

# TeMA

Journal of  
Land Use, Mobility and Environment

The mobility for the elderly population encompasses different dimensions of urban life including housing, transportation, work-related activities and social interactions. The initiatives for the elderly are mainly undertaken in the areas of health while in reality, this is only a part of the overall picture that might be considered while planning urban accessibility strategies.

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## Elderly Mobility

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Special Issue 2.2018

## Elderly Mobility

### Contents

- 3**     **Editorial Preface**  
M. Bricocoli, A. E. Brouwer, C. Gargiulo
- 9**     **Mobility and Accessibility of the ageing society. Defining profiles of the elderly population in neighbourhoods**  
M. Akhavan, G. Vecchio
- 23**    **Smart Mobility and elderly people. Can ICTs make the city more accessible for everybody?**  
R. Battarra, F. Zucaro, M.R. Tremiterra
- 43**    **Growing old and keeping mobile in Italy. Active ageing and the importance of urban mobility planning strategies**  
C. Burlando, I. Cusano
- 53**    **A set of variables for elderly accessibility in urban areas**  
C. Gargiulo, F. Zucaro, F. Gaglione
- 67**    **The tourist-religious mobility of the “silver-haired people”: the case of Pietrelcina (BN)**  
R.A. La Rocca, R. Fistola
- 85**    **Measuring spatial accessibility for elderly. An application to subway station in Milan**  
F. Manfredini, C. Di Rosa

- 95**    **Is Milan a city for elderly? Mobility for aging in place**  
I. Mariotti, A. E. Brouwer, M. Gelormini
- 105**   **Measuring walking accessibility to public transport of the elderly: the case of Naples**  
E. Papa, G. Carpentieri, C. Guida
- 117**   **Key characteristics of an age – friendly neighbourhood**  
F. Pinto, M. Sufineyestani

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## KEY CHARACTERISTICS OF AN AGE-FRIENDLY NEIGHBOURHOOD

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### ABSTRACT

European Union's inhabitants are quickly ageing. Therefore, ageing is an emerging issue, causing different kinds of problems. Among them, mobility is a remarkably complicated challenge, as it encompasses much more inter-related problems that have profound physical, mental and social consequences on well-being. Urban planning researchers indicate that a low level of mobility is generally linked to a low quality of life especially amongst elderly.

Mobility has an important positive effect on old people's independence and involvement in socio-economic life resulting in profits for themselves as well as the whole of society. Besides, mobility facilitates senior access to medical and health, educational, cultural, recreational services and other local welfare services; particularly to establish and foster social relations, and help them to combat social exclusion. Overall, everyday mobility is necessary for their social well-being, and physical and mental health.

This paper aimed to review and critically analyze the literature on the contribution between key characteristics of the neighbourhood that improve the outdoor mobility of old adults, quality of life and well-being in a number of countries all around the worlds. It also aimed to identify gaps in the level of scientific knowledge about this subject.

### KEYWORDS

Quality of Life; Well-Being; Mobility, Age-Friendly Neighbourhood; Review

## 1 INTRODUCTION

It is well known that older people have a preference to spend the major part of their time in their homes and neighbourhoods, in other words, they are more vulnerable to changes to the environment or potential challenges of their residential housing. These can consist of urban hazards and risks such as traffic jam, access to public toilets or resting places, pedestrian safety, or the physical layout of homes which may lead to limited mobility or noticeable risk of fall (Buffel et al., 2012; Golant, 2014).

Enabling and supporting ageing in place includes political, economic, social, and geographical areas. Allowing older adults to grow old in a familiar environment and to preserve independence and self-determination is sometimes considered positive (Davies & James, 2011). Whereas, some scholars also draw criticism and attention to the restrictions and potential shortcomings of ageing in place. These criticize address, for example, the suitability of the physical design of the home and neighbourhood, as well as the increased risk of loneliness and isolation and low amount of social support in the home and community (Howden-Chapman et al., 1999; Means, 2007).

Studies within environmental gerontology have revealed that a broader (geographic) viewpoint is required to investigate the multidimensional term of ageing in place. This is also shown by discussions about a shift from ageing in place to further research on 'place in ageing', which is focused on "identifying and understanding the key role of contexts of ageing" (Gardner, 2011).

Consequently, not only the home but also the neighbourhood and community have been found to be crucial when discussing the quality of life, health, and well-being of older adults (Howden-Chapman et al., 1999; Iwarsson et al., 2007). According to definition of WHO (2007) an age-friendly city is "an inclusive and accessible urban environment that promotes active and healthy ageing", considering this definition we categorized the features of age-friendly neighbourhood to: (i) an accessible built environment; (ii) and an inclusive social environment (Fig. 1).

