The question of proximity. Demographic ageing places the 15-minute-city theory under stress

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March 17, 2023

Abstract

Some of the major future challenges in urban planning are related to population ageing. Although the improvement of longevity can certainly be regarded as a human development success, many issues emerge in parallel, including social, economic, and spatial aspects. The Covid-19 pandemic experience and social distancing measures implemented have highlighted the need for compact communities and neighborhoods and in this context, urban theories promoting locality and accessibility have gained significant momentum. This paper focuses especially on the 15-minute city concept and sets its core element, an isochrone of 15 minutes of walking under scrutiny, to highlight how ageing places urban planning theories under stress. It tests the assumption that time-oriented theories of accessibility which rely on population-wide conventions may overestimate the mobility capacity and walking speeds of older people, that may lead to fallacies in spatial analyses and urban planning practice, especially in ageing societies. The findings suggest that a 30% adjusted equivalent, such as a 20-minute convention for the 15-minute city, might be more appropriate for older age groups. This contributes to the broader discussion about proximity and the walkable city, regardless of whether it is based on a 5-, 10-, 15-, or 20-minute model.

Demographic Ageing, the question of proximity, and the concept of the 15-minute city

Ageing refers to a major shift in demographic cohorts that reflects an increased life expectancy combined with lower fertility rates, leading to a higher proportion of elderly within societies. While population ageing is a global phenomenon the European Union provides one of the most distinctive examples. Ageing is more evident in the periphery of the EU geographic core, specially the Southern and Eastern parts and similarly differences are also observed within cities and neighborhoods. Although longevity can definitely be considered a human development success, ageing is also linked with many challenges that emerge in parallel. These can include economic issues such as pension costs, reduced labor supply, and increased need for medical care, among others. From a spatial and urban planning perspective, issues involve proposing agendas that promote active ageing. Active ageing means helping people remain in charge of their own lives for as long as possible, something that equals independent mobility and equity of access to services and amenities. In other words, ageing is strongly linked to accessibility issues.

The question of access -where, when, and by whom- is one of the classic issues for the spatial and functional organization of cities and is topologically linked to geographical distance. Planning models that promote proximity aim at an urban form that ensures equity of access to functions and land uses by all, which implies high densities and mixed land uses as well. This is generally opposed to models that promote distinct and

differentiated zones that heavily depend on trans-local connectivity, especially cars, to connect areas for daily commuting, like for example the Post-War CIAM agendas, or the US suburbia

During the Covid-19 pandemic, lockdowns, and the unfolding of mobility restrictions throughout Europe, the question of accessibility came to the forefront of academic and political discussion. That became most evident for population groups that came to be known as high-risk, meaning mostly the elderly and people with specific medical conditions. At a societal level and mainly due to ageing, a significant proportion of European populations fell automatically within this category and, in that sense, cities were also 'high risk.' At the individual level and scale, varying levels of accessibility have determined the quality of life for most urban populations, and more so for those belonging to high-risk groups, for almost two years. Overall, social distancing measures highlighted the need for cohesive and compact communities and neighborhoods, and in this context, concepts promoting locality and proximity like the 15-minute city (15MC) gained significant momentum. Although Paris adoption of the goal gained significant attention, the agenda is put forward by numerous cities around the world, for example those belonging to the C40 network: https://www.c40.org/cities/.

In summary, the basic idea of the 15MC states that cities should be designed or redesigned so that residents of all ages and social backgrounds have access to their everyday needs (housing, work, food, health, education, culture, and recreation) within an easily reachable distance set at 15 minutes. To accomplish this goal, the theory advocates a shift from private vehicles to active mobility (mainly walking and cycling), amid high residential densities, and through the mass adoption of digital technologies such as remote work or shared travel, which reduce unnecessary mobility and waste of time, in general (C40, n.d.; Moreno et al., 2021; Allam et al., 2021; Pozoukidou & Chatziyiannaki, 2021).

Although 15MC may initially be viewed as a rebranded proposition toward proximity, locality, mixed uses, and compact neighborhood design, it is often considered more literally as a planning practice or spatial analysis tool (Abdelfattah et al., 2022; Caselli et al., 2022; Ferrer-Ortiz et al., 2022; Marino et al., 2022; Gaglione, 2021; Graells-Garrido et al., 2021). Then, 15MC refers then to an isochrone that expresses a radius that defines an area considered to be local. Isochrones are not new and have long been used in transport planning, although they have gained wider attention in recent years, mainly because of the use of digital GPS tracking applications that enable near real-time data flows and estimations for both users and researchers or the planning community. Isochrones are primarily constructed using two variables: time and speed. Average speed conventions regarding walking (or cycling or driving) are used to determine the radius that defines 'nearby' and as such, a question arises as to what extent such conventions concern most people within a city, and most specifically older ones, as will be further discussed in this paper.

