
Article:
Ahmad, Z, Batool, Z orcid.org/0000-0001-7912-6770 and Starkey, P (2019) Understanding mobility characteristics and needs of older persons in urban Pakistan with respect to use of public transport and self-driving. Journal of Transport Geography, 74. pp. 181-190. ISSN 0966-6923

https://doi.org/10.1016/j.jtrangeo.2018.11.015

Title: Understanding mobility characteristics and needs of older persons in urban Pakistan with respect to use of public transport and self-driving

Abstract: Since 1990, Pakistan's demographic transition has been increasing life spans with a steady rise in the number of older persons. Pakistan faces many challenges in caring for its older population. The proportion of the population aged 60 years and above is estimated to increase from 5.8% in 2000 to 12.4% in 2050. A study was conducted to understand the existing mobility characteristics of the elderly, their perceived needs and constraining factors. Data was collected using convenient sampling from 450 people aged 60 years or older in nine towns within Lahore City. Older people were approached around urban facilities (shops, banks, terminals) and asked to respond to survey questions. Within-residence interviews were also conducted, mainly for those women who declined interviews in public places. Descriptive and comparative analyses were performed, including Pearson's chi squared test for independence. The results are discussed in terms of mode choice, public transport preferences, self-driving issues and the relative benefits of formal and informal public transport options. The study found lower levels of weekly trip-making compared to those reported for older people in China, South Korea and USA. Vehicle ownership (mainly cars and motorcycles) and socio-demographic factors were found to significantly affect trip making. There were large gender differences in trip making and vehicle ownership, suggesting further research and policy action targeting the mobility needs of elderly women. Older persons were concerned about safety issues concerning public transport and self-driving, and also the behavior of transport crews, and this has informed several of the concluding policy recommendations.

Keywords**:** elderly; mobility; trip frequency; public transport; self-driving

---

1. Introduction

In 2017, the global population aged 60 years or over was estimated to be 962 million, more than twice as many as in 1980 (United Nations, 2017). This number is projected to double by 2050. Two thirds of this population live in developing regions, where their numbers are growing faster than in the developed regions. By 2050, it is expected that nearly 8 in 10 of the world's older persons will be living in developing regions (United Nations, 2017). In Pakistan, the demographic transition has been progressing since the 1990s. There has been a reduction in the overall fertility rate and a consistent decline in mortality, leading to a higher life expectancy (Ali and Hussain, 2001). Using United Nations data from 2002, Saeed et al. (2011)

suggested the proportion of the population 60 years and above in Pakistan will increase from 5.8% in 2000, to 7.3% in 2025 and 12.4% in 2050. This anticipated rapid growth poses a great challenge for urban planners and transport operators to ensure there are travel options suitable for the complex travel needs of the elderly (Hess, 2009; Alsnih and Hensher, 2003). Making transport systems appropriate for older person should receive more attention as one of the key challenges that demographic ageing poses for the economy, health care and retirement systems (Buehler and Nobis, 2010).

1.1 Elderly mobility, self-driving and use of public transport

Research in Europe suggested that car availability was a result of people's way of life and not a cause of mobility (Scheiner, 2006). Nevertheless, car availability can be important for the well-being of older persons (Nordbakke and Schwanen, 2015). In Hong Kong, elderly individuals appeared to be as mobile as their younger counterparts; they were likely to take more trips, to have driving licenses and to self-drive (Szeto et al., 2017). Numerous studies in European countries have revealed that the use of cars and taxis is much higher than the use of buses, coaches and rail. The proportion of seniors dependent upon transport services is likely to shrink due to greater car accessibility (Siren and Haustein, 2016; Haustein and Siren, 2015). Rosenbloom (2004) reported that in the United States, older persons made most of their trips by car, with only around 6% walking and 2% using public transit. A study in the United Kingdom reported that older persons (70 and above) made about 50% of their trips by private car (including driving and car sharing) and only 12% by bus (DETR, 2000). However, in developing countries such as China, characterized by lower rates of owning cars and holding driving licenses, the elderly travel mostly on foot (49%), followed by public transport (43%), bicycle (4%) and car (<1%) (Hu et al., 2013). Where there is increasing car dependence among older people, this is likely to raise concerns relating to congestion, environmental issues (Rosenbloom, 2001), road safety (Oxley et al., 2010) and driving cessation (Golob and Hensher, 2007; Charlton et al., 2006). This suggests there will be benefits if the mobility needs of the elderly can be addressed through an increased use of public transport.

Public transport can offer a viable alternative to car use, in terms of costs, sustainability, low-emission, eco-friendliness and enhanced social benefits. These advantages are particularly important in context of developing countries where ownership of motor vehicles and cars is quite low, as shown in Table 1.

Table 1
Motor vehicle and car ownership per 1000 people

Country	Motor vehicles per 1000 people	Cars per 1000 people
United States	786	403
Japan	588	455
United Kingdom	516	454
China	69	54
Sri Lanka	48	20
Pakistan	20	16
India	18	11

Source: (EPI, 2014)

In Pakistan, there are only 16 cars for every 1000 people. With the elderly population estimated at 4.2% of the population (PakBS, 1998), there is likely to be a ratio of fewer than one car per 1000 older people. This makes public transport services particularly important for the elderly. In countries such as Portugal, the links between people's perceptions towards public transport and the use of public transport have been well established (Beirão and Sarsfield Cabral, 2007). Thus, it is important to understand the perceptions and preferences of the elderly population concerning the available modes of transport and factors affecting them.

1.2 Effects of demographic and socio-cultural factors on the mobility of older people

Traditional travel demand modeling generally assumes travel activities to be age-related (Figueroa et al., 2014). In the case of most elderly people, employment is no longer part of their regular activities. Hence, the changes generated by retirement can affect their trip-making behavior (Siren and Haustein, 2016; Van den Berg et al., 2011). As age increases, the willingness and ability to make trips decreases, resulting in decreased travel activity, journey time and distance (Golob and Hensher, 2007; Tacken, 1998). However, trips are considered important for healthy aging (Mollenkopf et al., 2005). Gender and income effects on elderly mobility have been widely documented (Moniruzzaman et al., 2013; Matthies et al., 2002).

Most of the existing research has focused on the influence of socio-demographics and built environments and the impact of socio-cultural backgrounds has attracted less attention (Feng, 2016). Social and cultural norms such as lifestyle, habits and values can exert profound personal and psychological influences and can result in different preferences and attitudes towards transportation modes (Scheiner, 2010; Ohnmacht et al., 2009).

1.3 Socio-cultural background of Pakistan

Pakistani society is composed of four major ethnic and language groups: Balochi, Pathan, Sindhi and Punjabi. These are associated closely with four different provinces: Baluchistan, Khyber Pakhtunkhwa, Sindh and Punjab, respectively. In Pakistani culture, old age is considered as a mark of esteem, wisdom and piety. This is due to the strong ties that exist in the joint family system, nurtured by religious values, that dignify the status of the elderly segment of society (Salahuddin and Jalbani, 2006). Gender relations in Pakistan rest on two basic perceptions: that women are subordinate to men, and that a man's honor resides in the actions of the women of his family. Thus, as in other orthodox Muslim societies, women are responsible for maintaining the family honor. To ensure that they do not dishonor their families, society limits women's mobility and places restrictions on their behavior and activities (Blood, 1995). Consequently, dependence on males tends to increase accordingly and the dependency of elderly females is even more pronounced.

