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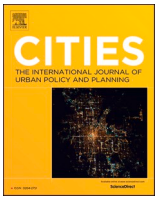

Proximity-centred accessibility – A conceptual debate involving planning practitioners worldwide

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ABSTRACT

In recent years, the concept of proximity has garnered increasing attention in both transportation research and practice, albeit under various terms and interpretations. Among these, the concept of the *15-minute city* has catalysed attention in planning practice, with recent evolution to the *x-minute city* and *city of proximities*. In

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research, proximity-centred accessibility has been offered as an umbrella term to express the ability to reach activities and destinations at short distances. Regardless of the terminology used, the essence of proximity lies in the ease with which one can access desired activities and destinations within reasonable travel times, independent of speed-enhancing transport modes most notably through walking.

This research investigates the nuanced meanings ascribed to proximity-centred accessibility by planning practitioners globally, spanning diverse regional and local contexts. For this, we used an online survey, disseminated among over 9000 practitioners from 22 countries across 5 continents, which generated over 1300 responses. The survey explored the preferred terms for proximity-centred accessibility and their definitions, specifically emphasizing time and distance thresholds and the identification of relevant activities. By juxtaposing our findings with an earlier survey of accessibility researchers, this study also contributes to the groundwork for a conceptual framework for proximity-centred accessibility.

Our findings affirm a relatively consistent interpretation of proximity among global planning practitioners, predominantly extending up to 1600 m, in accordance with earlier results for accessibility researchers. Despite some relevant dissimilarities among practitioners from megacities compared to their smaller city counterparts, or in specific countries (most notably the Netherlands), the distance that is considered proximate is the attribute that generates the most consistent results across different contexts. Also consistent was the relevance of short distances (up to 15 min walking) for activities such as primary and pre-primary schools, playgrounds, parks, food shopping, and pharmacies, reinforcing the importance of proximity to basic and caregiving activities. No term was found to be consistently meaningful across different contexts, although terms like local and neighbourhood accessibility and walking/pedestrian, or cycling accessibility, show higher preference in the global sample.

1. Introduction

The concept of the 15-minute city has catalysed a global discourse, emphasizing the importance of proximity in urban planning (Pozoukidou & Chatziyiannaki, 2021). It promotes the idea that all essential services and amenities should be in reach within a 15-minute walk or bike ride from residents' homes (Moreno et al., 2021). This paradigm highlights the importance of proximity for sustainable, resilient and lively local communities that enable people to live car-independent lifestyles and rely more on active modes of transport.

This emphasis on proximity reflects a realignment in accessibility planning literature, moving beyond a mobility-centred approach to once again incorporate proximity-centred perspectives (Elldér et al., 2018; Levine et al., 2012; Silva et al., 2023). Traditionally, accessibility has been understood as the "ease of reaching … destinations"(Levinson & Wu, 2020, p.130), often facilitated by fast and expansive modes of transport. However, contemporary approaches such as the 15-minute city spotlight spatial distribution of services and amenities close to residents' homes, advocating for urban layouts that reduce the necessity for long trips and enhance local accessibility (Lu & Diab, 2023; Moreno et al., 2021).

Despite its widespread adoption, proximity is understood differently by different people and across different contexts (Gil Solá & Vilhelmson, 2018; Vale et al., 2016). Proximity can have divergent interpretations and applications depending on the country, urban scale, and specific local conditions (Silva et al., 2023). Factors such as cultural norms, habitual practices, and urban infrastructure might influence how proximity is understood in various settings.

This paper aims to explore the meaning of proximity-centred accessibility from the perspective of planning practitioners worldwide. By gathering insights from diverse urban contexts, our study seeks to clarify the multifaceted nature of proximity and its implications for urban planning practices. Specifically, we seek to identify areas of broad agreement in the conceptualization of proximity (such as 15-minute cities), as well as areas of heterogeneous opinion. This research will provide valuable perspectives on how proximity is perceived across different countries and regions, fostering informed and contextually relevant planning practices on a worldwide scale.

The following sections are structured as follows. Section 2 provides an overview of the relevant literature followed by the research approach in Section 3, including the research questions and the data collection and analysis methods. This is followed by the presentation of the survey results (section 4) focused on the observed concurrences and dissimilarities regarding preferred terms (Subsection 4.2), proximity distance (Subsection 4.3), and relevant activities for proximity (Subsection 4.4). The paper ends with a summary of the main findings (Section 5) and conclusions, revisiting the conceptual framework for proximity-centred accessibility (Section 6), as well as, exploring the limitations of the study.

2. Literature review

In the early 1990s, Susan Handy suggested a distinction between local and regional accessibility (Handy, 1992). Local accessibility refers to the access of local or nearby services and amenities (Handy, 1992; Zhang et al., 2020), typically within a short walking or cycling distance. In contrast, regional accessibility encompasses the broader ability to access destinations and opportunities across a wider geographical area, often facilitated by faster transport modes that allow covering farther distances, such as regional public transport and private cars. This distinction underscores the varying scales at which accessibility can be assessed and the different infrastructural and planning considerations required at each level. Since then, the number of publications explicitly or implicitly addressing local accessibility (such as those focused on walking or cycling accessibility) has been steadily growing, as revealed by a literature review developed by Silva et al. (2023). Interest in local accessibility has also grown in practice, particularly after the COVID-19 pandemic, and principally fuelled by the 15-minute city concept by Carlos Moreno (Moreno et al., 2021). This concept was originally implemented in Paris but is currently followed by dozens of cities worldwide (for a review see (Allam et al., 2024; Büttner, 2024; Büttner et al., 2022; Lu & Diab, 2023; Teixeira et al., 2024)).

Despite the multiplicity of terms currently in use in both research and practice, proximity has gained predominance following recent publications by Moreno (2023) with a change of discourse towards the *city of proximities*. Contemporary with this practice-oriented shift, Silva et al. (2023) put forth the term of *proximity-centred accessibility* as an over-reaching term encompassing a diversity of terms used in research and concerned with accessibility attained mainly by proximity rather than by mobility. Following Levine et al. (2012), these terms reflect the dominant role of either mobility or proximity as means to attain accessibility. Proximity-centred accessibility refers to the ease to reach activities and destinations at short distances, enabling reasonable travel times regardless of the transport mode, most notably for walking. Therefore, the ease of reaching destinations is facilitated by reducing distances to these destinations, emphasizing the role of their spatial distribution. On the other hand, mobility-centred accessibility focuses on the efficiency and effectiveness of transportation systems in

facilitating movement across longer distances. This conceptual shift reflects an increasing recognition of the importance of proximity in enabling and thus bringing about sustainable, resilient and liveable communities. This is crucial, particularly in the face of current concerns related to climate change, car-dependency, and the promotion of human-scale cityscapes and urban design.

So far, the literature provides diverse meanings for proximity (Silva et al., 2023; Vale et al., 2016). In this context, proximity is often defined by the maximum distance residents are willing to travel by non-motorized modes, mainly walking, to access essential services (Maleki et al., 2012; Yang et al., 2018). A review by Vale et al. (2016), on accessibility measures by active modes, identified distance thresholds ranging between 500 m and 5 km. Similarly, Silva et al. (2023) found distances ranging between 400 m (Alawadi et al., 2021; Cao et al., 2008; Khan et al., 2014; Krizek, 2003b, 2003c, 2003a; Li et al., 2019; Maleki et al., 2012) and 2 km (van Eldijk et al., 2020; Vasconcelos & Farias, 2017),[1] involving a larger reference set focused on proximity. It is important to note that this review found little more than 60 papers explicitly defined distance or time thresholds for accessibility among the, close to, 150 papers reviewed.

The 15-minute city concept and related ideas exemplify this approach by proposing that all necessary amenities be accessible within a 15-minute walk or bike ride for all city residents (Lu & Diab, 2023; Moreno et al., 2021). This framework highlights the importance of creating compact, mixed-use neighbourhoods that minimize travel time and promote sustainable modes of transportation, thereby enhancing overall urban liveability. More recently, the 15-minute city concept has expanded to include various timeframes - 10, 20, or 30 min - thereby contextualizing specific travel durations within the broader planning principles of proximity (Moreno et al., 2021). In line with this, references to the x-minute city are also becoming common (such as, Logan et al. (2022); Lu and Diab (2023)).

Besides the definition of proximity, the definition of relevant destinations is also crucial in the context of the 15-minute city and proximity-centred accessibility. These destinations typically include essential services and amenities such as grocery stores, schools, healthcare facilities, parks, workplaces, and cultural venues (Lu & Diab, 2023; Silva et al., 2023). The identification and spatial distribution of these key destinations are crucial to urban planning that prioritizes proximity-centred accessibility. Urban planners can create more inclusive, resilient, and sustainable communities by ensuring that such destinations are within a short and convenient travel distance for all residents.

