (2002). Promoting physical activity in women: evaluation of a 2-year community-based intervention in Sydney, Australia. *Health Promotion International* 17: 127-137.
- Williams M. Success of "Be active - Play Again", a statewide physical activity campaign for children aged 8-12 years (abstract). 5th National Physical Activity Conference, Melbourne October 2005.
- Yancey AK, Kumanyika SK, Ponce NA, et al. (2004). Population-based interventions engaging communities of color in healthy eating and active living: a review. *Preventing Chronic Disease* [serial online] 2004 Jan [date cited 1.12.2005]. Available from: URL: http://www.cdc.gov/pcd/issues/2004/jan/03_0012.htm
- Yanek LR, Becker DM, Moy TF, et al. Project Joy: faith based cardiovascular health promotion for African American women. *Public Health Rep*, 2001; 116 (Suppl 1): 68-81.



Tasmania
Explore the possibilities

Get Moving
 Tasmania
Premier's Physical Activity Council
www.getmoving.tas.gov.au

 Tasmania Together

CONTACT DETAILS

Department of Health and Human
Services

GPO Box 125
Hobart Tasmania 7001

Phone: 03 6222 7650
Web: www.dhhs.tas.gov.au