



Computer  
Assisted  
Telephone  
Interviewing  
Technical  
Reference  
Group

Population Health Monitoring and Surveillance:  
Question Development Background Paper

# Physical Activity in Australia

May 2003

CATI Technical Reference Group  
National Public Health Partnership

Computer Assisted Telephone Interviewing (CATI) is a methodology widely used for surveillance of health behaviours and health outcomes in populations in Australia. The National CATI Health Survey Technical Reference Group (CATI TRG) is an advisory committee to the National Public Health Information Working Group under the National Public Health Partnership. Members of the CATI TRG include representatives from State/Territory Health Departments, the Commonwealth Department of Health and Ageing (DoHA), the Australian Bureau of the Statistics, the Australian Institute of Health and Welfare and the Public Health Information Development Unit at the University of Adelaide. Since its inception in 1999, the CATI TRG has been a forum for the development and promotion of national standards, valid methods and capacity for CATI health surveys and health surveillance.

To embark in the efforts towards 'harmonisation' of CATI health surveys in Australia, the CATI TRG has identified the need to develop question modules for behavioural risk factor and chronic disease topics based on well-developed conceptual frameworks that underpin the data requirements for health surveillance. The proposed question modules are set to undergo a rigorous process of cognitive and field-testing under the guidance of the CATI TRG and the results will be published in a question module manual as a key reference to those interested in CATI health surveys in Australia.

This paper has been prepared by the CATI TRG as part of a series, with funding predominantly from the DoHA. Its preparation has involved input from all State and Territory jurisdictions, DoHA, the Australian Bureau of Statistics, the Australian Institute of Health and Welfare and the Public Health Information Development Unit at the University of Adelaide as well as recognised content experts.

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# 1 Introduction

The purpose of this background paper is to present the conceptual framework that underpins the concepts and data requirements for the ongoing monitoring and surveillance of physical activity in Australia. This will assist in the development of nationally agreed computer assisted telephone interview (CATI) survey questions to monitor physical activity and its associated impact on individuals.

Monitoring of physical activity is imperative as inactivity accounts for 7% of the total burden of disease in Australia, second only to tobacco smoking, as a risk factor for ill health and injury and accounts for the highest burden amongst women (AIHW 1999). It is estimated that direct health care cost attributable to physical inactivity is around \$377 million per year, based on studies of coronary heart disease, non-insulin dependent diabetes mellitus, colon cancer, breast cancer, stroke and depression (Stephenson et al 2000). Physical activity is also linked to other health conditions and risk factors such as: injury, particularly falls in the elderly (Gillespie et al 1998); osteoporosis (Minor 1991); rheumatoid arthritis (Minor 1991); overweight and obesity (Koplan & Dietz 1999); high blood pressure (Kelly & McClellan 1999); and high blood cholesterol (Haskell 1994), amongst others.

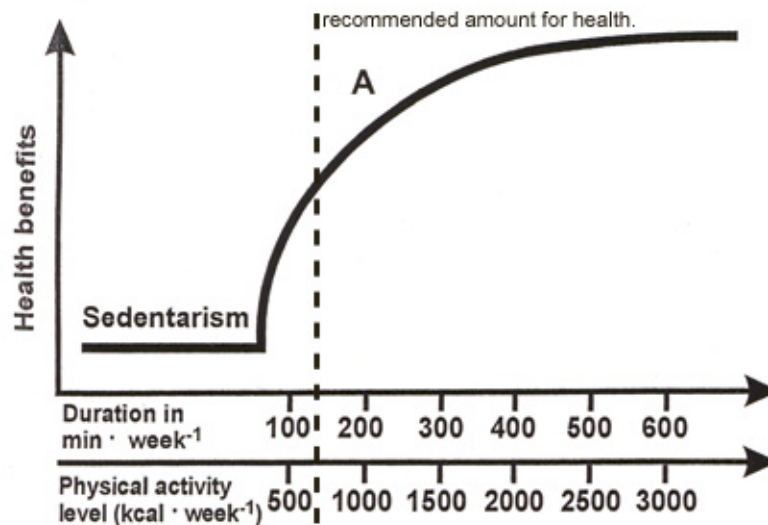
This report relates to the first step, the development of a data requirements paper and forms the basis for step 2, consultation with key stakeholders on the data requirements. Section 2 provides information on the health benefit and risks of physical activity including a discussion of the dose of physical activity required for health. Section 3 summarises the criteria by which data requirements should be selected; and the proposed set of data requirements, including their purpose, definition and rationale. Section 4 outlines the determinants of physical activity, and section 5 proposed data requirements. Best practice methods for assessing the validity and reliability of self-report physical activity questions are described in Section 6.