The value systems which once dominated in Pakistan are diminishing due to industrialization and shrinking family structures in the country. Therefore, the aged are increasingly considered as dependent and problematic for caretakers (Ashiq and Asad, 2017), and the elderly are increasingly neglected by family members. Because of this, elderly people feel themselves to be increasingly isolated from the society; this creates a sense of helplessness, hopelessness and vulnerability in them (Alam et al., 2016).

Elderly people in Pakistan face restrictions due to the non-availability of transport. Senior citizens may be unable to bear the costs of travel, restricting their movements, even for medical and other emergencies. Their financial or physical handicaps may make it difficult for them to easily reach facilities and return to their place of residence (Salahuddin and Jalbani, 2006). Insufficient transport for the elderly has caused reduction in their outdoor activities, particularly for women due to social norms.

The Multidimensional Poverty Index (MPI) report 2014-2015 stated that 38.8% of Pakistan's population lived in poverty (Alkire, 2016). A majority of the rural population (54.6%) lives in acute poverty while only 9.4% of the urban population do so (Rana, 2016). Poverty is likely to seriously affect the lives of the elderly, and their travel patterns.

1.4 Aim and rationale for the research

Bearing in mind the socio-cultural aspects of Pakistani society, it seems important to probe the mobility characteristics of the elderly, who may feel dependent, dejected and vulnerable. Hence, research on their trip-making behavior and their preferences towards different modes of transport seems necessary to gain insights about their day-to-day transport needs. This is the rationale for this study, as amplified in the following paragraphs.

1.4.1 The lack of research on elderly mobility in Pakistan

In existing literature, a number of research studies have examined trip-making behavior and mobility characteristics of the elderly living in several developed and developing countries (Choo et al., 2016; Hwang et al., 2015; Boschmann and Brady, 2013; Hu et al., 2013). However, little, if any, research has explored the travel characteristics of elderly people in Pakistan. In the wake of the rapidly-changing, socio-cultural context of the country (as discussed in section 1.3), there is a need to understand the mobility characteristics of older persons and the barriers they face. This is especially important considering the extensive and very varied transportation systems of the country and the absence of comprehensive transport policies relating to the elderly. DAWN (2015) reported that neither Pakistan, nor any of its provinces, have formulated policies to address the needs of its fast-growing aged population, which could reach 45 million by 2025. With weak state responses and the unsustainable belief that older people will always be supported by their families, there is need for informed decision-making to ensure the future mobility of the elderly in Pakistan.

1.4.2 The need to understand roles of both formal and informal transport services

This study has also tapped perceptions and preferences of elderly towards both formal and informal transport services. Formal transport includes the Metrobus (a two-lane, bus rapid transit system running 27 km north-south in Lahore) and conventional buses. The informal transport services include minibuses (known locally as ‘wagons), 3-seater auto-rickshaws and six-seater motorcycle-type three-wheelers (known locally as qingqis). The role of informal transport services with respect to elderly mobility is not well explored in the international literature, despite their widespread use in developing countries. Registered auto-rickshaws and qingqis increased by 226% between 2008 and 2015, while motorcars, jeeps and station wagons increased by 63% during this period (Gallup Pakistan, 2016). Thus, it appeared important to explore the effects of the informal transport services on the mobility of elderly, as this may help policy makers to develop targeted measures to promote inclusive mobility for all.

2. Materials and Methods

2.1 Study area characteristics

The study area selected for this research was the city of Lahore, capital of Punjab province. It is the second most populated metropolis of the country with around 11 million inhabitants and population density of 6300 persons/sq.km (PakBS, 2017). Figure 1 shows the locations of the provinces and major cities in Pakistan, along with population distribution at district level. Administratively, Lahore is divided into nine towns and a cantonment as show in Figure 2. The nine towns are sub-divided into 150 union councils (the smallest administrative unit in Pakistan) of which 122 are characterized as 'urban' and the rest are peri-urban/rural (PBS, 2015). The most recent available estimate of the proportion of the Lahore population that is elderly population is 5.2%, comprising 2.9% males and 2.3% females (PakBS, 1998). The weekday transport pattern of the city involves 12 million trips, comprising 8 million motorized trips and 4 million short walking trips.

