



International Walking Data Standard

Treatment of Walking in Travel Surveys

Internationally standardized monitoring methods
of walking and public space

Version August 2016

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Title

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Internationally standardized monitoring methods of walking and public space

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Content

Content	3
The International Walking Data Standard at a glance	4
E1 Objective	4
E2 Harmonization approach.....	5
E3 Key performance indicators.....	6
1. Introduction and objectives	9
2. Challenges and approaches	10
2.1 Data collection challenges.....	10
2.2 Harmonization approach.....	11
3. Main topics and issues	12
3.1 Overview of structure.....	12
3.2 Sampling	12
3.3 Data collection and reporting (analysis and presentation)	20
3.4 General methodological issues in travel surveys	37
3.5 Special challenge: Travel surveys on regional and city level	43
4 Key performance indicators	45
Literature.....	47
Authors	48
Annex.....	49
Annex 1: Overview about National Travel Surveys in Europe	49
Annex 2: Background and process of developing the Walking Data Standard	54

The International Walking Data Standard at a glance

This document demonstrates the need for an internationally recognised standard for the collection of data on walking, as a way of promoting and supporting policies and actions to improve the role of sustainable modes of travel. It also proposes a detailed set of requirements for walking data that are consistent and comparable.

Walking is a fundamental mode of travel and an essential part of any successful transport system. Collecting information about walking is a necessity, and provides crucial input for planning interventions and investment decisions. Travel surveys play a critical role in measuring the amount of walking done.



Currently, however, there are vast differences in the data collection methods used, which make comparisons difficult. Travel surveys usually focus on the national level but good information is equally required at the regional and local level. It is essential, therefore, to develop reliable, valid and yet easy to use travel surveys for cities and urban areas which include walking in a consistent and appropriate manner.

E1 Objective

The objective of the international Walking Data Standard (referred to in this document as the Walking Data Standard) is to ensure that walking has a high profile in transport and urban planning throughout the world. What is not measured is not seen as important, and what is not seen as important is not properly measured. International comparisons are important to establish “best” or “better” practice and to inspire and encourage better conditions for people wanting or having to walk.

Specifically, the objective is to establish comprehensive data on trips, such that walking is recorded with the same degree of accuracy and diligence as other modes.

The International Walking Data Standard addresses two distinct target audiences. On the one hand the experts on travel surveys and statistics and their relevant agencies who seek to better understand how the methods and measurements can include walking more appropriately. On the other hand the Walking Data Standard is aimed at all those in city and traffic planning who want to know how reliable travel survey data is and what the figures mean.



Data can only be compared if the definitions and methods used are compatible and consistent with each other. When developing a proposed harmonization of walking data, there are a number of is-

sues characterising the current situation and creating tension. The current situation is characterized by three major challenges:

- **Adequateness:** Walking is often not or not adequately measured in transport surveys. As a result walking is either not accounted for, heavily underestimated, and/or misrepresented. This compromises the accuracy of data on the other modes.
- **Comparability:** Data collection methods differ widely between countries and even within countries making comparability difficult.
- **Manageability:** Collecting transport data is often time consuming and resource intensive. The big challenge, therefore, is to keep data collection manageable.

E2 Harmonization approach

For the Walking Data Standard, three approaches are put forward for making changes to, and harmonising existing and future travel surveys:

- **Levels** - to enable the widest degree of comparability between different countries, regions and cities.
- **Conversion** - existing data can be converted to comply better with the standard.
- **Declaration** - When the levels are not feasible and conversion is not possible, then declaring and describing the difference will be most helpful.

Three levels, or layers, are put forward to enable the widest degree of comparability between different countries, regions and cities. In reviewing their survey methods and content in response to the Walking Data Standard, data agencies can select the “highest” level that is feasible in their circumstances.

- **Minimal level:** not fulfilling the requirements of the standard level (see below) but overlapping with some of them to enable some basic comparability. This level is intended as an interim until further improvements can be made.
- **Standard level:** fulfilling the basic requirements to adequately determine the amount of walking, and to allow comparability between surveys.
- **Elaborate level:** desirable additions of elements that bring extra insights about walking and that – hopefully – one day will become part of the standard level.

Three main issues present themselves when collecting and harmonizing walking data: Sampling, Data Collection and Reporting, and General Methodological Issues with Travel Surveys. A fourth, special case, Travel Surveys on a Regional and City Level, was also identified and is described in this document.

The issues and recommendations described in this document are summarized in the tables below. Discussion around each topic is available within the body of the document.

E3 Key performance indicators

The following five key performance indicators and sub-indicators were identified during the debates as being particularly relevant for walking. Since data on all modes is usually collected simultaneously, the indicators can be generalized to the following comprehensive list:

- 1 Share of people who have made at least one stage by mode on the survey day
- 2 Average number of daily trips per person by mode
- 3 Average daily travel time per person by mode
- 4 Average daily distance travelled per person by mode
- 5 Mode share of all modes based on
 - a stages
 - b main mode
 - c time
 - d distance

In terms of walking only, the list of indicators is summarised in the table below.

Table E-1 Summary of the key performance indicators – walking

	Key performance indicator	Standard level	Elaborate level
1	Share of people who have made at least one walking stage on the survey day	Whole population	Same as standard level
2	Average number of daily walking trips per person	Whole population	Whole population Mobile persons *
3	Average daily time walked per person	Whole population	Whole population Mobile persons *
4	Average daily distance walked per person	Whole population	Whole population Mobile persons *
5	Mode share of walking based on A stages B main mode C time D distance	Whole population	Same as standard level

* Mobile persons: those who left the house on the survey day and made at least one walking stage

Table E-2 Overview of International Walking Data Standard

Issues		Data collection			Data reporting (analysis & presentation)		
		Minimal Level	Standard Level	Elaborate Level	Minimal Level	Standard Level	Elaborate Level
1	Population included in survey	Same as in standard level	Trips of resident population	Same as standard level plus capture trips of non-residents by other methods; convert data to estimate all walking	Same as in standard level	Trips of residents	<ul style="list-style-type: none"> - Trips by all in area (residents and non- residents) - Trips by residents only - Trips by non-residents in area
2	Age limits	Existing age limitations	From age 5, no upper age limit	All ages, no limits	<ul style="list-style-type: none"> - Ages 18 y. & above - Other age group(s) according to elaborate level, if data available. 	<ul style="list-style-type: none"> - Total of all ages 5/6 years and above - Ages 5 to 17 years - Ages 18 to 64 years - Ages 65 and above 	<ul style="list-style-type: none"> - Total of all ages (from birth) - Ages 0-4 years; - Ages 5-11/12 y. (primary sch.); - Ages 12/13-17 y. (sec. school) - Ages 18-29, 30-39, 40-49, 50-64 - Ages 65-79 and 80+ years
3	Survey days	Average work day(s) / average season for geographical area	All days of the week and all seasons	Same as standard level	Average work day(s) / average season for geographical area.	All days of the week / All seasons or average season	<ul style="list-style-type: none"> - Same as standard level, plus: - Working & non-working days - Monthly values with descriptions which season they represent
4	Boundary	According to survey in use	All trips except those made abroad	Same as standard level	<ul style="list-style-type: none"> - Approximation to all trips - Categories of elaborate level if applicable 	All trips made by residents except international travel	<ul style="list-style-type: none"> - All trips by residents - Trips only within city/region - Trips to and from the city/region - Trips made beyond the city/region boundary
5	Unit of travel	"All modes" or "main mode"	Stages or all modes being transformed into stages	Same as standard level plus waiting times (e.g. at public transport stops)	Main mode Derive stages from "main mode" or "all modes"	Stages or all modes transformed into stages AND "Main mode"	<ul style="list-style-type: none"> - Walk all the way to destination - Walk stages as part of multi modal trip - Walk as purpose in itself - Trip stage times (waiting times)
6	Duration and length	According to survey in use (if possible transform distance into time)	Time AND distance per day	Same as standard level plus separate waiting times	Distance, if possible converted into time	Time AND distance per day: Mean AND median (percentiles)	<ul style="list-style-type: none"> - Waiting times - Walking times >150 mins./week - Walking times >30 mins./day
7	Threshold	According to survey in use (if possible, transform data to estimate distances btw. threshold & 50m)	No limits to stage or trip length (in "publicly accessible spaces")	Same as standard level	According to survey in use or transformed data	Minimum threshold of 50 metres/yards	<ul style="list-style-type: none"> - below 50 metres/yards - all trips without limits

Table E-2 (continued) Overview of International Walking Data Standard

Issues		Data collection			Data reporting (analysis & presentation)		
		Minimal Level	Standard Level	Elaborated Level	Minimal Level	Standard Level	Elaborated Level
8	Trip purpose	According to survey in use	All trip purposes, including work, education, business, leisure, shopping & personal business, escorting, other	Same as standard level plus in a separate study: travel behaviour during play activity, particularly of children	Mention trip purposes collected, estimate their share of all purposes	All trip purposes	Same as standard level plus split into purposes - work - education - business - leisure - shopping & personal business - escorting - other - travel behaviour during play activities, particularly of children
9	Participation	Same as in standard level	All respondents including those without a (walking) trip stage on the survey day	Same as in standard level; plus calculate both, average of total population and of mobile persons	Same as in standard level	- Share of population with at least one walking stage on the survey day; - Average number of walking stages, trips, walking time and distance of total population	- Share of population with at least one walking stage on the survey day; - Average number of walking stages, trips, walking time and distance of - total population - mobile pers. ("participants")
10	Survey methods & design	---	---	---	Describe and document all relevant elements of the survey	Describe and document all relevant elements of the survey	Describe and document all relevant elements of the survey
11	Reporting period	Multi-day surveys or one-day mobility for predetermined day	One-day mobility, preferably captured on the "previous day", or multi-day surveys if side effects are controlled. The survey sample must cover every day of the week.	Same as standard level plus capture info about regular mobility patterns	Mention the special data collection and describe possible shortcomings.	Present single day if multi-day survey has been done and show average of all days of the week.	Data for one-day mobility compared to regular travel patterns.
12	Statistical unit	Same as in standard level	Both options are possible: one person or everyone in the household as long as the sample is representative	Same as in standard level; if children are difficult to reach, then surveying everyone in the household where there are children	Same as in standard level	Make it clear which option was chosen if there are doubts about the response rates or representativeness	Same as in standard level

1. Introduction and objectives

This document demonstrates the need for an internationally recognised standard for the collection of data on walking, as a way of promoting and supporting policies and actions to improve the role of sustainable modes of travel. It also proposes a detailed set of requirements for walking data that are consistent and comparable.

As well as being a fundamental mode of travel and an essential part of any successful transport system, walking is increasingly acknowledged as providing a wide range of benefits in terms of health, social inclusion, environmental improvements, liveability of cities and economic opportunities. Thus, collecting information about walking is a necessity, and provides crucial input for planning interventions and investment decisions, e.g. by quantifying problems, measuring project outcomes, tracking performance or benchmarking. Travel surveys play a critical role in measuring the amount of walking done.

At the same time, walking presents particular challenges for accurate measurement. This is apparent from the vast differences in data collection methods used, which make it very difficult to compare the resulting data. The validity and reliability of data presented is often unclear and in many cases, methods and tools are poorly developed and utilised, so data is inconsistent or non-existent. Travel surveys usually focus on the national level but good information is equally required at the regional and local level. It is essential, therefore, to develop reliable, valid and yet easy to use travel surveys for cities and urban areas which include walking in a consistent and appropriate manner.

The objective of this international Walking Data Standard (referred to in this document as the Walking Data Standard) is to ensure that walking has a high profile in transport and urban planning throughout the world. What is not measured is not seen as important, and what is not seen as important is not properly measured. International comparisons are important to establish “best” or “better” practice and to inspire and encourage better conditions for people wanting or having to walk.

Specifically, the objective is to establish comprehensive data on trips, such that walking is recorded with the same degree of accuracy and diligence as other modes. The Walking Data Standard aims particularly at recording the number of walking trips and trip stages but also recording the time and distance walked. Based on this information, mode share and other outcomes can be determined and compared internationally.

The International Walking Data Standard addresses two distinct target audiences. On the one hand the experts on travel surveys and statistics and their relevant agencies who seek to better understand how the methods and measurements can include walking more appropriately. On the other hand the Walking Data Standard is aimed at all those in city and traffic planning who want to know how reliable travel survey data is and what the figures mean.

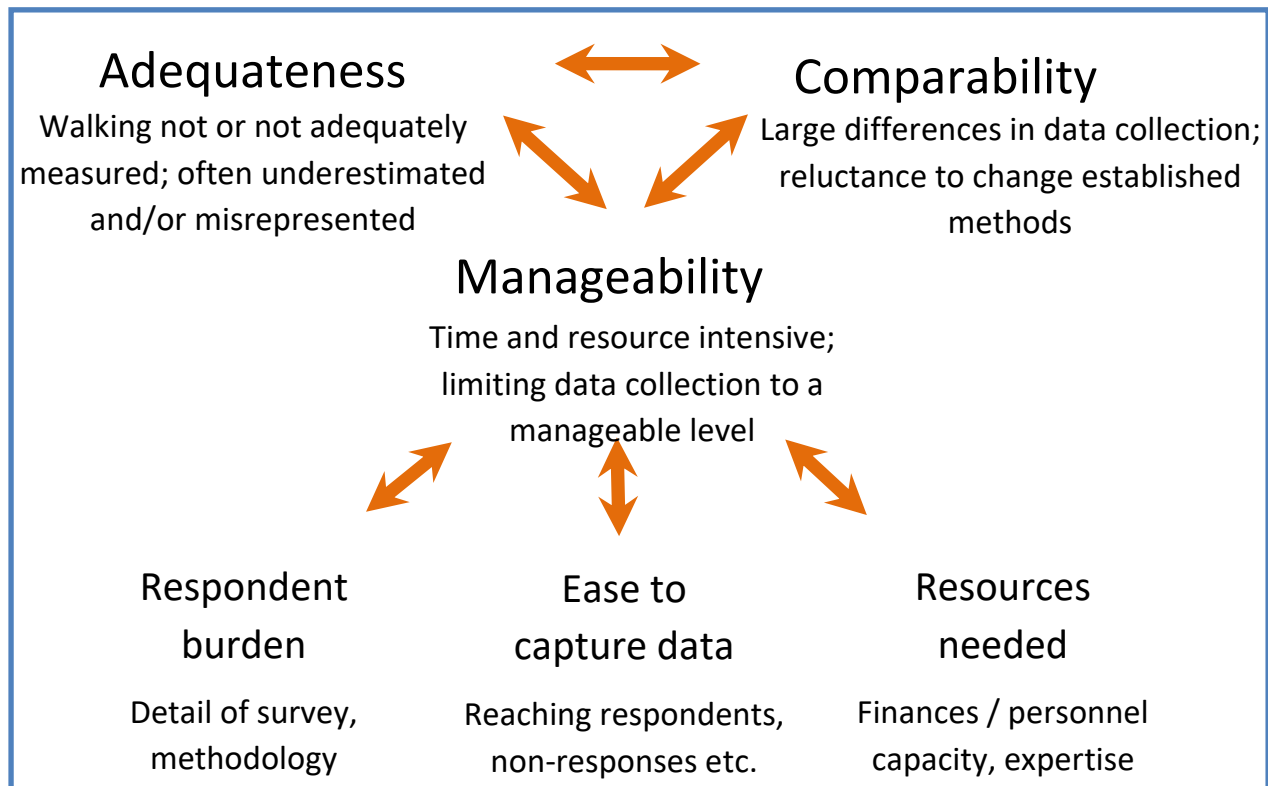
The work and recommendations presented in this report are based on numerous debates and workshops with transport, health, equity and methodology experts worldwide as well as on reviewing best practices and current data applications in travel surveys and other fields. Some of the main work was carried out at pre-conference workshops at the international Walk21 conference series; within the European COST Action 358 on Pedestrian's Quality Needs and at the international conference on Transport Survey Methods in Annecy 2008 (see annex 2). The development of the travel survey Walking Data Standard is part of the long-term effort “to establish international standards for the collection, analysis and dissemination of qualitative and quantitative techniques for measuring walking” as concluded at the 2006 Walk21 conference in Melbourne.