It can be assumed that professionally trained transport and urban planners consider different travel time thresholds depending on the type of facility under consideration, since these issues are commonly addressed in earlier planning theory concepts. For instance, Central Place Theory posits that each good has a "range" - an upper limit representing the maximum distance customers are willing to travel and a lower limit defining the minimum area required to sustain demand. Lower-order goods, such as elementary schools or general practitioners, have smaller ranges, whereas higher-order goods, like universities or hospitals, have larger ones (King, 2020). Implicit in both is the assumption that acceptable travel times and distances vary depending on the type of service or facility.

At the same time, rigid models, such as the 15-minute city, that assume a fixed radius for all facilities impose a uniform travel time or distance limit, regardless of the type of facility. This approach presents two problems. First, the uniform limit might be too generous, leading to an overestimation of travellers' willingness to walk. Conversely for other destinations, travellers may be willing to travel farther than the uniform limit assumes, resulting in an underestimation of their acceptable travel time. Studies on travel behaviour and surveys on acceptable travel times indicate that actual and acceptable walking distances and times vary by destination even for lower-order goods (Hamersma & Roeleven, 2024; Millward et al., 2013; Perchoux et al., 2019). This raises the question of how perceptions of "proximity" differ across different types of destinations.

Little is known so far on the perceptions on proximity of planning practitioners which are responsible for shaping proximity in cities. Two previous studies can be found exploring this issue. The first developed by Gil Solá and Vilhelmson (2018) explored the understanding of practitioners from three Swedish municipalities, using semi-structured, focus-group workshops. Five years later, Silva et al. (2023) published research exploring the perception of German and Portuguese practitioners based on results of a survey exploring preferred terms, proximity distance and relevant activities. The first study explored the understanding of practitioners from a range of planning fields to understand how proximity was translated into policies using a smaller sample of 35 practitioners and more in-depth discussions. The second study is more conceptual in nature, surveying practitioners on their use and meanings of proximity in planning practice, involving a larger sample of around 120 practitioners, mostly from land use and transport planning backgrounds. Both studies confirm the nuanced meaning of proximity in practice revealing diverse meanings for proximity regarding relevant activities, distances and time, although Gil Solá and Vilhelmson (2018) were able to converge on a common meaning represented in the form of a "flower" in which relevant daily life activities are clustered by desired travel time (adjacent to home, 10 min, 30 min), and activity types (recreation, culture and community life, transport, service and trade, work and school). Büttner et al. (2022) adopted these "Flowers of Proximity" in workshops with planning practitioners from five major European cities and found differences in the acceptable travel times for various destinations between the five groups.

In addition to barriers such as a lack of (technical) knowledge, data and human resources, such issues of limited conceptual clarity can be an obstacle to the application of accessibility analyses and the accessibility concept in general (Boisjoly & El-Geneidy, 2017; Rowangould et al., 2024). The conceptual ambiguity of frameworks like the X-minute city can also lead planning agencies, even in highly similar contexts, to set different maximum travel times or distances and to select different facility types as basic essentials (Lu & Diab, 2023) which, even though the choices seem negligible, potentially lead to different planning outcomes (Lu & Diab, 2025). Proximity-centred accessibility concepts are therefore caught in the tension between the need for standardization and the contextuality of their application, a circumstance they share with the accessibility concept in general (Rowangould et al., 2024).

3. Research approach

3.1. Research questions

This research complements the study by Silva et al. (2023), broadening the original sample of planning practitioners from 2 to 22 countries from 5 continents. Similarly to the predecessor study, we explore concurrences in meaning regarding preferred terms, proximity distance, and the relevant activities (objective O1). Following the larger sample and diversity of contexts, we examine dissimilarities across countries, city size, professional activity and scientific background of planning practitioners (objective O2). As a corollary, this research contributes to broadening the foundations for the conceptual framework on proximity-centred accessibility proposed by the predecessor study. It achieves this by comparing the perception of planning practitioners worldwide from this research, with those of accessibility researchers explored in the predecessor study.

For the analysis of concurrences (O1), our study follows the same set of four research questions as the predecessor study:

RQ1. What are the preferred terms to express proximity-centred accessibility in research and practice?

[1] Corresponding to 10 min cycling.

RQ2. What meaning is given to proximity in terms of travel distance and time?
RQ3. What activities are relevant when considering proximity-centred accessibility?
RQ4. What meaning is given to reasonable proximity (also in terms of travel distance and time) when regarding different activities?

To examine dissimilarities (O2), three additional research questions accompany each of the previous questions:

RQ5. What dissimilarities are visible across countries?
RQ6. What dissimilarities are visible across cities of different sizes?
RQ7. What dissimilarities are visible across practitioners' backgrounds (scientific and professional)?

3.2. Data collection and analysis

This study brought together researchers from 22 countries to facilitate the involvement of a broad world sample of planning practitioners. Data on planning practitioners' perceptions was collected via an online survey. The survey was adapted from the one used in the predecessor study.[2]

The survey consists of 17 questions divided into three parts (see Annex). The first part consists of nine questions exploring the meaning of proximity-centred accessibility. This included questions regarding the preferred terms, their understanding of 'nearby' in terms of distance and time, and questions on the relevance of reaching specific destinations nearby and what travel time is reasonable to reach these destinations. In the second part, participants were asked six questions about their professional activity, including their background (urban planning, transport planning, or other) their current or former responsibilities (technical, political, consultant, or other), and the size of the city they normally work with (from small cities under 100,000 to megacities over 10,000,000 inhabitants). In the third part, they were asked two questions regarding demographic profile, namely their age and gender. The full survey can be found in Annex. The survey was translated (whenever necessary) to the native language of each country involved in our research. Translations were developed by native speaking experts in the field of accessibility/proximity (co-authors of this research). During translation, minor changes were occasionally made to account for the differences in context, background or language specific jargon of different countries.

For the dissemination of the survey, researchers from each country compiled a contact list of planning practitioners in local public authorities from their respective countries, following a convenience sampling approach. The contact list was collected through multiple channels, including, but not limited to, personal mailing list resulting from prior professional engagements; national or local directories of planning professionals affiliated with local authorities (specifying responsibilities in land use or transport planning), and distribution lists by relevant professional associations in the field. The survey was disseminated by e-mail during May and June 2023, except for Germany and Portugal, where the answers were collected one year earlier.[3]

For the sample used in this study, the survey was disseminated among 9590 practitioners from 22 countries (from all 5 continents).[4] The countries included in the analysis disseminated the survey to at least 50 local planning practitioners and attained more than 10 replies. The full set of results is available as open data (in doi:https://doi.org/10.7910/DVN/KMSG5G) to enable further analysis and to encourage further development of the data set.

For comparison of practitioners' perceptions with those of researchers', this paper makes use of the results collected in Silva et al. (2023), referred to below as the 'expert survey'. This survey was disseminated during May and June 2022 to over 260 researchers, including authors of papers on proximity-centred accessibility and worldwide academic experts in accessibility (for more detail see Silva et al. (2023).

4. Surveying planning practitioners worldwide

4.1. Survey sample

Our study uses a sample of 1324 valid responses form the practitioners' survey (average response rate of 14 %). When relevant these results are compared to a sample of 61 valid responses from the experts' survey.

Table 1 provides the general characteristics of the practitioners' sample. The sample is fairly balanced on gender (51 % male), with most respondents aged between 30 and 49 (60 %). Most respondents have technical responsibilities (65 %) and work in urban planning (54 %). Regarding the size of the cities where the respondents work, the sample presents a balanced distribution with similar shares in each city size category, except in the megacities where the share is smaller (11 % versus 19 %–25 %). Lastly, the largest share of answers was collected from Southeast Europe and Middle Eastern countries (24 % of sample), followed by Southern European countries (20 % of the sample), while the smallest share is from Africa (3 % of the sample).

The sample from the experts' survey showed similar distributions regarding gender and age, with slightly higher prevalence of men, and slightly younger, when compared to practitioners (for more detail see Table 4 in Silva et al., 2023). It concentrates a higher proportion of responses from Europe and America, resulting in a smaller representation from Asia and Africa.