As a whole, an age-friendly community should provide a comprehensive and accessible physical and social environment in which support health, social involvement, and security of the elderly (Lai et al., 2016).



Fig. 1 Eight Domains of an Age-friendly City  
<https://www.agefriendlylou.com/louisville-initiative>  
<http://www.hecmworld.com/reverse-mortgage-news/age-friendly-cities-elders-seniors-planning>  
 (Jackisch et al., 2015)

Over the past few decades, there has been increased interest in the connections of everyday mobility with neighbourhood, well-being and quality of life, both in mobility research (van den Berg et al., 2016) and in transport studies (Banister & Bowling, 2004; Nordbakke & Schwanen, 2015; Spinney et al., 2009).

A considerable number of studies have been supported the importance of the elderly's mobility for their quality of life (e.g. Gabriel & Bowling, 2004; Levasseur et al., 2004; Puts et al., 2007) and a few of them also have been examined relationship between age-friendly environment with QOL and well-being (Engel et al., 2016; Nieboer & Cramm, 2017; Tiraphat et al., 2017). It should be noted that there are seven literature reviews about transportation, mobility, neighbourhood, built environment, health, healthy and active ageing and well-being. But none of these studies have been focused on the best practices to identify characteristics of an age-friendly neighbourhood that promote outdoor mobility and quality of life all together (Alidoust & Bosman, 2015; Annear et al., 2014; Yen et al., 2009; Yen & Anderson, 2012; Kerr et al., 2012; Levasseur et al., 2015; Rosso et al., 2011).

The goal of this study is to summarize the recent published articles on mobility and quality of life in neighbourhood which is age-friendly and to identify gaps in the level of scientific knowledge about this subject.

## 2 METHODS

In order to identify the scientific publications to be included in this review and analysis, six search engines and data bases were used to allow access to the largest number of existing publications on the relationship under analysis (Scopus, Science Direct, Sage, Wiley, Taylor & Francis Online, Research gate and NCBI<sup>1</sup> (pubmed)). These search engines were selected due to their interdisciplinary nature, to cover several disciplines involved in ageing and the relationship between mobility and QOL (or other indicators of well-being). Inclusion criteria were English-only and peer-review articles published between 1990 and 2018 with the following keywords and search terms (n=53) [strategy: (1 AND 2) AND (3 OR 4)]: 1) neighbourhood\* OR neighborhood\* OR environment\* OR setting\* OR context\* OR built environment\* OR social environment\* OR physical environment\* OR universal design\* OR inclusive design OR urban design OR communit\* design OR environment\* design\*, and 2) ageing in place OR aging in place OR age-friend\* OR elder\* OR old\* OR adult\* OR geriatric OR aged OR ageing OR aging OR senior OR old people OR older people and 3) accessibility OR access\* OR Proximity OR connect\* OR mobilit\* OR disabilit\* OR walkabl\* OR pedestrian\* OR walk\* OR cycl\* OR travel\* OR active transport\* OR bike OR biking\* OR trip\* OR public transit\* OR bus\* OR transport\* OR public transport\* OR physical function\* OR physical activ\* and 4) quality of life OR well-being OR Healthy ageing OR healthy aging OR active ageing OR active aging.

Moreover, the study group was restricted to studies with urban old people aged 60 years or older (male and female); furthermore, articles were excluded if they were a review or commentary or if they provided qualitative data only and not include interpretation, data collection and analysis. Additional articles were identified through review of reference lists of included articles, title and abstract. Identified citations were exported into Mendeley and duplicates were removed.

Applying these parameters, 14 studies were selected to be critically reviewed (Tab. 1) and key features of age-friendly neighbourhood environment were emerged (Tab. 2). In order to present an organized set of data on this subject and with our aim in mind, the findings and results were classified in three categories: (i)

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<sup>1</sup> National Center for Biotechnology Information Search database.

mobility, physical activity, walking, and travel behaviour; (ii) quality of life and well-being; and (iii) socio-economic characteristics.