2. Challenges and approaches

2.1 Data collection challenges

Data can only be compared if the definitions and methods used are compatible and consistent with each other. When developing a proposed harmonization of walking data, there are a number of issues characterising the current situation and creating tension. The figure below suggests some of these tensions that exist.

Figure 1: Challenges in creating an international standard for walking in travel surveys



The current situation is characterized by three major challenges:

- **Adequateness**: Walking is often not or not adequately measured in transport surveys. As a result walking is either not accounted for, heavily underestimated, and/or misrepresented.
- **Comparability**: Data collection methods differ widely between countries and even within countries making comparability difficult. There is understandably some reluctance to change established methods, not least because change can introduce difficulties for time series data, making long-term comparisons difficult or impossible.
- **Manageability**: Collecting transport data is often time consuming and resource intensive. The big challenge, therefore, is to keep data collection to a manageable level in terms of the resources needed to identify and recruit respondents, and to achieve high quality responses.

2.2 Harmonization approach

For the Walking Data Standard, three approaches are put forward for making changes to, and harmonising existing travel surveys:

1 Layers

Ideally, all surveys would reveal the highest level of detailed information on walking, but in practical terms it is unlikely that all surveys could be changed to achieve this. Three levels, or layers, are therefore put forward to enable the widest degree of comparability between different countries, regions and cities. It is important that aspirations for the “best” should not undermine achievement of the “good”. Thus in reviewing their survey methods and content in response to the Walking Data Standard, data agencies can select the “highest” level that is feasible in their circumstances.

- Minimal level: not fulfilling the requirements of the standard level (see below) but overlapping with some of them to enable some basic comparability. This level is intended as an interim until further improvements can be made.
- Standard level: fulfilling the basic requirements to adequately determine the amount of walking, and to allow comparability between surveys.
- Elaborate level: desirable additions of elements that bring extra insights about walking and that – hopefully – one day will become part of the standard level.

The differentiation between the levels is made in consideration of the following:

- Ease of collection
- Degree of universality in existing data sets (allowing immediate and backward comparability)
- Importance for transport planning (especially the promotion of sustainable modes) and related policy fields such as health and environment

2 Conversion

Some existing data can be converted to comply better with the standard. It may not be perfect but gives a better estimate of the real situation making it comparable with other data. This applies particularly to achieving consistency in longitudinal data series.

3 Declaration

When the layers are not feasible and conversion is not possible, then declaring and describing the difference will be most helpful. Since it is not always possible to use exactly the method or analysis procedure recommended, a description of the data and how it has been captured is always recommended, if necessary in an extra “notes and definitions” statement accompanying the data.

3. Main topics and issues

3.1 Overview of structure

Harmonization will require some resolution of the following four issues in order to better reflect walking and to be comprehensible for the target agencies that will eventually adopt the Walking Data Standard:

- Sampling (chapter 3.2)
- Data collection and reporting (analysis and presentation) (chapter 3.3)
- General methodological issues of travel surveys (chapter 3.4)
- Special challenge: Travel surveys at the regional and city level (chapter 3.5)

The first two parts on sampling, data collection and reporting are particularly important for walking. The third part is of a more general nature about methodological issues with an indirect impact on walking. The fourth aspect addresses the particular challenges on the regional and city levels of travel surveys.

Each of these is discussed in the following paragraphs, followed by a recommendation for the Walking Data Standard itself.

3.2 Sampling

Collecting data on walking across an urban area presents a range of challenges in terms of data sampling. Essentially, these come down to trade-offs between cost, time and complexity implications of survey designs and the volume and accuracy of information to be collected, as well as dealing with biases which may be introduced into the data as a result of the sampling framework. Consistency of approach is critical if the aim is to compare across locations. Three main issues arise in this field.

Issue 1 Population included in sample: Residents only or also non-residents? (chapter 3.2.1)

Issue 2 Age: Persons with a minimum and/or maximum age? (chapter 3.2.2)

Issue 3 Survey days: All days of the week and periods of the year? (chapter 3.2.3)

The issues above are described in the following sections with the conclusion in the form of recommendations.

3.2.1 Population in sample (Issue 1): Residents or also non-residents?

To capture all trips done within a specific area would mean that the trips of residents but also trips of non-residents, such as commuters, visitors and tourists coming in from outside need to be included. In cities with large volumes of visitors, a considerable proportion of walking activity is made by non-residents and can have different characteristics than those of residents' everyday habits. This information would – ideally – provide a fair assessment of the nature of walking undertaken within a city/region or other geographical area as correct basis for planning and decision making. However, there are a number of methodological challenges connected to this.

Most travel surveys are done as household surveys of residents within a certain geographical or political area. This gives a good indication of the travel behaviour by the residents, but makes it difficult to capture the trips made by visitors to a city. For ease of data collection, it is recommended to collect data of residents only and, if possible capture the walking done by non-residents with a different method. Focusing on travel behaviour of residents also means relying on information by the people to whom decision-makers are accountable and whose behaviour can be most directly influenced through transport and other policy decisions. Furthermore, it avoids double-counting when comparing travel behaviour between the residents of different jurisdictions¹.

If only data of residents is collected, the question arises “what happens with trips of the residents made outside or across their municipal boundaries”. This question is treated separately in Issue 4 below. It is recommended to include all trips by residents, also those made across municipal boundaries, except for travel abroad. An exception to this in cities near the border with lots of cross-border (walking) trips.

Recommendations:

Minimal level: same as Standard level.

Standard level: capture the trips of the resident population only. This includes all trips made, i.e. those made within and outside of the geographical area the interviewed residents live in, but not those made abroad (see also issue no 4). It should also be indicated whether the area/city in question is likely to have high levels of non-resident trips.

Elaborate level: same as standard level, plus capture trips by non-residents such as in-commuters, visitors and tourists, particularly walking trips. This could be done by different methods, for example, by pedestrian counts, on-street surveys, surveys at arrival points such as rail stations, or coordinated household surveys across geographic and political boundaries of a metropolitan area. This data could then be interpolated to give an estimate of all walking done. The methodology used for the conversion should be mentioned.

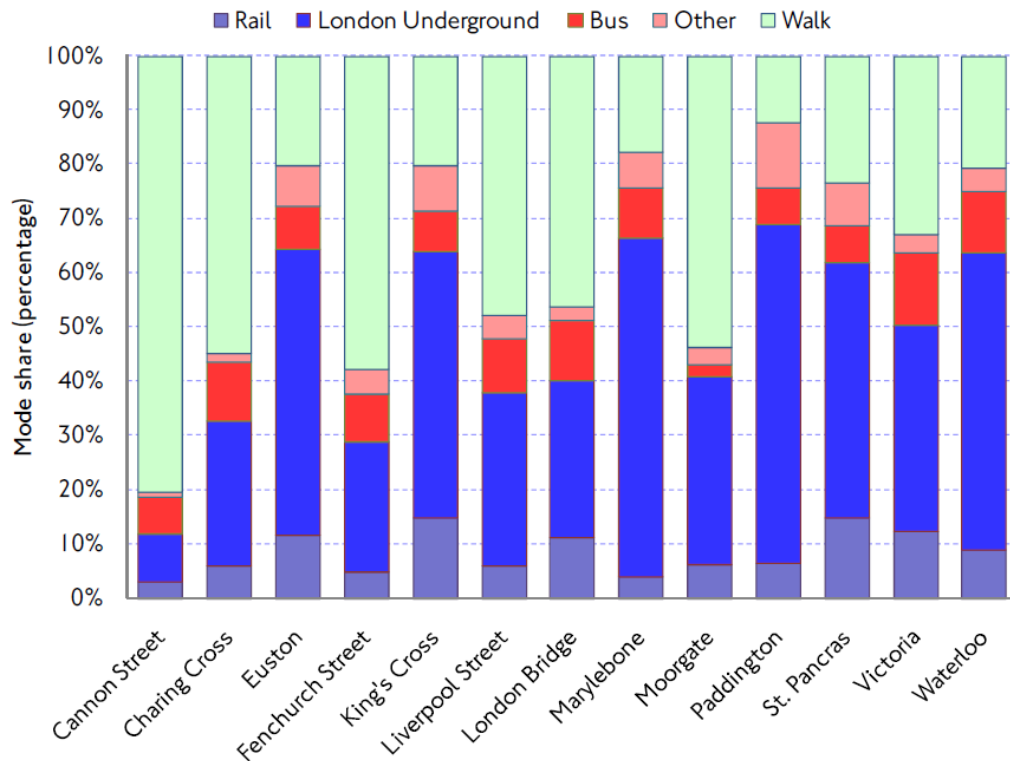
¹ There is, however, the challenge that some people live in different places at the same time. This so called multi-local living is on the increase. In Switzerland, for example, it is estimated that around 28% of the people live in at least two places – for many different reasons (see Schad and Hilti 2015). The problem is the increased difficulty to reach them and to lose some data when they spent their time on the assigned survey day in the other location. See also subchapter 3.4.3 for further thoughts on seasonal residents such as university students, for example.

Table 1 Summary for issue 1: Population in sample: residents or also non-residents?

	Sampling / data collection	Data reporting (analysis & presentation)
Minimal level	Same as Standard level	Same as Standard level
Standard level	Trips of resident population	Trips of residents
Elaborate level	Same as standard level plus capture trips of non-residents by other methods; convert data to estimate of all walking	<ul style="list-style-type: none"> - Trips by all in area (residents and non-residents) - Trips by residents only - Trips by non-residents in area

Example(s):

One interesting case study comes from the rail terminus surveys done to capture the onward travel of commuters once they arrive in central London.

Figure 2: Mode shares for onward travel from principal central London rail termini. Both weekday peak periods combined

Source: Transport for London, 2011b: Travel in London Report 4, figure 2.11

3.2.2 Age (Issue 2): Minimum and/or maximum age?

Children, young adults and elderly persons are among those walking most, so it is particularly important that they are included in travel surveys. Furthermore, these groups also have different mobility patterns and mode choices compared to the rest of the population.

Existing travel surveys differ widely regarding the age at which children are included. In some countries – for example, in the UK, Spain and one of the German surveys – it is from birth onwards. In others it is 5 or 6 years (for example, in Austria, Belgium, Finland, France, Sweden and Switzerland), and even higher in other countries (For example, 8 years in Israel, 10 years in Denmark, 13 years in Norway, and 14 years in Italy).

A few countries such as Denmark, Sweden and Italy also have a maximum age of persons being included in a travel survey (see annex 1 for details).

Ideally, data collection should start at birth (of course in the early years done by the parents, see below regarding proxy interviews) and be done for all ages without limit. In this way, the sample and data will be truly representative for the population. However, given the large differences in existing surveys it is recommended to split the data collection and presentation into age groups, allowing comparison between what might be described as “core” age groups.

The cut-off points are difficult to determine since school age (starting and ending school) as well as the age at which young people are allowed to drive a vehicle or the majority age differ widely as well². With people getting generally older, but each person aging individually (some getting fragile much earlier than others), it is not feasible to mark any logical maximum cut-off.

As a pragmatic approach the following cohort dividing points are suggested to help with data comparison:

- **Age 5 or 6:** At this age children in most countries are in kindergarten or school. The age of 5 years would be preferred, but the difference to the threshold of 6 years is only small.
- **Age 18:** A second cohort division point could be the age of 18 since the vast majority of countries have 18 as the age of majority and the legal age to vote. Many also have it as minimal age for allowing young people to drive a car. They are either working or still in school (in higher education).

Of course, individual surveys can present data for other age cohorts, but the Walking Data Standard would require the basic divisions at age 5 and 18 to be included.

There are a number of challenges related to capturing data from children and sometimes also from older citizens. The lower the age the more difficult it is to collect the data since younger children particularly need help to respond. In most countries, the consent of parents is needed to interview children. Generally, children and young people should report on their own travel as much as is possible. Proxy interviews – an adult helping substantially or fully answering on behalf of the child – should be restricted to a minimum and be labelled as such. The same applies for older or sensory impaired persons if they get help from a third person.

² For example, the “ages of majority” differs widely: in the majority of countries it is 18, but New Zealand, some Canadian provinces and some states in the USA have it at the ages of 19, 20 or even 21. Some, such as Iran and Saudi Arabia have it at the age of 8 years for females and 14 years for males.

Recommendations:

Minimal level: When data are collected at ages higher than 5 or 6 years (e.g. from the age of 13) and/or with an upper age limit, in the report it should be clearly mentioned at what age data collection started. The presented data should at least comprise the age group of 18 years and older.

Standard level: Collect data from the age of 5 (or 6) years with no maximum age limit. The data should be presented for age groups 5 to 17 years, 18 to 64 years and 65 years and above.

Elaborate level: Ideally, data collection starts at birth and is done for all ages. The data should be presented in four age groups in order to make it comparable with other travel surveys: age 0-4 years; age 5-17 years, ages 18 to 64 years and 65 years and higher. Because age is such a crucial determinant for walking, independence and health, it is recommended to split the reported data even further into sub-categories: Ages 5 to 11/12 years for primary school, ages 12/13 to 17 years for secondary school; ages 18 to 29 years and then 10+ year increments (30-39, 40-49, 50-64 years), followed by the seniors: 65 to 79 years for young seniors and ages 80 years and above for older seniors.

Table 2 Summary for issue 2: Age: minimum and/or maximum age?

