

4 Analysis and reporting of the survey data

This section describes the types of measures that can be constructed from the survey data and provides instructions on how each of these measures is derived. Details and examples of the usual method of reporting each measure are also provided. Although the examples of usual reporting method present the data in table form, it is also possible, and can be more informative, to present these data graphically. An example of a graphical presentation is provided. These methods and measures were used in reporting the results of the three National Physical Activity Surveys and other national and state surveys that used the Active Australia questions. With appropriate adjustments for sample demographics, use of these same measures allows comparisons to be made between new and previously published results.

For more examples of survey data presentation see Armstrong et al. 2000.

4.1 Measures derived from the Active Australia Survey

A number of different measures of participation in physical activity during the previous week can be derived from the survey data. These include:

- number of sessions of physical activity
- total time spent in each activity
- average time spent in each activity
- proportion of people who were doing a sufficient amount of activity to gain health benefits
- proportion of people who were sedentary.

The methods of constructing and reporting on each of these measures will be described in turn.

The other measures that can be derived from the survey data relate to awareness of the current public health messages about physical activity and health. The awareness section of the survey consists of five statements about physical activity and health. Survey respondents are asked to indicate to what extent they agree with each of the statements. The methods of analysing and reporting these data are also described below.

4.2 Data structure

This section describes the structure of the survey data and defines the variables used in this document.

Participation in physical activity

For each activity type there are two questions – number of sessions and time per week. Usually the time is recorded in hours and/or minutes, so for each activity type there will be two time variables – hours and minutes.

For example, a data set would have 12 variables as follows:

walksess	number of sessions walking
walkhrs	number of hours walking
walkmins	number of minutes walking
gardsess	number of sessions of vigorous gardening/yardwork
gardhrs	number of hours of vigorous gardening/yardwork
gardmins	number of minutes of vigorous gardening/yardwork
vigsess	number of sessions of other vigorous activities
vighrs	number of hours of other vigorous activities
vigmins	number of minutes of other vigorous activities
modsess	number of sessions of other moderate activities
modhrs	number of hours of other moderate activities
modmins	number of minutes of other moderate activities

These variable names will be used in this document to illustrate formulas for constructing measures to assess participation in physical activity.

Awareness of physical activity messages

For the awareness section of the survey there will be five variables, corresponding to the five statements on physical activity and health. In this document, the following variables will be used to refer to the five statements:

pamess1	Taking the stairs at work or generally being more active for at least 30 minutes each day is enough to improve your health.
pamess2	Half an hour of brisk walking on most days is enough to improve your health.
pamess3	To improve your health, it is essential for you to do vigorous exercise for at least 20 minutes each time, three times a week.
pamess4	Exercise doesn't have to be done all at one time – blocks of 10 minutes are okay.
pamess5	Moderate exercise that increases your heart rate slightly can improve your health.

Respondents are asked to indicate to what extent they agree with each of these statements, and the answers are usually coded numerically in the following manner:

1	=	Strongly agree
2	=	Agree
3	=	Neither agree nor disagree
4	=	Disagree
5	=	Strongly disagree

4.3 Number of sessions of each activity

This measure describes the number of sessions of physical activity people participated in during the previous week. Because this relates to a single question for each activity type (walking, other moderate activities, vigorous gardening/yardwork, other vigorous activities), the variables *walksess*, *gardsess*, *vigsess* and *modsess* defined in the previous section may be used without modification.

Usual reporting method

Usually, data on number of activity sessions are presented separately for each activity type, as the proportion of people participating in various numbers of activity sessions. For example, the variable 'walksess' may be split into four categories: 0, 1-2, 3-4 and 5 or more. Then the data presented would be the proportion of the population falling into each of those categories. It may also be useful to separate the data into subgroups, for example by age group or sex, as shown in Table 3.1.

Table 3.1: Sessions of physical activity in the previous week, by sex (per cent)

Physical activity	Men	Women	Persons
Walking			
Nil	25.4	20.2	22.8
1-2	18.3	19.4	18.8
3-4	12.6	23.5	18.1
5 or more	43.7	36.9	40.3
Total	100.0	100.0	100.0

4.4 Total time spent in each activity

This is a measure of the total amount of time spent in physical activity during the previous week. This is useful for describing population patterns of the time spent in different types of activities.

Total time in minutes for each activity is calculated by multiplying the hours by 60 and adding the minutes:

$\begin{aligned} \text{walktime} &= (\text{walkhrs} \times 60) + \text{walkmins} \\ \text{gardtime} &= (\text{gardhrs} \times 60) + \text{gardmins} \\ \text{vigtime} &= (\text{vighrs} \times 60) + \text{vigmins} \\ \text{modtime} &= (\text{modhrs} \times 60) + \text{modmins} \end{aligned}$
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Total time in hours would be calculated by dividing the minutes variable by 60 and adding the hours variable, or by dividing the total time in the minutes variable derived above by 60.

