# Evaluating walkability with WalkMyPlace - Five reasons why the utility of Walkscore.com may be limited in South America

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## Abstract

People who look for a new place to live, consider neighbourhood walkability as an important factor of their quality of life, and have used the platform walkscore.com to explore how walkable a neighbourhood is. Not only home seekers have an interest in walkability, but also planners and policy advisors, since promoting walking instead of car use has benefits such as reducing $CO_2$ emissions, maintaining and improving neighbourhood health and also social interaction. In our quest to implement a platform similar to walkscore.com that we named WalkMyPlace / CiudadCaminable, which for the moment has a geographical focus on Chile, we found reasons to be careful with results obtained with the Walk Score model, which implements a North American walkability perspective. In this article we review modelling issues that are related to social, cultural, and infrastructural differences between countries and continents. We conclude from these differences that the Walks Score model needs to be adjusted for use in Chile, and most likely other Latin American countries, since otherwise obtained scores may lead to false conclusions. However, we value highly the simplicity and flexibility of the walkscore.com model and consider it an important starting point to evaluate walkability in different parts of the world, including Latin America.

*Keywords*: Walkability, Walkscore, Accessibility Models, culture.

## 1   Introduction

Along with the recent trend to introduce pedestrian-only zones in city centers there is also a re-discovery of the qualities that provide "walkable" neighbourhoods. Talen & Koschinsky, (2013) describe a "walkable neighbourhood" as a place "*that is a safe, well-serviced neighborhood, with qualities that make walking a positive experience*". A neighbourhood is considered well-serviced when destinations of daily and weekly routines, such as the local primary school, grocery shops, and entertainment locations (e.g. cafe, bar, cinema) are only a 5 to 20 min walk away from home (Perry, 2013; Forsyth & Krizek, 2010).

Living in a walkable neighbourhood is considered by many as an indicator of a high quality of life, allowing to save time and money for transport when doing errands. However, several other benefits of walking and walkable neighbourhoods have been identified. These benefits include for instance a reduced ecological footprint by saving natural resources (i.e. fossil fuels) and creating less air and noise pollution (Litman, 2013), health benefits, such as reducing the risk of cardio-vascular diseases, reducing the risk of type 2 diabetes, and weight control (Litman, 2013; Hamer & Chida, 2008). Walking has also shown positive effects on an individual's social connection with his neighbours (Giles-Corti *et al.*, 2010; Talen & Koschinsky, 2013).

To assess walkability two general methods are often utilized: the first is to built models that evaluate land-use databases, i.e. inventories of travel destinations. The second method is to employ questionnaires or interviews in which people are asked directly how they perceive walkability of a place (Talen & Koschinsky, 2013). We note that the mentioned walkability models are usually build by relating results from surveys on physical activity of residents to descriptors of the built environment (Frank *et al.*, 2005; Ewing & Cervero, 2010).

Walkscore.com is a fairly popular website for home seekers and researchers, considering that more than 2800 documents in the Google Scholar database make reference to it. It allows to evaluate neighbourhood walkability using a land-use based model and presents evaluation results in a simple score system with a range from 0 to 100. Whereby neighbourhoods with scores between 0 and 49 are considered as "car-dependent" and neighbourhoods with a score between 90 and 100 are qualified as "walkers paradise". If a website user requests the walkability score for a particular location, then along with the walk score the platform gives details on the amenities found, i.e. shops, banks, coffee places, parks, etc., close by to the location (up to 2km) and also advertises available houses and apartments for sale or rental in the neighbourhood (Figure 1). Walkscore.com

has sparked interest in politics as a tool for policy evaluation and goal formulation to achieve "Liveable Neighbourhoods" (see for instance http://plan.lamayor.org/, City of Los Angeles).

The Walk Score platform provides limited support for countries other than the USA, Canada, New Zealand and Australia, and has limited customization options for users (walkscore.com, 2019). Since we have been interested in assessing walkability for different socio-demographic groups and later on wanted to use Walk Score to evaluate walkability of city neighbourhoods in Chile, a not supported country, we decided to re-implement the Walk Score model based on a white paper (WalkScore, 2011). We named our platform "CiudadCaminable" in Spanish, meaning "Walkable City", which is a fairly close translation to its English name "WalkMyPlace".