Hypothesis

To highlight how ageing places urban planning practices and conventions under stress, let alone when they are taken as normative guides, a simple hypothesis is examined, which states that ageing corresponds to a physically limited active mobility capacity for older people and, more specifically, slower gait speed. If true, the temporal-referenced and population-wide conventions used in spatial analyses and planning practice models, such as the 15MC, are expected to overestimate the ability of older people to cover equal distances in comparison to younger adults within a given timeframe. Furthermore, as the urban population continues to age, the same fallacy can lead to ever-shrinking perceived accessible areas, and (possibly) age discrimination. To test this assumption, the focus is specifically on the radius implied by the 15 min city theory through walking, which is by far the most common form of an active and non-car-dependent mean of daily mobility.

Methods and Analysis

To explore how the 15MC walking isochrone corresponds to two age groups, defined here as 'adults' and 'older adults', an online database search has been conducted using Google Scholar in research published in English (in early 2022), extending from 1995 to 2020 and concerning reports of objectively measured

walking speeds per age group and especially for older people (usually defined as over 60 or 65 years old). It is well established that free-living walking speeds fluctuate with terrain features, natural conditions such as temperature, visual stimuli, socioeconomic status, culture, or movement purposes (Fitzpatrick et al., 2006; Finnis & Walton, 2008; Levine & Norenzayan, 1999). To identify less subjective measures that better represent the physiological limitations of the human body and to exclude as many environmental factors as possible, the online search narrowed to studies measuring pedestrian speed while crossing crosswalks. The assumption here is that moving on a crosswalk is performed at normal to vigorous speed, without distractions, as quickly as possible, but not fast enough to become too inconvenient.

A significant number of papers were retrieved, of which five were selected on the basis that they provided not only average values but also estimations in the 15th percentile. The 85th and 15th percentiles of a normal distribution are two parameters that are commonly used in traffic safety, as the 15th percentile speed represents a threshold that can be exceeded by at least 85% (significant majority) of the population involved to be used in recommendations.

To test this hypothesis, two new average speeds were calculated, one referring to the average speeds measured and one referring to the 15th percentile estimations. Accordingly, the distance covered in 15 minutes was recalculated for each age group, as well as the time needed to cover 1000 meters (1km), which is another well-known walking distance convention for defining a neighborhood. Finally, to visualize the differences between groups in spatial terms, a network analysis was conducted using QGIS in the city center of Athens (municipality of Athens) and service areas were analyzed around the Athens-Metro stations, as an example.

Results

Based on the values presented in Figure 1, the reported walking speed for younger adults was found to be significantly (21%) faster than for older adults in average measure terms, and (32%) in the 15th percentile. The difference between average measures and 15^{th} percentile estimations was significant, indicating that using mean values overestimates speed conventions more for the elderly than for younger adults. Reverting the speed-time-distance calculations for the 15^{th} percentile estimations, the equal 15-minute walking distance ranged from 805 m for the elderly to 1060 m for younger adults. Taking the 1000-meter (1 km) convention as a reference, the travel time was close to 15 min for the younger adults and 20 min for the elderly.

Walking Speeds m/s **Source**	Adults	Older People	(Faster)	Notes
Knoblauch et al. (1996)				Un-signalized midblock crosswalk
Average	1.51	1.25	21%	
15th Percentile	1.25	0.97	29%	
Gates et al. (2006)				Pedestrian traffic signals crossing
Average	1.41	1.16	22%	
15th Percentile	1.15	0.92	25%	
Montufar et al. (2007)				Un-signalized midblock crosswalk
Average	1.61	1.36	18%	
15th Percentile	1.34	1.01	33%	
Fitzpatrick et al. (2006)				Intervals for traffic signals
Average	1.45	1.30	12%	Under/Over 60 years
15th Percentile	1.15	0.90	28%	
Guerrier and Jolibois 1998				Urban Intersections
Average	1.35	0.97	39%	
15th Percentile	1	0.67	49%	
Average Speeds	**1.47**	**1.21**	21%	
Average 15th Percentile speeds	**1.18**	**0.89**	32%	
1000m Covered in 15 minutes **(15th percentile average speed)**	**1060** **15.56**	**805** **20.51**		

Figure 1: Retrieved reported values and 15th percentile estimations from the five studies.