The number of valid responses and response rates per country can be found in Table 2. The response rates varied significantly across countries. Countries like Kenya (53 %) and Uruguay (51 %) had the highest response rates, despite having relatively small recipient pools. In contrast, countries where a larger pool of practitioners were contacted such as the Netherlands (3 %), USA (4 %) and Canada (5 %) had the lowest response rates. These variations in response rates may be the result of several factors. Firstly, the adopted dissemination strategy (i.e., convenience sampling) relied on the national researchers' distribution methods, with some relying more on direct professional contacts and others on broader mailing lists, potentially impacting practitioner engagement. As such, stronger professional networks or a closer connection between planning practitioners and the researchers conducting the study may have contributed to greater engagement in the countries with higher response rates. Likewise, a higher/lower perceived relevance of proximity-based accessibility in certain planning

[2] The adaption involved the rephrasing of some of the questions (to clarify the intention), changes in the order of the questions (also to improve the understanding of the questions) and the additions of one activity to the activity list, and of one city size level (megacities). Also worth mentioning is that the survey used in this research allowed surveyed to propose one additional activity to the activities list and classify its reasonable access time.

[3] These results have already been published in Silva et al. (2023), including further detail on the collection of data and sample.

[4] The full team involved 25 countries, which disseminated the survey to approximately 13,000 planning practitioners. Of these 3 were not included in this study, namely Australia, Sweden and UK. Two were not included due to the small number of respondents (less than 10). Another was not included due to incompatibilities in the survey distribution process.

Table 1
Survey sample description ($N = 1324$).

Age	20–29	10 %
	30–39	28 %
	40–49	32 %
	50–59	21 %
	60–69	8 %
	70 and over	1 %
Gender	Male	51 %
	Female	48 %
	Other	0 %
	Prefer not to say	1 %
Professional responsibilities	Political Responsibilities (politicians, decision makers)	8 %
	Technical Responsibilities (planners)	65 %
	Consultant Responsibilities	22 %
	Other	5 %
Main field of professional activity	Urban Planning	54 %
	Transport Planning	33 %
	Other	13 %
Size of the cities	Megacities (>10,000,000 inhab.)	11 %
	Very Large Cities (500,000–10,000,000 inhab.)	25 %
	Large Cities (250,000–500,000 inhab.)	19 %
	Medium Cities (100,000–250,000 inhab.)	20 %
	Small Cities (<100,000 inhab.)	24 %
Continents	Africa	3 %
	Asia	15 %
	Europe	55 %
	North America	9 %
	South America	18 %

Table 2
Responses per country and associated response ratio per million inhab.

Country	Number of recipients of survey	Survey responses	Response rate
Argentina	<100	15	20 %
Brazil	500–600	122	22 %
Canada	≈1000	46	5 %
Chile	100–200	55	29 %
China	200–300	100	49 %
Finland	300–400	116	39 %
France	400–500	68	18 %
Germany	100–200	48	27 %
Greece	100–200	16	12 %
Hungary	500–600	116	27 %
Israel	200–300	58	28 %
Italy	200–300	37	20 %
Kenya	<100	22	53 %
Netherlands	≈1400	43	3 %
Norway	300–400	37	12 %
Poland	300–400	95	32 %
Portugal	100–200	66	38 %
Spain	300–400	91	30 %
Tunisia	100–200	14	10 %
Turkey	100–200	37	29 %
Uruguay	<100	45	51 %
USA	≈2700	77	4 %

contexts could have also impacted the response rates. While these differences do not necessarily indicate variations in the importance of proximity-based accessibility, they highlight the challenges of cross-national surveys and the role of contextual factors in shaping survey participation.

Lastly, Table 3 provides a brief overview of the main demographic, economic, and transport characteristics of the 22 countries. China (1.41 billion) followed by the USA (334.9 million) are the most populous countries, while Uruguay (3.4 million) and Finland (5.6 million) have the smallest populations. Population density also varies greatly, with the Netherlands (508 inhab./km^2) and Israel (400 inhab./km^2) among the most densely populated, whereas Canada (4 inhabitants/km^2) and Norway (15 inhab./km^2) have the lowest densities. Our sample is also constituted by a wide range of economic conditions, from high-income countries such as Norway ($87,925 GDP per capita) and the USA ($82,769 GDP per capita) to low-income like Kenya ($1952 GDP per capita) and Tunisia ($3978 GDP per capita). Similarly, motorization rates also show substantial differences. While countries like the USA (860 vehicles per 1000 inhabitants) have some of the highest levels of car ownership in the world, Kenya (56 vehicles per 1000 inhabitants) and Tunisia (144 vehicles per 1000 inhabitants) have rates nearly an order of magnitude lower.

4.2. Overview of terms

Regarding preferred terms, our survey revealed little concurrence. None of the explored terms was able to garner the preference of more than half of the sample. Fig. 1 presents the proportion of respondents stating a preference for each term surveyed, with terms ordered by decreasing preference rate among the global sample of planning practitioners (left graph). The term walking accessibility mobilized the highest rate of preference in the global sample (48 %), with terms such as local, bicycle, and neighbourhood accessibility following (with rates around 35 %).

When comparing these results with previous evidence from experts it is clear that preferred terms are different among planners and researchers. We find that experts prefer terms such as local and neighbourhood accessibility, which are also among those favoured by practitioners. However, they also prefer terms such as proximity-centred

Table 3
Main characteristics of the 22 countries (data sources: World Bank, Our World in Data and United Nations).

Country	Pop (millions)	Pop density (inhab./km^2)	Urban pop (%)	GDP per capita (USD)	Motorization rate (vehicles/1000 inhab.)
Argentina	45.5	16	92	14,187	311
Brazil	211.1	25	87	10,295	214
Canada	40.1	4	81	53,431	707
Chile	19.7	26	88	17,068	246
China	1410.7	153	61	12,614	223
Finland	5.6	18	86	52,926	577
France	68.3	119	81	44,691	704
Germany	83.3	233	78	54,343	627
Greece	10.4	81	79	23,401	617
Hungary	9.6	107	72	22,142	463
Israel	9.8	400	93	52,642	404
Italy	59.0	200	69	39,003	756
Kenya	55.3	94	28	1952	56
Netherlands	17.9	508	92	64,572	588
Norway	5.5	15	83	87,925	635
Poland	36.7	124	60	22,057	761
Portugal	10.6	111	66	27,331	640
Spain	48.3	94	80	33,509	627
Tunisia	12.2	76	70	3978	144
Turkey	85.3	110	76	13,106	220
Uruguay	3.4	20	95	22,798	311
USA	334.9	36	83	82,769	860

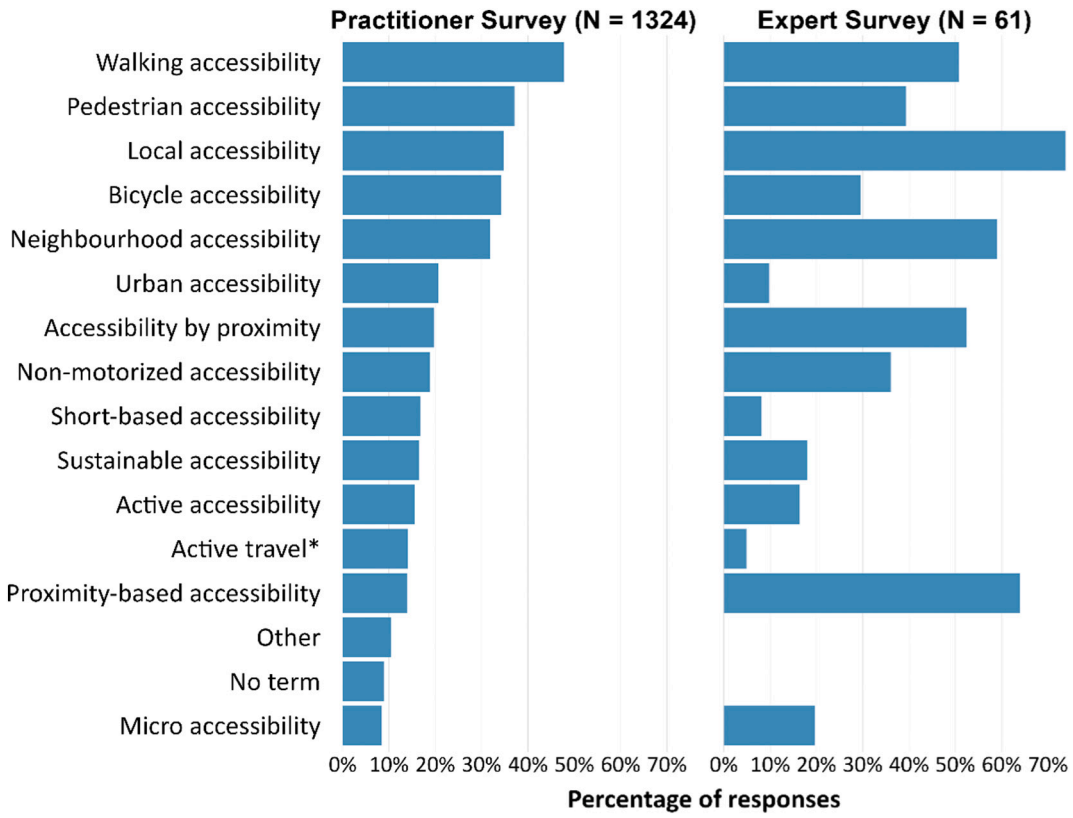

Fig. 1. Preferred terms by practitioners (left) and accessibility experts (right).
All graphs of this paper were created using a script collected from the github repository (https://github.com). The final script is available at https://github.com/rafapereirabr/proximity_access_global_survey.

accessibility, which was among the least favoured by practitioners. Walking accessibility is also found among the top 5 terms by experts, although with a significantly lower proportion of experts than for other terms. Experts seem to prefer terms which explicitly relate to proximity (including local and neighbourhood accessibility). Practitioners, on the other hand, show higher preference for terms which hold an implicit connection to proximity through the explicit relation to a slower transport mode (such as walking or cycling). It is thus clear that proximity has so far been addressed in practice with a multiplicity of terms and not necessarily explicitly regarding spatial proximity, but instead looking at accessibility by slow modes only.