Figure 1: Screenshot of the apartment search section of Walkscore.com showing for each apartment to rent a Walk Score. Map colors indicate Walk Score from red to green.
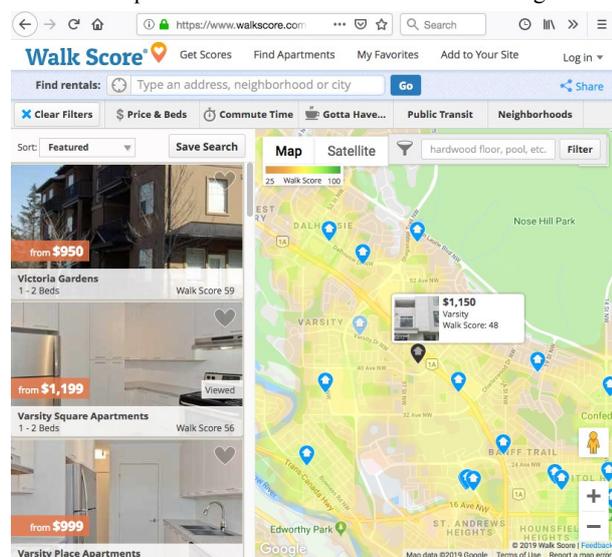


Source: Walkscore.com.

In this paper we will review what we learned from our implementation of the Walk Score model in WalkMyPlace. We identified five points that limit the utility of Walk Score as an assessment tool when used in Chile. Considering that Chile is a Latin American country and assuming comparably close cultural and behavioural characteristics, our findings may be transferable to other Latin American countries. We discuss the five points after describing briefly how the Walkscore.com model works and how we have implemented it in CiudadCaminable, i.e. WalkMyPlace.

## 2 Evaluation of walkability based on land use databases

Walkscore.com assesses walkability by using a model that evaluates content of a land use database and elements of street network configuration with respect to an address given by the website user (WalkScore, 2011). The model output is therefore reflecting more or less the density of walking destinations and a *walking potential*, instead of estimating (occurred) walking itself (Hall & Ram, 2018). WalkMyPlace is designed to permit a general assessment of accessibility to amenities, and not only walkability to amenities, by allowing the user to choose among different travel modes, including biking and public transit. Below we give more details on how both platforms and models work.

### 2.1 How Walkscore.com works

A white paper from 2011 outlines how the Walk Score model works – using basically a four-step approach: (i) for a given user location a search radius is created, and (ii) the land-use database within that radius is searched for amenities. (iii) Based on the found amenities the walk score is calculated. (iv) The amenity score is adjusted according to an evaluation of two network configuration elements: average block length and intersection density. Both measures are included to evaluate (perceived) pedestrian friendliness of the built environment (Lee & Moudon, 2006; Ewing & Cervero, 2010).

Nine different categories of amenities are of interest for the evaluation: (1) grocery, (2) restaurants, (3) shopping, (4) coffee, (5) banks, (6) parks, (7) schools, (8) books, and (9) entertainment. For each destination that has been found within the walk area a weight is given according to its category importance, its frequency of occurrence (i.e. count), and distance to the user location. The weights were chosen according to a review of the literature (Lee & Moudon, 2006; Moudon *et al.*, 2006; Cerin *et al.*, 2007; Iacono, Krizek & El-Geneidy, 2010; El-Geneidy & Levinson, 2011).

The original WalkScore.com algorithm used a 1-Mile radius area (Duncan *et al.*, 2011) which was later replaced by network-based distance evaluations in the "Street Smart" Walk Score algorithm (WalkScore, 2011). Weighting according to distance is subsequently based on walking routes using a polynomial function. Amenities that are farther than 1.5 miles away receive a zero weight in the score calculation.

Travel destination data sources for the walkscore.com database have been business listing data from Google.com and Localeze, park data from OpenStreetMap, and school data from Education.com. Road network data are also from OpenStreetMap. Further data sources that are mentioned on the website are the US Census, to account for population density, and Walk Scores own users who can add places to the database.

Besides the Walk Score product itself the walkscore.com platform also offers *Bike Score*, *Transit Score* and *Crime Grade*. The latter score, crime grade, indicates the level of crime in a neighbourhood based on police records. Transit Score evaluates accessibility to and frequency of public transit services at the user location. Finally, Bike Score combines Walk Score's evaluation of access to travel destinations with data on bike infrastructure and terrain, among others.