To avoid errors due to over-reporting, any times greater than 840 minutes (14 hours) for a single activity type are recoded to 840 minutes. Missing values are not imputed.

Usual reporting method

Total time spent in activity is usually reported by presenting the average of total time over a population or subgroup. Instructions on how to derive and report the average time are shown below.

4.5 Average time spent in each activity

This measure is used to illustrate the population distribution of the total time spent in activity. Note that the question assessing moderate activity other than walking has been found to have low validity (Brown et al. 2002) and therefore should not be reported on its own, although it is still used when calculating 'sufficient' activity and can be combined with the walking question as a measure of total moderate activity.

The average time per week spent in each of the activity types (walking, other moderate activities, vigorous gardening/yardwork, other vigorous activities) can be calculated as the sum of total times reported divided by the relevant number in the sample. This number can be calculated in two ways, depending on the desired measure: as the average for the overall population, or as the average for people participating in a particular activity type.

Note that vigorous activity time is **not** doubled when calculating these measures; this is only undertaken when calculating time for deriving 'sufficient' activity (see section 4.6).

Overall population average

The average time spent by the overall population in a particular activity is calculated by taking the sum of the total time spent in the activity and dividing it by the number of people reporting valid answers to the questions for that activity type. This includes all people reporting activity times of up to 840 minutes (after times greater than 840 minutes have been recoded, as specified previously) as well as those reporting no participation in the activity (i.e. number of sessions = 0).

People who did not answer the questions relating to a particular activity type are excluded from the calculations for that activity, as are those who reported at least one session of the activity but have no time recorded for it.

For example, the population average time spent walking would be calculated as follows:

$$\text{avgwalk1} = \text{sum}(\text{walktime}) / (\text{number}\{0 < \text{walktime} \leq 840\} + \text{number}\{\text{walksess}=0\})$$

where number{criteria} indicates number of people satisfying the criteria.

Average for people reporting participation

The average time for those people who participated in a particular activity type is calculated by taking the sum of the total time spent in activity and dividing it by the number of people reporting a total activity time of up to 840 minutes (after times greater than 840 minutes have been recoded).

People who did not answer the questions relating to a particular activity type are excluded from the calculations for that activity. People who did not participate in the activity (number of sessions = 0) are also excluded, as are those who reported at least one session of the activity but have no time recorded for it.

For example, the average time spent walking among those people who walked would be calculated as follows:

$$\text{avgwalk2} = \text{sum}(\text{walktime}) / \text{number}\{0 < \text{walktime} \leq 840\}$$

where $\text{number}\{\text{criteria}\}$ indicates number of people satisfying the criteria.

Usual reporting method

The distribution of activity times is generally highly skewed, so it is usual to report the 75th and 95th percentiles in addition to the mean. The 25th percentile, median and the minimum and maximum values may also be of interest. For the total sample, the median value may be zero because of the inclusion of non-participating people in the calculations. The data may be analysed and presented separately by age, sex, or other characteristics of interest, as shown in Table 3.2.

Table 3.2: Total time (minutes) in physical activity during the previous week, by sex

	Walking		Vigorous intensity	
	Males	Females	Males	Females
Mean	125	143	70	54
75th percentile	160	165	85	68
95th percentile	583	604	126	74

4.6 Proportion of people doing ‘sufficient’ activity for health

This is a measure of the proportion of the population who reported participating in physical activity at levels sufficient to confer a health benefit. It provides an indication of the number of people obtaining the health benefits of physical activity, and conversely an indication of the number of people not obtaining these benefits and hence at increased risk of poor health outcomes.

For the purposes of calculating ‘sufficient’ activity for health, we are interested in participation in walking, moderate activity, and vigorous activity. Gardening is not included in the calculation of sufficient activity, as there is limited research on the validity of the self-reported intensity of these activities (Armstrong et al. 2000).

There are two different ways of calculating ‘sufficient’ activity for health. These are:

- (a) the accumulation of a sufficient **amount** of activity over a week
- (b) the accumulation of a sufficient **amount** of activity by participation in a sufficient **number of sessions** over a week.

The *National Physical Activity Guidelines for Australians* (DHAC 1999) recommend that, to achieve health benefits, a person should participate in 30 minutes of at least moderate-intensity physical activity on most days of the week. For the purposes of calculating ‘sufficient’ activity, this is interpreted as 30 minutes on at least 5 days of the week; a total of at least 150 minutes of activity per week. Therefore the two definitions of ‘sufficient’ above become:

- (a) the accumulation of at least **150 minutes** of activity over 1 week
- (b) the accumulation of at least **150 minutes** of activity and at least **5 sessions** of activity over 1 week.