	Sampling / data collection	Data reporting (analysis & presentation)
Minimal level	Based on existing age limitations	- Ages 18 years and above - Other age group(s) according to elaborate level, if data available.
Standard level	From age of 5 with no upper age limit	Total of all ages 5 years and above Ages 5 to 17 years Ages 18 to 64 years Ages 65 and above
Elaborate level	All ages, no lower or upper age limit	- Total of all ages - Ages 0-4 years; Ages 5-11/12 y. (primary sch.); - Ages 12/13-17 years (secondary school) - Ages 18-29, 30-39, 40-49, 50-64 years - Ages 65-79 and 80+ years

Example(s):

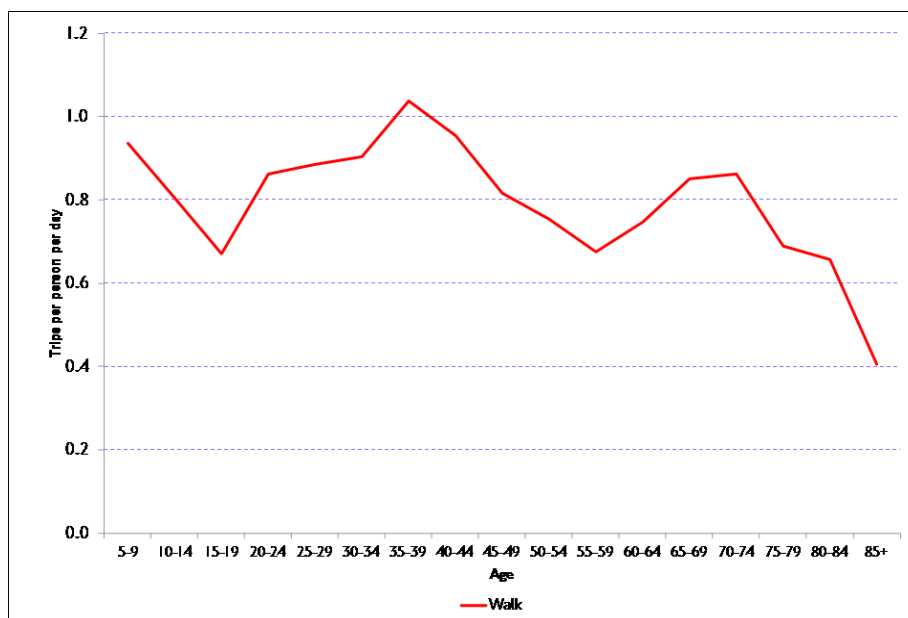
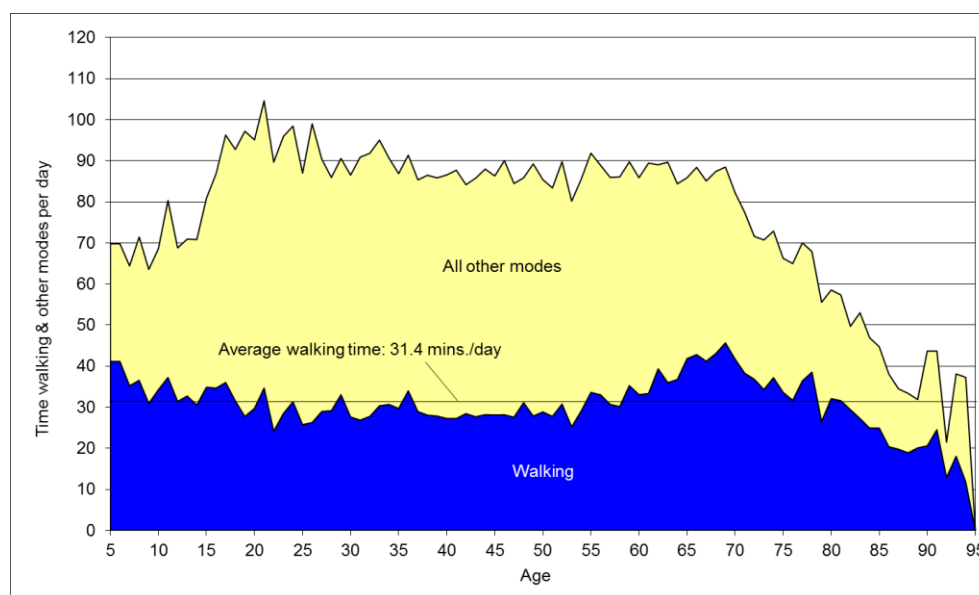


Figure 3: Walking trips per person per day in London

Source: Transport for London, 2011: Travel in London Supplementary Report: London Travel Demand Survey (LTDS)

Figure 4: Time for walking and for other modes per person per day according to age (National data in Switzerland)



Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

Table 3 Daily walking trips (all the way), walking stages, time and distance walked according to age group (National data in Switzerland)

	Daily walking trips (all the way) per person	Daily walking stages per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	N (persons)	
All ages 6+	1.0	2.3	31.4	2.03	62,868	Standard level
18+ years	1.0	2.2	30.9	2.01	55,060	Minimal level
6 to 17 years	1.5	2.8	34.5	2.20	7,808	Standard/elaborate level
18 to 64 years	1.0	2.3	29.8	2.02	39,160	Standard/elaborate level
65+ years	1.0	1.8	35.1	1.98	15,900	Standard/elaborate level

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.2.3 Survey days (Issue 3): All days of the week and periods of the year?

Mobility patterns differ between days of the week and also between the seasons. Since collecting data is quite resource intensive, often only data on mobility of workdays is captured – sometimes even limited to work trips only (see issue 8 below).

The limitation of many surveys to workdays, and especially to journeys to work, reflects a common bias in transport planning towards addressing problems of peak hour congestion. This is inadequate in providing an evidence base for tackling the wider transport issues, such as mode choice and demand management, inclusive mobility, environmental impact, and health aspects. To get a meaningful and representative picture of the mobility patterns and particularly of walking, it is crucial to collect data on all days of the week including non-working days.

If only data on (some) workdays can be collected this has to be done carefully depending on the cultural background. The best approach is to rotate sample days of the work week. It should be avoided to use one work day only.

In many places there is great seasonal variety. For example, the amount of walking in Calgary can look very small if the survey is done only in the middle of winter; likewise in Dubai in the hottest months.

In order to overcome these limitations, national travel surveys usually include all seasons. This approach should apply to all travel surveys if possible. On a regional or city level, however, this can often not be done for reasons of limited resources. It is recommended to choose in such cases an “average” season of that geographical area.

Alternatively, the season can be rotated year by year: Year 1 spring (if applicable), Year 2 summer (if applicable), Year 3 winter (if applicable) etc. This would vary for different countries; some do not have a spring or autumn. Some barely have a winter or a summer. Alternatively there are ways of adjusting data for seasonal effects, which may be done using smaller samples on particular aspects, especially walking and cycling; or by deriving factors from national data.

In a representative sample of all days of the year, i.e. 365 days per year, holidays are included, thus, reflecting all aspects of mobility of the population. If a time sample has to be chosen it should be done outside of the main holiday season.

Recommendations:

Minimal level: Take data for an average work day and/or choose an average season for the geographical area. When presenting the data, mention which days/seasons were used. Alternatively, derive data for all days of the week and all seasons from national surveys or other sources.

Standard level: it is recommended to capture the mobility patterns of all days of the week and all seasons. This can be achieved by rotating sample days and seasons year by year and aggregating the results, in order to limit survey costs.

Elaborate level: Same as in standard level for data collection. Present data according to days of the week and months or seasons.

The days of the week should distinguish between working days and non-working days. If there are two or more non-working days, they can be further split up e.g. between Saturdays and Sundays in some countries, if travel patterns differ.

The seasonal variations can be presented as monthly values indicating which seasons they represent or be grouped into seasons according to the conditions in the geographical area.

Table 4 Summary for issue 3: survey days: all days of the week and periods of the year?

	Sampling / data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	Average work day(s) / average season for the geographical area.	Average work day(s) / average season for the geographical area.
<u>Standard level</u>	All days of the week and all seasons	All days of the week / All seasons or average season
<u>Elaborate level</u>	Same as standard level	- Same as standard level, plus: - Working days and non-working days - Monthly values with descriptions which season they represent

Example(s):**Table 5 Daily walking trips (all the way), walking stages, time and distance walked according to day of the week (National data in Switzerland)**

	Daily walking trips (all the way) per person	Daily walking stages per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	N (persons)	
All days	1.0	2.3	31.4	2.0	62,868	Standard level
Working days (Monday-Friday)	1.1	2.5	29.6	2.0	44,337	Minimal level
Non-working days (Sat/Sun)	0.8	1.6	35.7	2.1	18,531	Elaborate level
Saturday	0.9	1.9	34.2	2.0	7,786	Elaborate level
Sunday	0.7	1.3	37.2	2.2	10,745	Elaborate level

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

Table 6 Daily walking trips (all the way), walking stages, time and distance walked according to season (National data in Switzerland)

	Daily walking trips (all the way) per person	Daily walking stages per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	N (persons)	
Spring (March, April, May)	1.1	2.2	31.0	2.1	15,098	Elaborate level
Summer (June, July, August)	1.0	2.1	31.0	1.9	15,515	Elaborate level
Autumn (September, October, November)	1.1	2.5	32.9	2.1	16,827	Elaborate level
Winter (December, January, February)	1.1	2.3	30.5	2.0	15,428	Elaborate level
Total year	1.0	2.3	31.4	2.0	62,868	Elaborate level

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3 Data collection and reporting (analysis and presentation)

After making the choices in terms of sampling, the collection of the actual data poses another array of challenges which are discussed in the following paragraphs. Six issues need to be addressed.

- Issue 4 Boundary: All trips made or only those within the city? (chapter 3.3.1)
- Issue 5 Unit of travel: Stages, trips and/or main mode? (chapter 3.3.2)
- Issue 6 Duration and length: Trip distance and/or time?(chapter 3.3.3)
- Issue 7 Threshold: Minimum and/or maximum length of stage or trip? (chapter 3.3.4)
- Issue 8 Trip purposes: All purposes or commuting only? (chapter 3.3.5)
- Issue 9: Participation: Whole population and/or mobile persons? (chapter 3.3.6)

3.3.1 Boundary (Issue 4): All trips made or only those within the city?

For mode share, and particularly for the share of walking, it is crucial to know if all trips have been included or only those within a city/region/country and possibly those starting and/or ending there. This issue arises mainly on the city and regional level and not so much for the national level since travels abroad are usually not included in the daily mobility surveys.

Currently, data collected and presented by cities differs widely between these options. If only trips within city boundaries are included, then mode share of walking (and cycling) is higher than when all trips are shown.

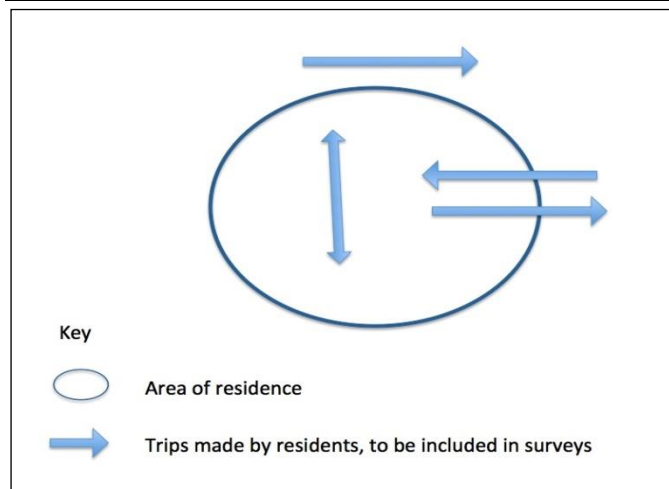
Some city administrative areas (like Zurich, Birmingham and Sydney) include the core city area only, whereas others include what might be termed the greater city area, or metropolitan area. While this issue is of substantial importance for motorized modes and public transport, it is less of an issue for walking because the number of these cross-boundary or beyond-boundary walking trips is usually fairly small. However, it will affect time and distance walked as well as mode share.

Generally, reporting of national data on daily mobility excludes international travel (i.e. trips made abroad). This is also recommended here: data collected and presented should comprise all trips made by the interviewed population except for international travel. For example, if a person did a walk in a neighbouring city in the same country, this walk would be included in the survey. For special situations, with communities lying very close to a national border where it is known that a lot of cross-border (walking) trips are made, these should be included.

For data analysis and reporting on the elaborate level, a detailed split between “all trips made”, “trips only within city boundaries” and “trips to and from the city” could be made.

Recommendations:

Minimal level: Collect the data according to current practice of the city (e.g. within the city boundary only) and adjust the data if possible to get an approximation of the total trips. In the reporting, mention how the data were collected and how they were adjusted. Display the results according to one of the categories given for the elaborate level if possible.



Standard level: Include all trips by the surveyed residents, wherever the trips are made. Not included are trips abroad, except in special situations when there is significant cross-border traffic in a city beside the border. The trips made entirely outside the area of residence are usually very small.

Figure 5: Trips to be recorded in the standard level

Elaborate level: Collect the data as on the standard level and distinguish in the presentation further between “all trips”, “trips only within city/regional boundaries” and “trips to and from the city/region”.

Table 7 Summary for issue 4: Boundary: all trips made or only those within the city?

	Data collection	Data reporting (analysis & presentation)
Minimal level	According to survey in use	<ul style="list-style-type: none"> - Approximation to all trips - Categories of elaborate level if applicable
Standard level	All trips except those made abroad	All trips made by residents except international travel
Elaborate level	Same as standard level	<ul style="list-style-type: none"> - All trips by residents - Trips only within city/region - Trips to and from the city/region - Trips made beyond the city/region boundary

Example(s):

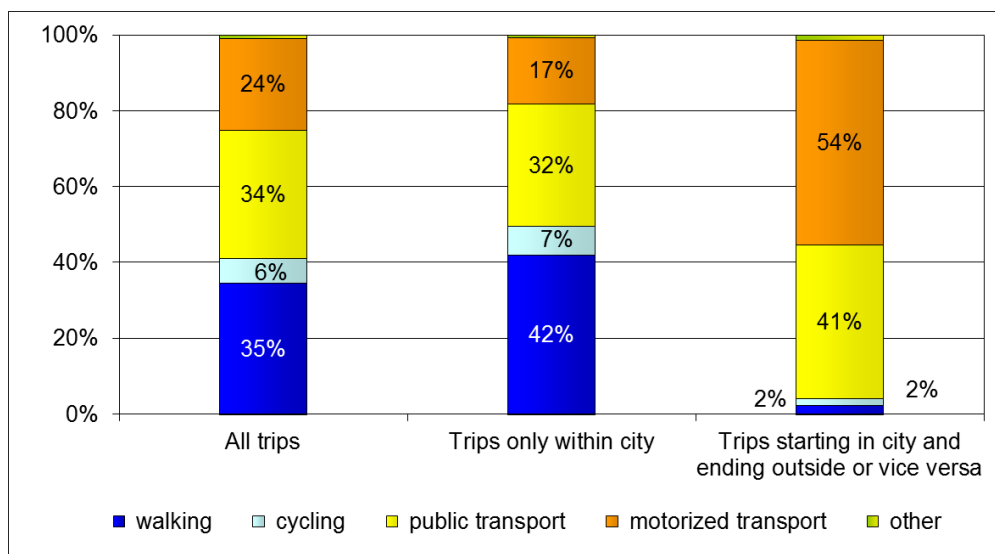


Figure 6: Mode share of the population of Zurich, based on main mode: all trips, trips within the city only and trips starting in the city and ending outside or vice versa.

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3.2 Units of travel (Issue 5): Stages, trips and/or main mode?

Walking is important on its own but also as a means of access to and between other modes. It is considered the “glue of the transport system”. Since there is an element of walking in every trip, a large proportion of total walking activity is undertaken as part of multi-modal trips that by definition consist of two or more trip “stages”. But often only the “main” mode is recorded and/or presented in travel surveys. While this indicator typically under-estimates total walking activity, it is available for many cities and regions and thus offers relatively good comparability. Where trip **stages** are surveyed, this makes sure all walking is included. On the other hand, it is not a particularly powerful indicator of total walking activity since this can include very short walks to access other transport modes as well as much longer trips.

“Main mode”, according to the British National Travel Survey (and most national surveys), is defined as follows: *“The main mode of a trip is that used for the longest stage of the trip by distance. With stages of equal length the mode of the latest stage is used.”* Sometimes main mode is also based on a hierarchy of modes with highly motorized modes such as planes, cars or trains at the top and cycling and walking at the bottom. This means that surveys recording only main modes will neglect some of the walking done and underestimate the real walking share.

For this reason, surveys should always record trip stages. This means that all modes of each trip are captured. Which can then be transformed into main mode if desired. Stages should also be shown when it comes to presenting the data. This approach allows direct comparisons of the number and characteristics of walking trips stages between cities with very different mobility patterns.

Ideally, on a more elaborate level, walking data can and should be divided up into the following characteristics:

- Walk all the way to destination, e.g. walk to a cinema, restaurant or visiting friends. Walking is the main mode here
- Walk stages as part of multi modal trip – walk to another means of transport e.g. the car or bus.
- Walk as purpose in itself – e.g. walking the dog, walking for exercise, walking through the countryside, hiking etc. This category includes all walking trips where going for a walk is the main purpose of the trip – the walk itself is the “destination”. Usually these walks are leisure and or recreational activities.