### 2.2 How WalkMyPlace works

The accessibility scores calculated with the WalkMyPlace platform are obtained in a three-step approach, which include: (i) the calculation of the accessible area for a user given location and travel time, i.e. the walkshed (Figure 2), bikeshed, or transitshed, (ii) searching the land-use database for potential destinations within the accessible area, and (iii) the calculation of the score values, whereby each potential destination receives

a weight based on its type and frequency of occurrence. Model output are walking scores between 0 and 100, with a value of 100 indicating a "walkers paradise", as called by Walk Score.

Our procedure is similar to the Walk Score model, but without the 4th step, which corrects walking scores based on street network configuration. This step was left out, since the foundation for score penalization in the Walk Score model is somewhat unclear. The destination categories were the same as in the Walk Score model at the beginning of the WalkMyPlace implementation. However, below we will discuss the validity of Walk Score categories for Chile.

The main data source for our platform is OpenStreetMap. That is, street & pedestrian network data is obtained from OpenStreetMap to generate access-sheds with the (free) software OpenTripPlanner. However, routing functions do not account for the existence of sidewalks in particular[1], as such data is not available – which is also the case for Walk Score. Public transit schedules are obtained from the Chilean Ministry of Transport and Telecommunications in the form of GTFS files. OpenStreetMap does also provide the land-use database with potential travel destinations. The original platform prototype developed in 2012 did provide additionally a crime score that was calculated based on police records (Steiniger, Poorazizi & Hunter, 2013). However, such information is not available in Chile at the needed scale.

Figure 2: Screenshot of WalkMyPlace / CiudadCaminable showing the result of an accessibility evaluation. The blue polygon marks the calculated walkshed for a 15 minutes walk.
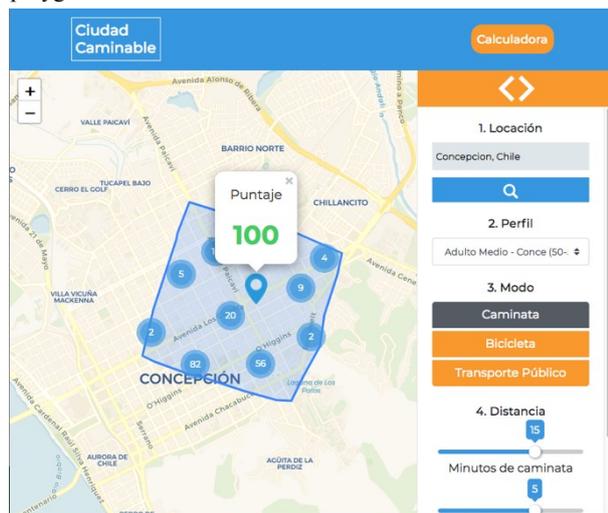


Source: own elaboration.

## 3 Five reasons that lower Walkscore's utility for analysing walkability in South America

The implementation of the Walk Score model has led us to the principal question of "*How representative are the walking scores that we obtain with the model?*". A potential mismatch between the Walk Score model's output and people's perception on walkability can be assessed with a series of

interviews or with a little questionnaire (Nykiforuk *et al.*, 2016). For instance, in an interview we can ask "*Please rate on a scale from 0 to 100 the probability that you will walk when you buy groceries?*" or: "*How likely is it that you will walk once a week to the park that is two blocks way?*" However, whereas interviews and questionnaires allow to measure existence and size of a potential gap between model output and ground truth, they do not explain why differences exists, i.e. where the Walk Score model may be wrong.

Over the past three years we explored several factors that may explain a mismatch between scores obtained with the Walk Score model and people's perception. So far we have identified five factors that we will detail below.

### 3.1 Database Coverage

The first factor that contributes to a difference between perceived "walkability" and Walk Scores, or better: amenity availability, is the completeness of the land-use database. Said simple: if there is no amenity in the access-shed then the score is zero; no destinations = no scores. When we implemented the first prototype in Canada, we used the MapQuest database. This did work quite well for Canada, but when we tried to use the same database to calculate scores in Chile, we found that many categories were missing amenities, which may be why MapQuest did not support Chile officially. Similarly, the global land-use database used by Walk Score probably misses many trip destinations for certain countries and therefore may be the reason why Walk Score does support only four countries officially: United States, Canada, Australia, and New Zealand.