This paper will provide a valuable resource to those interested in the monitoring and surveillance of physical activity.

## 2 Health benefits of physical activity

The epidemiological evidence for the dose of physical activity thought to provide a health benefit should form the basis of the data requirement on the prevalence of physical activity and the identification of people whose health is at risk due to inactivity.

### Dose-response relationship



**Figure 1:** Schematic illustration depicting the relationship between physical activity level defined in minutes of participation per week or energy expenditure, resulting from a dose response symposium, 2001 with Australian Physical Activity Guidelines for Adults threshold for health added (Bouchard, 2001).

The significant role of physical activity in preventing and treating a number of health conditions and injuries is now well established (Blair et al 1996, Lee & Paffenbarger 1997, Villeneuve et al 1998). Physical activity is usually conceptualised in terms of:

- frequency (sessions per week),
- duration (minutes per week),
- intensity (amount of energy expended) and
- the context in which it is undertaken (leisure time, job-related, house work-house maintenance-caring for family, and transport).

Only physical activity of specific intensity and duration confers a health benefit (Capersen et al 1985, Egger et al 1999, Bouchard 2001). The precise dose-response relationship between physical activity and health, especially in regards to specific diseases and total physical activity across all domains (leisure time, job-related, house work-house maintenance-caring for family, and transport) is less well understood. A recent consensus paper resulting from a symposium on the dose response relationship between physical activity and health concluded that the relationship is most likely curvilinear, with the greatest health improvement occurring when a person moves from being sedentary (less than 100 minutes leisure time physical activity per week) or when a person moves from only participating in



light physical activity (1-2.9 METS) to undertaking moderate intensity (3-5.9 METS) physical activity (Bouchard 2001). Additional increases in physical activity result in additional health benefits (Bouchard 2001). This relationship is depicted in Figure 1. Harm related to physical activity tends to predominantly occur in competitive sports and in untrained sedentary individuals who embark upon sudden vigorous activity (Powell et al 1998).

## **2.1 National physical activity guidelines**

In 1999 the Department of Health and Ageing, National Physical Activity Guidelines for Australians were developed through an evidence based consensus process, prompted by the US Surgeon General's report in 1996 on the same topic (USDHHS 1996, DHAC 1999, Egger et al 1999). These guidelines are outlined below.

Point three of the guidelines forms the current threshold of physical activity deemed necessary for health which is used to categorise people 'at risk' and for health education purposes. This threshold equates to the accumulation of 150 minutes of at least moderate intensity physical activity per week (with minutes in vigorous activity weighted by 2), which can be accumulated in bouts of at least 10 minutes and ideally undertaken over at least 5 separate sessions. There is an assumption that this threshold relates primarily to leisure-time physical activity and that some physical activity is undertaken in other domains of life (job related etc).

### **2.1.1 Physical activity guidelines for Australians**

#### **Preamble**

The guidelines refer to the minimum levels of physical activity required for good health. They are not intended for high-level fitness or sports training. Try to carry out all guidelines and for best results combine an active lifestyle with healthy eating.