Definitions (see also examples below)

A stage is defined by the use of one mode of transport. A new stage starts when the mode or the vehicle is changed. A stage can be part of a linked trip or a trip where one mode is used all the way (e.g. walking all the way) or where the use of the one mode is the purpose itself (e.g. a leisure walk starting and ending at home).

A trip is defined by the purpose or activity at the destination. It can comprise one or several stages. A new trip and thus also a new stage starts when there is a change of purpose or activity. However, incidental purposes, such as buying a coffee on the way, are usually excluded.

All modes are defined as those modes used on a trip, usually in their sequence. If a mode is used several times, it is only captured once, e.g. walking – bus – (walking).

Main mode of a trip is that used for the longest stage of the trip by distance or the most important purpose of the trip. With stages of equal length or importance the mode of the latest stage is used (definition by the UK National Travel Survey).

Recommendations:

Minimal level: If stage data is not collected or available, there are two options:

- Option 1): The collected data is presented as “main mode” or “all modes” mentioning that stages were not collected.
- Option 2): Stages may be derived from “all modes” or “main mode” and recalculated based on an approximation factor. It is known, for example, that almost every public transport trip has at least two walking stages attached. If changing between buses or from bus to train is necessary, the number of walking stages is even higher. Similarly, motorized trips always entail a shorter or longer walk to and from the car park.

The following conversion factors are suggested: for each public transport main mode, add 2 walking stages; for each motorized trip, add one walking stage. It is assumed that some of the car parking is at the same address where the trip originates or ends.

Standard level: Collect the data based on trip stages or “all modes” being transformed into stages. This is necessary in order to properly catch all walking done. In reporting, the data should also be transformed into main mode to have both stages and main mode. Particularly when calculating mode share, this gives the full picture and makes the data more comparable.

Elaborate level: It is recommended to survey the trips according to these categories: “walk all the way to destination”; “walk stages as part of multi modal trip” and “walk as purpose in itself” (or “just walk”). For data on trip times, waiting times at public transport stops could be captured. These stages should be presented separately from the other stages.

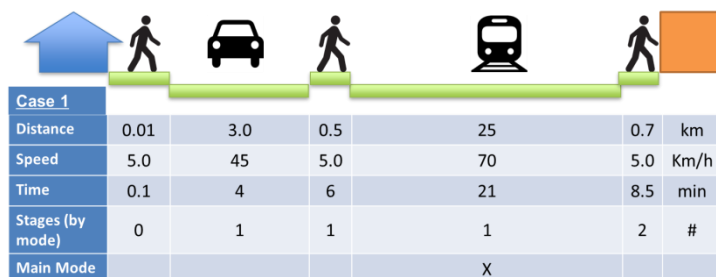
Table 8 Summary for issue 5: Units of travel: Stages, trips and/or main mode

	Data collection	Data reporting (analysis & presentation)
Minimal level	“All modes” or “main mode”	Main mode Derive stages from “main mode” or “all modes”
Standard level	Stages or “all modes” transformed into stages	Stages or “all modes” transformed into stages AND “Main mode”
Elaborate level	Same as standard level plus waiting times (e.g. at public transport stops); transform into main mode	- Walk all the way to destination - Walk stages as part of multi modal trip - Walk as purpose in itself - Trip stage times (waiting times)

Example(s):

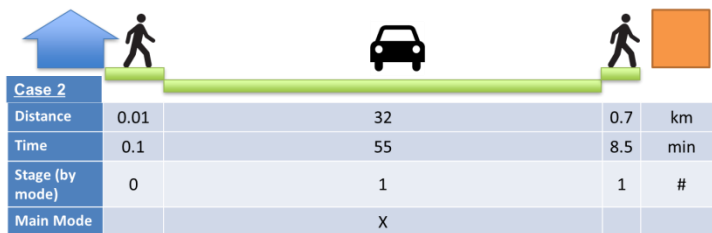
The images below show three possible trips to a work destination. For the purposes of this example, a work trip is used, however the points that are being highlighted hold true for any form of trip purpose.

Figure 7: Elements of a trip in terms of distance, time, trip stage and “main mode”



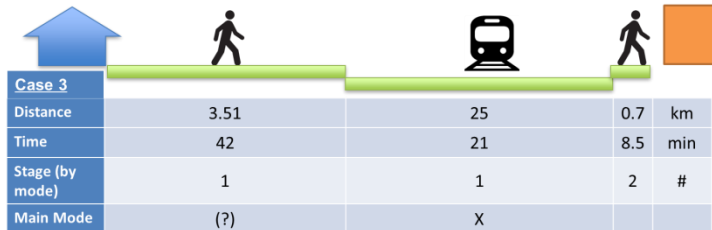
Example 1 - Park & Ride to Train Station

In the first example, a person leaves their home and walks to the curb where their automobile is parked. They then drive their automobile 3.0 km (4 minutes) to park near a train station. From their parking space near the station, they then walk 500 metres (6 minutes) to the train that they board. The train journey covers 25 km and takes them 21 minutes. Once the train arrives near their office, they walk 700 metres (8.5 minutes) to their office where they start their day.



Example 2 - Automobile Trip

The second example shows a person taking an automobile trip to work for the majority of the destination; with only a short walk from their front door to their car parked on the street and a 700 m walk at the end of the journey from their parking space to the office door.

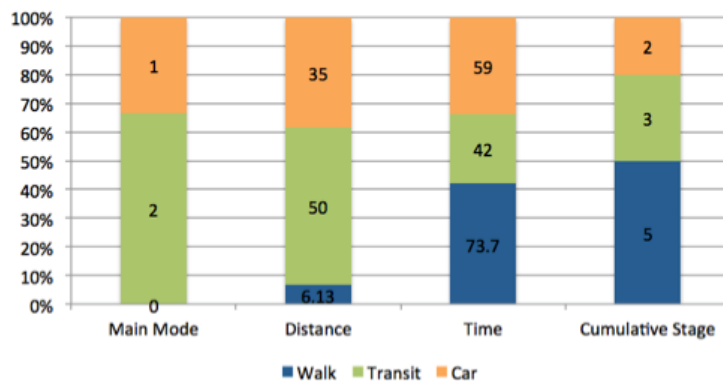


Example 3 - Walk to Train Station

The third example shows a person walking 3.5 km to a train station where they catch the train to the downtown station. From the downtown train station to the office building was 700m along urban streets.

When similar characteristics of these three examples are summarized (e.g. distances, time of journey, number of stages by mode, and the main mode of the journey) key trends emerge in how the walking trip is either accounted for or neglected depending on the methodology.

Case 1, 2, 3 – Main Mode, Distance, Time, Stages



The Trouble with Main Mode

With Main Mode as the recorded aspect of the trip, none of the walking portions of any of the three scenarios trips are accounted for, despite contributing over 40% of the total travel time. Even in the third scenario (walk to train station) it can be seen that subjectivity in reporting main mode by the respondent is dependent on how they personally perceive the main mode of their trip. In that case, they could have based their response on distance or time for the mode.

In order to ensure that walking trips are accounted for in travel surveys, trip stages are important to include in data collection.

Since some data sets do not include trip stages, collecting both the trip stage and the main mode data should be collected to ensure data can still be compared between jurisdictions.

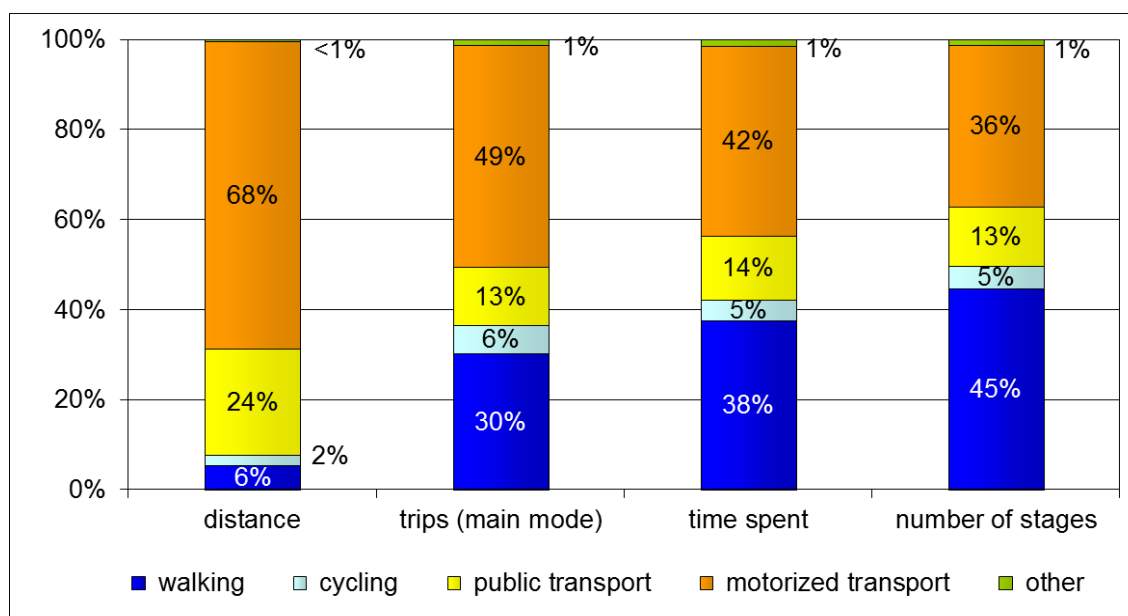
The Trouble with Distance

With Distance as the recorded aspect of the trip, the data favours the modes with higher speeds and can cover larger distances in shorter times than that of walking. As shown in reporting distance in these three examples, the walking mode received just less than 10%, public transport accounted for just over 50%, and car travel nearly 40%.

The majority of walking trips are short in distance. Reporting data based on distance therefore shows a bias towards modes which are able to cover large distances over short time due to high speed travel. This results in trips made on foot or by bicycle being unfairly disadvantaged. As such, when considering modes that are completed primarily by human effort, time is more important than distance.

It is for the reasons described in these two reporting methods that this paper recommends that trip stages, average daily time, and distance walked per person based on trip stages be collected and reported. It is acknowledged that this example simplifies the situation by only considering three individual trips. As shown using data from Switzerland, this case study does provide a reasonable comparison to how travel occurs in more complex scenarios.

Figure 8: Comparison of mode share according to distance, “main mode” trips, time spent and trip stages (National data in Switzerland)



Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

Table 9 Daily walking trips (all the way), walking stages, time and distance walked compared to being measured as trip stages or “main mode” (National data in Switzerland)

	Stages / trips walked per day per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	N (persons)	
Stages	2.3	31.4	2.03	62,868	Standard level
Trips main mode (walk all the way)	1.0	20.2	1.30	62,868	Standard level

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3.3 Duration and length (Issue 6): Trip distance and/or time?

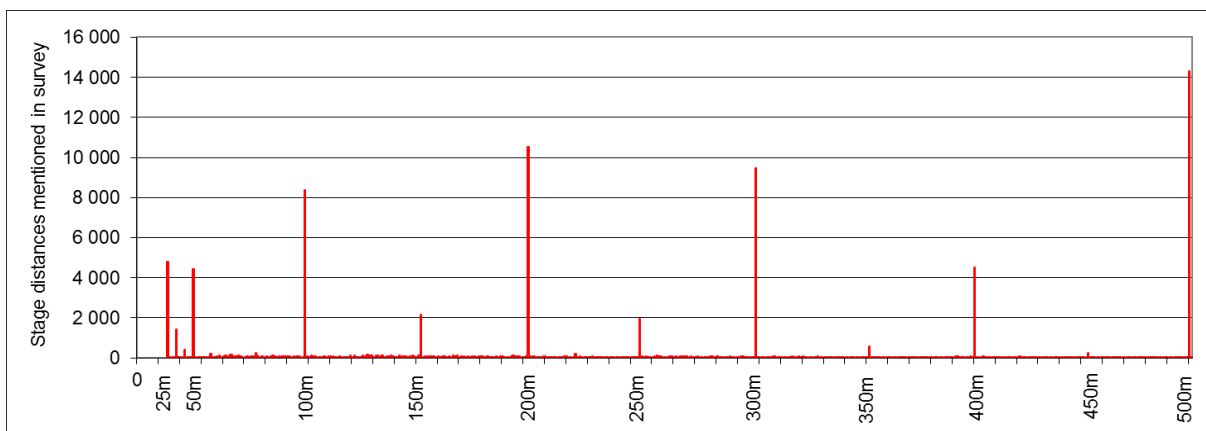
When collecting data on the number of stages and/or trips, it is relatively easy to also collect data on the distance travelled and the time needed for each stage and/or trip. Both elements are important for walking as they allow the calculation of a number of additional mobility characteristics, such as exposure to road danger or physical activity metrics. While for other modes, distance is usually in the forefront and one of the key variables used, for walking, time is much more important, not least because public health professionals generally use this metric in physical activity measurement. In fact, because walking covers a relatively short distance but is time intense, all analyses focusing on distance only usually underestimate the role of walking in mobility. From a walking perspective it is, thus, crucial to always capture and report distance and time.

It should be noted that objectives regarding walking (and cycling) are often not adequately reflected in transport planning methods. For example, journey time reduction is the main component of most transport project evaluations, and yet from a health planning perspective, the objective is to **increase** the amount of time spent walking. Similarly, measures that achieve mode switch from car to walk are successful in environmental terms, but may show as a negative in a standard evaluation because journey time is increased!

Distance and time are still in most cases estimated by the persons being interviewed (self-estimation). Experience shows that these estimates are not always accurate; however, it is not so clear if distances are over- or underestimated. The latest figures from the Swiss national travel survey with geocoding show that usually motorized and public transport trips between 1 and 20 kms have been overestimated. There are no data on walking and cycling. For the travel survey in 2000, it was estimated that about half of the persons interviewed misjudged the distance by more than 25 percent.

One of the reasons why estimates are only rough indicators is that people tend to round figures in their estimates, e.g. 750 metres are rounded down or up to 500 metres or 1km. The question is, whether in large samples this equalizes between respondents.

Figure 9: Distribution of stage distances (25 to 500 metres) mentioned by the persons surveyed indicating that people naturally tend to adjust the distances to next round figure. (National data in Switzerland)



Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

Geo-localisation and tracking information is used increasingly in travel surveys. Based on trip origins and destinations either crow-fly distances can be calculated or routes assumed. For the latter, it needs a comprehensive GIS base which is not always available for walking routes. The small scale routes of pedestrians are often not on the maps used for geocoding other modes. They may also potentially assume wrong routes when just two geo points are given. However, for the purpose of deriving time and distance they may be sufficient when a decent GIS base map is used, particularly when comparing the results to alternatives which are just as much approximations.

GPS-tracking might be used more often in the future to calibrate time and distance. The SHANTI report points out, that “for practical reasons it is not realistic to recommend one specific way how trip distances should be collected. (...) However, suitable ex-post-harmonization measures must be developed to make survey results comparable” (Armoogum ed. 2014, p 72).

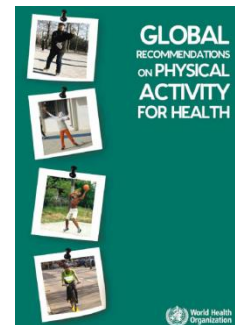
Trip distances and times are almost as unequally distributed as income in a society. A few people travel very far, while most travel low or medium distances. Similarly, the distribution of walking trip stages in many cities will often include a large proportion of relatively short walking trip stages, with a small number of very long trips. The use of the mean average distance or time can therefore often be skewed by a few observed responses at the upper end of the scale.