Using OpenStreetMap as our land-use database, with open access to all available data, we have been able to evaluate database completeness with respect to the 9 categories of amenities/services. To explore the impact of completeness, we completed the database for about 30 sample sites in total, that where in three Chilean cities, and recalculate scores after completion.

Results of our database validation show that completeness of amenities was in-between 7% and 73% for the 11 sample sites in the metropolitan region of Santiago de Chile (Steiniger *et al.*, 2016) – a city with more than 6 Million inhabitants. Completeness was in-between 23% and 82% for the 10 sample sites in the city of Valdivia, a city with about 250.000 inhabitants. Most complete areas - with 73% and 82% completeness - were city centers. "Fixing" the database, i.e. mapping all amenities in a category for a sample site, resulted in score changes from 0 points to 64 points, on the 0-100 walk score scale (Steiniger *et al.*, 2016). At average scores increased through database completion by 28 points for the Santiago metropolitan region.

### 3.2 Factor "Observed Behaviour" : Where do people shop and buy groceries?

The Walk Score model, developed with a North American lifestyle in mind, recognizes two categories as a source of food: "Groceries" and "Dining & Drinking" (Figure 3). The category "Groceries" includes destinations such as food stores, beverage stores, bakeries and supermarkets. Places in the "Dinning &

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[1] In OpenStreetMap road segments may have a "pedestrian access" tag that is evaluated by OpenTripPlanner. But it is

rather used to define pedestrian "no-go" areas, such as highways, instead of specifying sidewalk existence.

Drinking" category include amenities of the three sub-categories *Restaurants*, *Coffee*, and *Bars*. Additionally, the amenities category "Shopping" may include stores that also offer food (Figure 3), for instance when examining walkscore.com results in Santiago the category included a supermarket in the list of destinations. The Walk Score methodology paper outlines that score calculations requires only 1 store in the "Grocery" category for receiving the maximum score. "Dining & Drinking" accounts for up to 10 restaurants and 2 coffee places.

So, what's wrong with this in Chile? First, requiring only one store in the grocery category seems to imply that the model developers were thinking of supermarkets as the one-stop-shop. However, in Chile people often buy food in corner stores, since supermarkets are somewhat expensive given an average household income of US\$ 1380 per month (OECD, 2016). Additionally, one needs to consider that supermarket chains open stores only in areas where people have a sufficient income for shopping in supermarkets (own study in progress). Furthermore, one very important source of fresh food are weekly street markets, so-called *ferias*, which offer produce, among other things, often significantly cheaper than supermarkets (Peñaloza, Denegri & Gerhard, 2015). Alcoholic drinks and beverages are often bought in "Bottle Shops", as they possess liquor licenses as well, and are often just around the corner too. In consequence, an appropriate scoring model for Chile would require to include "Ferias", giving them a fairly high weight, add a focus on "Corner stores" and "Bottle shops", and perhaps include a butchery or bakery due to a very uneven geographical distribution of supermarkets in Chile, and therefore uneven access by the population.

Second, accounting for up to 12 places in the dining & drinking category seems to be far away from Chilean reality, since it is not given that the average family in Chile can afford to eat out. In consequence, one may call the walkscore.com model a walkability index that rather caters to the young (single) professional or upper middle class families. For Chile, one should account for, perhaps, five places in the "Dining & Drinking" category (coffee, drink, eat), and additionally give these places a fairly low score in comparison to groceries, parks, schools, etc. (see Section 3.3)

Figure 3: Screenshot of Walk Score's location assessment with detailed scoring information per amenity category.
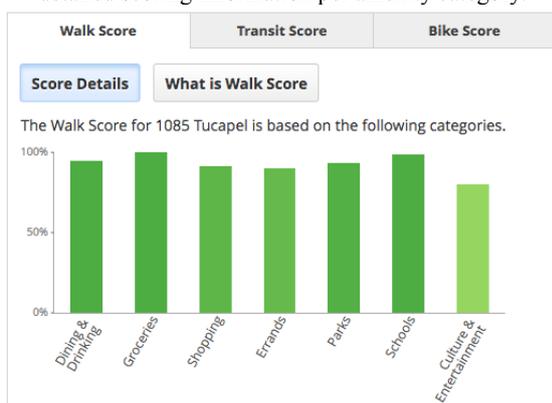


Source: Walkscore.com.

## 3.3 Factor "People's Preferences": Different country – different preferences

Weights of the amenity categories in Walk Score were obtained studying the literature describing the importance of amenities from a North American perspective (Walkscore 2011). The categories that can contribute most to the Walk Score are "Grocery" and "Restaurant" with a total weight of 3, as can be seen in Table 1.