#### **Guidelines**

- Think of movement as an opportunity, not an inconvenience.
- Where any form of movement of the body is seen as an opportunity for improving health, not as a time-wasting inconvenience.
- Be active every day in as many ways as you can.
- Make a habit of cycling or walking instead of using the car, or do things yourself instead of using labour-saving machines.
- Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days.
- Moderate-intensity activity includes things such as brisk walking or cycling. Combine short sessions of different activities of around 10-15 minutes each to a total of 30 minutes or more. The 30 minutes total need not be continuous.
- If you can, also enjoy some regular, vigorous exercise for extra health and fitness.
- Vigorous exercise makes you 'huff and puff'. For best results, this should be added to the above Guidelines on 3-4 days a week for 20 minutes or more each time (DHAC 1999).

## 3 Rationale for data requirements

While the threshold for health enhancing physical activity has been established (150 minutes of at least moderate physical activity per week) the interpretation of what ‘types or domains’ (ie leisure time, job related etc) of physical activity should be included has been inconsistently dealt with in survey design and reporting. This paper argues that based on the current evidence the threshold of ‘sufficient physical activity for health’ should primarily relate to leisure time physical activity. The reasons for this are provided in the following section. However, this paper also argues that surveillance of physical activity undertaken in other domains of life (job related, house work-house maintenance-caring for family, transportation) should also be collected because the evidence shows some relationship between physical activity undertaken in these domains and health. This information, however, should be collected separately for each domain as there is no current known threshold for physical activity for health that includes all these domains.

### 3.1 Recreation, sport and leisure-time physical activity

The reason why the definition of ‘sufficient’ physical activity for general health relates only to leisure time physical activity and not to non-leisure time activities such as occupational or household physical activity are:

- The dose-response relationship between leisure-time physical activity and health is better established than that between non-leisure time activities and health status (Egger et al 1999). While non-leisure time physical activity influences total energy expenditure and health outcomes the precise dose-response relationship and threshold for sufficient non-leisure time physical activity for general health is unknown. Therefore the threshold for sufficient leisure time physical activity for general health is useful as: a proxy measure for the relationship between physical activity and health status; as a benchmark for identifying people whose health is at risk due to inactivity; and as a health promotion message.
- Leisure time physical activity is of priority policy interest as a context for promoting activity because in general people can amend their leisure time but not their occupational and domestic physical activity. Most occupations in developed countries are sedentary, with the greatest opportunity for increasing leisure time physical activity being during leisure time (Morris & Crawford 1958, Montoye et al 1996, Egger et al 1999). On average people have between 3-4 hours of leisure time a day depending on: number of hours a person works; split of household duties; travel time; number of dependents; and need for self-sufficiency (Stundl 1977, Hanke et al 1979).
- While questions on leisure time physical activity show adequate validity, questions on occupational physical activity, gardening, yard work and domestic work show poor validity (Ainsworth et al 2000).

#### 3.1.1 Non-leisure time physical activity

Non-leisure time physical activity contributes to overall physical activity and hence if monitored will help inform:

- about amount of physical activity being undertaken in these domains;
- provide an insight into changes in leisure time physical activity are being off set by changes in other domains; and
- inform the dose-response relationship between physical activity in these domains and health. The value of measuring physical activity in these domains are discussed below.

### **3.1.2 Job related physical activity**

Early epidemiological studies which examined the association between levels of occupational physical activity and coronary heart disease found that lower occupational physical activity was associated with increased risk of premature mortality for CVD (Paffenbarger et al 1970, Cassel et al 1971, Paffenbarger & Hale 1975). Therefore there is some justification for measuring job related physical activity, however it is recommended that job related physical activity be collected as a separate domain and not included in the current threshold of 150 minutes moderate physical activity per week. The reasons for this being:

- little is known about the dose-response relationship between the intensity and duration of job related physical activity and health outcomes hence it is unknown how the current threshold for sufficient physical activity would need to be adjusted;
- accurate measurement of job related physical activity is notoriously difficult to achieve;
- job related physical activity is not directly relevant to government policy as it is usually not amenable to change;
- in developed countries, job related physical activity accounts for only a small proportion of total physical activity (Montoye et al 1996).