Nº	AUTHORS	SAMPLE CHARACTERISTICS AND LOCATION	MAIN GOAL	TYPE OF STUDY
1	Banister & Bowling, 2004	1000 older people aged 65 years and over in Britain, UK.	To explore the constituents of perceived QOL in older age.	Quantitative and qualitative Secondary data (re-use of qualitative data) Interviews
2	Gabriel & Bowling, 2004	999 people aged 65 or more years living in private households in Britain, UK.	To contribute to the development of a conceptual framework and body of knowledge on QOL in old age based on older people's views	Qualitative and quantitative: Interview data
3	Levasseur et al., 2004	A convenience sample of 46 people aged 60 to 90 living in the community. Québec, Canada.	To explore the relationships between subjective QOL and social participation of older adults with physical disabilities.	Quantitative A cross-sectional design
4	Scheiner, 2006	A net sample of 4.500 personally interviewed persons aged ≥60 years in the city of Bonn, the left-Rhine suburban space of Bonn, and a part of the Eifel, a rural area about 50 km from Bonn, Germany.	To understand if the car makes elderly people happy and mobile? Settlement structures, car availability and leisure mobility of the elderly	Qualitative Interviews Quantitative
5	Puts et al., 2007	25 older men and women. Amsterdam and vicinity.	To explore the meaning of QOL to older frail and non-frail persons living in the community	Qualitative Interviews: the audiotaped interviews were transcribed and coded for content and analyzed using the grounded-theory approach.
6	Spinney et al., 2009	1558 non-working elderly, Canada.	To quantify the impacts of transport mobility and to investigate their impacts on the QOL non-working elderly Canadians.	Quantitative Statistics Canada's GSS Time-diary survey
7	Haustein, 2012	1,500 standardized telephone interviews, individuals aged 60 years and above living in the German federal state of North Rhine-Westphalia (NRW).	To understand mobility behavior of the elderly, and why do we need a segmentation approach for the elderly.	Qualitative Interviews Quantitative
8	Nordbakke & Schwanen, 2015	4.712 people aged 67—and older, Norway in October–November 2011.	To analyse the link between transport and well-being by considering the extent to which older adults believe that their needs for out-of-home activity participation remain unsatisfied.	Quantitative Nationally representative data
9	Engel et al., 2016	160 community-dwelling older adults (aged 65 years and more) on low income from Metro Vancouver, Canada.	To examine the association between the built environment and social cohesion with QOL.	Quantitative Cross-sectional data from The Walk the Talk (WTT)

10	van den Berg et al., 2016	344 respondents in 2014, the southeast of the Netherlands.	To estimate feelings of loneliness as an important aspect of QOL in relation with mobility aspects and built environmental characteristics.	Quantitative
11	Nieboer & Cramm, 2017	945 community-dwelling older adults living in Rotterdam's districts Lombardijen, LageLand/ Prinsenland, Oude Westen, and Vreewijk, the Netherlands.	To identify relationships between age-friendly environments (in terms of social and physical neighbourhood attributes) and older people's overall wellbeing.	Quantitative Questionnaire
12	Tiraphat et al., 2017	4183 older adults (60 years) using multistage stratified systematic sampling from all four regions in Thailand.	To examine the association between age-friendly environments and QOL among Thai older adults.	Qualitative and quantitative Cross-sectional interview
13	Wong et al., 2017	719 respondents aged ≥60 years; A multi-stage sampling method was used to collect views of community-dwelling older people from two local districts of Hong Kong, China.	To examine the effects of perceived age-friendliness of neighbourhood environments on self-rated health (SRH) among community-dwelling older Chinese.	Quantitative A structured questionnaire
14	Hawkesworth et al., 2017	795 men and 638 women aged 69–92 years from two national cohorts, covering 20 British towns.	To investigate the association between objectively measured PA (Actigraph GT3x accelerometers) and multiple dimensions of the built environment.	Using a cross-sectional multilevel linear regression analysis. Exposures were captured by a novel foot-based audit tool that recorded fine-detail neighbourhood features relevant to PA in older adults, and routine data.

Tab.1 Selected studies for literature review

In this review evidence, documenting the critical role of the neighbourhood in promoting or inhibiting quality of life, well-being, and mobility in older individuals will present.

The remainder of the article is structured as follows. First, it reviews the literature on the concept of environment and physical activity and walking aimed to recognize effective factors that contribute to improve mobility, and then presents the studies on quality of life and well-being in relationship with neighbourhood environment.

After that, data for determining the social and built environment of neighbourhood, which are affect mobility and quality of life, were collected using review of literature from interdisciplinary point of view. Finally, the discussion and conclusion were presented and gaps about this subject were identified for future studies in order to improve mobility, well-being, and quality of life of elderly in neighbourhood.

In the next sections, we are going to discuss the main outcomes measures identified in the assessment of the literature-included mobility, physical activity and walking, travel behaviour; quality of life and well-being; and socio-economic characteristics.