Fig. 2 illustrates the variability across countries, presenting seven countries as illustrative examples. Terms that might be highly favoured in one country might be near to irrelevant in others, for example, local accessibility is preferred by almost half (45.5 %) of American practitioners but by only 12 % of their Chinese counterparts. Similarly, dissimilarities are found across scientific and professional backgrounds. These findings suggest that the terminology around proximity-centred accessibility is not set and varies according to locational, professional, and situational contexts. This was already hinted at in the predecessor study, even suggesting the need for new terms.

4.3. *Distance of proximity*

Replies to the question of what practitioners consider "nearby" generally seem to converge around distances up to 1600 m (90th percentile), leaving a relatively small portion of responses in higher distance classes (see Fig. 3 left).[5] Indeed, more than half of respondents (50th percentile) consider "nearby" to be at distances closer than 800 m, while distances up to 1200 m already reach the 80th percentile of responses. This aligns with the perception from accessibility experts (Fig. 3, right), leading us to question whether there is a seemingly "universal distance of adequate proximity", in analogy with Hupkes (1982) and Marchetti (1994). Some dissimilarities were also observed, as described below.

When looking at different sub-samples of the survey responses, two dimensions provide the most relevant dissimilarities: city size and countries. With regard to the former, results exhibited a distinct pattern whereby respondents from smaller cities had a looser standard regarding what distance is considered in their interpretation of "nearby". For example, distances greater than 1200 m were viewed as nearby by only 5 % of respondents from megacities, but this share grew progressively with decreasing city size up to 25 % in small cities (Fig. 4). We speculate this pattern to be the outcome of larger cities tending to be denser than their smaller counterparts (Cardoso & Gonçalves, 2020) placing more destinations within a close radius of any given resident. It is again important to notice that, like with the global sample, distances up to 800 m hold close to half of the respondents. This sub-sample also shows a slight increase with city size, particularly for mega cities.

When comparing proximity distance across countries (Fig. 5) we found that China shows the most significant deviation from the global sample, with a significantly higher proportion of responses at shorter distance than in other countries. Proximity is defined for distances up to 1200 m by Chinese practitioners and up to 2400 m by African (Kenya

[5] The survey design allowed for only one category selection for this question. However, each category was framed as "up to" a certain distance (400, 800, 1200, 1600, etc., see Annex) and not and intervale.

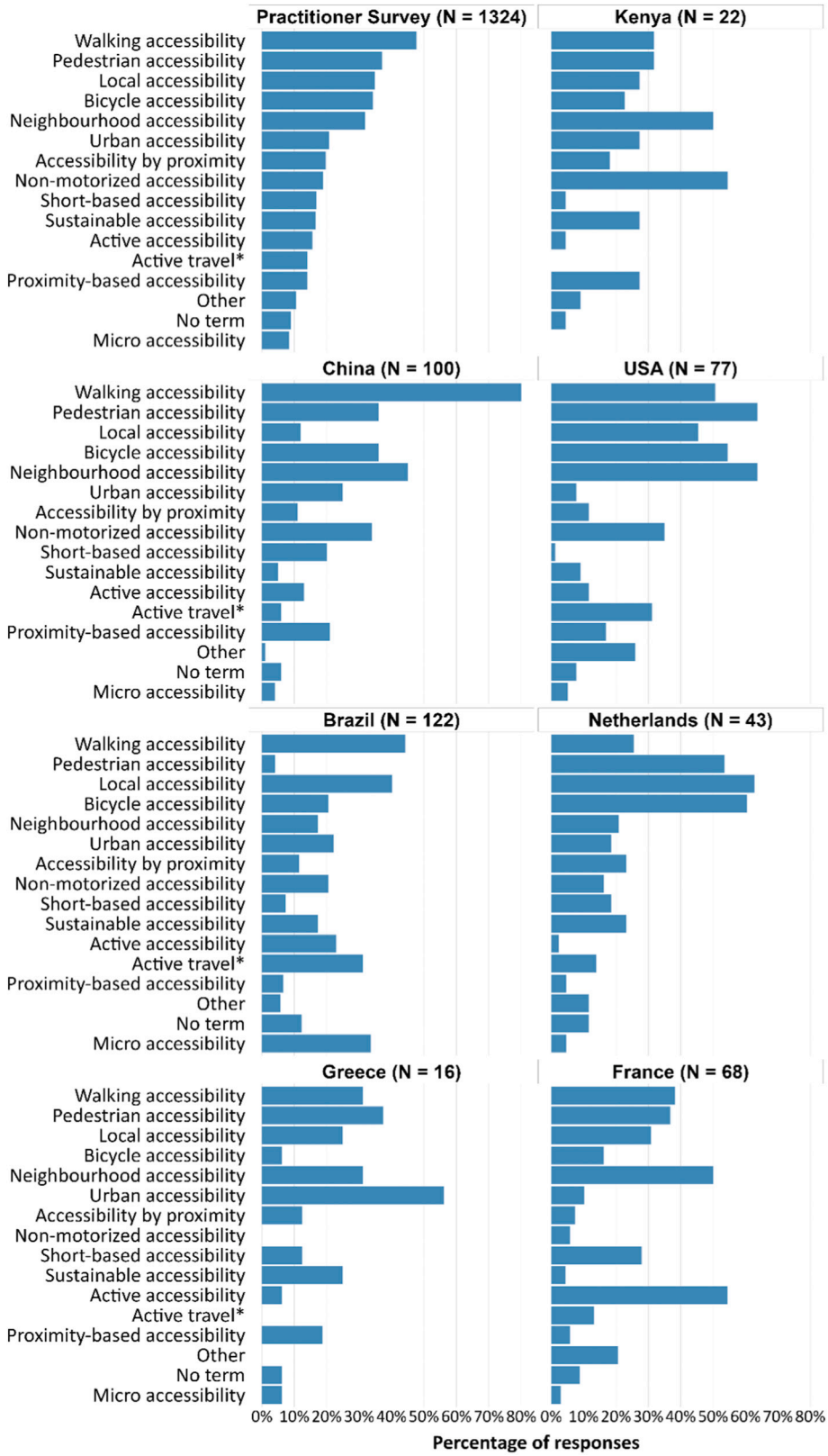

Fig. 2. Preferred terms by practitioners, per country (examples).

and Tunisia) practitioners,[6] while for the remaining sub-samples (and the total sample as a whole) proximity is defined at up to 1600 m (using the 90th percentile). In addition to these disparities, a cross-national statistical exploration reveals notable heterogeneity even within seemingly similar contexts, such as in European countries. This is exemplified by the Netherlands, where the proximity threshold reaches 5000 m

[6] These results must be regarded with care, considering the very low response rate for this sub-sample.

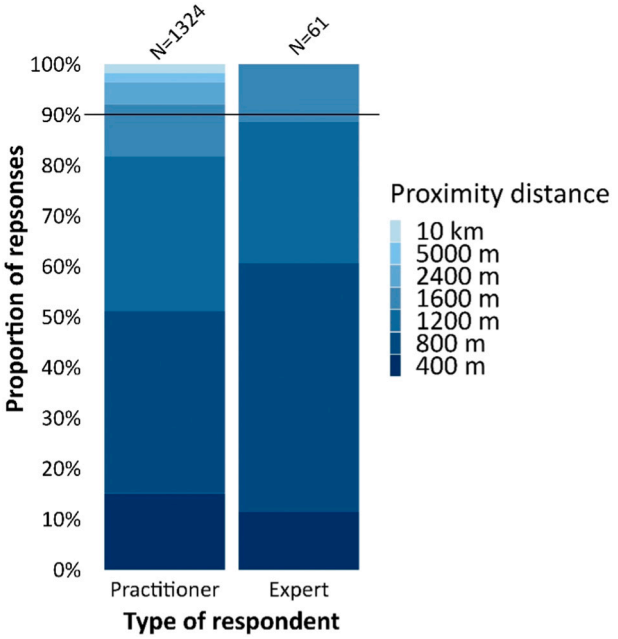

Fig. 3. Proximity distance by practitioners (left) and accessibility experts (right).