### **3.1.3 Transportation physical activity**

A recent study by Andersen et al (2000) has shown a significant association between active commuting and reduced risk of all-cause and CVD mortality and provides a significant opportunity for people to increase their physical activity and hence is of policy interest. Reasons for suggesting that transport related physical activity be collected as a separate domain are that such activity may be poorly recalled and the threshold for health is unknown (Brown et al 2002).

### **3.1.4 Housework, house maintenance and caring for family**

At least two studies have found that higher household physical activity is associated with lower levels of CVD risk and premature mortality among women (Greendale et al 1996, Weller & Corey 1998). It is interesting to note that there has not been found to be an association between overweight and hours spent in housework (Lawlor et al 2000).

A small study on the physical activity patterns of women found that the total prevalence of physical activity was higher for women when domestic duties were included rather than just leisure time physical activity, however when household tasks are included the women still did not achieve the threshold for sufficient physical activity unless they also undertook some leisure time physical activity. This suggests that while domestic duties contribute to total physical activity, the 150-minute leisure time physical activity threshold for health derived

from the National Physical Activity Guidelines for Australians are relevant to this group and should be monitored (Brown et al 2001).

The reason why these women did not meet the guidelines is because while the majority of women's weekly energy expenditure is spent in tasks of daily living (selfcare, child care, tidying, preparing meals and socialising) only a small proportion of these activities are undertaken at intensities deemed adequate for health (3 or more METS). The only tasks found to be of adequate intensity were walking with a pram, vacuum cleaning and window washing and these tasks only account for a small proportion of daily energy expenditure (Brown et al 2001). The study does suggest that expanding acts of daily living such as pushing the pram to the shops could be a potential context for women to increase their levels of physical activity. The study did not find a significant difference between the amount of physical activity undertaken by women with or without children.

### **3.2 Data requirements not recommended or uncertain for inclusion**

There are a number of concepts which are not suited for collection through self-report surveys, particularly: different doses of physical activity for each of the national health priority areas; physical activity for weight loss; incidental physical activity; sufficient physical activity across domains; sitting; children's physical activity patterns; reporting in units of energy.

#### **3.2.1 Physical activity to prevent and treat specific diseases and injuries**

The current Physical Activity Guidelines for Australians relate to general health and there is evidence that physical activity can reduce the risk of five of the six national health priority areas: cardiovascular disease; type 2 diabetes; site specific cancer (colon and breast cancer); injury (falls in the elderly) and depression. The dose recommended for health (150 minutes per week) relates to general health. Different thresholds of 'sufficient' physical activity for different diseases are not recommended at this time because of lack of evidence and consensus on the dose-response relationship between physical activity and specific diseases.

#### **3.2.2 Physical activity for weight loss**

Physical activity is protective of health independent of weight but also plays a significant role in weight loss and maintenance. The National Health and Medical Research Council are currently developing guidelines for the treatment and management of overweight and obesity including recommendations on physical activity and weight. When completed these should guide the contents of measuring physical activity for weight loss. This measurement will be difficult as the amount of physical activity required for weight loss will be dependent on energy input (amount of kilojoules consumed).

#### **3.2.3 Incidental physical activity**

Incidental physical activity is non-planned, ad hoc physical activity, usually short in duration and intensity such as stair climbing. The National Physical Activity Guidelines for Australians recommend that people take up opportunities to be active in as many ways as possible, including incidental physical activity. Incidental physical activity is not recommended as a population surveillance data requirement because it is assumed that the total amount of physical activity undertaken through separate sessions of incidental physical

activity would be difficult to accurately recall as vigorous and discrete physical activity is usually recalled more accurately (Montoye et al 1996).