### 3 RESULTS

#### 3.1 MOBILITY, PHYSICAL ACTIVITY, WALKING, AND TRAVEL BEHAVIOUR

There is a growing body of knowledge that associate mobility and other relevant terms to the social and built environments of neighbourhood.

Regarding built environment aspects, a review of the literature illustrates the lower distance to public transport stops, and enhanced connectivity through public transport to final destinations considered as important factors to promote mobility of elderly (Banister & Bowling, 2004; Lai et al., 2016; Nordbakke & Schwanen, 2015; van den Berg et al., 2016). On the subject of social environment, we found more results; For instance, accessibility of the urban environment and its impacts on the elderly's social life have been broadly discussed in the literature. Since loss of mobility increases with age (Guralnik et al., 1993), the social life of the elderly is correlated with the accessibility of their environment. Indeed, transport is a key indicator of accessibility particularly in terms of getting access to local services and facilities, and engaging in social activities (Banister & Bowling, 2004).

van den Berg et al.'s work (2016) examine the impacts of travel behaviour and mobility aspects and attributions of the built environment on loneliness. They suggest that accessibility reduces feelings of loneliness that means people living nearer to a highway are less lonely.

They also understood that the neighbourhood features explain a considerable part of difference in loneliness. Whereas, people's perception of the neighbourhood and its facilities are the most significant predictors. Moreover, this study indicates that the use of various transport means (bicycle, car and public transport) remarkably decreases loneliness.

This highlights the critical role of mobility. In other words, transportation modes provide access to social relations out of the neighbourhood and may be critical to maintain one's social network. In addition, public transport provides a space where people are in close proximity and where social interactions can happen. This study has shown that people's residential environment and access to social relations (enabled by mobility tools) play a key role in feelings of loneliness or social isolation.

As a whole, all objective neighbourhood characteristics except distance to highway tested in their study have no impact on loneliness. By contrast, subjective satisfaction with neighbourhood and amenities are related to low level of loneliness. Furthermore, the outcomes determine that being a volunteer and the frequency of social relations have more explanatory power.

Another study conducted by Banister & Bowling (2004) suggest that the transport elements are reinforced by the importance of locality, and social network. These elements are both positive in the matter of availability, safety, trust and engagement, but they also act as an obstacle in terms of vulnerability and isolation (particularly at night).

The negative perception of the speed and traffic volume have perceived as the key issue in the local area (Banister & Bowling, 2004).

As stated by Levasseur et al. (2015) mobility and social participation in seniors have been demonstrated to be positively linked to indicators of most age-friendly characteristics, i.e., with 1) proximity to resources and recreational facilities, 2) social support, 3) having a car or driver's license, 4) public transportation, and 5) security, and negatively related to 6) low user-friendliness of the walking environment, and 7) insecurity.

### 3.2 QUALITY OF LIFE AND WELL-BEING

Key findings of latest studies recognized significant relations between social, physical or built environment indicators and quality of life and well-being.

The study by Tiraphat et al. (2017) demonstrated significant associations between perceived age-friendly environments, in particular, physical, security and social environments, and quality of life.

The strongest predictor of quality of life was social trust, followed by criminal safety, service accessibility, social support, social cohesion, aesthetics, and walkable neighbourhood. This study found an important positive relation between social trust, social support and social cohesion and quality of life among the elderly. Concerning crime, this study revealed a noteworthy correlation between criminal safety and physical as well as mental health-related quality of life. Some of the studies might claim that the social environment is more important than the physical environment in regards to the quality of life of this population (Levasseur et al., 2004).

Regarding physical or built environments, Tiraphat et al. (2017) also found the significant association between accessibility, aesthetics and places for walking in neighbourhood and quality of life. They did not find an association between street connectivity and quality of life among Thai older persons. Additionally, they did not disclose a relationship between traffic safety and the quality of life.

While Engel et al. (2006) in contrast to Tiraphat et al. (2017) revealed that street connectivity and social cohesion might be critical for aged people's capability well-being.

Based on the findings of van den Berg et al. (2016) two main factors including feeling at home in the neighbourhood and accessibility are essential for people's quality of life in all neighbourhoods, regardless of urban density. Besides, they realized social relations are vital for people's quality of life. In addition, they recommend that in addition to the more objective aspects (such as social network size and frequency of social interaction) it is crucial to study subjective aspects of social relations as well.

This study discovered that the urban density was not affecting feelings of loneliness or social isolation. However, they found that people who are more satisfied with their neighbourhood and facilities they will probably feel less lonely.