Calculating total activity time

Total time in activity overall is calculated, as shown below, by adding the time spent in walking and moderate activity and twice the time spent in vigorous activity (not including gardening and yardwork). The time spent in vigorous activity is doubled because vigorous activity is more intense and so confers greater health benefits than moderate activity (Armstrong et al. 2000).

$\text{sufftime} = \text{walktime} + \text{modtime} + (2 \times \text{vigtime})$
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To avoid errors due to over-reporting, total times in all activities that are greater than 1680 minutes (28 hours) are recoded to 1680 mins.

Calculating total activity sessions

Total sessions are calculated by adding the number of sessions of walking, moderate activity and vigorous activity (not including gardening, as before), as shown below:

$\text{suffsess} = \text{walksess} + \text{modsess} + \text{vigsess}$

Identifying people participating in ‘sufficient’ activity

(a) Sufficient time

For calculation of sufficient activity using time only, the data are grouped into three categories based on total activity time. Participation in at least 150 minutes per week is classified as ‘sufficient’. People who are doing no activity at all are classed as sedentary. The remainder are classed as ‘insufficient’ – that is, they are participating in some activity but not enough to obtain a health benefit. This results in the following classification:

sufftime = 0	sedentary
1 <= sufftime <= 149	insufficiently active
sufftime >= 150	sufficiently active for health.

(b) Sufficient time and sessions

The second definition of ‘sufficient’ activity for health includes both the time and number of sessions of activity. As before, people doing no activity at all are classed as sedentary. People doing at least 150 minutes of activity over at least five sessions are classed as ‘sufficient’. The remainder are classed as ‘insufficient’ – that is, participating in some activity but either not enough in total or **not regularly enough** to obtain a health benefit.

The data are grouped into three categories as follows:

sufftime = 0	sedentary
1 <= sufftime <= 149	} insufficiently active
OR	
sufftime >= 150 and suffsess < 5	} insufficiently active
sufftime >= 150 and suffsess >= 5	

There are some problems with this measure in that it assumes each session is undertaken on a different day. Further, the length of time spent in each session is unknown. Therefore the activity may not equate to 30 minutes per day over 5 days. However, it is the best approximation to the guidelines available using the current survey questions.

Usual reporting method

These data are usually reported by presenting the proportion of people in each of the three categories defined above. Alternatively, the proportions of people who are sedentary and insufficiently active can be combined and presented to show the total number of people who are not sufficiently active for health. As for the other measures described in this document, the data can be analysed and presented separately by age group, sex, or any other characteristics of interest. Tables 3.3 and 3.4 and Figure 3.1 provide examples.

Table 3.3: Percentage of people achieving 'sufficient' time during the previous week, by sex

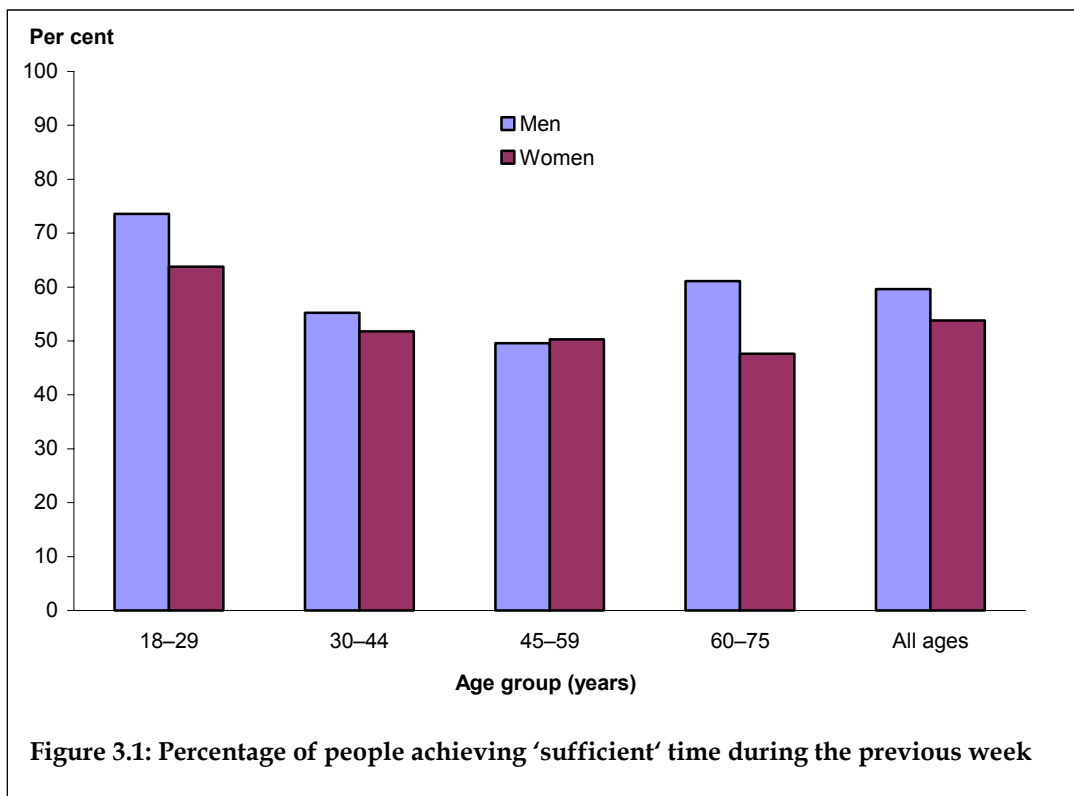
	Sedentary	Insufficient	'Sufficient'*
Sex			
Men	15.1	24.8	60.1
Women	15.9	31.6	52.5
<i>Persons</i>	<i>15.4</i>	<i>27.4</i>	<i>57.2</i>