### **3.2.4 Sufficient physical activity across domains**

A glaring gap in the proposed set of data requirements described above is 'sufficient leisure time and non-leisure time physical activity for general health'. At this stage only an approximate threshold is known based on a number of assumptions and would be equivalent to between 1,600 and 2,000 kilocalories of energy expenditure per week (800-1000 kilocalories leisure time and 800-1000 kilocalories non-leisure time physical activity), which would be equivalent to 300 minutes of moderate intensity physical activity per week (Paffenbarger et al 1978, Paffenbarger et al 1993, Egger et al 1999). As tempting as it is to recommend such a data requirement, there is not enough published research to substantiate this assumption. Hence it is recommended that the only threshold of sufficient physical activity for health which should be measured at this stage is that relating to leisure time physical activity. This does not preclude the collection of non-leisure time physical activity but caution is recommended in how the combined amount of physical activity is interpreted as being sufficient for health.

### **3.2.5 Sitting**

Questions on minutes spent sitting should not replace measures of physical activity because the two concepts are different. For example, in a study on children's activity patterns, some of the children who recorded the most amount of time sitting watching television, also recorded large amounts of time being physically active, such as playing school sports (Presentation at South Australia Physical Activity and Health Specialist Training Course, Adelaide May 2001).

### **3.2.6 Children**

It is not recommended for children's physical activity to be measured through self-report surveys because while the health benefit of children participating in physical activity has been established, self-report or parental recall of physical activity undertaken by children under the age of 10 years have been shown to have poor validity when assessed against objective measures such as motion sensors and direct observation (Pate 1993, Trost 2001).

### **3.2.7 Reporting in units of energy expenditure**

The reason why it is suggested that prevalence of physical activity be reported as minutes rather than a unit of energy expenditure (which could be derived from surveys which collect information on frequency, intensity and duration) is because age and weight also impact on energy expenditure and would need to be taken into account, making the analysis and reporting more complex. Both physical activity and energy expenditure are associated with health status but the relationship is stronger for energy expenditure, most likely because research on energy expenditure usually involves an objective measure which has less measurement bias than physical activity self-report.

## **4 Determinants of physical activity**

The information on the determinants of physical activity does not inform the development of data requirements and questions relating to physical activity prevalence measurement but does provide direction on what other concepts should be measured so as to monitor and inform appropriate physical activity interventions. For example the demographic, ethnic and socio-economic determinants found to relate to physical inactivity identifies population groups most at risk in these groups. Environmental and skill based determinants of physical activity inform: the types of interventions which are required; the different sectors which need to be involved; and, if monitored, will gauge whether physical activity is being facilitated.

The determinants of physical activity found to be strongly associated with the amount of physical activity undertaken by people, based on a recent review of existing research, are described below (Trost et al 2001).

### **4.1 Demographic and biological factors**

Significant positive influences identified are: male gender; education; genetic factors; and income/socioeconomic status. Older age and non-white race/ethnicity were found to be consistent negative influences on physical activity participation.

### **4.2 Psychological, cognitive, and emotional factors**

Salient positive influences on physical activity participation include: enjoyment of physical activity; expected benefits of physical activity; intentions; perceived health or fitness; physical activity self-efficacy; self-motivation; exercise self-schemata; and stage of change. Salient negative influences include: barriers to physical activity and mood disturbance. Variables consistently unrelated to physical activity behaviour are: knowledge of health and exercise; normative beliefs regarding physical activity; and susceptibility to illness/seriousness of illness.

### **4.3 Behavioural attributes and skills**

Three factors have repeatedly documented evidence of positive associations with physical activity behaviour: physical activity history during adulthood; healthy diet; and processes of change. Activity history during childhood/youth, school sports, and smoking status were judged to be consistently unrelated to physical activity behaviour.

### **4.4 Social and cultural factors**

Three factors have repeatedly documented positive associations with physical activity: physician influence; social support from friends/peers; and social support from spouse/family.