The primary analysis by Levasseur et al. (2004) explored the associations between environmental features and HRQOL as well as capability well-being. Interpersonal relationships, responsibilities, fitness and recreation were the categories of social participation most related to quality of life. They displayed that social roles were more associated with quality of life in comparison to daily activities. Besides, satisfaction with the accomplishment of life habits was also more positively correlated with quality of life rather than the performance itself.

"Correlations between some social participation categories, especially those related to social roles than daily activities and specific QOL domains were higher may be due to the fact that daily activities are basic skills acquired over a long period of time and might provide less fulfilment than social roles. In addition, social roles might be more connected to personal standards and aspirations, which are the main aspects of QOL. This exploratory study suggests that social participation is a restricted determinant of quality of life. Truly, social participation was positively associated with QOL of older people with physical disabilities, but only weakly may be explained by the more profound meaning of QOL which takes into consideration the person's cognitive and emotional perceptions".

In the study by Puts et al. (2007), non-frail or frail respondents did not report well-being as most important. In this study, they did not find any important difference in the main themes between the frail and non-frail persons. However, non-frail respondents mentioned health as the most important and necessary to enjoy

life, and thus well-being. "As frailty increased, quality of life was observed to decrease and the priorities of the domains of quality of life were observed to change". For the frail persons, social contacts were most significant and described as a requirement to well-being. "So for both the frail and the non-frail persons, this hierarchical SPF model with well-being as realized by the satisfaction of physical and social needs, can be recognized in this results.

Resources for physical well-being (such as food, healthcare, money) and resources for social well-being (such as education or a spouse) were described in this study as a prerequisite for quality of life". Furthermore, social activities such as helping others found very essential for the high level of QOL in this study. As an additional theme, home and neighbourhood were important for QOL. As well, this study showed that quality of life consists of more than health and functional capacity. In conclusion, for the elderly, quality of life included being in good health, feeling good, having social relationships, being active, helping other people and living in a nice house in a decent neighbourhood.

According to Banister & Bowling (2004), mobility, locality and social networks influence perceptions of QOL, and their study shows that the perceptions of what constitutes QOL for the elderly can be reconstructed in terms of six main 'Building Blocks': 1. Peoples' standards of social comparison and expectations of life; 2. A sense of optimism and belief that "all will be well in the end"; 3. Having good health and physical functioning; 4. Engaging in a large number of social activities and feeling supported; 5. Living in a neighbourhood with good community facilities and services (including transport); 6. Feeling safe in one's neighbourhood.

These factors seem to have contributed far more to the perceived QOL than indicators of material circumstance, such as actual levels of income, education, home ownership or social class. As the outcome of the paper has underlined, transport is important in terms of getting access to local services and facilities (Building Block 5), and in engaging in social activities (Building Block 4). The transport elements are reinforced by the importance of locality, and social networks (Building Blocks 4–6).

The study by Gabriel & Bowling (2004) stands out in that it considers potential and actual movement as one constituent of well-being amongst others, such as "having good social relations, a positive outlook, good health and physical functioning, enough financial resources and engaging in hobbies and leisure activities". The main QOL themes that emerged were: "having good social relationships, help and support; living in a home and that is perceived to give pleasure, feels safe, is neighbourly and has access to local facilities and services including transport; engaging in hobbies and leisure activities as well as maintaining social activities and role in society; having a positive psychological outlook and acceptance of unchangeable circumstances; having good health and mobility; and having enough money to meet basic needs, to participate in society, to enjoy life and to retain one's independence and control over life".

A recent study by Nieboer & Cramm (2017) clarified that "levels of age-friendliness and older people's ability to realize the instrumental goals to achieve overall well-being varied seriously among neighbourhoods, with older people living in less age-friendly communities reporting lower levels of well-being".

Spinney et al. (2009) also tried to unravel the community advantages of transport mobility, to include maintenance of both social and community networks have been successful as far as they expectedly affect the irrelevant domains of well-being.

The results suggest GSS Time- Use data are apposite for further development of a quality of life index that adds in the benefits of transport mobility. "Their results indicate that it is important to ensure these empirically based generalizations are based on enjoyment level associated with different activities.

For example, they discovered that daily engagement in activities associated with providing helping services to other community members might prove burdensome and those people would like to spend more time alone”.

### 3.3 SOCIO-ECONOMIC CHARACTERISTICS

A review of the literature showed that age, other personal and household characteristics were linked to neighbourhood environment and mobility characteristics and in general were used as explanatory variables. The results of van den Berg et al. (2016) indicate that “although age has little explanatory power, older people are likely to feel lonelier. However, age explains only a small part of the variance in loneliness. Adding other personal and household characteristics increased the model fit considerably.