(90th percentile). Responses from the Netherlands suggest that practitioners integrate walking and cycling, which is, as part of a 'national cycling habitus'. In other words, looking at proximity from a context-specific perspective highlights the contextual/cultural nature of the proximity concept. Countries such as China, Israel and Brasil show particularly high proportion of responses for distances up to 500 m (around 30th percentile). With for the first two countries and Greece, show close to the 80th percentile for distances up to 800 m, evidence that in certain countries proximity seems to mean shorter distances. Thus, regardless of the general concurrence around up to 1600 m, it is important to also consider the diversity of meaning for proximity within this 90th percentile threshold (particularly 800 m and 1200 m).

4.4. Relevant activities for proximity

When exploring different activities, our results reveal clear differences regarding relevance and reasonable travel time. However, there is a robust consensus for any given activity regardless of practitioners' locational, professional, and situational context (continent, country, city sizes, scientific and professional background).

Practitioners from across the globe seem to place high relevance on pre-primary and primary schools, parks and green spaces, food shopping, and pharmacies. These activities should be accessed within short travel times (max. 15 min) (Fig. 6, left). Meanwhile, cultural activities and higher education facilities are consistently assessed as less relevant and reached in longer travel times (max. 30 min). The consensus may be associated with some universal values around most relevant activities in the satisfaction of basic needs, including children receiving proper education, access to green and open spaces, food and medical needs. However, this may also indicate a dominant urban structure globally, with perceptions reflecting actual experiences. For instance, primary schools and healthcare facilities are better spatially distributed in most cities than jobs or leisure activities, which are usually more concentrated in city centres (Pereira, 2022; Wu et al., 2021). These results align with those found for accessibility experts (Fig. 6, right).

Regardless of some minor differences, the same group of basic needs is among the most valued and with shorter reasonable travel times for both practitioners and experts. This group of activities was consistently expected to be available in less than 10 min travel time by more than half of both samples. Grouping activities by their median reasonable travel distance, we find the same groups across both samples (apart from hospitals). Pre-primary and primary schools, playgrounds, parks, food shopping and pharmacies are expected to be found at up to 10 min,

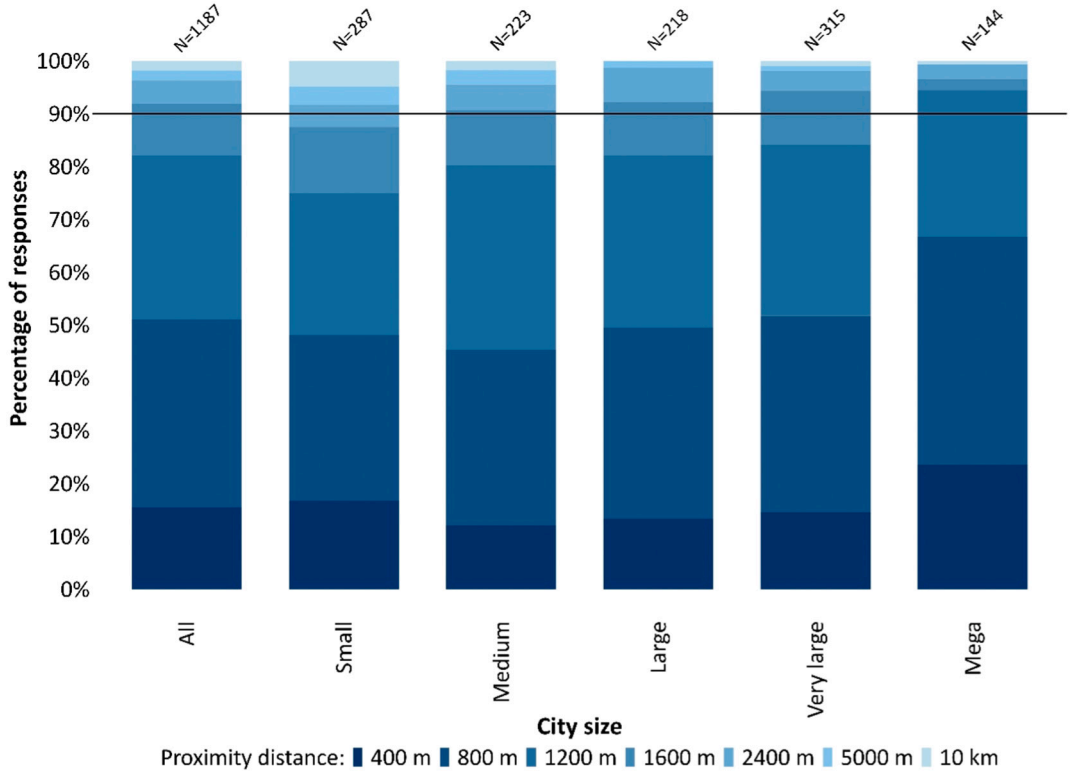

Fig. 4. Proximity distance per city size.

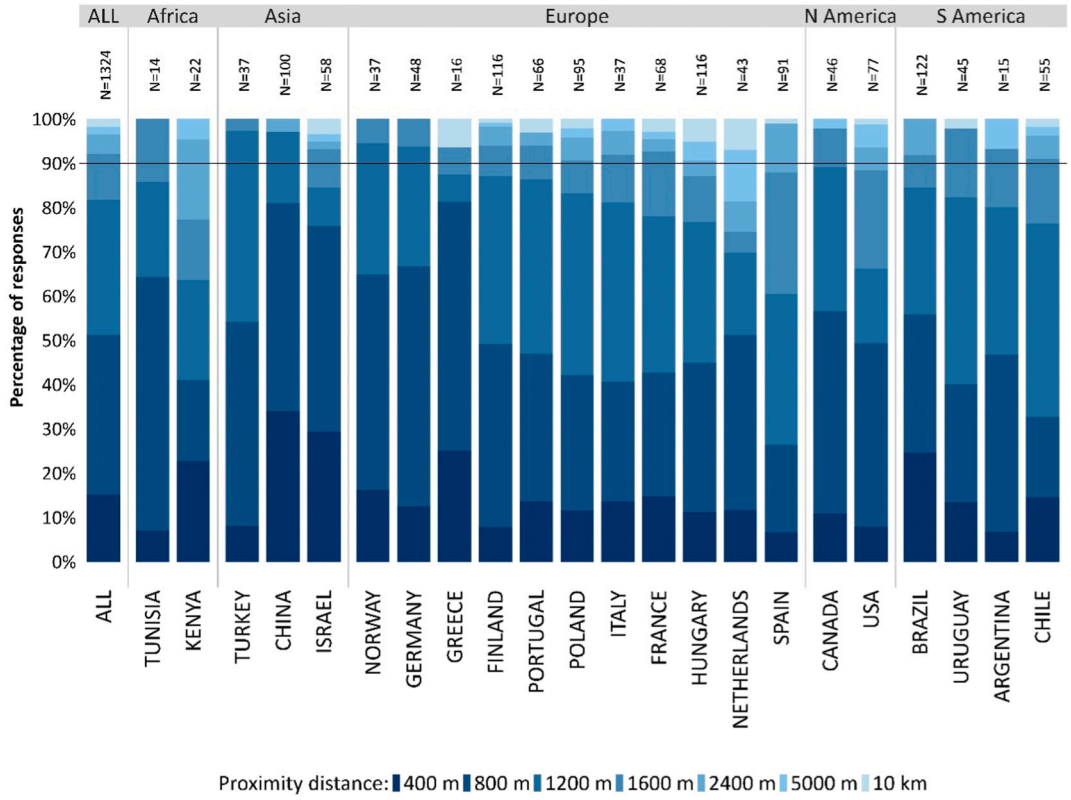

Fig. 5. Proximity distance per country.