Table 1: Ranking of importance of amenities and assigned weights. Sources: Walkscore (2011), own survey (Muñoz-

| Category Importance | Walk Score (weights) | WalkMyPlace (weights) |
|---|---|---|
| 1. (Most) | Drinking & Dining (total: 5): Restaurants (3) & Coffee (2) | Health (8) |
| 2. | | Emergency (7.7) |
| 3. | Grocery (3) | Park (5.5) |
| 4. | Shopping (2) | Shopping & Grocery (5.2) |
| 5. | Park (1) | School (5.0) |
| 6. | School (1) | Bank (5.0) |
| 7. | Bank (1) | Books (3.2) |
| 8. | Books (1) | Entertainment (3.0) |
| 9. (Least) | Entertainment (1) | Drinking & Dining (2.6) |

Turra, 2018).

With the goal to develop a set of weights for different demographic groups in Chile, which also helps to confirm if Chileans follow this preference schema, we performed a street survey in the metropolitan area of Concepcion, and collected about 160 responses. For the survey we grouped the categories "Shopping" and "Groceries" into one, as well as "Coffee" and "Restaurants" (Drinking & Dining), and added two additional categories: (i) Health - to evaluate access to hospitals, doctors, pharmacies, and (ii) emergency services - to evaluate access to police and fire departments. We decided to add emergency services, since such amenities can contribute to higher perceived safety of the area and its public spaces, therefore influencing the choice to walk (Olvera *et al.*, 2012); although statistics may not show that police or fire station nearby actually makes the neighbourhood safer.

To our surprise the resulting ranking is fairly different from the one used by Walk Score (Table 1). When comparing both rankings we find two points remarkable: First, the most important category in Walk Score, i.e. "Drinking & Dining", is considered the least important by the people that we asked in Chile. Second, the two new categories "Health" and "Emergency", are considered as most important by our participants. Walk Score lists pharmacies only within the category "Errands", whereas medical centers, police and fire emergency services do not seem to be considered at all.

## 3.4 Factor "Limits": A different country means different limits to walking

Exploring the factors that influence (i) the choice to walk, instead to drive or take public transit, and (ii) the choice (and

importance) of destinations, one will most likely recognize that those differ among countries. Although factors such as street crime, the price for a bus tickets, availability of a car, and availability and quality of pedestrian infrastructure may affect the choice to walk in many countries, they may affect decision making perhaps only in a certain group of the population and also only in certain places. In the following we address three universal types of limits to walking: crime, family income and infrastructure.

*Crime* - The choice of walking for a lot of places in the Americas is affected by the rate of crime or fear of being robbed, etc. (Weber Corseuil *et al.*, 2012; Olvera *et al.*, 2012). From our (starting) research in Chile on walking vs. crime we see that there are general no-go areas for certain groups of the population, in particular people that only visit a neighborhood, and we see that "perceived crime" is much more important than "observed" crime. Hence, a platform that evaluates walkability should account for two crime components: Does the neighborhood "feel"(!) safe to non-residents? And at what day time does it feel safe? Providing a "crime grade" as Walk Score does, and a "crime index" as the original WalkMyPlace prototype did for Calgary, that are both based on police reports, is therefore only a first step. The next steps are to measure perception of crime, and then to develop a method that adjusts walking scores with respect to the perceived level of safety.

*Income* - We have outlined earlier that household income has an effect on destination choice for buying groceries and on the importance of dining & drinking locations. However, household income does also affect preferences for other categories of destinations, and in particular the choice of entertainment, such as theatres or cinema, and to some lesser extent the choice of "shopping" destinations. Table 1 shows that entertainment is considered of very low importance by our survey participants - with the last but one spot. As a consequence we suggest to develop different weighting or preference profiles for different socio-demographic groups. For instance, we have started analyzing the survey data with 160 respondents assigning them to five age groups. However, score differences among 4 of the 5 age groups show no statistical significance, only walking scores for elderly are significantly different from teens, young adults, adults, and older adults. But we observed significant differences for profiles generated for different neighborhoods.