It also changed the effect of age, showing the largest negative effect on the age category 35–64. Regarding the other personal and household characteristics, the results showed that households in the age category of 35–64 with children are less lonely, whereas household younger than 35 years of age with children are more likely to be lonely. In line with other studies, this study found lower educated people to be lonelier and healthier people, people who volunteer and people who have more social interactions to be less lonely”.

This research found that younger people living in an apartment are more likely to be lonely. This may however also be a reflection of income, as high-income households in the Netherlands are less likely to live in an apartment. For the youngest age group, a recent move is related to a lower likelihood of being lonely, whereas it found a positive effect of a long residence for the oldest age group.

“Status is known to be linked to lower-order means to achieve well-being, such as wealth, education, and work (Nieboer & Cramm, 2017). This association implies that older people with higher education and income levels who continue to do voluntary work in the community are those reporting the highest status levels. These people may expect more from their neighbourhoods in terms of the ability to achieve well-being, such as transportation, civic participation, communication, and education.

Those with lower educational and income levels who do not participate in community activities may expect less from neighbourhoods in terms of these specific attributes. The same relationship is expected to apply to stimulation and civic participation; those reporting higher levels of stimulation were most critical about civic participation in the neighbourhood.

Higher educated older persons were more critical regarding the domains such as civic participation, transportation, and communication and information in their neighbourhoods, suggesting a socioeconomic rise in the perceived lack of neighbourhood attributes facilitating ageing in place” (Nieboer & Cramm, 2017). A study by Levasseur et al. (2004) showed that the ‘health and functioning’ domain of the QOL is the most associated with both performance and satisfaction in the accomplishment of both daily activities and social roles. It means that participants with better health and functioning QOL performed better and were more satisfied with their social participation.

In line with Levasseur et al. (2004), Nordbakke & Schwanen (2015) understood health condition and health-related problems with walking, as well as living arrangement (living with a partner/spouse), are associated with the level of unmet activity needs.

The lay models presented by Gabriel & Bowling (2004) also emphasised the importance of financial circumstances and independence, which need to be incorporated into a definition of the overall quality of life. As well, they conclude that “to achieve a better understanding of the quality of later life, it is important to move beyond health and functional status and their impact on life as a proxy concept and measure.

A model of the quality of life and its associated measurement scales should be based on concepts derived from older people themselves". This is because this analysis indicated that objective measures of household income and distance to nearest public transport stop were not related to the level of unmet activity needs, whereas the subjective evaluations 'cannot afford it' and 'poor public transport supply' did have statistically significant impacts.

The issue of preserving the ability to drive a car in later life is also evident and being able to drive reduces unmet activity needs has received considerable attention (Nordbakke & Schwanen, 2015) "Given that car ownership may at some moment become unaffordable for older people (e.g. due to loss of a spouse or a continuing decline in real terms of retirement pension), it is important that transport and social policies not only maintain or develop older people's driving skills and abilities but also ensure that owning and using a car remain financially feasible among old people".

It is concluded that policymakers looking for increasing well-being above a minimum threshold of what counts as a decent life should enhance older adults' ability to drive in old age and car availability (Puts et al., 2007; Nordbakke & Schwanen, 2015; Levasseur et al., 2015).

Similarly, Banister & Bowling (2004) explained that an increasing amount of travel is being undertaken by car, but this level will increase further given the growth in elderly car ownership, health and license holders (Banister & Bowling, 2004).

FACTOR	EXPLANATION	LITERATURE
Socio-economic Characteristics		
Gender, sex		Banister & Bowling 2004; Engel et al., 2016; Levasseur et al., 2004; Nieboer & Cramm, 2017; Nordbakke & Schwanen, 2015; Puts et al., 2007; Spinney et al., 2009; Tiraphat et al., 2017; van den Berg et al., 2016;
Age		Banister & Bowling, 2004; Levasseur et al., 2004; Nieboer & Cramm, 2017; Puts et al., 2007; Spinney et al., 2009; Tiraphat et al., 2017; van den Berg et al., 2016
Income	Financial circumstances	Banister & Bowling, 2004; Gabriel & Bowling, 2004; Nordbakke & Schwanen, 2015; Tiraphat et al., 2017; van den Berg et al., 2016;
Education		Levasseur et al., 2004; Engel et al., 2016; Nieboer & Cramm, 2017; Puts et al., 2007; Tiraphat et al., 2017; van den Berg et al., 2016;
Marital status		Banister & Bowling, 2004; Engel et al., 2016; Nieboer & Cramm, 2017; Nordbakke & Schwanen, 2015; Puts et al., 2007; Tiraphat et al., 2017
Ethnicity/ Race		Engel et al., 2016; Nieboer & Cramm, 2017
Household size and composition		Banister & Bowling 2004; van den Berg et al., 2016
Length of residence		Tiraphat et al., 2017; van den Berg et al., 2016
Residence location		Nordbakke & Schwanen, 2015; Tiraphat et al., 2017
House ownership		Banister & Bowling, 2004; Levasseur et al., 2004
Employment status		van den Berg et al., 2016
living arrangement	Alone With a spouse or partner With another family member With a friend or roommate Other	Levasseur et al., 2004; Engel et al., 2016; Spinney et al., 2009; Tiraphat et al., 2017