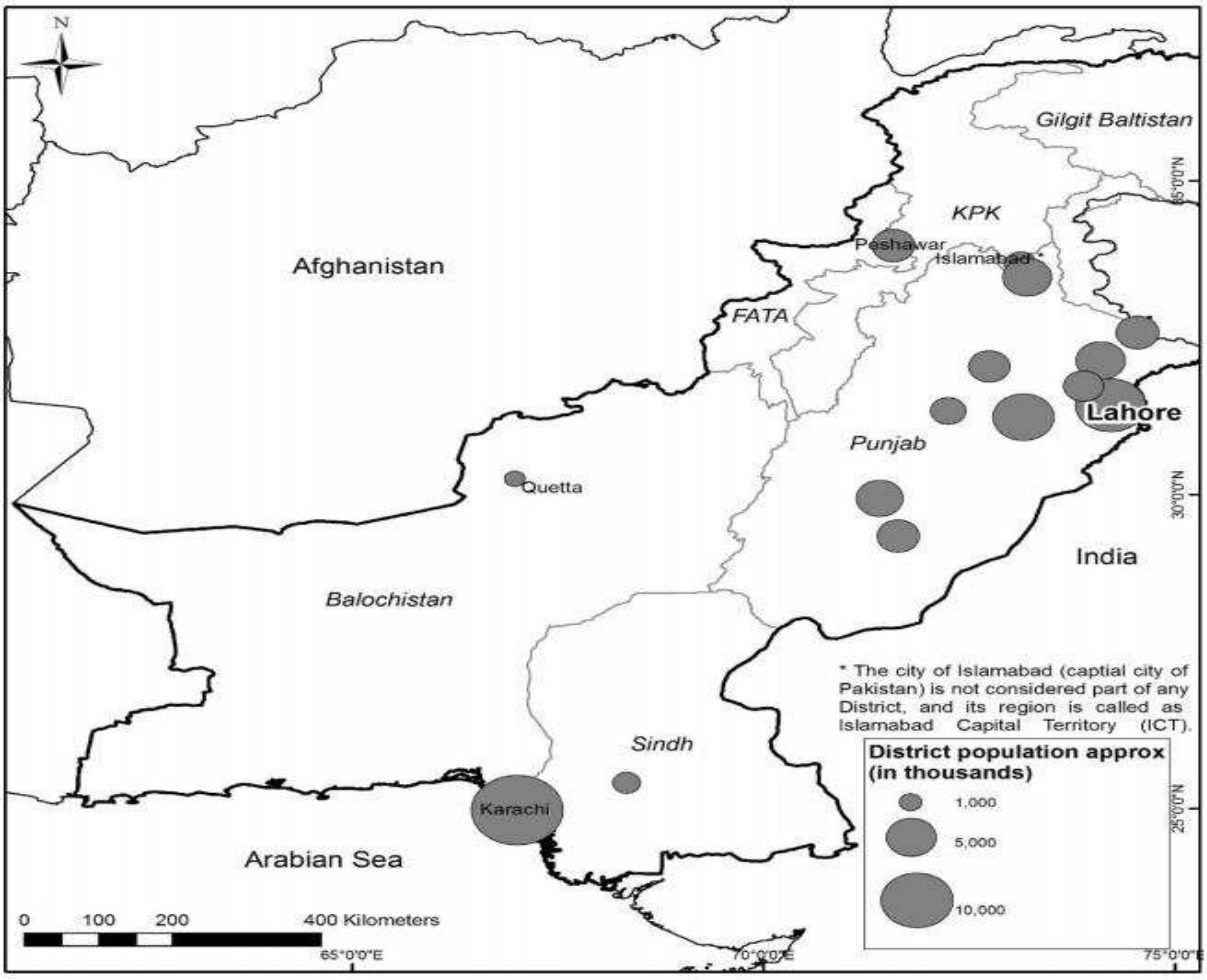


Figure 1. Location of provinces and major cities in Pakistan

(Sources: Rana and Bhatti, 2017; BBS, 2014; KPKBS, 2014; PBS, 2014; SBS, 2013)

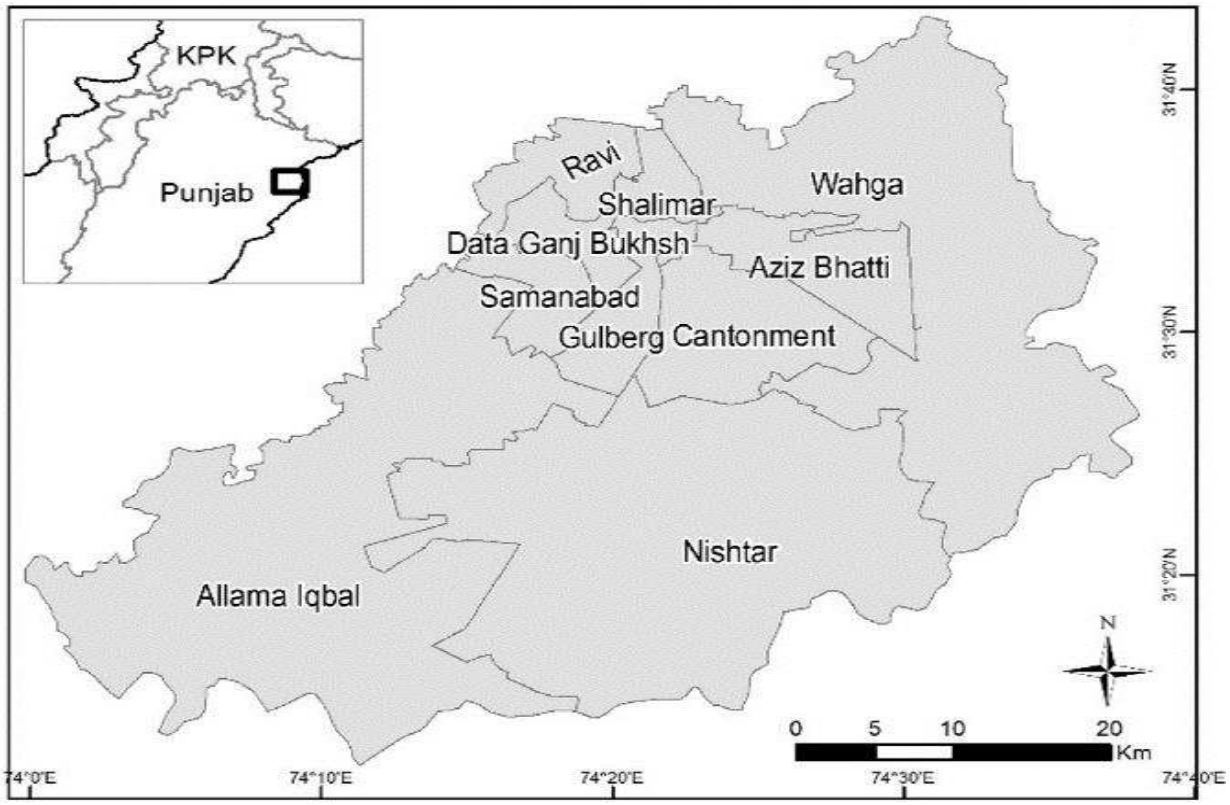


Figure 2. Location map of towns in Lahore (Source: Rana and Bhatti, 2017)

Public transport modes available in Lahore, can be categorized as High Occupancy Vehicles (HOV), the Metrobus and buses, and Low Occupancy Vehicles (LOV) which include minibuses, qingqis, auto-rickshaws and taxis. Most of the HOV and LOV routes operate under Lahore Transport Company (LTC). Auto-rickshaws and taxis are 'on-demand' transport modes with no fixed schedules or routes. It was estimated by JICA (2012) that public transport modes together carried about 800,000 passengers a day, or about 20.1% of modal share (12.5% buses and minibuses, 7.6% autorickshaws. qingqis and taxis). It was further estimated there had been only about 5000 qingqi route licenses issued, and that perhaps 40,000 qingqis were operating illegally, with many competing on licensed bus routes (JICA, 2012). Walking was the main mode of transport in Lahore (about 54%), with the balance (around 26%) met by motorcycles and private cars (JICA, 2012). It is also estimated that there are about 1.75 million households in the city (PakBS, 2017), with 20% owning cars and 45% owning motorcycles. Between 2001 and 2008 there was a 483% increase in motorcycle ownership, and motorcycles are now considered to account for 22.4 % of modal share (JICA, 2012).

Table 2 shows the frequency of trips per day undertaken by elderly of different age groups (JICA, 2012). One of the most striking features is the difference between elderly men and

elderly women. The sociological context for this large gender difference was mentioned in section 1.3.

Table 2
Average trip frequency per day of older persons in Lahore

Age Group (Years)	Male trip frequency per day	Female trip frequency per day	Total
60-64	0.96	0.22	0.59
65-69	0.76	0.18	0.47
70-74	0.55	0.16	0.36
75+	0.44	0.10	0.27
Average no. of trips per day	0.68	0.17	0.43

Source: (JICA, 2012)

2.2 Data collection

The data was collected in nine towns of Lahore. A total of 450 elderly respondents, all over 60 years, were interviewed (50 respondents from each town). Based on the gender profile of the population of older persons (PakBS, 1998), it was intended to interview 252 males and 198 females. It is well known that mobility characteristics and travel patterns change as people get older (Truong and Somenahalli, 2015; Alsnih and Hensher, 2003; Hildebrand, 2003). Therefore, the respondents were classified into four age groups: 60-64, 65-69, 70-74 and over 75. Table 3 shows the population of older persons in Pakistan and Lahore, using the same age categories.