Distance-based representation places greater importance on trips to farther destinations. By contrast, in terms of land use and transport planning, the presence of short walking trips should be seen as a measure of success. Therefore, presentation of walking activity by time is preferable to distance since this reflects the proportion of time that people experience the transport system using each transport mode. When comparing walking trip stage characteristics, it is good practice to include the median and 90th percentile values in addition to the mean.

Time is crucial in assessing health outcomes. The World Health Organization WHO recommends at least 150 minutes of physical activity, such as walking, throughout the week. The earlier recommendation was 30 minutes per day on 5 days of the week³. When time is captured on a weekly basis, the 150 minutes can be used. The time in day surveys can be converted into the brackets of more than 30 minutes of walking (and cycling) and less than 30 minutes.

While “the longer, the better” is certainly welcome from a health perspective, the same may be a negative sign of bad accessibility and undesirable long distances if long walking times result in daily mobility without being self-chosen.

The time taken for trips and trip stages is a useful addition to basic trip data. Quite often there are also some waiting times on a trip, e.g. at the public transport stop. This could be included in a more elaborate version of the survey⁴. In some surveys also the search time for finding a parking spot is included in a similar way. The question here is where to draw the line as there are time losses in many ways in everyday mobility and during daily activities



³ See for more details: World Health Organization, WHO 2010, “Global recommendations on physical activity for health”, accessible here: www.who.int/dietphysicalactivity/factsheet_recommendations/en/. The recommendations call for moderate-intensity physical activity. Most walking can be classified as such but possibly not all.

⁴ Werner Broeg, for example, calculates a total of 5.28 stages for each public transport trip based on data from German cities. The stages are divided up as follows: access to the stop: 1.06; waiting: 0.92; movement (in pt): 1.43; change pt: 0.43; waiting after change: 0.37; leaving the stop: 1.07; total of 5.28 stages (see Broeg 2014).

Recommendations:

Minimal level: If only trip distances are collected, they should be converted into time if possible. It should be mentioned how the data were collected.

Standard level: Always capture time AND distance when collecting data for both stages and trips. It is not feasible at this moment in time to agree on a standard for the way distance or time are collected (by self-estimation, geo-localisation or GPS-tracking etc.) although the method used effects the outcome and comparability of the data. It should always be described in detail. From a walking perspective, time is more important than distance. This also needs to be considered in reporting. Furthermore, in reporting and analysis, the data should always be presented as median (or percentiles) besides the normally used mean. Those countries using the Imperial system are invited to translate their data into the metric system.

Elaborate level: Include waiting times in the data collection and show them in addition to the travelling times. Furthermore for health assessments, calculate the percentage of 18 to 64 year olds meeting the WHO criteria. The measure calculated will depend on whether daily or weekly data is collected. With the former it is possible to calculate the share of people walking > 30 mins daily and with the latter > 150 mins weekly.

Table 10 Summary for issue 6: Duration and length: Trip distances and/or time?

	Data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	According to survey in use (if possible transform distance into time)	Distance, if possible converted into time
<u>Standard level</u>	Time AND distance	Time AND distance: Mean AND median (percentiles)
<u>Elaborate level</u>	Same as standard level plus separate waiting times	- Waiting times - Walking times > 150 mins. per week - Walking times > 30 mins. per day

Metric and imperial systems

One difficulty with distance is the different units of measurement used around the world, and different levels of understanding of them. The USA uses yards and miles (Imperial system). Also some countries with links to the British Commonwealth maintain some elements of the Imperial system in a formal or informal capacity. However, since most of the rest of the world uses the metric system (metres and kilometres), the international standard should use this system.

In the definition of walk trip distances, this is not a significant problem for the US and UK. For example a distance of 100 yards is 91.44 metres, a difference of 8.56%. Survey respondents, whose answers will always be approximate in any case, may not perceive such a difference. If distances are measured automatically, the technical equipment used also may not distinguish such a difference. Those countries using the Imperial system should translate their data into the metric system to make it comparable with the rest of the world.

Example(s):**Table 11 Comparison of daily walking trips according to mean and median daily walking trips and stages, as well as time or distance walked per day (National data in Switzerland)**

	Daily walking trips (all the way) per person	Daily walking stages per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	<i>N</i> (persons)	
Mean	1.0	2.3	31.4	2.03	62,868	Standard level
Median *	0.6	1.5	10.0	0.72	62,868	Standard level

* The median marks the point where half of the population lies above and half below the given value, e. half of the population walks less than 10 minutes per day, the other half more than 10 minutes. The mean time is 31.4 minutes. This shows that many people walk only for a relatively short time but the few who walk relatively far push up the average/mean time.

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

Table 12 Share of population making at least one walking stage or trip on day surveyed; share of people walking less or more than 30 minutes (National data Switzerland and city of Zurich)

	Switzerland		City of Zurich		
	Percent	<i>N</i> (persons)	Percent	<i>N</i> (persons)	
No walking stage or trip on survey day	38.5%	24,399	23.1%	564	Elaborate level
Walking time up to 29 minutes per day	28.3%	16,996	36.2%	817	
Walking time of 30 mins & more per day	33.2%	21,473	40.7%	1,009	
Total	100.0%	62,868	100.0%	2,390	

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3.4 Threshold (Issue 7): Minimum and/or maximum length of stage or trip?

One of the questions when collecting data on stages is whether criteria should be applied to what counts as a stage, particularly a walking stage. Stages often only count if they are done in public spaces. However, public and private domains are often difficult to distinguish and are becoming more so⁵, and a different definition is suggested to be more appropriate: “publicly accessible spaces”. This includes shopping malls or train stations but not a private house or an office building. In some travel surveys the threshold is the crossing of a property line. However, this is often difficult to determine. The definition of “publicly accessible spaces” includes also those that may be closed at night. But a lot of walking may be done during the day in these places. The line needs to be drawn with common sense. While walking to an from the parking lot to the mall will be included, the walking within the shops won’t. The same is true for university buildings. While walks on campus will be included, the movements within the buildings won’t, although these are also publicly accessible.

The next question is, should a time or distance threshold be included? While a number of countries have no limits in terms of distance or time of trip stages, some do. For example Spain and Italy only record walking trips of 5 minutes or more. 5 minutes equates to about 300 to 400 metres of walking distance. In Israel the threshold is 100 metres. In Great Britain only walk trips of over 50 yards are included, and moreover, “short walks” (over 50 yards and less than one mile) are collected only on the 7th day of a week-long travel diary only. Research shows that because of this design, walking is substantially underestimated. As the SHANTI report points out: “Differences in definitions of short distance travels are of little importance for the overall kilometres but they influence the distribution on modes, especially the share of walking trips.” (Armoogum 2014 ed, p 81)

The easiest and most adequate way to handle this issue is to include all stages no matter how long they are and where they are made as long as they are done on publicly accessible spaces. This way the accuracy of the collected data is improved as well, because everyone is aware that most trips begin and/or end with a walk stage – be it a trip by bicycle, car or public transport.

Recommendations:

Minimal level: Use the data based on survey in use and mention the minimal stage distance applied. If possible, try to apply a conversion factor based on experiences from other studies (e.g. with GPS) to determine the share of short walking stages. No international conversion factor has been agreed yet.

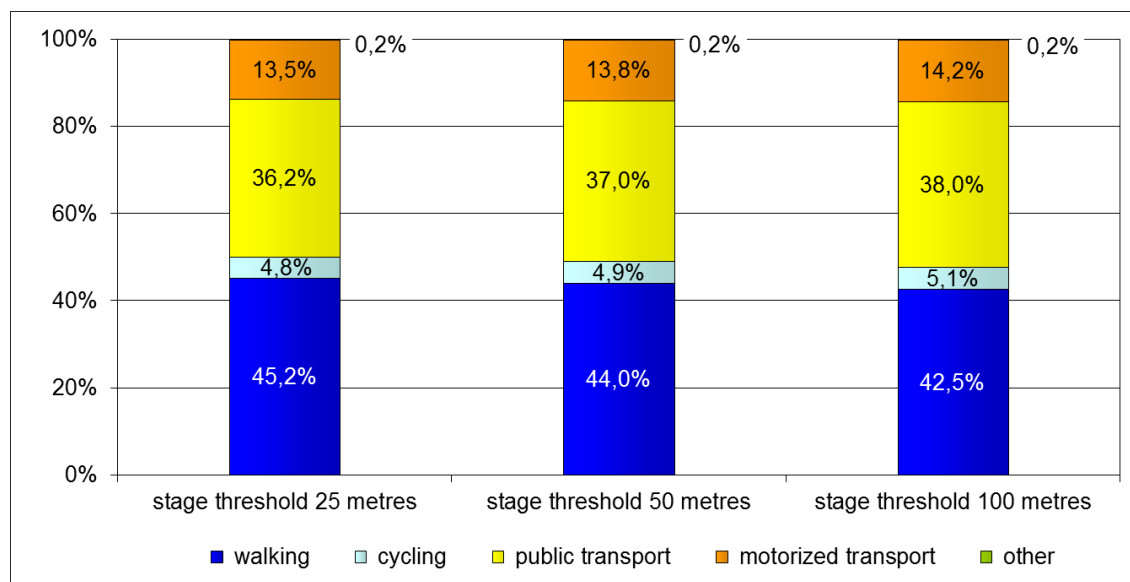
Standard level: No limits of time or distance to be applied while collecting the data. All walking which takes place in publicly accessible spaces should be included. For the presentation of the data, a 50 meter threshold is recommended (preferably actual distance, or if not available, crow-fly distance) as most travel surveys have some limits regarding stage distance. When data is, for example, collected for stages of 25 metres or more, this data can be recalculated with a threshold of 50 metres instead. 50 yards is acceptable for countries using the Imperial system.

Elaborate level: Same as standard level. Show the data for all trips without limits. Furthermore distinguish for distances above as well as for below 50 metres.

⁵ It is, for example, not always clear if a walk from and to the car park in a shopping mall or the movements in a train station are included. These stages may be a few hundred metres long.

Table 13 Summary for issue 7: Threshold: Minimum and/or maximum length of stage or trip?

	Data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	According to survey in use (if possible transform data to estimate distances between threshold and 50m)	According to survey in use or transformed data
<u>Standard level</u>	No limits to stage or trip length All stages except those on fully private ground or business premises	Minimum threshold of 50 metres (or yards)
<u>Elaborate level</u>	Same as standard level	- below 50 metres - all trips without limits

Example(s):**Figure 10:** Effects on mode share depending on the minimal threshold for stages – 25, 50 or 100 metres Example of Swiss national data (minimal stage threshold is 25 metres in Switzerland)

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3.5 Trip purposes (Issue 8): All purposes or commuting only?

At the destination of each trip lies an activity. This activity determines the purpose of the trip. In some instances the trip is itself an activity i.e. the purpose, for example when someone takes a leisure walk.

Most national travel surveys cover all trip purposes. However, there are still state or city travel surveys that capture only work trips (commuting). This is also true for most population censuses (e.g. in the UK, Portugal or in the US with the American Community Survey ACS). But the journey to work is too limited to address most of the policy issues surrounding walking, accounting for a small and declining number of trips in the western world. The New South Wales travel survey, for example, shows only 9% of trips, and 13% of distance being commute purpose. Walking has a particularly low share in commuting trips, so limiting the data collection to commute trips underestimates not only the general mobility of the population but also the share of walking.

A further question is whether collecting data should be limited to functional trips or also include trips for their own sake such as walking the dog or walking for health. These recreational trips could potentially distort the picture since some of them, like hiking trips, may be quite long. However, in times when leisure and health are becoming more important issues, transport data collection needs to include those non-utility trips as well if it is to be of use to the public health domain. Furthermore, non-utility trips are also included for other means of transport, e.g. when someone goes for a drive on Sunday by car or bicycle. Lastly, it is sometimes difficult to draw the line between activities: when is a trip functional and when is it something just for its own sake? Ultimately all human activity has a purpose, and walking is no exception. In the British National Travel Survey there is a journey purpose category called “just walk”, which seems an adequate response to the question.

This has to do with a specific characteristic of walking where one can combine different purposes on the same trip – e.g. integrate shopping into a leisure or health walk. These multipurpose characteristic may pose a problem when collecting data. It is recommended that only one purpose per trip is recorded based on what the person interviewed mentions as most important purpose. This is also true when it comes to distinguishing between different purposes. For some, shopping may be more leisure than actual shopping.

Another problem is to capture all the sub-activities between main activities, e.g. buying a coffee or newspaper on the way to work, or giving kids a ride while the person is on her/his way to another activity, or visiting several shops during a leisure/shopping outing. Ideally, all those sub-activities would need to be captured but in reality and for practical reasons, this is not done. One possibility to deal with this issue is to adopt the approach taken in the National Travel Survey NTS in the UK: “In order to reduce the burden on respondents, travel involving a number of stops for the same main purpose and using the same form of transport are treated as one continuous series of calls trip from the first such call to the last one. Only shopping and ‘in course of work’ travel can be treated in this way. A doctor’s round would therefore consist of one trip to the first patient, one series of calls trip to the other patients and one trip from the last call back to the surgery or home. In general, series of calls trips are excluded from published tables.” (Department for Transport 2014c, p.9). For the Standard it is recommended to include the main purpose of the trip. Trivial subsidiary purposes (e.g. a stop to buy a newspaper) are disregarded.

There is no meaningful general definition and distinction between purposes to be made since they differ also according to cultural or sub-cultural context. According to the SHANTI report, “(...) trip purposes can be ambiguous and might be interpreted differently in different cultural contexts. Comparability of trip purpose information is therefore more difficult than mode information.” (Armoogum ed. 2014, p 70/71) The report suggests providing a sufficient number of purpose categories and adding descriptions to facilitate allocation of responses to the relevant categories (Armoogum ed. 2014, p 70).

Usually the following pre-defined main categories are used for trip purposes:

- Travel to usual place of work or education
- Business (travel for work purpose)
- Leisure
- Shopping and personal business
- Escorting
- Other

Not included here are play activities of children and adults. Although children can be quite mobile when they play (e.g. with their bikes or on foot), their activities are very difficult to capture. It is recommended to find out more about this kind of activity in a separate survey. Similarly, when adults are active on other forms of equipment, such as in-line skates or scooters, they should be captured and presented separately from walking trips. The recent proliferation of motorised “mini self balancing” scooter-like devices makes this all the more important.

Escorting is a distinct category in which the accompanied person’s purpose should be elicited because it determines the destination (see also SHANTI report, Armoogum ed. 2014, p 70).

Also, the trip back home should be identified separately as a purpose when collecting the data. In most travel surveys, the trip purpose “return home” is later re-categorized to either (1) the last purpose before going home or (2) to the purpose where the person spent most of the time or (3) the main purpose of the outing (e.g. work). In order to simplify the task, it is recommended not to standardise this categorization as likely the differences are small.