Dog owner		Haustein, 2012
Season ticket		Haustein, 2012; Scheiner, 2006
Free access to public transportation	free bus-passes or discounted fares for older people	Gabriel & Bowling, 2004; Haustein, 2012
Access to smart mobile phone/ internet		Haustein, 2012; Nieboer & Cramm, 2017; Wong et al., 2017
Mobility Assets	(Driving License and Car)	Banister & Bowling, 2004; Nordbakke & Schwanen, 2015
Health Status	Illness and restrictions	Banister & Bowling, 2004; Gabriel & Bowling, 2004; Levasseur et al., 2004; Puts et al, 2007; Spinney et al., 2009; Tiraphat et al., 2017; van den Berg et al., 2016
Health-related QOL (HRQOL)		Engel et al., 2016
Physical Functioning and capacity	Functional autonomy, activity limitation, mobility aid, mortality and disability	Banister & Bowling, 2004; Levasseur et al., 2004; Nieboer & Cramm, 2017; Puts et al., 2007; Spinney et al., 2009
Physiological well-being	Depression, anxiety, anger, stress and cognitive functioning	Gabriel & Bowling, 2004; Engel et al., 2016; Puts et al., 2007; Spinney et al., 2009
Social well-being		Nieboer & Cramm, 2017
Capability well-being	EQ-5D-5L ICECAP-O	Engel et al., 2016
Quality of life	Level of satisfaction	Banister & Bowling, 2004; Levasseur et al., 2004; Spinney et al., 2009; Tiraphat et al., 2017
<b>Age-friendly Neighbourhood</b>		
<b>Accessible Physical and Built Environment</b>		
Walkability	Network of pedestrian path, road pavement quality, attractive routes and nice place to walk	Banister & Bowling, 2004; Tiraphat et al., 2017
Street Connectivity	Distance from first intersection and block length	Engel et al., 2016; Tiraphat et al., 2017
Density	Open and built area near buildings	Engel et al., 2016; van den Berg et al., 2016
Housing type and neighbourhood	Affordable and suitable	Gabriel & Bowling, 2004; Levasseur et al., 2004; van den Berg et al., 2016
Land Use	Diversity and mix-access	Engel et al., 2016
Green area	Park, garden, forest and nature (green and blue spaces)	Hawkesworth et al., 2017; Engel et al., 2016; van den Berg et al., 2016; Wong et al., 2017
Third Places	Recreation and leisure activities (cinema, theater, museum, café, coffee shop, restaurant, bar, stadium, cemetery, church, social and community centers, beauty salons, library, sport center, university, and so on)	Gabriel & Bowling, 2004; Levasseur et al., 2004; Nordbakke & Schwanen, 2015
Shops, Services, Facilities and Places	Post office, bank, police station, supermarket, local market, and so on	Banister & Bowling, 2004; Hawkesworth et al., 2017; Nordbakke & Schwanen, 2015; Scheiner, 2006; van den Berg et al., 2016
Health care services	Pharmacies, private clinic and hospital	Banister & Bowling, 2004; Nordbakke & Schwanen, 2015
Facilities for people aged 65 +		Banister & Bowling, 2004
Physical barrier		Engel et al., 2016
Hilliness		Engel et al., 2016; Nordbakke & Schwanen, 2015