### **4.5 Physical environmental factors**

Only climate/season shows a consistent influence on physical activity behaviour. Factors which showed a salient but weak environmental influence are: exercise equipment in the home, satisfaction with recreation facilities, neighbourhood safety, frequent observation of

others engaging in physical activity, and enjoyable scenery. Factors mostly unrelated to physical activity behaviour are: perceived access to physical activity facilities; cost of physical activity programs; and home equipment.

#### **4.6 Physical activity characteristics**

Higher intensity and perceived effort were classified as negative influences of physical activity.

## 5 Proposed data requirements

Data requirements need to: relate to existing health policy; capture the evidence on the relationship between the risk factor and health; and be collectable ie “Can the data requirement be collected through questions which are: reliable; valid; short enough for inclusion in a survey and suited to self-report surveys?”.

Applying the first two criteria listed above, a number of different proposed data requirements have been identified for adult Australian population surveillance of physical activity for general health. Each of these data requirements serves a different function and their inclusion as a concept to be measured in surveys will depend on the purpose of that survey.

While both leisure time and non-leisure time physical activity will impact on health, the current evidence on dose-response relationships relates to leisure time physical activity, therefore a data requirement on the amount of sufficient leisure time physical activity for health is recommended for this domain. A description of each of the data requirements is provided below.

### 5.1 Primary data requirements

#### 5.1.1 Leisure time, recreation and sport related physical activity for general health

##### **Continuous variable**

*Total amount* of leisure time, recreation and sport related physical activity for general health.

Definition: Total minutes and number of sessions per week of self perceived moderate intensity (equivalent to 3–5.9METs) and self perceived vigorous intensity (equivalent to 6 or more METs) leisure time physical activity, undertaken in bouts of at least 10 minutes, in addition to non-leisure time activity undertaken as part of daily living. Leisure time physical activity includes activity undertaken for sport and recreation conducted specifically for enjoyment, social, competitive or fitness purposes, performed in leisure time, recreation and sport physical activity.

Purpose: To gauge the amounts of leisure time physical activity being undertaken by the population, sub-population or individual. This enables: the calculation of ‘sufficient physical activity for general health’; ongoing study on the dose-response relationship between physical activity and health; and investigation of the relationship between different amounts of physical activity and other variables such as determinants of physical activity and demographic characteristics. The data requirement addresses the National Public Health Partnership’s framework policy questions ‘Are the factors determining health changing for the better or worse?’ and enables monitoring of the National Physical Activity Guidelines for Australians.



### **Categorical variable**

*Sufficient* leisure-time, recreation and sport physical activity for general health (duration and intensity)

Definition: Accumulation of 150 minutes of at least moderate intensity (3–5.9METS) physical activity per week (with minutes in vigorous activity – 6+ METS- weighted by 2), which can be accumulated in bouts of at least 10 minutes undertaken in addition to non-leisure time activity undertaken as part of daily living.

Purpose: Answers the National Public Health Partnership’s framework policy questions ‘Are the factors determining health changing for the better or worse?’ and monitors the National Physical Activity Guidelines for Australian adults. It does so through measuring the prevalence of what has been set as a threshold for sufficient physical activity for general health, based on the available evidence and current policy.

*Sufficient frequency* of leisure-time, recreation and sport physical activity for health general health (duration, intensity and frequency)

Definition: Accumulation of 150 minutes of at least moderate (3–5.9METS) intensity physical activity per week (with minutes in vigorous - 6+ METS- activity weighted by 2), which can be accumulated in bouts of at least 10 minutes in addition to non-leisure time activity undertaken as part of daily living.

Purpose: The same purpose as the preceding data requirement but with the inclusion of measuring sufficient ‘frequency’ of physical activity to gauge those who are and are not undertaking physical activity over a number of sessions per week. The frequency of physical activity required for to confer a health benefit has not been firmly established, however more frequent activity is perceived to provide a greater health benefit than occasional activity, therefore the National Physical Activity Guidelines for Australians recommend that moderate activity be undertaken at least 5 days a week and vigorous activity at least three times a week.