Table 3
Population of elderly age groups in Pakistan and Lahore as per (1998) population census

Age group (years)	Population* (million)	Percentage in total population	Population in Lahore	Percent in Lahore Population
60-64	2.04	1.58%	123,000	1.94%
65-69	1.20	0.92%	37,000	0.58%
70-74	1.09	0.84%	63,000	1.00%
75+	1.21	0.93%	67,000	1.05%

*Excluding population of the Federally Administrated Tribal Areas (FATA)
Source: (Pakistan Bureau of Statistics, retrieved on June 13, 2018 from http://www.pbs.gov.pk/)

Nine enumerators were assigned to fill out the research questionnaires for the selected respondents. Convenience sampling technique were employed, by which respondents were selected on the basis of their convenient accessibility and proximity to the surveyor. Data were collected through both roadside interviews and home interviews. In each town, locations were selected to target older persons around shopping plazas, commercial banks, residential areas and major roads. At the beginning of each interview, respondents were briefed about the nature

of research and purpose of collecting information from them. Only male respondents agreed to participate interviews in public spaces, and some indicated their reluctance. None of female respondents were willing to be interviewed in this way, as the socio-cultural norms of Pakistani society restrict women from such activities, without prior permission from their head of the household. Home interviews were conducted for all female respondents.

In total, 660 people were approached out of which 210 refused to share information without specifying a reason. For the men, 381 were approached, with 63 unwilling to be interviewed. For the women, 279 approached, and 147 were not willing to be interviewed. As noted, the high refusal rate for women (three times that of men) was thought to be a consequence of socio-cultural environment of Pakistan. Some women appeared uninterested in this survey and some indicated they did not want to share the personal information requested in the questionnaires.

2.3 Study measures

The questionnaires comprised three distinct sections. The first, entitled 'Socio-demographic and trip characteristics' collected information about age, gender, income, profession, residence, vehicle ownership and the frequency of trips undertaken in a week. The second, entitled 'Mobility characteristics with respect to the use of public transport' included questions associated with trip made using different modes of public transport and associated issues, such as health, psychological factors and accessibility. This section also included perceptions of various attributes of public transport, such as routes, operating hours, comfort, driver and station crew behavior and fellow passengers. The third section, entitled, Mobility characteristics with respect to the use of personal vehicles, collected information relating to self-driving and related factors, including the behavior of other road users and the reasons why elderly people stop self-driving. The questionnaires were administered in Urdu (the national language of Pakistan), with various responses that could be ticked.

2.4 Analysis

Data entry was been made using Statistical Package for the Social Sciences (SPSS) software. Twenty-five questionnaires (out of 450) were incomplete, and only valid information was entered.

Descriptive and comparative analyses were performed on the data set to determine significant differences. The chi-square test was mainly used to evaluate tests of independence in crosstabulation (also known as a bivariate table). Crosstabulation presents the distributions of

two categorical variables simultaneously. The test of independence assesses whether an association exists between the two variables by comparing the observed pattern of responses in the cells to the pattern that would be expected if the variables were truly independent of each other. To make a conclusion about the hypothesis with 95% confidence interval, p-value of the chi-square statistic should be less than .05 (which is the alpha level associated with a 95% confidence level). If the p-value is less than .05 then it can be concluded that the variables are not independent of each other and that there is a statistical relationship between the variables. In case p value > 0.05, categorical variables are independent of each other and have no significant relationship between them. The results of these analyses are presented in Section 3.

3. Results and Discussion

3.1 Socio-demographic and trip characteristics of the respondents

Table 4 presents socio-demographic characteristics of the respondents. As noted, about 70% male and 30% female respondents participated in the survey, with the low proportion of women being associated with the reluctance of some women to engage with this research. Almost half of the participants were in the 60-64 year age group. About half (48%) of the respondents considered themselves to be dependent. A dependency ratio of 52 dependents per 100 working-age persons is characteristic of developing regions (United Nations, 2013). In Pakistani culture, older persons are seldom self-employed nor part-time workers, and they usually live with the families of their adult children (or with their adult unmarried children). About 56% possessed a personal vehicle which were mainly motorcycles (26%) and cars (24%) and almost all respondents could drive. Adeel (2017) pointed out that Pakistan's old and narrow streets were no longer friendly passageways, as many of the residents now own and use motorcycles.

The participants were found to make an average of 9.4 trips a week. This is quite low when compared with the results of some elderly mobility studies conducted in USA, China and South Korea, as shown in Table 5. Male respondents made 10.8 trips per week, compared with 6.1 trips made by females, which was a statistically significant difference (Sig. $p < 0.05$). This difference may be associated with Pakistani socio-cultural norms, including 'family honor' and the many women's need for male permission to travel (Sathar and Kazi, 1997). However, the greater number of trips by elderly men, compared to elderly women is also consistent with other studies undertaken in China, South Korea, UK and USA (Choo et al., 2016; Hwang et al., 2015; Boschmann and Brady, 2013; Hu et al., 2013; Dobbs, 2005; Pucher and Renne, 2003).

Table 4
Socio-demographic characteristics and average trip frequency of sample

Attribute	Range	Sample (%)	Avg. no. of trips per week	Sig. p[1]
Sample		100	9.4	
Gender	Male	70.7	10.8	0.000
	Female	29.3	6.1	
Age group (years)	60-64	49.1	10.5	0.000
	65-69	31.3	9.2	
	70-74	14.4	7.4	
	75+	5.1	5.6	
Monthly income	Dependent	48.0	6.8	0.000
	Low income	24.0	10.0	
	Middle income	13.0	12.1	
	Upper-middle income	9.0	15.3	
	High income	6.0	12.4	
Vehicle ownership	Yes	55.8	12.6	0.000
	No	44.2	5.6	
Driving	Yes	54.7	13.6	0.072
	No	45.3	11.3	
Type of possessed vehicle	Cycle	0.9	3.0	0.071
	Motorcycle	26.4	11.1	
	Car	24.3	13.7	
	Pickup	3.8	15.0	
	Minibus	0.4	23.0	

Note: [1]Sig. p: Pearson's Chi-Square test significance value (p)
Significant ($p<0.05$), Non-Significant ($p>0.05$)

As can be seen in Table 4, there was a decrease in trip frequency as people aged, with 10.5 trips a week for people aged 60-64 declining to 5.6 trips a week for people aged 75 and older. This finding is in accord with studies in the Philippines, UK and USA (Pettersson and Schmöcker, 2010; Schmöcker et al., 2005; Collia et al., 2003). The decrease may well be related to health issues and various forms of impairments. Although, Daniel et. al. (2013) pointed out that older age does not necessarily lead to a decrease in mobility, especially for those who are not affected with health issues.

Table 4 also shows the effect of monthly income on the trip making of the respondents. Trip frequency rose between the increasing wealth categories from ‘dependent’ to ‘upper-middle income group’. Adeel (2016) suggested that personal income is positively associated with mobility levels, with those with no income having least mobility. However, Table 4 also shows a slight decrease in mobility between the ‘upper-middle-income’ and ‘high-income’ groups. This finding is not in agreement other studies that suggest older persons with a high monthly

household income tend to make more trips than those with fewer financial resources (Hahn et al., 2016). One possible explanation could be that high-income groups may be able to afford assistance, so that other people do shopping and small errands so that the elderly person does not have to go out.