Lack of cul- de- sacs		Engel et al., 2016
Accessibility and Proximity		Banister & Bowling, 2004; Tiraphat et al., 2017; van den Berg et al., 2016
Public Transportation system		Banister & Bowling, 2004; Nordbakke & Schwanen, 2015; van den Berg et al., 2016
Distance from bus and tram stops		Haustein, 2012
Distance from metro stations		Wong et al., 2017
Availability of seats and shelters along the bus and tram route		Wong et al., 2017
Cycle path and way		Engel et al., 2016
Safe crosswalks	Safe crossing points with extended green times	Banister & Bowling, 2004; Nieboer & Cramm, 2017
Bench, place to rest and public toilet		Nordbakke & Schwanen, 2015
Parking area		Nieboer & Cramm, 2017; Nordbakke & Schwanen, 2015
Escalators and elevator		Nieboer & Cramm, 2017; Puts et al., 2007
Aesthetics	Foliage, attractive buildings and scenery, absence of litter, rubbish collection, and graffiti	Banister & Bowling, 2004; Engel et al., 2016; Tiraphat et al., 2017
Safety and Security	Traffic Hazards, unattended dog and Crime	Banister & Bowling, 2004; Engel et al., 2016; Tiraphat et al., 2017
Street lighting	At night	Banister & Bowling, 2004; Wong et al., 2017
Pollution	Air	Banister & Bowling, 2004
Noise		Banister & Bowling, 2004
Weather and climate	Temperature, sunlight, ventilation and humidity	Haustein, 2012; Nordbakke & Schwanen, 2015; Pinto, 2014
Neighbourhood satisfaction	Rating neighbourhood quality	Banister & Bowling, 2004
Inclusive Social Environment		
Social relations and contacts	Relationship, communication network, interaction, ties, bonds, friends and family	Banister & Bowling, 2004; Gabriel & Bowling, 2004; Levasseur et al., 2004; Nordbakke & Schwanen, 2015; van den Berg et al., 2016
Social roles and activities		Gabriel & Bowling, 2004; Levasseur et al., 2004; Nordbakke & Schwanen, 2015
Social support		Tiraphat et al., 2017
Social trust		Banister & Bowling, 2004; Tiraphat et al., 2017
Social cohesion		Engel et al., 2016; Tiraphat et al., 2017
Activity participation, involvement and engagement	Being a volunteer	Levasseur et al., 2004; Nordbakke & Schwanen, 2015
Sense of belonging		Spinney et al., 2009

Tab.2 Literature Review of Age-friendly Neighbourhood Factors associated with Mobility, QOL and Well-being

## 4 DISCUSSION AND CONCLUSION

The substantial evidence provides a comprehensive understanding of neighbourhood characteristics associated with mobility, quality of life and well-being. In addition, this study prepares support for the relationship between an inclusive social environment and accessible built environment and quality of life and mobility in elderly.

Drawing on the literature review and the findings, neighbourhood environment plays a crucial role in mobility and quality of life and consequently support their well-being. This paper suggests that neighbourhood from two major aspects can influence on mobility, quality of life and well-being negative and positive directions. As highlighted in selected studies, mobility, quality of life and well-being in seniors have been demonstrated to be correlated with indicators of most age-friendly neighbourhood characteristics, as you can see in Tab. 3.

POSITIVELY ASSOCIATED WITH:	NEGATIVELY ASSOCIATED WITH:
Proximity to community resources, services, and recreational facilities	Poor user-friendliness of the walking environment
Street connectivity	Neighbourhood insecurity (the speed and traffic volume, Criminal safety, and lighting)
Aesthetic	Physical barrier
Having a car or driver's license	Loneliness
Public transportation (lower distance to public transport)	
Living closer to a highway	
Neighbourhood security	
Good health and physical functioning	
Feeling at home in the neighbourhood	
Satisfaction with accomplishment of life habits	
Education	
Enough financial resources	
Engaging in hobbies and leisure activities	
Social support	
Social trust	
Social cohesion	
Being a volunteer and participation in community (Stay active)	
Social networks and number of social interactions, contacts, and relations	

Tab. 3 Summery of main findings about association between age-friendly neighbourhood, mobility, qol and well-being

In addition, we identified some gaps in the level of scientific knowledge about this subject. A majority of the existing literature used quantitative method while there is more need to use mixed-method and cross-sectional studies. Some of them just measured in terms of objective or subjective and perceived aspects of quality of life and well-being.

We conclude here with a few additional points critical of the mainstream literature. In addition to the more objective aspects (such as social network size and frequency of social interaction), it is necessary to study subjective domains of social relations and take into consideration objective and subjective or perceived aspects altogether. Some of the studies might suggest that the social environment is more important than the physical environment in regards to the quality of life, so further studies are necessary in order to conclude it.

There is a lack of literature about communication and information domain of age-friendly city. Future studies should benefit from the use of broader measures of enacted mobility. Majority of previous studies acknowledged walking and physical activity measures as the major measures of mobility, however, use of assistive devices, public transportation, and a car can promote mobility, quality of life and well-being, and access to welfare services.

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