Recommendations:

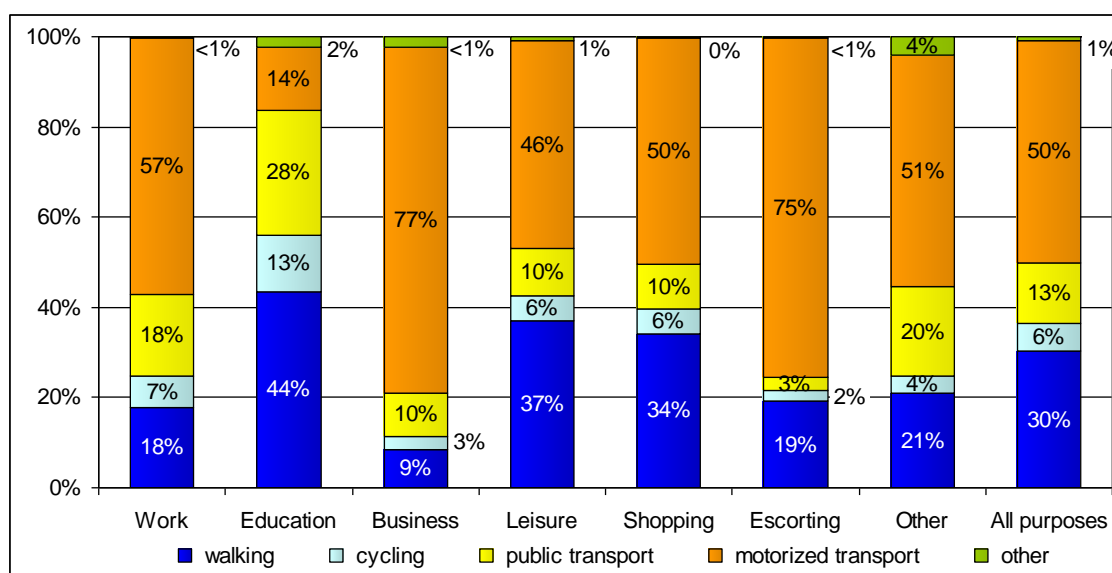
Minimal level: If only work (and education) trips are collected and presented, it should be mentioned specifically. Also, an estimate of the share of this purpose should be given, if possible. It is assumed that in areas where walk to work levels are high, there are likely to be also higher levels of walking for other purposes.

Standard level: All trip purposes to be included, not just commuting to work trips. Generally, the following purposes should be captured: “work”, “education”; “work-related travel (business)”, “leisure”; “shopping and personal business”; “escorting” and “other”. In multipurpose trips the most important purpose should be chosen based in the response by the interviewed person. Since there are large differences between cultures, it is important to provide a sufficient number of purpose categories and adding descriptions to facilitate allocation of responses to the relevant categories. Not included as (own) categories are play activities of children and adults. A trip back home is separately identified and then assigned to either (1) the last purpose before going home or (2) to the purpose where the person spent most of the time at or (3) the main purpose of the outing (e.g. work).

Elaborate level: The data should be collected as on the standard level, but ideally is presented for each purpose separately. Then, for example, data on work trips can be compared with travel surveys that only capture that purpose. Additionally, travel behaviour during play activities, particularly of children, could be collected separately

Table 14 Summary for issue 8: Trip purposes: All purposes or commuting only

	Data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	According to survey in use	Mention trip purposes collected, estimate their share of all purposes
<u>Standard level</u>	All trip purposes	All trip purposes
<u>Elaborate level</u>	Same as standard level plus in a separate study: travel behaviour during play activity, particularly of children	<ul style="list-style-type: none"> - work - education - business - leisure - shopping and personal business - escorting - other - travel behaviour during play activities, particularly of children

Example(s):**Figure 11:** Mode share according to trip purpose – showing large differences between the modes depending on the purpose (National data in Switzerland)

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.3.6 Participation (Issue 9): Whole population and/or mobile persons?

Not everyone leaves the house to pursue an activity somewhere else. Usually between 10% and 15% of the population stay at home on a weekday (see Madre et al. 2004), more on the weekends. The reasons for this are numerous and not easy to categorise because objective and subjective reasons are intertwined: illness (own or needing to care for someone else), no reason to leave home, person does not feel like going out, weather etc. In some cases a larger number of immobile persons can be also due to the data collection process. It is known that people who do not lead very mobile lifestyles or people with no or limited mobility may not feel as responsive to a travel survey as others. Similarly, the most busy people in society may be less likely to respond as well.

When we measure daily mobility – in terms of number of stages, trips or time and distance – we usually take the average of the whole population. This means that those not being mobile on the survey day are included as well, but their stages, trips, minutes and metres are 0 (zero). If only those who were/are mobile on the survey day are taken into the equation, the average number of stages, trips, travel time and distance, of course, increases.

Furthermore, not everyone who leaves the house also walks. Some people jump on their bicycle or into their car right in front of their doorstep or in the underground garage. And they park their vehicle again right at the front door of their destination. Again the average distance walked or time spent walking is higher when we only take those with at least one walking stage on the survey day compared to the average of the whole population.

In order to get the full picture of the people's mobility patterns it is recommended to give the share of people who made at least one walking stage on the survey day (participation rate) as well as give the average number of walking stages, trips, walking time and distance for the whole population. The elaborate level should additionally include the number of walking stages, trips, walking time and distance of those having been mobile on the survey day.

Recommendations:

Minimal level: Same as standard level, if available

Standard level: it is recommended to measure the share of people who made at least one walking stage on the survey day (participation rate) and give the average number of walking stages, trips, walking time and distance for the whole population.

Elaborate level: Same as standard level but additionally include the number of walking stages, trips, walking time and distance of those having been mobile on the survey day.

Table 15 Summary for issue 9: Participation: whole population and/or mobile persons?

	Data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	Same as in standard level	Same as in standard level
<u>Standard level</u>	All respondents including those without a (walking) trip stage on the survey day	<ul style="list-style-type: none"> - Share of population with at least one walking stage on the survey day; - Average number of walking stages, trips, walking time and distance of total population
<u>Elaborate level</u>	Same as in standard level; plus calculate both the average of total population and of mobile persons	<ul style="list-style-type: none"> - Share of population with at least one walking stage on the survey day; - Average number of walking stages, trips, walking time and distance of <ul style="list-style-type: none"> - total population - mobile persons ("participants")

Example(s):

Table 16 Daily walking trips (all the way), walking stages, time and distance walked measured for the total population and for mobile persons only (National data in Switzerland)

	Daily walking trips (all the way) per person	Daily walking stages per person	Daily time walked (mins) per person (based on stages)	Daily distance walked (kms) per person (based on stages)	<i>N (persons)</i>	
Total population	1.0	2.3	31.4	2.03	62,868	Standard level
Mobile persons *	2.4	3.7	51.1	3.31	38,471 ** 28,037 ***	Elaborate level

* People who walked at least one stage on the survey day; ** N persons based on stages; *** N persons based on trips

Data source: Federal Statistical Office (FSO) and Federal Office for Spatial Development (ARE): Microcensus mobility and traffic 2010

3.4 General methodological issues in travel surveys

Collecting data on daily mobility in a representative, reliable and valid manner is one of the big challenges in travel surveys. Since these problems are of a more general nature and not only affect walking, they are treated here separately.

Three main issues are dealt with here:

Issue 10 Survey methods and design: challenges, systematic and/or random errors? (chapter 3.4.1)

Issue 11: Reporting period: One-day or multi-day mobility surveys and panels? (chapter 3.4.2)

Issue 12: Statistical unit: Survey one person or everyone in household? (chapter 3.4.3)

The issues are described again in the following sections with the conclusion in the form of recommendations.

3.4.1 Survey methods and design (Issue 10): challenges, systematic and/or random errors?

Among the reasons for the challenges to the collection of mobility data are the increasing difficulties agencies face in reaching sampled respondents (traditionally by phone or letter). The range of communication media continues to widen in the age of mobile-phones and the internet. As a result people are required to filter/process an ever increasing volume of information and don't have the time and patience to report in detail about their stages and trips made. They are also often sceptical about surveys and/or concerned about data protection issues.

It has been shown many times that the methodological issues have a substantial influence on the outcome of the survey. This is why the methods and designs have to be developed so carefully. The response rate, for example, is a good indicator for the quality of a survey. Surveys with low response rates have shown that those people responding to a survey differ substantially from those people not responding, particularly regarding number of trips, trip purpose and mode choice.

There is a vast literature about survey methods and design. The chosen method and design affect the outcome substantially. Even more decisive is the quality of the data collection process. It affects a whole range of issues and is very susceptible to systematic errors. A few examples of these will be described further below.

The quality of the data collection process is absolutely crucial to achieving a good response rate and, thus, good results. No matter which methods or method combinations are used – be it face-to-face interviews, telephone or postal surveys or new forms such as e-mail and web surveys or the use of additional tracking technologies (e.g. GPS)⁶ – some things are crucial to observe (see also figure at the end of this sub-chapter):

⁶ The methods have each their advantages and shortcomings as described, for example, in the SHANTI report (see Armoogum ed. 2014, p. 35ff). In practice, the methods are often used in combination and supported by computer technology, e.g. in the form of CATI (computer-assisted telephone interviews), CAPI (computer-assisted personal interviews) or CAWI (computer-assisted web interviews). See also the annex of this report for an overview of the national surveys in Europe.

The use of GPS or mobile data to measure walking activity is not at a stage of development that could enable the walking component of the mode split to be determined. Nor is this likely in the near future. It is a subject for monitoring, while recognising that such technology might help to reveal a wider range of aspects of activity on foot. However, the purpose of the International Standard is to get good baseline data on trip making and mode split that are comparable, and the GPS/mobile data do not contribute to this goal. (see also Armoogum ed. 2014, p. 43 ff and Broeg et al. 2009, p. 20ff).

- Concept and design: The concept and every question has to be clear and based on the needs and abilities of the respondents in order that they understand the questionnaire. This requires that the questionnaire is tested thoroughly before hand. As a rule of thumb, Broeg states that the response rate increases when people are interested in the topic and the survey design makes it easy for the respondents to participate (Broeg 2015, p. 11).
- First contact: People have to be pre-notified about the survey with a written letter and statement. Ideally, participants should be free to choose between different options to respond, e.g. by using the postal survey, the phone-only or web-based survey, all of them with active support and validation back-up. Broeg mentions that people most often still opt for the “self-administered, mail-back questionnaire, coupled with motivation by post and telephone to encourage high response rates (typically between 60% and 80%)” (Broeg et al. 2009, p.1).
- Motivation during the process: There should be a continued supervision during the survey with calls to support people and remind those whose responses are due to send them in. When using a written-postal-survey, “the telephone is not used for questioning, rather for motivation. Only if information cannot be obtained any other way is questioning carried out by telephone.” (Broeg 2006, p.6)
- Quality control during data collection or shortly after: Coding and validating the data is an important step as it is one of the few possibilities to check the data. The validation of the data comprises corrections of the non-response effect and non-reported trips, a socio-demographic weighting and correction of seasonal effects. “The validation should always check two (non-response) effects: the effect resulting from the fact that not all persons in a sample participate in the survey, and that resulting from the fact that the persons responding don't give complete answers (e.g. they don't record all of their activities/trips in the diary).” (Broeg 2006, p.4/5)

In the New KONTIV[®] Design, an exploratory telephone call is made on the arrival day of the written questionnaire (Broeg 2006, p.8). Besides checking the plausibility of the responses and having the chance to ask back, people can be asked about attitudes, experiences and expectations which in turn help to interpret and explain the results.

- Documentation: Documentation of the survey process is crucial in order to make transparent the steps that have been carried out and which methods have been used. Documentation is particularly important when data is being compared, e.g. in benchmarking, as is the case for the International Standard. The following items should always be mentioned together with the data:
 - Survey method and design; data collection method, sample size, response rates etc.
 - Reporting period: one day or multi-day survey or panel
 - Statistical unit: one person or everyone in household surveyed
 - Population included in the sample: residents, non-residents
 - Age: minimal and maximum age, proxy interviews
 - Survey days: days of the week and periods of the year
 - Perimeter: all trips or only those within the city
 - Unit of travel: Stages or trips “main mode” as basis
 - Duration and length: Time and distance based on routing (GIS) or self-declaration
 - Threshold: Minimum length of stage or trip
 - Trip purposes: which ones are included
 - Participation: whole population and/or mobile persons

Systematic and/or random errors

A careful design and data collection process will help to avoid systematic errors. As Broeg points out: “There are always two types of errors to be considered in empirical studies: random errors (sampling-related) and systematic errors (design related). (...) In practice, the error due to systematic factors (e.g. response rate) can be many times larger than sampling error. (...) The real problem of these two types of errors is that random errors can be calculated exactly, but not corrected, whereas systematic errors can be corrected through survey design changes but cannot be precisely calculated.” (Broeg 2006, P.14) Two items need particular attention since they affect the validity and reliability of a survey and result in distortions, particularly regarding the non-response rate and the non-reported trips.

- **Non-response rate:** Low response rates affect the number and share of immobile persons, the number of trips and their characteristics (distance, time, purpose). Broeg mentions that a response rate of 55% and above gives a fairly stable picture in terms of the mobility patterns. With rates below that often the bias and systematic error is much larger than the confidence interval.
- **Non-reported trips:** Non-reported items and in particular non-reported trips usually affect the mode of walking in some way or other. Walking stages and trips are most likely to be forgotten because they are usually short and so common. Non-reported trips are largely independent of the response rate. The assumption that late responders have particularly large numbers of non-reported trips is not true. “In principle, non-reported trips have a similar proportion, irrespective of the response rate.” (Broeg et al. 2009, p. 16)

Recommendations:

For all levels: describe chosen data collection method (e.g. phone interviews, CATI), achieved response rates, how the rate of the non-reported trips was controlled.

Table 17 Summary for issue 11: Survey methods and design: challenges, systematic and/or random errors?

	Data collection	Data reporting (analysis & presentation)
<u>All levels</u>	---	Describe and document all relevant elements of the survey

Example(s):

No examples available

3.4.2 Reporting period (Issue 11): One-day or multi-day mobility, panels?

According to the SHANTI report, “the most common travel survey format is the cross-sectional one-day travel survey” (see also data in the annex 2). But there is increasing interest “in surveys with a) longer reporting periods (multi-day surveys) and b) repeated participation (panel surveys). (...) Multi-day surveys capture information about behavioural variability of travellers over multiple days. (...) Panel surveys with repeated participation enable the analysis of the development of individual travel behaviour over time, e.g. over several years. Due to the strong day-to-day variability of travel behaviour, panel surveys only make sense if the reporting period during single waves covers multiple days.” (Armoogum ed. 2014, p. 65).

For the purpose intended here, it is recommended to focus on the one-day survey. Aggregate data of a multi-day survey may be used as well but caution needs to be applied. This is due to the fact that multi-day surveys pose a higher burden on the respondents and can be biased due to fatigue, and selectivity, e.g. when respondents with low or very high mobility drop out. This can affect the mode of walking substantially.

For all survey types data over different days of the week has to be collected in order to ensure that each week day is represented, or at least some weekdays and some weekend days (see issue 3, chapter 3.2.3)

Panel surveys with repeated rounds of interviews in longer intervals (“waves”) suffer from similar problems. They almost always have difficulty with response rates because e.g. some people drop out or their life circumstances change (see Broeg. 2009, p.16ff and Broeg 2012). Panel surveys are useful to analyse changes over the course of a certain life period but not to achieve reliable mobility data.

Some European countries ask for the travel behaviour of the day before the contact and some ask for a pre-defined day. A third group includes questions on the previous weekend (e.g. France and Italy, see annex for details 2). This poses some questions regarding the ability of respondents to accurately recall their daily activities. The same applies to questions about the mobility of a pre-defined day if that lies further back. Fatigue effects may also appear in surveys which last for a week as in the British NTS or the German MOP survey.

Recommendations:

Minimal level: Data of multi-day surveys may be included if possible shortcomings due to low response rates or fatigue effects are made transparent, particularly when there is reason to believe that walking patterns are affected.