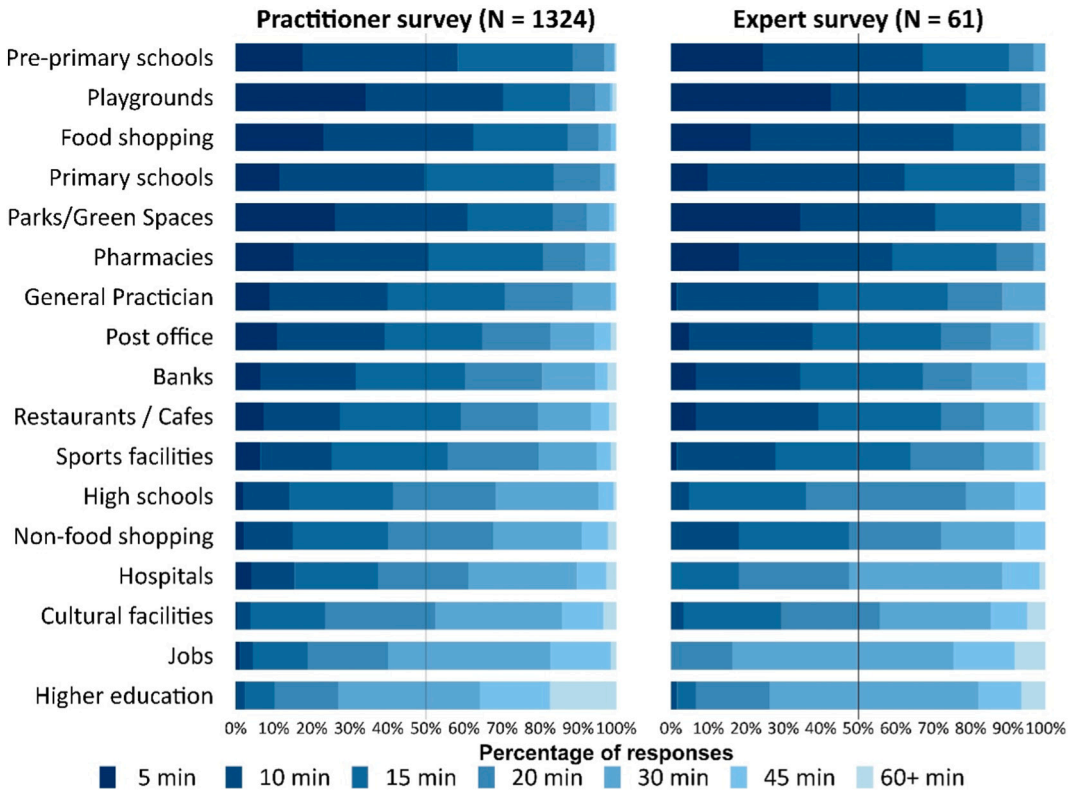

Fig. 6. Reasonable access time to each activity by practitioners (left) and accessibility experts (right).

while general practicians (medical doctors), post offices, banks, restaurants, and sports facilities are expected to be found at up to 15 min. At up to 20 min, both sub-samples expect to find high schools, non-food shopping and cultural facilities, while jobs and higher education may be further away. Regarding hospitals, these are placed by experts in the last group, while practitioners prefer them closer (up to 20 min). In comparison to the 15-min city's rigid benchmark, the results show a relevant variance between the different activities.

Fig. 7 shows reasonable access times to primary schools (top) and high schools (bottom), chosen as illustrative examples of the variability referred to above. The latter is among those holding the highest proportion of respondents accepting longer travel times, while the former illustrates the opposite case. Both graphs show the whole sample in the far-left bar followed by one bar per country order by decreasing the aggregate proportion of travel times up to 15 min. The median reasonable time to access high schools varies between 15 min, for Greece and Brazil, 20 min for countries like France and Canada, and 30 min for Italy and Norway (median values). For primary schools, Greece shows a median of 10 min access time, although now France shows the highest proportion of respondents for this time threshold. Regardless of the country, and considering median values, practitioners agree on a maximum of 15 min to access for primary schools.

Across city size, our comparison revealed some relevant discrepancies between megacities and their counterparts. Regarding the relevance of activities, in megacities, practitioners consistently assign higher relevance to proximity to restaurants or cafes (17.5 % above the overall sample), hospitals (17.3 % above the overall sample), post offices (15 % above the overall sample), and cultural facilities (13 % above the overall sample). Similarly, in megacities, there is a tendency to undervalue the relevance of proximity to playgrounds (13.9 % below the overall sample). In terms of travel time (Fig. 8), practitioners from megacities favour shorter access times than those from smaller cities for activities such as, pre-primary schools, post offices, restaurants/cafes, and sport facilities. This might be related to the high density of activities in the former sub-sample, which seem to enable shorter travel time expectations to many activities. On the other hand, a larger proportion of practitioners from megacities accept very long access times to, for instance, jobs and higher education. Again, density could be responsible here, considering the congestion level of megacities (for cars and public transport). This, together with the low relevance of proximity in destination choice for these activities (when compared to others), and the negative influence of megacities size on travel distances.

5. Main findings

Table 4 summarizes the main findings for the 8 research questions. The abstract meaning of proximity was that which revealed the strongest agreement across different contexts, with more than 90 % of

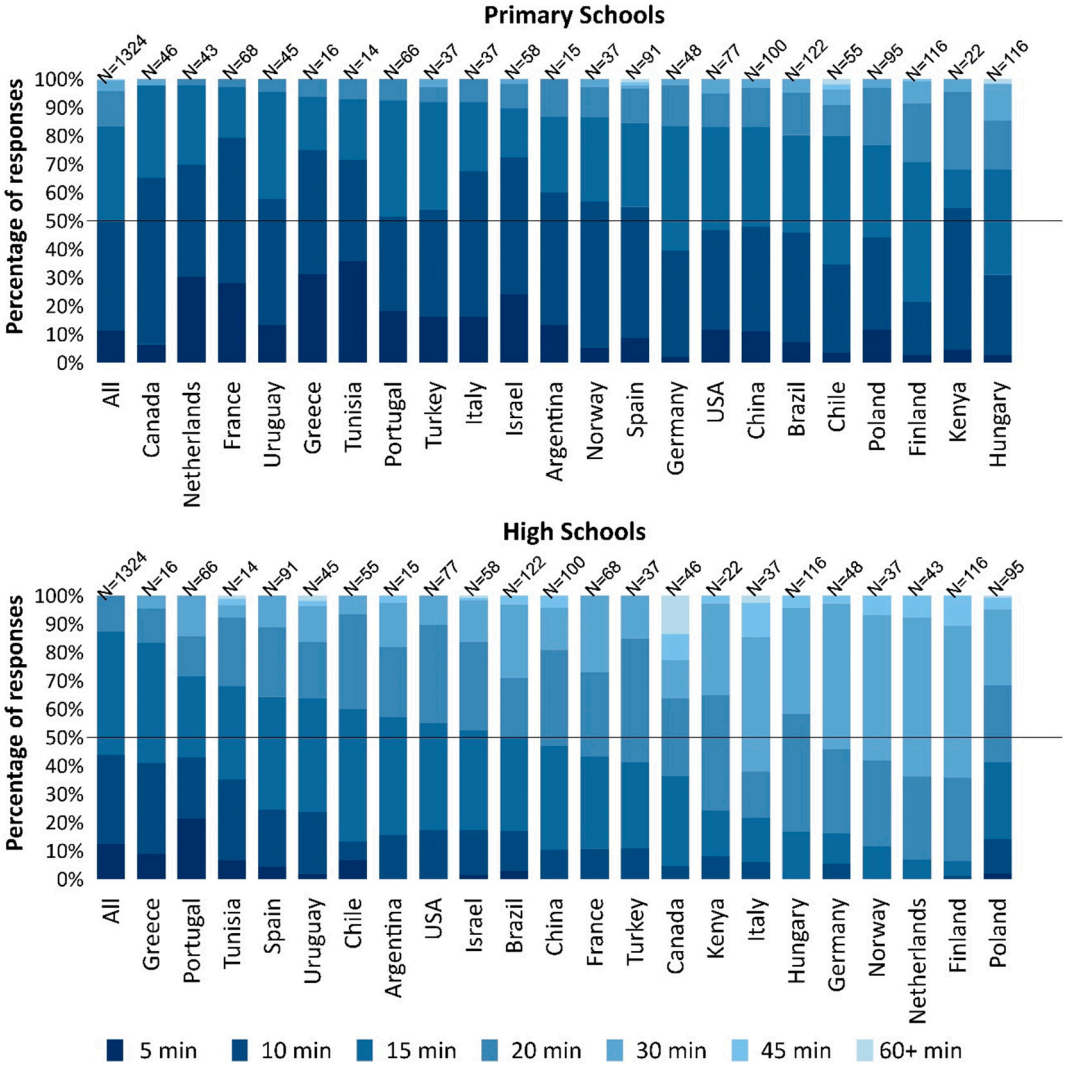

Fig. 7. Reasonable access time to primary and high schools per country.