* 'Sufficient' time is defined as 150 minutes per week, using the sum of walking, moderate activity and vigorous activity (weighted by two).

Table 3.4: Percentage of people achieving 'sufficient' time and sessions during the previous week, by age group

	Sedentary	Insufficient	'Sufficient'*
Age group (years)			
18–29	8.7	39.6	51.7
30–44	13.6	42.4	44.0
45–59	19.4	40.2	40.4
60–75	22.1	38.3	39.6
<i>All ages</i>	<i>16.1</i>	<i>40.3</i>	<i>43.6</i>

* 'Sufficient' time and sessions is defined as 150 minutes (using the sum of walking, moderate activity and vigorous activity (weighted by two)) and five sessions of activity per week.



4.7 Proportion of people who were sedentary

This is a measure of the proportion of the population who reported no leisure-time physical activity or walking during the previous week. This gives an indication of the number of people who are at increased risk of poor health because of inactivity.

The proportion of people who were sedentary can be obtained from the calculations for sufficient activity described previously. Alternatively, people who were sedentary can be identified by adding the time spent in walking, moderate and vigorous activities (not including gardening and yardwork) as follows:

$$\text{tottime} = \text{walktime} + \text{modtime} + \text{vigtime}$$

Any person who has tottime = 0 is classified as sedentary.

Usual reporting method

The proportion of people sedentary is usually presented in a table or graph, grouped by age, sex or other characteristics of interest, similar to the method for reporting proportion undertaking 'sufficient' activity.

4.8 Awareness of physical activity messages

This is a measure of the extent to which people recognise and acknowledge the current public health messages concerning physical activity and health. It indicates the success (or otherwise) of the promotion of physical activity messages in the community.

For each statement, the response variable provides five categories of agreement, and these can be considered as they are without modification as numbers or proportions of people strongly agreeing, agreeing, disagreeing, strongly disagreeing, or having no opinion about the statements. However, if a message has been very successful in its uptake by the community, the number of people in the 'disagree' and 'strongly disagree' categories may be extremely small. Therefore it is usual to group the five agreement categories into two: one for those who agree or strongly agree with the statement, and the other for those who do not agree or have no opinion. This indicates the number of people who are aware of and accept the relevant public health message, which is commonly the most desired information for assessing the impact of promotional efforts. Alternatively, examination of the characteristics of the group that do not agree with the messages may indicate possible target groups for different or more focused interventions.

Usual reporting method

The data on awareness of physical activity messages is usually presented in a table, showing the percentage of people who agree or strongly agree with each statement. As with each of the other measures described, the data can be presented by age group, sex or other characteristics of interest. Table 3.5 gives an example.

Table 3.5: Percentage of people agreeing (combined 'strongly agree' and 'agree') with knowledge statements, by sex

	Message 1	Message 2	Message 3	Message 4	Message 5
Sex					
Men	84.6	87.7	70.1	71.6	94.6
Women	91.3	93.8	63.8	75.1	96.3
<i>Persons</i>	<i>87.4</i>	<i>89.9</i>	<i>66.4</i>	<i>73.2</i>	<i>95.1</i>

- Message 1: Taking the stairs at work or generally being more active for at least 30 minutes each day is enough to improve your health.
 Message 2: Half an hour of brisk walking on most days is enough to improve your health.
 Message 3: To improve your health, it is essential for you to do vigorous exercise for at least 20 minutes each time, three times a week.
 Message 4: Exercise doesn't have to be done all at one time—blocks of 10 minutes are okay.
 Message 5: Moderate exercise that increases your heart rate slightly can improve your health.