Big walkers over non-walking drivers: a walking-related metric for evaluating the success of transportation and public health policies

Walk 21

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Link between lack of daily physical activity and the current global epidemic of overweight, obesity and type 2 diabetes

Increased urbanisation, interest for urban lifestyles & proximity

Data challenges: walking tends to be lumped together with other modes under headings such as mobilité douce, Langsamverkehr…

Humans are genetically designed to walk. Hunter-gatherers walk around 6-12 km/day (Marlowe 2005, Pontzer 2012)

Walking among domestic cows: 7-10 km per day (Rouda et al. 1990, Raizman et al. 2013), wild reindeer up to 16 km per day during summer (Reimers et al. 2013)

Compared with quadrupedal mammals of similar body mass, human walking is economical of metabolic energy, but human running is expensive (Steudel-Numbers 2003, Alexander 2004)
### Swiss transport micro-survey

<table>
<thead>
<tr>
<th>Data</th>
<th>Nombre d’observations</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households / Ménages / Haushalte</td>
<td>59’971</td>
<td>99</td>
</tr>
<tr>
<td>Target people / Personnes-cibles / Zielpersonen</td>
<td>62’868</td>
<td>214</td>
</tr>
<tr>
<td>Home trips / Boucles / Ausgänge</td>
<td>85’436</td>
<td>36</td>
</tr>
<tr>
<td>Trips / Déplacements / Wege</td>
<td>211’359</td>
<td>87</td>
</tr>
<tr>
<td>Stages / Etapes / Etappen</td>
<td>310’193</td>
<td>116</td>
</tr>
<tr>
<td>Routes / Routen</td>
<td>285’529</td>
<td>4</td>
</tr>
<tr>
<td>Segments / Segmente</td>
<td>10’064’058</td>
<td>2</td>
</tr>
</tbody>
</table>
Several trips to form a home trip
Each trip has a destination and motive

1st trip: go to work
2nd trip: leisure (BBQ)
3rd trip: return home
Each trip is subdivided into stages (Etappen, étapes). Each stage is associated with a single transport mode.

1st trip: go to work

1st stage: cycle

2nd stage: train

3rd stage: walk
Basic transport data for Switzerland

- Each resident of Switzerland covered around 37 km on the reference day (without counting trips abroad)
- This corresponds to a travel time of 83 minutes
- Men cover 11 km more per day than women.
- People living in households with a monthly income over CHF 14’000 cover distances 2.5 times greater than people living in households with incomes under CHF 2000.

IMPORTANT:
- Trips < 25 metres are not taken into account
- Trips within buildings or facilities are not taken into account
- Running and skiing (!) are taken into account, but do not amount to substantial numbers of trips in the database.
Mode share (% of trips) for **walking** in the 5 largest conurbations in Switzerland

<table>
<thead>
<tr>
<th>Conurbation (Agglo)</th>
<th>Mode share (men)</th>
<th>Mode share (women)</th>
<th>Mode share (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zürich</td>
<td>28%</td>
<td>33%</td>
<td>30%</td>
</tr>
<tr>
<td>Genève</td>
<td>34%</td>
<td>40%</td>
<td>37%</td>
</tr>
<tr>
<td>Basel</td>
<td>29%</td>
<td>35%</td>
<td>32%</td>
</tr>
<tr>
<td>Bern</td>
<td>29%</td>
<td>34%</td>
<td>32%</td>
</tr>
<tr>
<td>Lausanne</td>
<td>28%</td>
<td>34%</td>
<td>31%</td>
</tr>
<tr>
<td>Average 5 agglos</td>
<td>30%</td>
<td>35%</td>
<td>32%</td>
</tr>
</tbody>
</table>
What do the walking trips look like?

- Average distance: 710 mètres
- As the crow flies: 420 mètres
- Average time: 12 minutes
- Therefore average speed: 3.5 km/h

- a bit on the low side when looking with health promotion glasses!

Where do these people walk? (for 5 cities)

- Mapping shows very different patterns between cities
- The concentration of walking is strongest in Geneva, but this is also the conurbation with the most fragmentation
- In other cities, walking seems less concentrated in the city centre and more diffuse in its pattern.

Map credits: S. Munafò et al., EPFL (next slides)
Walking in 5 Swiss conurbations
Focus on Geneva and Zurich
Walking trips < 3km
All purposes
Barriers to walking
Wait, we are not finished yet!
Is the **distribution** of daily walking distances in the population similar to the distribution of the **age** of the people in the survey?
Is the distribution of walking similar to that of the duration of the interview in this survey?
The **distribution** of daily walking in the population is anything but normal!

The histogram shows km by foot per person on the reference day:

0: no walking in public space
1: less than 1 km
2: over 1 and less than 2 km
etc.
Metrics and indicators: rationale

• Sustainability calls for the use of indicators, because it is hard to measure directly.