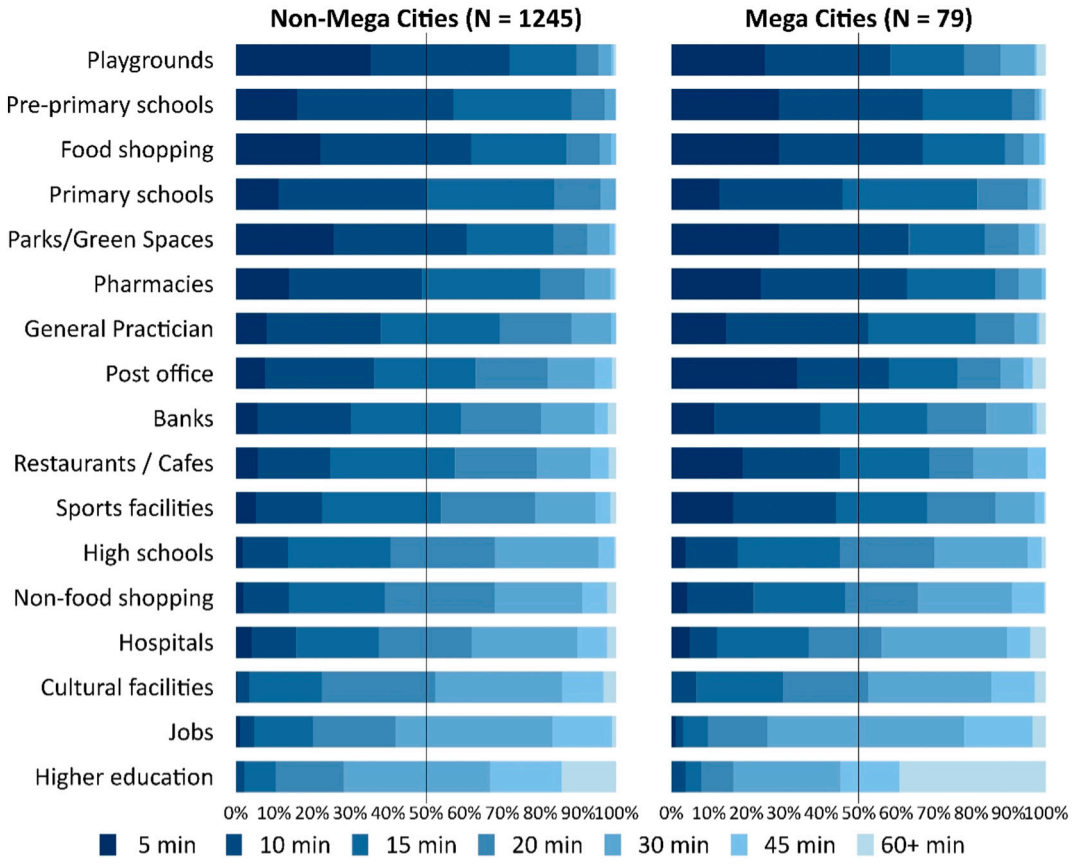

Fig. 8. Reasonable access time to each activity for megacities and non-megacities.

Table 4
Summary of findings.

		Concurrences (O1)				
		Intensity	Meaning	Countries	City size	Practitioners' Background
				(RQ5)	(RQ6)	(RQ7)
Preferred Terms for Proximity-centred Accessibility	(RQ1)	−	Mixed findings	++	+	++
Proximity Meaning	(RQ2)	++	up to 1600 m (90th percentile)	−−	−	−−
Relevant Activities	(RQ3)	+	Most relevant: activities related to basic needs and caregiving (pre-primary and primary schools, parks and green spaces, food shopping, and pharmacies)	+/−	−	−
Reasonable Proximity per Activity	(RQ4)	+	Basic needs should be served at up to 15 min walking (90th percentile; 10 min for 50th percentile)	+/−	−	−

Intensity of Dissimilarities/Concurrencces: −− very weak; − weak; +/− medium; + strong; ++ very strong.

practitioners selecting distances of up to 1600 m (with a high representation of distances up to 1200 m and even up to 800 m). It is clear that practitioners largely see proximity as the ability to reach a desired activity at a very close distance, typically associated with walking trips of less than 20 min and thus reachable without the need for any speed-enhancing vehicles. Despite some exceptions, most notably, in countries such as the Netherlands, there seems to be a universal vehicle independent travel distance budget for what is considered nearby, similar to what has earlier been proposed by with Hupkes (1982) and Marchetti (1994). While our findings hint at a universal geographical scope for proximity, dissimilarities become more apparent when considering perceptions of the resources and amenities associated with proximity.

Our findings on the relevance and meaning of proximity for different activities were also fairly consistent, although to a lesser extent than that of proximity distance. Concurrence was particularly high among a group of activities related to the satisfaction of basic needs and caregiving, namely, pre-primary and primary schools, playgrounds and green spaces, food shopping, and pharmacies. Independent of context, these activities were consistently regarded as highly valuable and should be conveniently accessible within short travel distances, with most respondents defining reasonable travel times as 10 min walking or lower. This is in line with the discussion raised by Madariaga (2016) around the mobility of care.

On the opposite side of the spectrum, we find activities such as jobs and higher education facilities, with most respondents accepting travel times of up to 30 min walking. Despite the clear dominant trends here we still find noteworthy dissimilarities, for instance across countries for particular activities, or across city size, which was also visible regarding

the general meaning of proximity. Regarding the latter, our findings indicate shorter reasonable travel times across activities for megacities when compared to the smaller counterparts. However, these results must be regarded with care, considering the dominance of cities from one single continent and even country (namely China) in the megacity subsample.

The observed variability in reasonable access times across different activities, countries, and city sizes aligns with the expectations outlined in the literature review. Specifically, our findings reinforce the notion that access time preferences do not conform to a single, universal threshold as proposed by the 15-minute city model and related frameworks. Instead, the practitioners' expectations of reasonable travel times vary depending on the type of activity, country, and urban scale. These results highlight the importance of critically re-evaluating the assumption of a fixed, universally applicable benchmark, such as 15 min, in urban accessibility planning. Rather, access time standards should be activity-sensitive and adapted to the local context. This has also been recognised by the original author of the term, Carlos Moreno, who now uses multiple travel time thresholds and even goes so far as to state that the exact time is not relevant, with many references available to the x-minute city (such as, Logan et al. (2022); Lu and Diab (2023)). Recent publications (Allam et al., 2020; Moreno, 2023) have seen a change in discourse towards the city of proximity instead of the 15-minute city, in an approximation to terms such as *the human-scale city* or that of *city for people*.

Of the four research questions explored for the conceptual framework on proximity-centred accessibility, the terminology employed was revealed to show the lowest concurrence of results. Each country, continent, city size, or professional background showed different preferences. Variations within each group are also significant, suggesting that dissimilarities are more related to personal circumstances than to any particular group. These findings reinforce the findings of the predecessor study. In fact, our broader research confirmed dissimilarities of varied natures (not only national contexts). Two possible explanations might be suggested for this phenomenon. This might simply be the result of a limited use in practice of such terms and of their underlying concerns. But it also might mean that terms developed and used in research might not be meaningful in practice. Researchers look to develop consistent language for precision and clarity across the research community. For practitioners, local understanding among citizens and stakeholders is paramount, and can vary by context.

6. Conclusion

Our study offers relevant evidence on the meaning of proximity and thus for the definition of the x-minute city from the perspective of local planning practitioners worldwide regarding travel distance thresholds and relevant activities for a series of specific contexts, such as specific countries and even city sizes. Together with the results from the predecessor study, these results are fundamental to inform proximity-centred research and to replace the use of educated assumptions (at best) in many accessibility measurements and x-minute city assessments so far.

Our findings reinforce some of the grounds for a conceptual framework for proximity-centred accessibility suggested in the predecessor study:

1. Proximity refers to physical distances up to 1600 m, enabling reasonable travel times regardless of the transport mode, most notably for walking.
2. Context plays an essential role in the relevance of activities and in establishing travel thresholds for each activity.
3. Regardless of context, activities related to basic needs and caregiving (such as pre-primary and primary schools, playgrounds and green spaces, food shopping, and pharmacies) play a particularly relevant role.
4. Travel thresholds vary significantly across different activities.

Our research provides found that no single term has been established globally and that there are significant regional variations in preferred terminology. Our findings underpin the importance of researchers and practitioners alike to be aware of different terminologies prevalent in different countries, and even across the same country. This is particularly crucial when communicating outcomes or research, for example.

It is important to point out that our findings, so far, still provide a partial view of the meaning of proximity with further studies required. First, we highlight the limited array of countries (22) involved in the planning practitioners' survey. By making the full results of the survey open data (under a ‘share alike’ license) we aim to encourage the development of an international research community contributing with further studies into different national, and regional context. Even the countries explored in this study were so at varying degrees of representativity of national practitioners. For those with lower representativity, follow up studies are required involving larger samples.