Table 5
Comparison of daily trip frequency of older persons in various countries

City, Country	Survey year	Age	Men	Women	Total	Reference
Denver, USA	2010	60+	4.10	3.92	4.01	Boschmann and Brady (2013)
New York, USA	2009	65+	2.80	2.39	2.55	Hwang et al. (2015)
Changchun, China	2008	60+	2.64	2.53	2.59	Hu et al. (2013)
Seoul, South Korea	2010	65+	1.67	1.17	1.41	Choo et al. (2016)
Lahore, Pakistan	**2017**	**60+**	**1.54**	**0.87**	**1.20**	**This study**

Respondents who possessed a personal vehicle travelled more than twice as many times a week then those without their own vehicles. Figure 3 shows the distribution of trip frequency with respect to various socio-demographic attributes. Although an insignificant difference, elderly people who were self-driving made more trips in a week than those who are not self-driving. This finding agrees with the research of Paez et al. (2007) and Schmöcker et al. (2005).

Driving one's own vehicle is associated with higher levels of life satisfaction, less loneliness and better perceived control (OECD, 2001). In this study, 26% of respondents possessed a motorcycle and made an average of 11 trips per week, and 24% possessed a car and made 13.7 trips per week. This is consistent with other research that suggested access to a car positively affected trip frequencies of older persons in Canada (Paez et al., 2007).

The elderly respondents who owned a pickup made 15 trips a week, and those with a minibus made 23 trips per week. This is likely to be related to the use of such vehicles for commercial purposes. Fewer than 1% of respondents possessed bicycles, and cyclists only made 3 cycling trips per week. The low use of bicycle ownership and use may be related to road safety concerns, in the absence of dedicated bicycle lanes and the insensitive or unpredictable behavior of motorists in the city. It is considered increasingly hard for pedestrians and cyclists to move around the city (Bari, 2017). As people get older, fewer people choose cycle due to traffic concerns and/or their deteriorating physical condition (Hu et al., 2013).

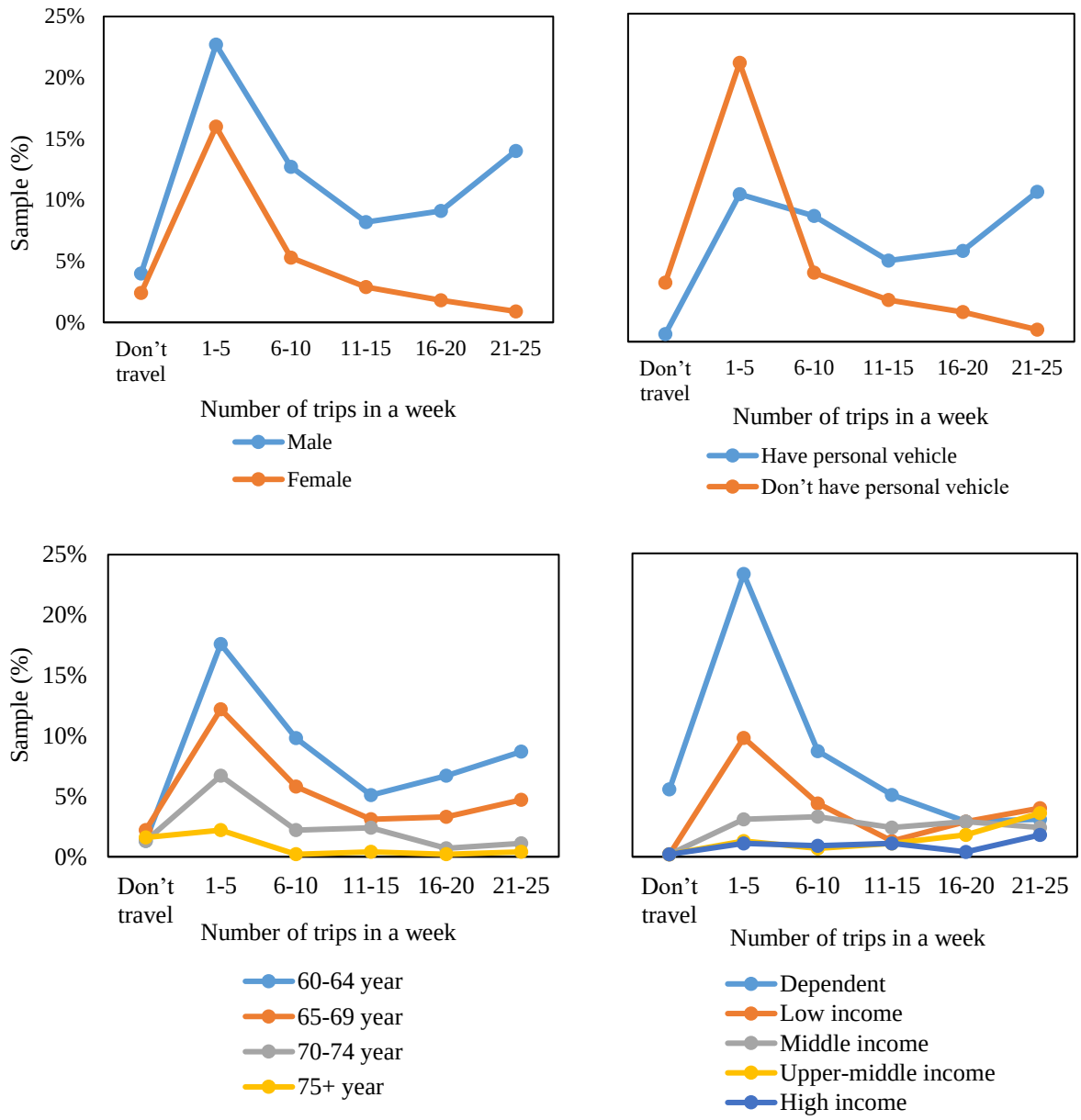


Figure 3. Distribution of trip frequency in a week with respect to socio-demographic attributes

3.2 Mobility characteristics with respect to use of public transport

Table 6 shows the use of public transport and trip frequency of the respondents in terms of their age group, gender and monthly income. About 62% of respondents used public transport, with an average of 3.2 trips per week. The use of public transport and trip frequency were found to be negatively associated with age and monthly income. This is consistent with other research that showed that public transport use amongst the elderly declines, associated with increased health issues, greater car dependence and/or higher income (Rees and Lyth 2004; Rosenbloom, 2001). While 67% of male respondents used public transport, taking 3.3 trips a week, 33% of

women did so, taking 3.1 trips a week. As noted, this difference may be associated with the Pakistani socio-cultural norms, in which males tend to travel more than females.

All groups of respondents, irrespective of age, gender and income, suggested they would use public transport more often, if it were improved.

Table 6
Respondents use of public transport and their trip frequency

Age Group (Years)	Use public transport (%)	Sig. (p)	Trips/ week[1]	Sig. (p)	Anticipated trips/week[2]	Sig. (p)
Sample	62.0		3.2		4.2	
Age Group						
60-64	54.0	0.032	3.5	0.185	4.7	0.596
65-69	28.4		2.5		3.8	
70-74	14.0		3.7		4.1	
75+	3.6		1.7		2.4	
Gender						
Male	66.9	0.026	3.3	0.015	4.4	0.554
Female	33.1		3.1		3.7	
Monthly income						
Dependent	48.6	0.004	2.8	0.015	3.2	0.004
Low income	26.3		4.0		6.3	
Middle income	15.1		3.1		4.6	
Upper-middle income	7.2		3.9		4.3	
High income	2.9		1.7		2.9	

Note: [1]Average number of trips per week by using public transport.
[2]Anticipated average number of trips per week if public transport is improved.