• An important role of indicators is to select a few clear and representative variables that really matter (Gudmundsson et al. 2016)

• So, what matters the most for sustainable and healthy urban mobility? – Walking!?

• From the point of view of public health and the environment, people who walk great distances display a desirable behaviour

• It can be argued that those who drive a car without any walking in public space on a given day do not

• A metric could describe the relationship between these two behaviours

• Such a metric would make more sense in a conurbation than in a city centre

• The objective of the metric would be to inform public policy
<table>
<thead>
<tr>
<th>Behaviour on a reference day</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stayed at home</td>
<td>7252</td>
<td>11.5</td>
</tr>
<tr>
<td>Cycle &amp; no walk</td>
<td>2495</td>
<td>4.0</td>
</tr>
<tr>
<td>Drive &amp; no walk</td>
<td>14120</td>
<td>22.5</td>
</tr>
<tr>
<td>Small walk &lt; 3 km</td>
<td>24404</td>
<td>38.8</td>
</tr>
<tr>
<td>Big walk 3-20 km</td>
<td>14376</td>
<td>22.9</td>
</tr>
<tr>
<td>Outliers (walk &gt; 20 km)</td>
<td>222</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62868</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Creation of a new metric

• We suggest a new metric which is the ratio between:

  The proportion of people walking > 3 km in public space on a reference day (thereby exceeding public health guidelines)

  and

  The proportion of people driving a motorised vehicle without any walking in public space on a reference day (thus sub-performing regarding transportation and public health objectives)

• Because these two groups exist in roughly equal proportions in Switzerland, the value of this metric is more or less equal to 1 for the whole country
A quasi normal distribution (distribution of the metric through the 50 Swiss conurbations)
Characteristics of the new metric

- The metric is **specific** and **time-bound**: the survey is **repeated** every 5 years in a standardised manner.
- It is **easy** to calculate and the basic data are **available**.
- It deals away with the problem of defining a denominator: it is a ratio of two quantities which are investigated in the same way, at the same time and on the same population.
- It can be seen at first glance whether frequent walkers are more prevalent than non-walking drivers (metric > 1) or the opposite (metric < 1).
- There are grounds to believe that it may be useful for planners and decision-makers.
Preliminary evaluation of the metric

- Preliminary analysis on the 50 conurbations in Switzerland shows that the new metric discriminates well between conurbations.
- The average is 1.02 (i.e. very close to 1.0).
- The standard deviation is around 0.15.
- The distribution is approximately normal.
Distribution of the metric across the 50 Swiss conurbations

<table>
<thead>
<tr>
<th>Metric</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metric</td>
<td>51</td>
<td>0.73</td>
<td>1.3</td>
<td>1.0</td>
<td>0.15</td>
<td>0.14</td>
<td>-0.65</td>
</tr>
</tbody>
</table>

N.B. This is an *experimental* map for the metric!

Legend:
Red: lowest values
Orange
Yellow
Light green
Dark green: highest
Top 12 conurbations for this metric

Bern
Basel
Brig-Visp
Interlaken
St. Moritz
Chur
Luzern
Winterthur
St. Gallen
Zürich
Burgdorf
Genève
Bottom 12 conurbations for this metric

1. Lachen
2. Bulle
3. Stans
4. Not in a conurbation
5. Sierre-Montana
6. Wohlen
7. Bellinzona
8. Amriswil-Romanshorn
9. Monthey-Aigle
10. Heerbrugg-Altstätten
11. Sion
12. Chiasso-Mendrisio
Implications for policy

• Switzerland is a decentralised country where most walking-related policy is decided and rolled out at local level

• According to two recent reviews of urban sustainable development indicators (Tanguay et al. 2010; Mori and Christodoulou 2012):
  • There is a lack of consensus on what to measure, and how
  • There are problems regarding the accessibility of data on which to base the indicators
  • We therefore suggest integrating this new big walkers/non-walking drivers metric into existing urban sustainable development indicator systems, most of which contain very little on walking
Limitations

• Most indicators emerge as sets or families of indicators, which together define a framework on which to build, assess and modify policy (Gudmundsson et al. 2016)

• In this case, we are suggesting a stand-alone indicator or metric, which may or may not be easy to integrate into existing systems.

• The metric does not take public transport or cycling into account.

• This is a preliminary attempt at combining public health and transport aspects within a single metric. There may be other (better?) ways of combining information from these two sectors.
Conclusion

• The suggested metric is a first attempt at defining a walking-related measurement for public policy

• It includes information relative to transport policy and to public health policy: it therefore has the advantage of interdisciplinarity, but maybe also the drawback of more complex accountability: is the health department or the transport department responsible?

• It has desirable characteristics as a metric (time-bound, specific, repeatable, no denominator needed) and corresponds to a certain degree to so-called S.M.A.R.T. criteria (Specific. Measurable. Attainable. Relevant. Timely)

• This preliminary analysis shows that walking-related indicators and metrics deserve further examination
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Thank you for your attention!

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