Standard level: Use data from one-day travel surveys in which respondents report preferably about their travel behaviour on the previous day. Multi-day surveys may be included if particular effects such as fatigue are controlled for. Panel survey data should not be used. Data from all days of the week needs to be included in the sample.

Elaborate level: Provided there is good data quality, the comparison between one-day mobility and multi-day mobility (patterns) could be interesting.

Table 18 Summary for issue 11: Reporting period: One-day or multi-day surveys for daily mobility?

	Data collection	Data reporting (analysis & presentation)
Minimal level	Multi-day surveys or one-day mobility for pre-determined day	Mention the special data collection and describe possible shortcomings.
Standard level	One-day mobility, preferably captured on the “previous day”, or multi-day surveys if side effects are controlled. The survey sample must cover every day of the week.	Present single day if multi-day survey has been done and show average of all days of the week.
Elaborate level	Same as standard level plus capture info about regular mobility patterns	Data for one-day mobility compared to regular travel patterns.

Example(s):

In 2014, the UK Department for Transport consulted users of its travel data on issues relating to the collection on short walks in the National Travel Survey (NTS).

The NTS survey uses a 7-day travel diary methodology leading to some fatigue effects that are controlled for. The Department for Transport stated that “by the end of the travel week, the NTS is subject to under-reporting such that the average number of trips recorded on day 7 is approximately 10% lower than on day 1. Appropriate weights are produced and applied to the travel data to reduce any biases from the under-reporting of trips during the course of the travel week” (Department for Transport, 2014a).

The under-reporting issue is more pertinent for walking since the NTS methodology uses a minimum walking distance of 1 mile for the first six days of the travel diary. On day 7 respondents are asked to additionally record all short walks, defined as walking trip stages of 50 yards or more. In order to understand the potential for under-reporting, the DfT conducted an experiment with the NTS data collection in the 2nd quarter of 2013, where a controlled sample of respondents were asked to report on the short walks (between 50 yards and 1 mile) on day 1 instead of day 7.

The findings show a consistent under-reporting of short walk trips on day 7 as opposed to day 1. The study also concludes “that the difference in reporting is at the person level. If someone reports short walks at all, they don’t forget individual short walks at a different rate to those reporting on day 1. The issue is that a larger proportion of people fail to report any short walks if collected on day 7.” The under-reporting is greater for walk-only trips rather than trip stages, and for adults rather than children.

Table 19 Percentage of respondents reporting a short walk on day 1 or day 7 of a 7-day travel survey (NTS, 2013)

	Day 1	Day 7
All people	30.8%	22.8%
All adults aged 16+	29.1%	20.3%
Children aged 0-15	36.8%	32.7%
Short walk-only trip	22.4%	14.4%
Short walking trip stage as part of multi-stage trip	8.6%	7.5%

Table 20 Average number of short walks per person on day 1 or day 7 of a 7-day travel survey (NTS, 2013)

	Day 1	Day 7
All people	0.77	0.58
All adults aged 16+	0.75	0.54
Children aged 0-15	0.82	0.74
Short walk-only trip	0.54	0.34
Short walking trip stage as part of multi-stage trip	0.21	0.20

Following the consultation, the Department for Transport issued a response stating their intention to maintain the current data collection methodology for the sake of consistency and to conduct additional research before publishing a further review of the methodology (Department for Transport, 2014b).

3.4.3 Statistical unit (Issue 12): Survey one person or everyone in household?

How many persons should be interviewed in a household? Should it be just one or everyone living there? The approaches to this question differ substantially between countries (see data in annex 1). In some national travel surveys everyone in the household is interviewed, for example in the UK, in other countries (e.g. Switzerland) it is only one or two persons per household.

Each solution has its advantages and disadvantages. Surveying all members in a household can take a lot of time and bears the risk that not all members can or will fill in the questionnaire due to temporary absence or because they don't want to participate. Interviews with all members of a household, on the other hand, enable analysis of the interaction between their mobility patterns. And particularly small children and young people can be more easily contacted in a full household survey. Alternatively, an individual based survey allows for a more representative sample which may mean that it is easier to weigh the responses.

In principal, it doesn't matter which option is chosen as long as the sample is randomized for households and the population as a whole. It could also be decided that only in households with children everyone is surveyed while in other households only one person is interviewed.

Generally people in hospitals and institutions (homes for seniors, psychiatric care institutions or prisons), are not included in the survey which may lead to some distortions e.g. when it comes to the share of people with walking disabilities. In the time of ageing populations we are interested in their physical activity levels. At the same time [the definitions of institutions offering care is becoming more fluid with intermediate examples of sheltered housing and private developments with varying levels of care services attached.](#)

It is sometimes also debated if and how seasonal residents, seasonal workers and university students should be included in a survey since they do not live in the same place all the time.

The Standard recommends to include everyone living at an address at the time of contact and have their travel recorded, provided these people have a chance to leave the institution. [Tourists in hotel are not included since they are not residents. For a student this means that he/she would be interviewed when living in a student residence during term time about his travels there and when living at home during semester holidays about his/her mobility there.](#)

Recommendations:

Minimal level: Same as standard level

Standard level: it is recommended to choose the type of survey in which it is most easy to achieve a representative sample of the population. Generally interviewing individuals may give the best results in terms of response rates.

Elaborate level: Same as standard level. If children are difficult to reach, then surveying everyone in the household where there are children may be an option.

Table 21 Summary for issue 12: Statistical unit: Survey one person or everyone in household?

	Data collection	Data reporting (analysis & presentation)
<u>Minimal level</u>	Same as in standard level	Same as in standard level
<u>Standard level</u>	Both options are possible: one person or everyone in the household as long as the sample is representative	Make it clear which option was chosen if there are doubts about the response rates or representativeness
<u>Elaborate level</u>	Same as in standard level; if children are difficult to reach, then surveying everyone in the household where there are children	Same as in standard level

3.5 Special challenge: Travel surveys on regional and city level

In many countries data about mode share is available on the national level and usually for the biggest cities. The methods, however, often differ between countries and sometimes even within the national framework. One of the biggest challenges is to collect data on the regional and local level, particularly for smaller and medium sized cities⁷. They need a good database for their investment decisions in transport but often lack the data. Among the reasons for this situation are:

- National surveys have too small a sample for regional/local use
- Regional surveys vary a great deal; e.g. re terminology, methods etc.
- If data is collected, the focus is usually on cars
- Lack of expertise, capacity and high costs are biggest obstacles
- Lack of sensitivity about the importance of data collection
- No cost-benefit analysis and thus, lack of willingness to spend some money
- Comprehensiveness and precision vs. cost

What is needed, thus, is an approach from many different sides.

Demonstrating the benefits of mobility survey data: the most important measure is probably to advocate for the benefits of travel surveys, e.g. by describing why it's important or useful to have travel surveys on regional and local levels. In particular it should be pointed out that data driven decision making may save a lot of money in the end. If investments are based on reliable data and not assumptions, it may show that mobility can be provided with much less money, e.g. when the mode share of walking (and cycling) can be increased with much less money instead of building new expensive roads. Generally it has to be communicated clearly that it is worth spending the money for the travel survey in order to make informed decisions.

Joining forces, add-ins to other surveys: In many countries surveys on the national level already exist. Maybe the municipality can join the national level e.g. by increasing the sample size for the region or city. The region of Canterbury around Christchurch in New Zealand has, as an example, funded an additional sample of the New Zealand Household Travel Survey, see <http://www.transport.govt.nz/research/travelsurvey/travelsurvey-method/>.

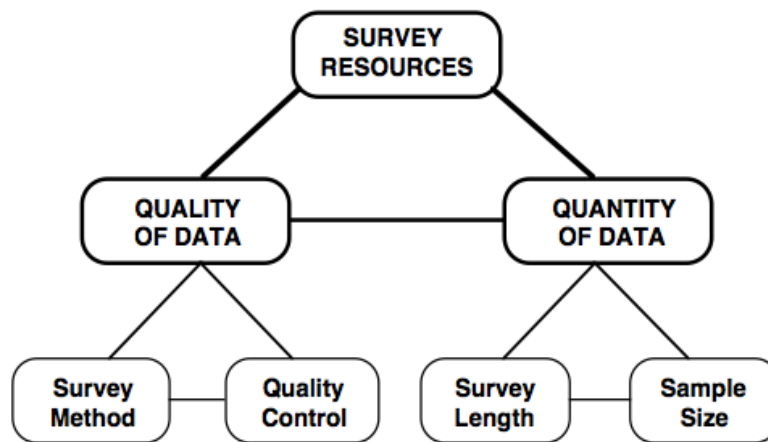
Possible synergies can also be achieved by joining forces, e.g. with health surveys or other regular or single data collections in the area. Or by doing surveys jointly in several cities of an area (province, state, conurbation etc.).

⁷ There are a few exceptions: Socialdata, for example, has collected data in many cities all over the world with the same methodology. Some European, North American and Australian and New Zealand cities are collecting their own data as well. However, the methods differ widely. In Europe, EPOMM, the European Platform for Mobility Management, provides some city data for comparisons. But even within the same city, the data sources differ substantially. For example, the city of Zurich data for 2001 and 2005 is provided. In 2001, according to the website, mode share for walking was at 23%, four years later, it was at 35%. In turn the share of motorized transport was reduced from 43% to 30%. It is clear, that this huge change is not a real one but one of different data collection methodology. Thus, the two surveys measure something quite different – but which data is closer to reality? (EPOMM website accessed 5 October 2015: <http://www.epomm.eu/tems/index.phtml>).

Using alternatives: In the short-term there are a number of alternatives available that may not give as good a picture as a travel survey but may provide some first insights. Among these alternatives are e.g. traffic counts and here of particular interest, counts of pedestrians in 'representative' spots in town⁸. A proven method is also a hands-up survey in schools where school children tell how they got to school on that particular morning or on a regular basis⁹.

Inspiring experts to develop new tools: While the above mentioned approaches may be useful as a first step, it would be desirable to eventually create a travel survey plan that is scalable so that it can be used in smaller as well as mid-sized cities and in regions, all being based on the same methodology, being cost-effective and without a huge burden on the respondents. National innovation centers and universities world-wide are invited to develop such a travel survey methodology and tool.

Figure 12: Trade-offs in selection of the survey method with particular relevance on the regional and local level¹⁰



(Source: Richardson, Ampt & Meyburg 1995)

⁸ There are new apps available in the meantime to make counting easier while professional supervision guarantees a high quality. See e.g. the app Counterpoint: <http://counterpointapp.org>.

⁹ Surveys like that are done regularly in Scotland, for example, see <http://www.sustrans.org.uk/scotland/what-we-do/schools-and-universities/hands-scotland>.

¹⁰ Richardson, A. J., Ampt, E. S., & Meyburg, A. H. (1995). Survey Methods for Transport Planning. Melbourne, Eucalyptus Press, University of Melbourne, Parkville.

4 Key performance indicators

The following five key performance indicators and sub-indicators were identified during the debates as being particularly relevant for walking.

- 1 Share of people who have made at least one walking stage on the survey day
- 2 Average number of daily walking trips per person
- 3 Average daily time walked per person
- 4 Average daily distance walked per person
- 5 Mode share of walking based on stages, main mode, time and distance

The data should be based on the whole population. On the elaborate level the values of the performance indicators 2 to 4 should also be calculated for the mobile persons only i.e. for those who left the house and made at least one walking stage on the survey day.

Table 22 Summary of the key performance indicators – walking

	Key performance indicator	Standard level	Elaborate level
1	Share of people who have made at least one walking stage on the survey day	Whole population	Same as standard level
2	Average number of daily walking trips per person	Whole population	Whole population Mobile persons *
3	Average daily time walked per person	Whole population	Whole population Mobile persons *
4	Average daily distance walked per person	Whole population	Whole population Mobile persons *
5	Mode share of walking based on A stages B main mode C time D distance	Whole population	Same as standard level

* Mobile persons: those who left the house on the survey day and made at least one walking stage

Since data on all modes is usually collected simultaneously, the indicators can be generalized to the following comprehensive list:

- 1 Share of people who have made at least one stage by mode on the survey day
- 2 Average number of daily trips per person by mode
- 3 Average daily travel time per person by mode
- 4 Average daily distance travelled per person by mode
- 5 Mode share of all modes based on
 - a stages
 - b main mode
 - c time
 - d distance

Examples of travel surveys in the UK and their scope

In the UK context at a national level in the UK there are two main sources of information about levels of walking – the National Travel Survey (NTS) and the Census of Population. The NTS is based on travel diaries collected from a large national sample in Britain and is undertaken on an annual basis, going back as far as 1988, with more ad hoc and less regular surveys since the mid-1960s. Its use is intended as a means to establish longer term trends and thus is less useful as a means of understanding more immediate changes. While an immensely useful source of information on travel and having some advantages for the study of walking (for example there is some information on trip stages i.e. walking as part of a longer trip), there are also weaknesses. There is considerable degree of underreporting of very short trips, particularly for walking¹¹. There is no information on routes. Perhaps most importantly it is not possible to break the locational information down beyond the level of Government Office Regions (currently England is split up into 9 such regions), partly due to the sample size, but also as the data on origin and destination of trips is recorded at this level (and hence for walk trips most will start and end in the same GOR).

The Census in the UK has been undertaken nationally every 10 years and involves all households, though the focus of the survey covers all aspects of life, not just transport. From a sample perspective it far exceeds the NTS, though there are other key limitations. Principally, it does not cover walking in any great detail and the main focus is on travel to work. It is, however, possible to get some idea of more local variations in walking from this source, which given the sampling issues, is not really possible from NTS. No information is available on changes which occur in the intervening 10 years between surveys. The Census will be online only from now on.

Some urban areas undertake their own diary based travel surveys as a matter of course. For example, the London Travel Demand Survey (LTDS) is a household based travel survey using a sample of households resident in the Greater London area¹². This provides useful data on the amount of walking done by Londoners, but does not provide information on the amount of walking done in London as no information is collected on the walking done by those who do not live in the area, but who use it (for example the large number of people who commute into the city every day and tourists).

Importantly, none of these sources of information give any hint about suppressed demand for walking, simply they provide a record of some aspects of what actually happens. Nor do these sources provide information on the quality of the environments or the response of those who are doing the walking in those environments. Eventually guidelines should be developed how cities could go about obtaining such information.

More ad hoc surveys of walking are undertaken, particularly by highway and city authorities, often providing a lot of detail, often based on observation and often linked to potential or ongoing work on aspects of the urban environment. Whilst useful and providing a lot of understanding for the specific locations involved there is rarely any systematic organization of such surveys, nor consistency of application across different locations. Again, it is not possible from these to get a feel for how much walking or what type of walking happens in a given city or urban area.

¹¹ See for details: Department for Transport, July 2014: A statistical consultation on the collection of short walk data in the National Travel Survey, London and the response from December 2014: Response to statistical consultation on the collection of short walk data in the National Travel Survey

¹² For more information see Transport for London (2011) Travel in London Supplementary Report: London Travel Demand Survey (LTDS)

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Annex

Annex 1: Overview about National Travel Surveys in Europe

The Shanti report has assembled information about National Travel surveys in European countries. The figure below gives an overview.