Table 7 presents the opinions of the elderly respondents regarding various factors that affected their use of public transport. Many respondents seemed positive noting that they were treated with respect (58%), that public transport drivers generally stopped the vehicle the correct location to board (70%) and to alight (54%). Many (65%) reported they had been offered a seat by a fellow passenger, and that drivers generally gave them sufficient time to be seated and to disembark (61%). On the less positive side, around two thirds of respondents had negative feelings relating to congestion, distress, fatigue and the effort required to use public transport. Surprising, 40% of the elderly respondents seemed unaware that there were priority seats for senior citizens in buses and on the Metrobus. About 39% of respondents said they required somebody to accompany them while travelling. This is comparable to the findings of Mohammadian et. al. (2013) that suggested that while 66% of the elderly could travel alone, 34% required someone to accompany them.

Table 7
Elderly opinion about different factors affecting the use of public transport

Factors	Attribute	Sample (%)
Subjective Factors	Driver stopped vehicle at stopping point to board	70
	Driver properly stopped vehicle to alight	54
	Driver gives enough time to be seated/stand up in vehicle	61
	Have knowledge of priority seating for senior citizen	60
	Seat offered to sit by fellow passenger	65
	Gained respect as a senior citizen	58
	Assistance is required to travel through public transport	39
Health and Psychological factors	Perceive congested	63
	Feel oppressive to commute	67
	Feel occupied that lessen time for social meetings	65
	Momentary distress upon application of sudden brakes	67
	Fatigue causing by stoppage at each station	66
	Commuting requires much effort	63

Table 8 summarizes how easy it was for people to access public transport to sample. About half the respondents were able to reach public transport within a five-minute walk. A further 16% needed to walk for more than five minutes while 34% had to take a paratransit (auto rickshaw or taxi) to reach a bus stop or the Metrobus. Santos et al. (2017) pointed out that irregular sidewalks, inaccessible public transport and other characteristics of the built environment can create barriers to the mobility of elderly people thus reduce their use of public transport.

Table 8
Accessibility and assistance required to use public transport

Factors	Attribute	Respondents (%)
Accessibility	Just at a door step	16
	To a walking distance of 5 minutes	34
	To a walking distance of more than 5 minutes	16
	Para-transit is to be used to get public transport station	34
Assistance	From Door to door	42
	To load/unload baggage	33
	To board/alight vehicle	17
	To carry wheelchair	8

In Pakistan, older women are particularly likely to be affected by poor access to public transport, being discouraged by having to walk long distances by foot, with risks of harassment and stalking (Aurat Foundation, 2012; Sohail, 2000). Elderly people with poor access to public transport may have to use private vehicles, or they simply may not travel. As indicated in Table

8, of the respondents that said they needed some assistance, 42% required door-to-door assistance, 33% required someone to help load/unload baggage, 17% needed assistance to board and to alight from a public transport vehicle and 8% reported the need for help with their wheelchair.

The respondents' access to public transport in the various towns is shown in Figure 4. The elderly respondents in Wahga Town had the easiest access, with 28% of them having public transport at their doorsteps. Respondents from Gulberg Town had the biggest problems with access, with 76% elderly having to use paratransit to reach a bus stop. While all towns had public transport services, Figure 4 shows that the respondents in each town faced a range of accessibility scenarios, which presumably reflected where in each town the respondents lived. Without further information, it was not possible to draw general conclusions on the relative accessibility of the towns.

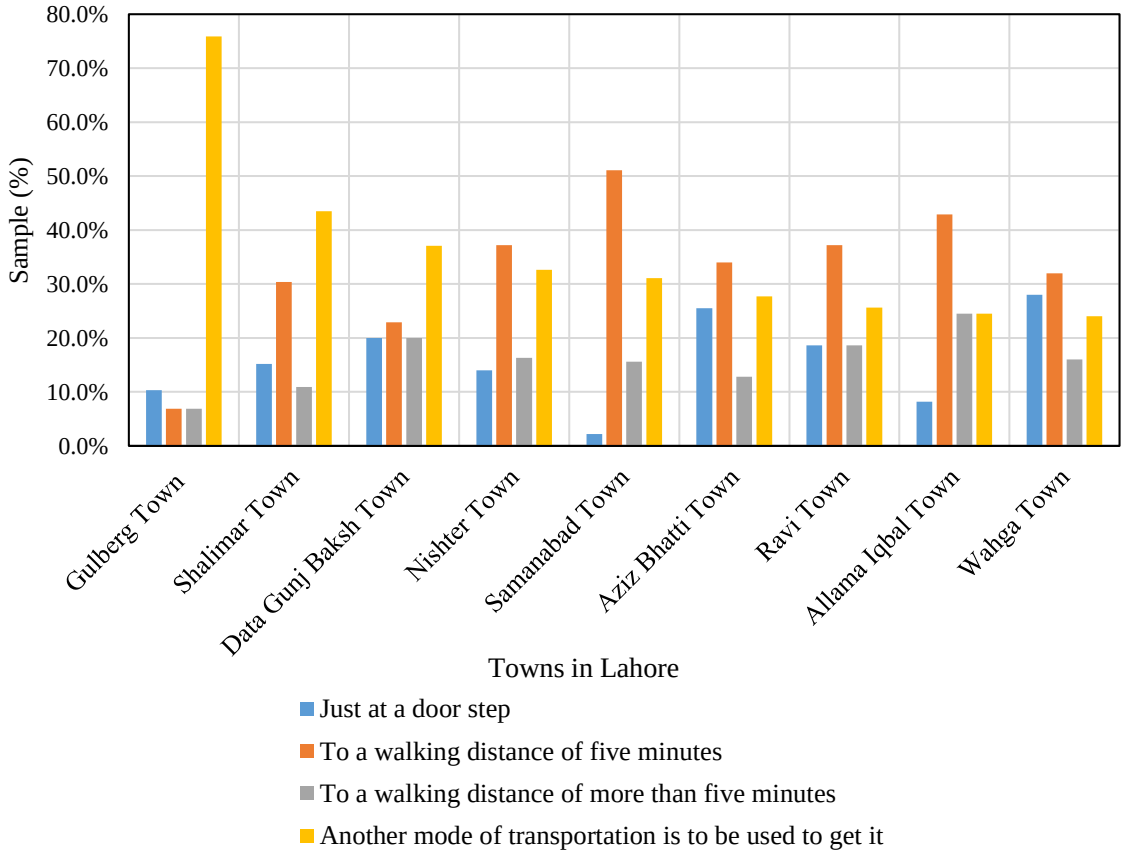
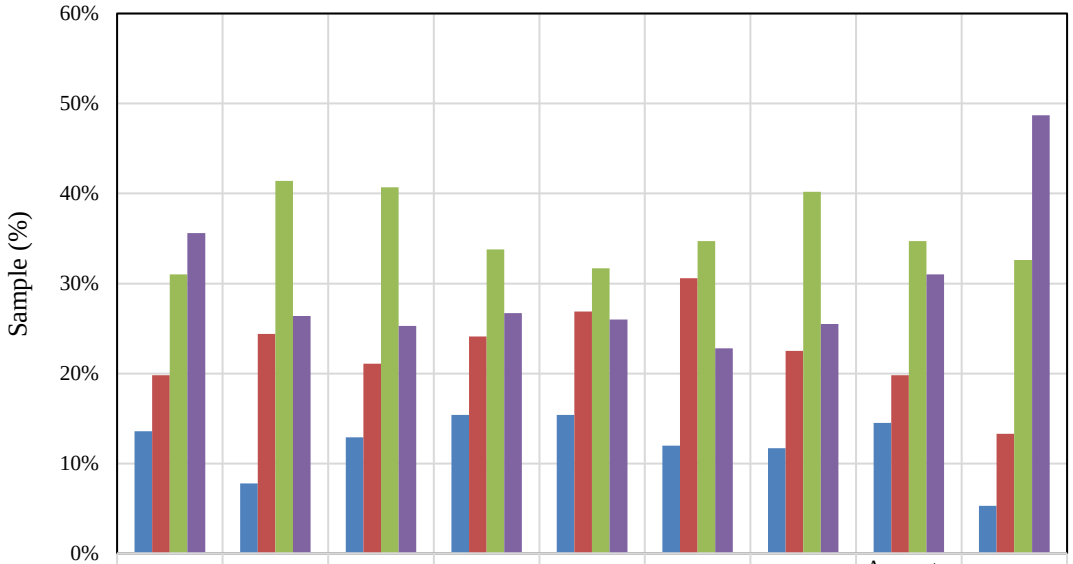