In addition to the survey of practitioners and academic experts, further research is needed into citizens' perceptions on proximity-centred accessibility. Such study should further explore concurrences in the meaning of proximity worldwide while delving even deeper into dissimilarities, by adding important elements of socio-demographics ranging from gender, to age, ethnicity, social status, and capabilities. Such study is currently underway, with the development of the survey process enabling a meaningful discussion across a variety of individual and regional context.

CRediT authorship contribution statement

Cecília Silva: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Benjamin Büttner:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Sebastian Seisenberger:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **João Filipe Teixeira:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis. **María Teresa Baquero-Larriva:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Eda Beyazit:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Maxime Hachette:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Diego Hernandez:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Wambui Kariuki:** Writing – original draft, Investigation, Formal analysis. **Patxi J. Lamíquiz-Daudén:** Writing – original draft, Investigation, Formal analysis. **Jonathan Levine:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis. **Alain L'Hostis:** Writing – original draft, Methodology, Investigation, Formal analysis. **Chunjiang Li:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Karel Martens:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Juan Carlos Martin:** Writing – original draft, Methodology, Investigation, Formal analysis. **Lucila Martinazzo:** Writing – review & editing, Writing – original draft, Visualization, Investigation, Formal analysis. **Beatriz Mella-Lira:** Writing – original draft, Methodology, Investigation, Formal analysis. **Louis A. Merlin:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis. **Dylan Moinse:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Fabio Palacio:** Writing – review & editing, Investigation. **Roberto Patuelli:** Writing – original draft, Formal analysis. **Rafael H.M. Pereira:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis. **Miklós Radics:** Writing – original draft, Visualization,

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Annex A. Proximity-based accessibility – practitioners survey TEMPLATE

**Adaptable for each context
*Mandatory

Proximity-based accessibility - conceptual discussion

Thank you for your availability to participate in this survey, aimed to explore the understanding of accessibility by proximity. The survey has around a dozen questions and should take about **15 min** to respond.

Our research aims to understand how local practitioners from different backgrounds value accessibility to different activities at the neighbourhood level. **When we refer to proximity-based accessibility we mean "the ability to reach relevant activities/destinations nearby".**

***Although policy has long focused on what we call long distance accessibility (mostly provided by fast transport modes), recent concerns regarding the resilience of urban systems to climate change, the pandemic and even war, have raised new awareness on accessibility provided by proximity. For instance the prominence of the movements such as the 15-minute city or the 20-minute neighbourhood, has raised the prominance of higher proximity and reduced dependence on mobility for accessibility.*

The survey is anonymous. By filling in the survey you agree to willingly share your opinions with us.

Thank you,

***Expert's name*

Concept

1. Which of the following term/terms would you use in your practice to refer to our concept of accessibility by proximity? Please check all that apply. Note that this survey is being implemented in different countries; as such, some terms may have little to no meaning in your context. *

- ☐ I don't use any term to refer to accessibility by proximity
- ☐ Local Accessibility
- ☐ Micro Accessibility
- ☐ Neighbourhood Accessibility
- ☐ Walking Accessibility
- ☐ Non-motorized Accessibility
- ☐ Active Accessibility
- ☐ Accessibility by Proximity
- ☐ Proximity-based Accessibility
- ☐ Active Travel or Human-powered transportation
- ☐ Pedestrian Accessibility
- ☐ Bicycle Accessibility
- ☐ Short-based Accessibility
- ☐ Urban Accessibility
- ☐ Sustainable Accessibility
- ☐ Other:

2. If you replied 'Other' in the question above, please provide the term you usually use to refer to our concept of accessibility by proximity

3. If you like, provide any comments to our definition or you term(s) here:

4. When you think of something being ‘nearby’, what distance do you have in mind? *

- ○ up to 400m / 0.25miles (roughly 5min walking)

- ○ up to 800m / 0.5miles (roughly 10min walking)
- ○ up to 1200m / 0.75miles (roughly 15min walking)
- ○ up to 1600m / 1mile (roughly 20min walking)
- ○ up to 2400m / 1.5miles (roughly 30min walking)
- ○ up to 5km / 3miles (roughly 60min walking)
- ○ up to 10km / 6miles (roughly 15min driving, average speed of 40km/h)

5. Thinking about each of the activities/destinations below, how relevant is it to be able to reach them nearby? (professional opinion) from 1 - not relevant - to 5 - highly relevant. *

	1 (not relevant)	2	3	4	5 (highly relevant
Jobs	○	○	○	○	○
Pre-primary schools	○	○	○	○	○
Primary schools	○	○	○	○	○
High schools	○	○	○	○	○
Higher education facilities	○	○	○	○	○
Hospitals	○	○	○	○	○
Pharmacies	○	○	○	○	○
General Practitioner (Medical Doctor)	○	○	○	○	○
Sports facilities (a place to practices ports)	○	○	○	○	○
Parks / green spaces	○	○	○	○	○
Playgrounds	○	○	○	○	○
Banks/ ATM	○	○	○	○	○

. (*continued*).

Restaurants / Cafés	○	○	○	○	○
Food Shopping	○	○	○	○	○
Non-food shopping	○	○	○	○	○
Cinema / Theater / other cultural facilties	○	○	○	○	○
Post office/ Pick up points	○	○	○	○	○
Beauty salons	○	○	○	○	○

6. Identify the reasonable time threshold to access each of the destinations (classify the absolute time, regardless of the transport mode). *

	5 min	10 min	15 min	20 min	30 min	45 min	60 min or more
Jobs	○	○	○	○	○	○	○
Pre-primary schools	○	○	○	○	○	○	○
Primary schools	○	○	○	○	○	○	○
High schools	○	○	○	○	○	○	○
Higher education facilities	○	○	○	○	○	○	○
Hospitals	○	○	○	○	○	○	○
Pharmacies	○	○	○	○	○	○	○
General Practitioner (Medical Doctor)	○	○	○	○	○	○	○
Sports facilities (a	○	○	○	○	○	○	○

. (*continued*).

place to practices ports)							
Parks / green spaces	○	○	○	○	○	○	○
Playgrounds	○	○	○	○	○	○	○
Banks/ ATM	○	○	○	○	○	○	○
Restaurants / Cafés	○	○	○	○	○	○	○
Food Shopping	○	○	○	○	○	○	○
Non-food shopping	○	○	○	○	○	○	○
Cinema / Theater / other cultural facilties	○	○	○	○	○	○	○
Post office/ Pick up points	○	○	○	○	○	○	○
Beauty salons	○	○	○	○	○	○	○

7. (optional) Would you suggest an additional activity for the list above?

- ○ Yes
- ○ No

8. Which activity would you suggest?

9. Identify the reasonable time to access the destination you suggested (classify the absolute time, regardless of the transport mode). *

5 min	10 min	15 min	20 min	30 min	45 min	60 min or more

. (*continued*).

Suggested activity	○	○	○	○	○	○	○

Professional Activity

10. In my professional activity, I have (or had): *

- ☐ Political Responsibilities (politicians, decisions makers)
- ☐ Technical Responsibilities (planners)
- ☐ Consultant Responsibilities
- ☐ Other

11. Classify the relevance of proximity-centred accessibility in your professional activity (from 1 - not relevant- to 5 - very relevant). *

	1 - not important	2	3	4	5 - very important
Importance of proximity-centred accessibility in my professional activity	○	○	○	○	○

12. Identify the main field of your professional activity *

- ☐ ***Urban Planning / land-Use Planning / Spatial Planning*
- ☐ ***Transport Planning / Traffic Planning / Traffic Engineering*
- ☐ Other

13. In case you replied 'Other' in the question above, please specify your main field of professional activity:

14. Identify the size of the ***cities/communes/municipalities* you normally work with. *

. (*continued*).

- ☐ Megacities (above 10.000.000 inhabitants)
- ☐ Very Large City (between 500.000 and 10.000.000 inhabitants)
- ☐ Large City (between 250.000 and 500.000 inhabitants)
- ☐ Medium City (between 100.000 and 250.000 inhabitants)
- ☐ Small City (<100.000 inhabitants)

15. Specify the name of the city.

General data

16. Age: *

- ○ 20-29
- ○ 30-39
- ○ 40-49
- ○ 50-59
- ○ 60-69
- ○ 70 and over

17. Gender: *

- ○ Male
- ○ Female
- ○ Other
- ○ Prefer not to say

. (*continued*).

End of survey

Thank you for sharing your expertise.

Data availability

Data will be made available on request.

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