Table 23 National Travel Surveys NTS in European countries

Country	Survey
Austria	Mobilitätserhebung österreichischer Haushalte (MÖH); Mobility Survey of Austrian Households
Belgium	BELDAM NTS Belgian Daily Mobility
Denmark	Transportvaneundersøgelsen (TU); Transport Behaviour Survey
Finland	Henkilöliikennetutkimus (HLT); National Travel Survey
France	Enquête Nationale Transports et Déplacements (ENTD); National Survey Transportations and Travel
Germany	Deutsches Mobilitätspanel (MOP); German Mobility Panel Mobilität in Deutschland (MID); Mobility in Germany
Great Britain (since 2013 England only)	National Travel Survey (NTS)
Israel	National Travel Habits Survey (NTHS)
Italy	Osservatorio sui comportamenti di mobilità degli italiani (AUDIMOB) (<i>Italian mobility behaviours Observatory</i>)
Latvia	Ledzīvotāju pārvietošanās apsekojums 2003.g.; Passenger mobility survey
Netherlands	Onderzoek Verplaatsingen in Nederland (OVIN); Movement Research in the Netherlands
Norway	Nasjonale Reisevaneundersøkelsen (RVU); National Travel Survey
Spain	MOVILIA Mobility Survey
Sweden	The National Swedish Travel Survey
Switzerland	Mikrozensus Verkehr; Microcensus Traffic

Source: SHANTI report (Armoogum ed. 2014, p 22)

For each of the European surveys additional information was collected about the most recent years of data collection, the survey mode and method and the response rates of individuals.

Table 24 Survey methods of NTS in European Countries (Appendix A in SHANTI, p.159ff)

Country	Year	Survey mode	Computer-aided interview	Contact before survey	Response rate individuals having described their mobility / individuals in the scope
Austria	1995	Postal delivery and personal collection of questionnaire	No		77%
Belgium	1999	Postal self administered + phone call reminder	CATI for phone call	Official letter before survey	33%
	2009	Postal self administered + phone call reminder - Sub-sample face to face	CATI for phone call	Official letter before survey	
Denmark	Before 2003	Telephone survey	CATI	Official letter before survey	67%
	From 2006	Web + Telephone survey	CAWI/CATI, same questionnaire for both	Official letter before survey	62%
Finland	2004-05	Telephone interview	CATI	Official letter with simplified trip diary form before survey	67%
	2010-11	Telephone interview	CATI	Official letter with simplified trip diary form before survey	56%
France	1993-94	2 visits, face-to-face + self administered vehicle diary	No	Official letter before survey	82%
	2007-08	2 visits, face-to-face + self administered vehicle diary (GPS possible)	CAPI	Official letter before survey	78%

Country	Year	Survey mode	Computer-aided interview	Contact before survey	Response rate individuals having described their mobility / individuals in the scope
Germany	2002 MID	Telephone survey when phone number is available (60%); if not postal survey	CATI for telephone survey	Official letter before survey	42%
	2008 MID	HH level: mainly telephone (~90%), some online (~5%) or written questionnaire (by post (~5%); person/ trip level: only telephone	CAWI option for HH interview (sub-sample); CATI for telephone interviews on HH, person and trip level	Official letter before survey	20,9% (HH level)
Germany	2008 MOP	Phone survey Random Route Dialling (RDD)	Mailed the 7-day paper and pencil diary	First contact by phone	
Italy	2000-09	Telephone interview	CATI		67%
Luxembourg	1995	Self administered by mail	No	Official letter before survey	61%
Netherlands	2004-09	Self administered + phone call motivation/ reminder (when telephone number is available)		Official letter before survey	Around 70%
	2010-..	Mixed-mode: first web-based. Persons who are not able to enter the survey by internet are reproached by telephone (when telephone number is available) or face-to-face	Yes	Official letter before survey	60% expected

Table 25 Survey methods of NTS in European Countries continued
(Appendix A in SHANTI, p.159ff)

Country	Year	Survey mode	Computer-aided interview	Contact before survey	Response rate individuals having described their mobility / individuals in the scope
Spain	2000	Daily mobility and household characteristics: face to face survey Long distance: telephone survey	Daily mobility: CAPI Long distance: CATI	Official letter before survey	70%
	2006	Daily mobility and household characteristics: face to face survey Long distance: telephone survey	Daily mobility: No? Long distance: CATI	Official letter before survey	55%
Sweden	2005	Telephone survey	CATI	Official letter before survey	68%
	2011-2012	Telephone survey	CATI	Official letter before survey	
Great Britain	2009	Face-to-face, 2 visits, self-completion diary	CAPI	Official letter before survey	59%
	2010	Face-to-face, 2 visits, self-completion diary	CAPI	Official letter before survey	60%
Israel	1996/97	Home interview and travel diary for completion by survey respondents	no	Official letter before survey	90% (60% full response + 30% partial response)
	2011	Daily mobility: home interview and activity-travel diary, Long-distance trips: Telephone survey	Yes. Portable computer for home interview, Internet-based travel diary, GPS for trip data	Official letter before survey, survey promotion on the radio and in the newspapers	60%

Country	Year	Survey mode	Computer-aided interview	Contact before survey	Response rate individuals having described their mobility / individuals in the scope
Norway	2005	Telephone	Yes	Letter and telephone	50%
	2009/10	Telephone	Yes	Letter and telephone	46%
Switzerland	2005	Telephone survey	Yes	Official letter before survey	72%
	2010	Telephone survey	Yes	Official letter before survey	

Table 26 Minimum and maximum age of individuals in National Travel Surveys in Europe

Country	Minimum age	Maximum age
Austria	6	None
Belgium	5	None
Denmark	10	84
Finland	6	None
France	6	None
Germany	10 for MOP; None for MID	None
Great Britain	None	None
Israel	8	None
Italy	14	80
Netherlands	No information available	No information available
Norway	13	None
Spain	None	None
Sweden	6	84
Switzerland	6	None

Source: Shanti Wiki; Shanti report (Armoogum 2014, p 33)

Table 27 Stage and trip distance limits in latest National Travel Surveys in Europe

Country	Collection of stages	Distance limit for trip
Austria	Information not available	Information not available
Belgium	Yes	No
Denmark	Yes	Walk stages < 50 m excluded if linked to other modes
Finland	Yes	No
France	No, but multiple modes are identified	No
Germany	No, but multiple modes are identified	No
Great Britain	Yes	Walk trips > 50 yards and <1 mile only on day 7
Israel	Yes	> 100 metres
Italy	No	> 5 min for walk trips; trips > 20 km are not included
Netherlands	Yes	No
Norway	No, but all transport modes are recorded	No
Spain	Yes (daily mobility)	Daily mobility > 5 min for walk trips
Sweden	Yes	No
Switzerland	Yes	> 25 metres (for a stage)

Source: Excerpt of table 2.7 in SHANTI report (Armoogum ed. 2014, p 48)

Table 28 Statistical Unit of NTS in European countries

Country	Year	Statistical unit	All household members?
Belgium	2009	Household	All household members
Denmark	From 2006	Persons	1 individual
Finland	2010-11	Individual	Sampled individual
France	2007-08	Household	1 individual
Germany (MiD)	2002, 2008	Individuals aged 14 years and older	All household members (from 0 upwards)
Great Britain	2009	Household	All household members
Israel	2011	Household	All household members age 8 and above that spend at least three nights in the apartment
Italy	2000-09	Persons	1 individual
Netherlands	2010-...	Persons	1 individual, who also has to fill in the questions about characteristics of his/her household
Norway	2009/10	Individuals of 13 years old and more	Only sampled individuals
Spain	2006	Household	Individual
Sweden	2011-2012	Individual	Only selected individual
Switzerland	2010	Household	Selected individual(s)

Source: SHANTI report (Armoogum ed. 2014, p 163, appendix B)

Table 29 Type of questionnaire of daily mobility in the last NTS of European countries

Country	Type of questionnaires in daily mobility
Austria	No information available
Belgium	Diary for a pre-defined day
Denmark	Trip of the day before. The survey day is predefined
Finland	Trips of a specific predefined day. Telephone interview with memory jogger, a simplified trip diary form sent in advance
France	Trips of the day before and of the last weekend day by memory
Germany	MID: CATI based on memory jogger; MOP: paper and pencil trip diary for 7 days a week
Great Britain	7-day diary previous to the first visit + face-to-face questionnaire
Israel	Memory jogger for the day before, travel diary + GPS for survey period
Italy	Trips of the day before and of the last week end day by memory
Netherlands	Diary for a pre-defined day
Norway	Trips on a specified day
Spain	Week day before + 1 weekend day by memory
Sweden	Memory collection with memory jogger sent in advance
Switzerland	Stage diary

Source: SHANTI report (Armoogum ed. 2014, p 45)

Annex 2: Background and process of developing the Walking Data Standard

The work “towards internationally standardized monitoring methods of walking and public space” was initiated within two settings:

- Walk21, the international conference series on Walking and Liveable Communities
- European COST Action 358 on Pedestrians’ Quality Needs

The effort in both settings started with the frustrating experience that data on walking was either non-existent or not comparable, that methodologies and tools were missing and above all, that this produced misleading information about walking. The encouraging side was that the interest and need to know more about measuring walking was rising, that attitudes were changing and new evaluation methods and techniques were being developed, thus, creating a window of opportunity.

Experts from different countries decided to use this window of opportunity to try to create some minimal international standards. This decision was reflected in the conclusions of the Walk21 conference in Melbourne 2006. Following the adoption of the International Charter for Walking it was concluded that the next step was to aim for “*establishing a set of international guidelines for the collection, analysis and dissemination of quantitative and qualitative techniques for measuring walking.*”

The discussions to establish such a standard were concurrently held within the European COST Action 358 and during pre-conference Workshops at Walk21 conferences. The first such workshop took place in Toronto 2007. The initial idea was also presented at the international conference on Transport Survey Methods in Annecy 2008. Following are some short descriptions of the topics discussed and outcomes achieved.

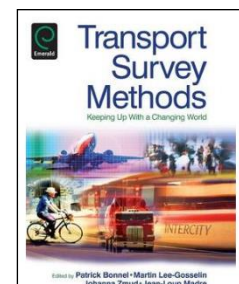
European COST Action 358 on Pedestrians’ Quality Needs PQN, 2006 – 2010

The European COST Action 358 “Pedestrians’ Quality Needs PQN” started in 2006 and aimed to establish innovative policy development and to create a knowledge base for experts, practitioners and advocates. 20 European countries participated in the project which concluded in an international Walk21 conference in The Hague in 2010. One of the reports (B4) was dedicated to Measuring Walking, presenting the results of the research and also some innovative methods (see: www.walkeurope.org)



8th International conference on Transport Survey Methods in Annecy 2008

Some of the first thoughts and results of the work was presented at the 8th International Conference on Transport Survey Methods in Annecy (France) 2008. This provided the opportunity to debate the issues with experts from different backgrounds including survey methodology specialists. The approach was broad and included – besides the travel survey issues – suggestions for pedestrian counts, observations, pedestrian flow models and other topics.



Walk21, international conference series on Walking and Liveable Communities

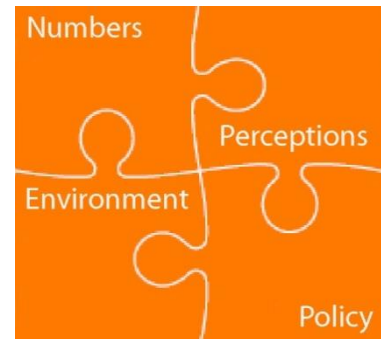
Probably some of the most inspiring discussions happened during the many pre-conference workshops held in conjunction with the Walk21 conference series. Usually between 30 and 70 experts from all over the world and with different backgrounds attended the one-day workshops. The following paragraphs briefly describe the topics and main conclusions reached:

Toronto 2007: Relevant dimensions (part I)

... what and how walking could and should be measured
=> principal agreement on a list of dimensions

Result: main dimensions of Measuring Walking & Sojourning:

- How much?
- What are the qualities?
- What are the perceptions?
- What are the institutional conditions?



Barcelona 2008: Counting pedestrians (part II)

... users & producers of automatic counters exchange experiences
=> building momentum in a crucial area

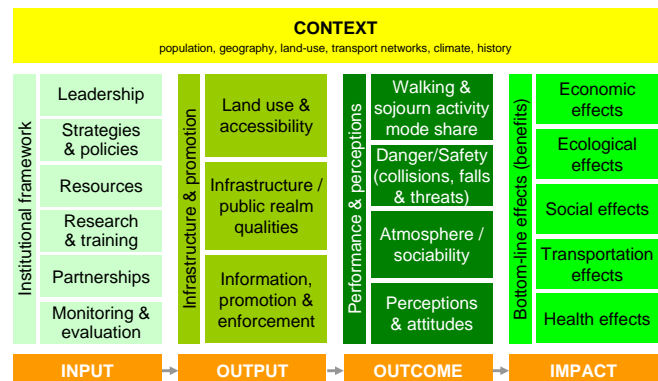
Result: learning from each other: pros and cons of each technology, calibration, influences of weather & other factors, challenges and benefits



New York 2009: Performance indicators (part III)

... assemble relevant indicators to measure walking and public space
=> draft basis of what should be measured

Result: Walk21 Assessment Model for Measuring Walking with Input, Output, Outcome and Impact



The Hague 2010: Data collection methods (part IV)

... discuss adequate methods for pedestrian flows, sojourning & trip data
=> ideas about how things should be measured

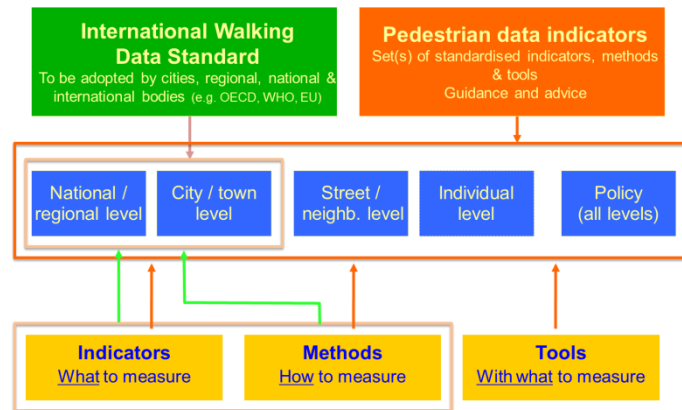
Result (one of many): Presence vs. flow: when presence is measured, the pedestrian/vehicle relationship is reversed



Munich 2013: Indicator Sets & outline of International Walking Data Standard (part V)

...define indicator sets and related methods
=> agreement on outline of International Walking Data Standard

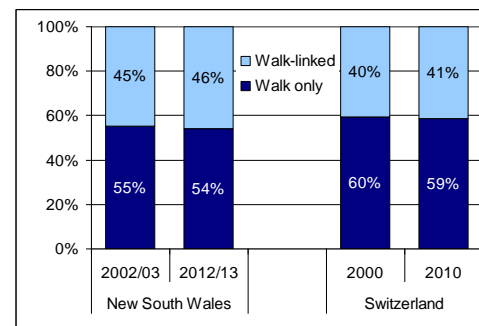
Result: Walking can be measured at a variety of scales based on indicators, methods and tools. The graphic illustrates the scope of the Walking Data Standard as it relates to other pedestrian and walking indicators.



Sydney 2014: How data changes perceptions & outcomes (part VI)

...with a special focus on AUS / NZ context and travel survey standards
=> learning from each other re transport data for health, manual counting, walkability assessments

Result: Importance to capture 'walk only' AND 'walk-linked' trips; comparisons between New South Wales and Switzerland; Data sources: NSW: Grace Corpuz, 2014; CH: BFS/ARE, own calculation



Vienna 2015: Benefits of the travel survey standard (part VII)

...adopt the travel survey standard and work towards its implementation
=> demonstrate what travel surveys can achieve and how data can make a difference

Result: Official launch of the International Walking Data Standard! Debate how the Standard can be implemented.



The presentations of the different workshops are available on this website:
www.measuring-walking.org