Figure 4. Towns of Lahore and accessibility to public transport

The respondents were asked to rate various public transport attributes on a scale of unimportant to very important. The results are summarized in Figure 5. Most of the transport attributes received broadly similar assessments, with about two thirds of the respondents regarding them

as ‘important’ or ‘very important’. However, safety stood out being considered ‘important’ or ‘very important’ by 82% of respondents. It is perhaps surprising that the elderly respondents did not give special importance to fares. On the other hand, they did give the same importance to wheel-chair access as many other attributes, suggesting empathy for older persons and people with disabilities, since most respondents did not themselves need to use wheelchairs**.**



	Route	Availability hours	Trip in evening	Trip in night	Trip at weekend	Fare	No. of stations	Access to wheelchair	Safety
Unimportant	14%	8%	13%	15%	15%	12%	12%	15%	5%
Somewhat important	20%	24%	21%	24%	27%	31%	23%	20%	13%
Important	31%	41%	41%	34%	32%	35%	40%	35%	33%
Very important	36%	26%	25%	27%	26%	23%	26%	31%	49%

Figure 5. Level of importance of different parameters to use public transport

Respondents were asked to rank four modes of transport for each of fourteen characteristics, including access, fares, routes and operational characteristics. The transport modes were the Metrobus, bus, minibus (wagon) and qingqi/rickshaw. The results were extremely clear and consistent for most attributes, as shown in Table 9. The modern Metrobus was the clear leader, followed by bus and then qingqi/rickshaw. The least popular was the minibus (wagon), although these forms of transport did score higher than qingqi/rickshaws on a few issues including speed and punctuality. The exception to all the accolades for the Metrobus was in terms of ‘securing a seat’. Interestingly, qingqi/rickshaw was ranked first for this attribute by participants, which was thought to be because qingqis have fixed seating capacity and all passengers that are picked up will be sure of a seat.

Table 9
Ranking of public modes of transport against different attributes

Attribute	Rank*			
	Metrobus	Bus	Minibus	Qingqi/Rickshaw
Route system	1	2	4	3
Operating hours	1	2	4	3
Punctuality	1	2	3	4
Speed	1	2	3	4
Fare	1	2	4	3
Ticket collection	1	2	3	4
Station facilities	1	2	4	3
Waiting condition at station	1	2	3	4
Number of stations on route	1	2	4	3
On-board comfort	1	2	4	3
Securing a seat	2	3	4	1
On-board safety	1	2	4	3
Access	1	2	4	3
Visual and auditory info	1	2	3	4

*Rank (1, 2, 3, and 4) denote percentage in descending order against the liking of relevant attribute.

The respondents were asked to rate the behavior of the transport services personnel (driver, fellow passengers and station crew) on a five-point Likert scale. The results are presented in Figure 6. For all behaviors, the Metrobus was again rated highest, with the informal modes of transport (qingqi/rickshaw and minibus/wagon) quite badly for behavior.

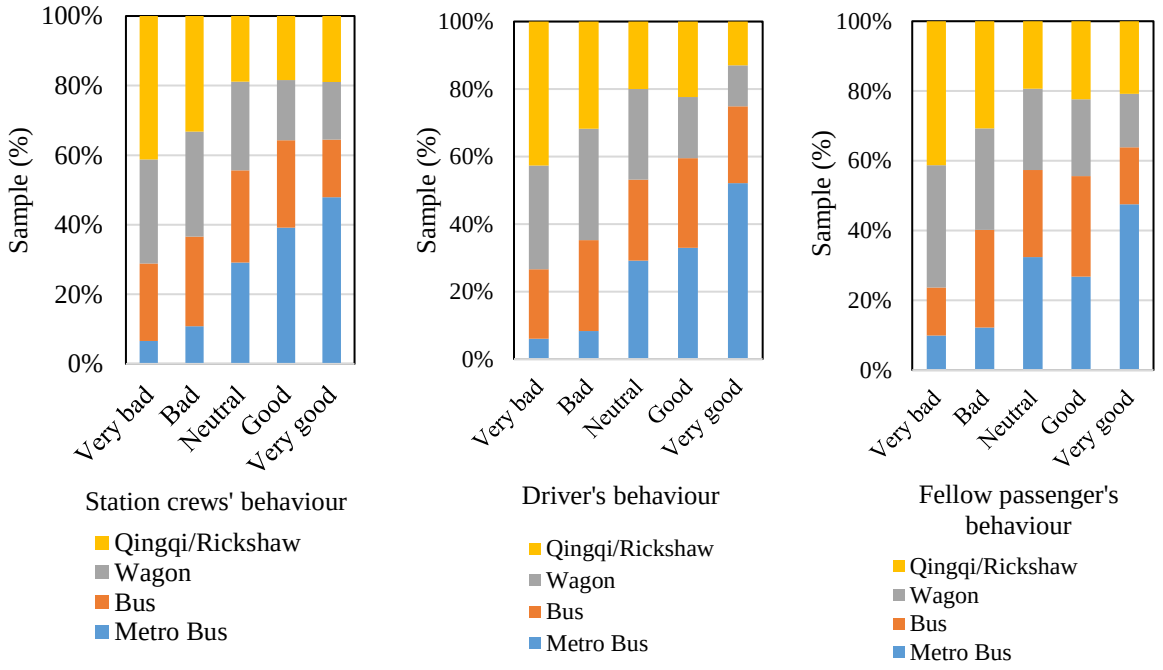


Figure 6. Assessment of subjective behavior of personnel associated with public transport

3.3 Mobility Characteristics with respect to use of personal vehicle

Respondents were asked if they had a personal vehicle that they drove. As noted before, most vehicles were private cars or motorcycles. About 55% respondents (almost all of which were men) did self-drive personal vehicles. This is shown in Table 10, which also gives the age groups and income groups of the self-driving older persons. The large gender difference can be associated with the Pakistani socio-cultural norms that tend to restrict women's access to driving, limiting driving experience and access to vehicles. There was also a clear negatively link to age, with self-driving dropping with age, particularly after 70 years. The relationship between self-driving and people's income group was not very clear in this study.