### **Sedentary**

Definition: People who undertake no leisure-time, recreation and sport physical activity.

Purpose: Identify those most at risk due to inactivity.

## **5.2 Secondary data requirements**

### **5.2.1 Non- leisure time physical activity – total minutes of physical activity of at least moderate intensity in the following domains**

#### **Job related**

Definition: Total minutes and number of sessions per week of self perceived moderate intensity (equivalent to 3-5.9 METS) and self perceived vigorous intensity (equivalent to 6 or more METS) job related physical activity, undertaken in bouts of at least 10 minutes not undertaken in leisure time activity. Job related physical activity refers to physical activity undertaken as part of paid or unpaid, excluding travelling to and from work.

Purpose: To monitor amount of physical activity occurring in a specific domain of life and to see if this is off set by amount undertaken during leisure-time, recreation and sport related physical activity and how this relates to health.

### **Housework, house maintenance & caring for family**

Definition: Total minutes and number of sessions per week of self perceived moderate intensity (equivalent to 3-5.9 METS) and self perceived vigorous intensity (equivalent to 6 or more METS) physical activity undertaken as part of domestic, parenting and carer duties undertaken.

Purpose: To monitor amount of physical activity occurring a specific domain of life and to see if this is off set by amount undertaken during leisure-time, recreation and sport related physical activity and how this relates to health.

### **Transportation**

Definition: Total minutes and number of sessions per week of self perceived moderate intensity (equivalent to 3 or more METS) and self perceived vigorous intensity (equivalent to 6 or more METS) physical activity undertaken for the purpose of travel to and from places.

Purpose: To monitor amount of physical activity occurring a specific domain of life and to see if this is off set by amount undertaken during recreations, sport and leisure-time physical activity and how this relates to health.

## **5.2.2 Determinants of physical activity**

Definition: Factors which determine physical activity levels (psychological, cognitive and emotional factors, behavioural attributes and skills, social and cultural skills, and the physical environment).

Purpose: The purpose of measuring this data requirement is to provide information on the factors which influence the amounts of physical activity being undertaken and which provides information on the design and performance of appropriate physical activity interventions. This data requirement also addresses the questions raised in the National Public Health Partnership's performance indicator framework which relate to attitudes, beliefs and knowledge of behaviours determining health.

### **Demographic variables**

Information should be collected on: adults 18-75 years of age, gender, Aboriginal and Torres Strait Islanders, ethnicity, socio-economic status, income, educational attainment, body mass index (BMI), rural/urban, and disability, marital status, number of children and children over 25 years of age, occupational status, to answer the questions raised in the National Public Health Partnership's performance indicator framework questions 'Are behaviours determining health the same for every one?' and 'Where and for whom are they changing for the worse?'

## **6 Best practice assessment of self-report physical activity**

The assessment of survey questions needs to involve an assessment of the criterion validity and reliability of the questions. The method for assessing the criterion validity of self-report physical activity questions will depend on which data requirements the questions are seeking information.

While there is currently no universally accepted gold standard for measuring physical activity prevalence, the current best practice method for assessing the criterion validity of self-report questions on the intensity, duration and frequency of physical activity are a combination of accelerometers and log books (Ainsworth et al 2000). Accelerometers are small computer motion sensors which measure intensity, duration and frequency of activity. Their use is recommended in conjunction with log books to enable information to be collected on the type and context (job related, housework, leisure etc) of physical activity. A log book (usually 7 - day) is essential if one is interested in analysing the validity of the questionnaire items on walking and the items on moderate-intensity physical activity separately. This is due to an important limitation in the accelerometers, namely an inability to differentiate between walking activity and other moderate-intensity activities. This limitation means data from the accelerometers can only be used to assess the validity of the self reported minutes of participation in walking and moderate-intensity activities combined. To overcome the effect of season it is recommended that surveillance be undertaken at the same time when surveys are administered over several years.