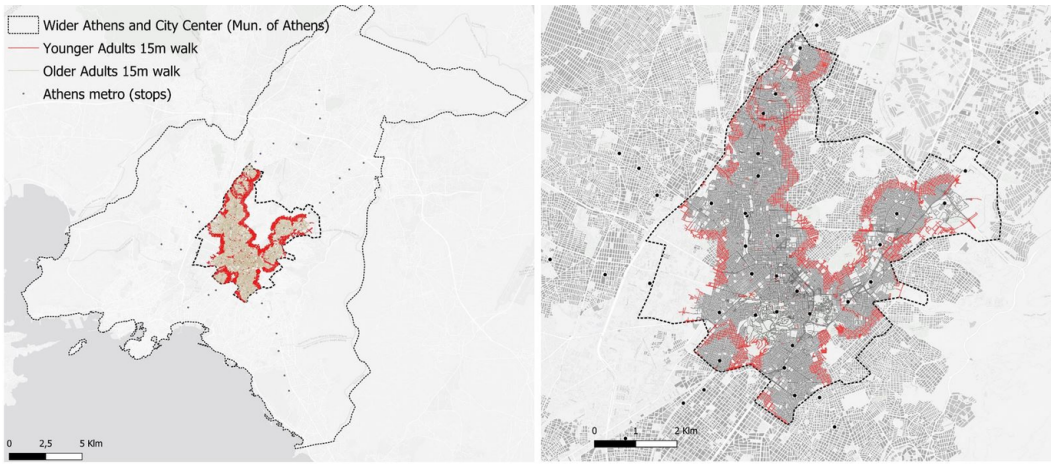

Figure 2: 15m-walking Service Areas around metro stations in Athens Municipality for the two age groups. Distances were set to 805m-(grey color-older people) and 1060m (red color-younger adults), and the results were visualized on two scales. Street network data were retrieved from OSM(OpenStreetMap) and the urban fabric background from the Urban Atlas LCLU 2018 dataset. Network analysis was conducted using the QGIS software.

Discussion: Ageing Cities, shrinking places, and the re-emerging question of proximity

Due to demographic ageing, planning for all age groups has often been discussed in recent decades with an emphasis on social cohesion, community development, urban health, and the adaptation of planning practices to new mobility needs and trends. As societies age, the capacity for physically intensive mobility shrinks in terms of endurance and speed, and city areas and land use become less reachable in that sense. Demographic data of today and future projections, especially regarding Europe, both point out that equity of access through active mobility is to become more challenging in the future. This observation in the era of fast intercontinental transport and the vast adoption of digital tools that eliminate physical proximity for many economic activities and material flows almost represents an irony.

In light of the Covid-19 pandemic and the lockdowns experience, the surging return of interest to the local unit as the core of multiple and overlapping human activities was a notable and welcomed outcome of this turbulent period. Proximity theories, whether they refer to a 5-,10-, or 15-minute model or a 500m or 1000m distance buffer, can as such be regarded as justified models for walkable and neighborhood-oriented cities. Regarding 15MC, the theory bears novel and interesting concepts such as the embracement of high densities linked to the massive adoption of digital technologies. However, focusing more on time values (or 'chrono-urbanism) also involves significant limitations, especially when the theory is taken as a literal goal or spatial analysis method. In this case, if the core element of the theory (15-minute distance) is stressed with challenging issues such as demographic ageing, the limitations of such conventions become more evident and need to be better adjusted.

Even though simply adjusting timeframes for the elderly (e.g., by 30% as argued in this research) could be a "quick fix," it should be mentioned that walking capacity should not be confused with the ability, the will, the reason, or the motivation to walk at the first place, pointing to a multifactorial relationship that can be overlooked by quantitative and normative methods. For example, regional research findings have pointed out that many older people tend to walk significantly long distances daily, but only for a few years after retirement age, probably due to the availability of free time and the voluntary trade of effort and speed for endurance and socialization, thus causing even further confusion (Buehler et al., 2011; Sugiyama et al., 2019). Finally, the main assumptions of the digitization of most everyday activities should be treated with healthy skepticism, especially for those who are less capable of rapidly adapting to new and tech-savvy lifestyles. In conclusion, to answer the question of 'how far is too far, which can, of course, be rephrased as 'how long is too long, a better and more detailed approach is suggested when putting into practice what appears to be, or can be holistic suggestions.

Suggested Future Steps: Cities and changing human bodies

From a Eurocentric point of view, most planning and anthropometric standards and conventions regarding pedestrian walking in the literature trace their roots to the post-war reconstruction aligned with the last major phase of expanding urbanization related to population growth. Accordingly, urban forms in European cities today have mainly been structured around the concept of nuclear family and work-home daily commuting, emphasizing functionality and purposely directing resources and planning agendas toward that double goal. Yet, as demographics change, the nature and organization of work changes, and finally human bodies change, these conventions need to be revisited and revised to better align with up-to-date data and future projections.

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