*Infrastructure* - The issue of existence and quality of pedestrian infrastructure may be best described by the question: "*Does a person have a safe and easy walking experience to the potential destination*?". Having an amenity close-by in a walkable distance does not mean that it encourages residents to walk, since amenities may not be reachable in a safe and easy walk, but only in a short car ride. A safe and easy walking experience can be provided by pedestrian infrastructure, including at least the existence of sidewalks and signage that gives pedestrians opportunity - or even priority - to advance safely. A perhaps good example in the US or Canada are shopping malls with excess parking space, making it cumbersome, and eventually dangerous, to cross the car parking area to reach the malls main entries (see Figure 4).

Very often cities in middle and low income countries, but also suburbia in North America, may simply miss sidewalks that provide at least a safe, or somewhat safer, walking experience. Figure 5 shows for instance a not uncommon walking experience in Lagos, Nigeria.

As a consequence, we deem it necessary that route calculations to possible destinations, i.e. walkshed generation, is based primarily on the sidewalk network - and ideally also accounts for the existence of other pedestrian infrastructure and quality of the sidewalks. However, such datasets are not existing in Chile.

Figure 4: Crossing a large parking area is necessary to reach a shopping mall's entry in Calgary, Canada.



Source: Streetview on Maps.Google.com.

Figure 5: Walking experience in a side street in Lagos, Nigeria, which provides space also for small businesses such as a fax service.



Source: AnonymREF.

## 3.5  Score Interpretation – The Walk Score level fallacy

To help interpreting the scores obtained with the Walk Score model, the website proposes five quality levels for walkability; for score values between

- 0-24: almost all errands require a car,
- 25-49: most errands require a car,

- 50-69: some errands can be accomplished by foot,
- 70-89: most errands can be accomplished by foot, and
- 90-100: daily errands do not require a car.

When we calculated walking scores with WalkMyPlace for neighborhoods in 6 Chilean cities, we found that neighborhoods with a high percentage of families receiving social support, i.e. with low incomes, have usually very low walking scores (< 20 points) (Steiniger *et al.*, 2018). Using the (North American) Walk Score interpretation residents in these neighborhoods would probably bring their groceries home by car, which seems very unlikely as these families cannot afford to buy or maintain a car – and perhaps not even buy a new bicycle. Hence, while density of trip destinations may indeed be low and people may need to choose a different transport option or walk longer, the conclusion of a high car-dependence for a neighborhood in Chile requires at least verification (rich car-dependent neighborhoods do exist, but are less likely to encounter than low-scoring, poor neighborhoods). Given this, the quality levels proposed by WalkScore need to be adjusted to fit South American reality.

## 4 Conclusions

Many studies have validated the utility of the Walk Score model and many other studies have critiqued it, with recent reviews by Koschinsky *et al.* (2017) and Hall & Ram (2018). We contribute to this discussion by evaluating the Walk Score model and its applicability to Chile and neighboring countries – with a focus on people's perceptions and economic reality. Working on the implementation of the Walk Score model in our own platform we find the general model approach simple enough to re-implement it, and flexible enough to adapt it to Chile. We therefore consider it a good starting point for walkability evaluations in Chile. However, results provided by walkscore.com should be taken with caution since the completeness of the land use database is unknown and since the model does not consider behavior and preferences of the Chilean population.

False conclusions based on results from the current model are therefore possible: For instance, that no supermarket exists in a neighborhood does not mean that there is no demand for supermarkets and that the neighborhood is less walkable (i.e. a missing supermarket will not contribute to the score). It does may mean, however, that people get fresh and perhaps cheaper produce at the weekly street market and that they get other groceries in the little corner store - all within walking distance. A low walking score calculated by the Walk Score model may also mean that residents have a low family income and that therefore, walking and public transit are the only mobility options for them to do other types of basic errands, that they can't afford to eat out, and that they certainly have a need for entertainment - but can't afford to go to a movie theater.

As a consequence of our observations the Walk Score model needs to be adjusted to the local behavioral context and peoples' preferences. Therefore, our evaluation also proposes solutions to adapt the model to Chiles context – which also means that our suggested solutions may be of limited use for other geographic regions, such as Western Europe. Apart from adjusting the model to preferences and behavior of the local population, the model also needs to be extended to better account for limits (i.e. crime, income and infrastructure) - and

the proposed walkability levels need re-interpretation to reflect the choices that people really have. Some of these points we hope to address in our future work, including modifications to amenity categories and weights, and developing tools to build inventories on street furniture and pedestrian infrastructure.

## 5 Acknowledgements

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