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# Glossary

## Physical activity

Any bodily movement produced by skeletal muscles that results in energy expenditure (Capersen et al 1985). Not be confused with exercise which is a subset of physical activity, defined as planned, structured and repetitive bodily movement done to improve or maintain one or more components of physical fitness. While both fitness and physical activity are health related, physical activity is an independent protective factor for health. Physical activity is conceptualised in terms of the frequency, duration, intensity and the context in which it is undertaken (eg leisure time, job related, household and house maintenance, and transport) (Bouchard & Shephard 1994, Bauman et al 2002).

## Context / domains of physical activity

**Job related:** physical activity undertaken as part of paid or unpaid work, excluding travelling to and from work.

**Housework, house maintenance & caring for family:** physical activity undertaken as part of domestic, parenting and carer duties. Most housework and house maintenance tasks are of light intensity. Examples of moderate – vigorous activities are window cleaning, vacuuming, pushing a pram and digging (Brown et al 2001).

**Leisure time:** Leisure time physical activity refers to sport and recreational physical activity, including a range of activities conducted specifically for enjoyment, social, competitive or fitness purposes, performed in leisure or discretionary time (Armstrong et al 2000).

**Transportation:** is undertaken for the purpose of travel to and from places.

## Sufficient leisure time physical activity for general health

Accumulation of 150 minutes of at least moderate intensity physical activity per week (with minutes in vigorous activity weighted by 2), which can be accumulated in bouts of at least 10 minutes and ideally undertaken over at least 5 separate sessions (Egger et al 1999). This is based on the assumption that individuals also undertake non-leisure time physical activity in other parts of their day, assumed (not proven) to be equivalent to between 800 -1000 kilocalories per week (Paffenbarger et al 1978).

## Physical activity – duration

Length of time spent participating in physical activity, usually measured in hours and minutes per week. The definition of sufficient physical activity only includes moderate intensity activity undertaken for 10 or more minutes.

## Physical activity - frequency

The number of times a person participated in physical activity, usually measured in sessions per week. The National Physical Activity Guidelines for Australian adults recommend that physical activity be undertaken on most days of the week, with 'most' being interpreted here as 5 days of the week.

### **Physical activity - intensity**

There are a number of units for measuring energy expenditure but the recommend unit is Metabolic Equivalent (METs). METs is a unit used to estimate the metabolic cost (oxygen consumption) of physical activity. One MET is defined as the energy expenditure for sitting quietly, which for the average adult is about 1 kilocalorie per body weight per hour or 3.5 ml of oxygen per kilogram body weight per minute. In self-report surveys, respondents are asked to report their perceptions of the intensity of their physical activity as light, moderate or vigorous, on the basis of how breathing is affected at different levels of intensity as well as examples of the intensity of different types of activities. While this method is not as accurate as direct observation, it is adequately valid for some types of physical activity, as shown in studies which compare perceptions with objective measures (Ainsworth et al 2000).

### **Light intensity physical activity**

Defined as 1-2.9 METs. The definition of 'sufficient' physical activity for better health excludes light intensity activity. Examples of light physical activity include reading, dishwashing, walking at an ambling pace.

### **Moderate intensity physical activity**

Defined as 3-5.9 METs. This is included in a measure of 'sufficient' physical activity for better health. Examples include activities during which a person can talk but not sing such as walking at a brisk pace.

### **Vigorous physical activity**

Defined as 6-9 METs. In calculating 'sufficient' physical activity for health benefit in vigorous activity is weighted by two because the energy expended in vigorous activity is approximately double that of moderate activity compared to moderate activity. Examples include activities which make a person huff and puff such as running, squash, vigorous cycling.

(Terms expanded from Armstrong et al 2000)



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