Table 10
Self-driving characteristics of sample

Attribute	Range	Self-driving (%)
Sample		54.7
Gender	Male	53.9
	Female	0.8
Age Group	60-64	53.7
	65-69	35.8
	70-74	9.0
	75+	1.5
Monthly income	Dependent	22.4
	Low income	27.6
	Middle income	25.4
	Upper-middle income	12.7
	High income	11.9

Research in USA, suggested that older men made more trips (Straight, 1997), women tended to limit when and where they drove (Glasgow, 2000) and that women drive fewer total miles (Marottoli et al., 1993). It is widely established that with increasing age, older persons tend to reduce their driving, so it ceases to be an everyday occurrence (Bauer et al., 2003), mainly because of poor health (Rimmö and Hakamies-Blomqvist, 2002; Hakamies-Blomqvist and Wahlstrom, 1998; Johnson, 1998).

Respondents were asked about various internal and external factors that might affect the use of their personal vehicles. The results are summarized in Table 11. This shows there was no clear consensus on whether the attitudes of other drivers were generally positive or negative. However, more than 60% of the respondents reported that personal health and psychological factors might restrict their self-driving including physical/mental fatigue (73%) and fear of being robbed (73%). Certainly, Lahore is gaining a reputation for poor law and order, with

frequent reports in the press and other media of robberies and crimes (Correspondent, 2017). While 43% of the elderly respondents could drive without the need of company, the others relied on family members to travel with them. In UK, it was found that older persons were increasingly relying on their children to drive them for key appointments and activities (Smithers, 2017).

Table 11
Factors affecting the use of personal vehicle and self-driving

Factor	Attribute	Respondents (%)
Health and Psychological factors affecting self-drive	Health causing hindrance	63
	Physical/mental fatigue	73
	Perceive toughness	73
	Rush at public places	67
	Get affected due to road condition	61
	Fear of being robbed	73
Subjective assistance required while travelling on personal vehicle	Accompaniment not needed	43
	Accompanied by daughter/son	35
	Accompanied by wife/husband	16
	Accompanied by sister/brother	7
Behavior of road users while self-driving	Friendly	13
	Strict/Harsh	25
	Helping/Cooperative	28
	Ignorant	34

The respondents were asked what was their preferred means of transport for making trips, and the results are presented in Figure 7. Half of them (49.7%) said they preferred to travel by car, followed by motorcycle (16%) and walking (11%). In many countries, cars are the preferred means of transport, and with older persons there tends to be a shift from being a driver to be a passenger with rising age (Daniel et. al., 2013). Motorcycles may be a realistic second choice due to their lower cost and better door-to-door access. Older persons often like walking because they can choose their own pace and have more time to assess their surroundings than when in a vehicle (Anderson, 2010). It was noteworthy that for the three most preferred options, the respondents would feel ‘in control’ of their travel, unlike the public transport alternatives. Research from several countries has shown how the use of public transport declines as older persons age (Alsnih and Hensher, 2006).

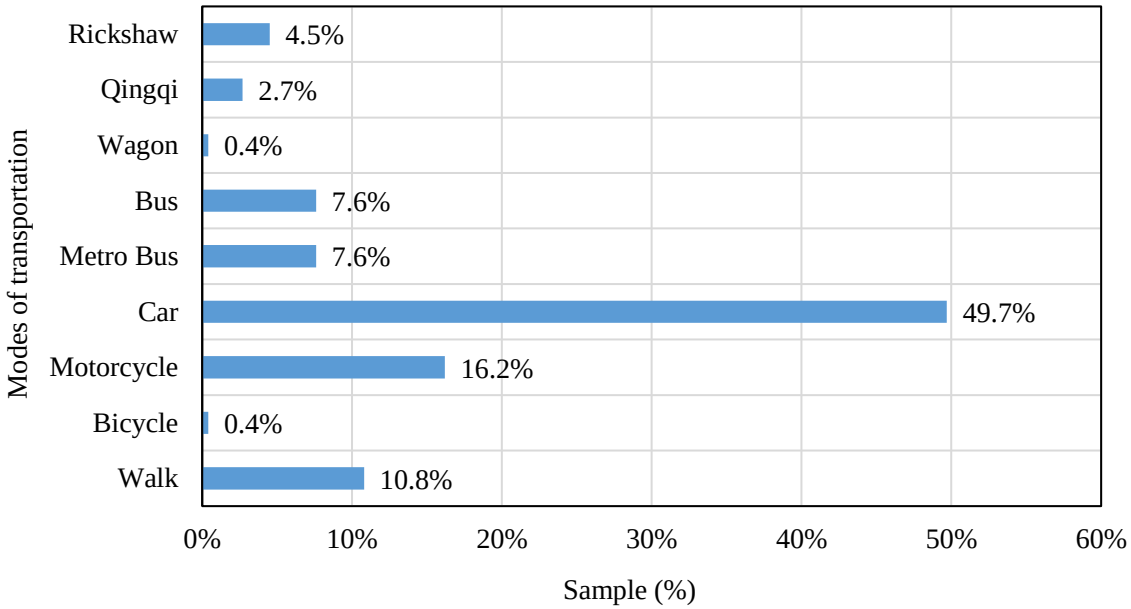


Figure 7. Most preferred mode of transportation by sample

4. Conclusions and Policy Recommendations

The older persons that took part in this study were found to make fewer trips per week than has been found in some other studies cited, for example in USA, South Korea, and China. Elderly males were found to make significantly more trips than elderly females. Two thirds of male respondents used public transport, compared to one third of the women surveyed. However, it must be noted, it was much more difficult to interview women, and the final female sample size was below the desired number. The trip frequency of the elderly people surveyed decreased with age, both for public transport and self-driving. Trip frequency was positively associated with vehicle ownership and self-driving. In general, the number of trips a week increased with income levels. The preferred modes of travel were car, motorcycle and walking, all of which appear to be more 'independent' means of travelling compared with being a passenger on public transport. However, cycling was the least popular means of transport; this may have been associated with the great importance the older persons attached to safety, although cycling was also the most energetic of the transport options.

Two thirds of respondents admitted to negative feelings (fatigue, over-crowding, being overwhelmed) while using public transport. Most people (58%) thought they were given respect as senior citizens, but they felt the behavior of public transport staff was poor, particularly for the informal means of transport (qingqi/rickshaw and minibus). The older persons interviewed thought highly of the Metrobus and buses, and most said they would use

public transport more often if it were improved. While most respondents were within a five-minute walk of a bus stop, one third of them had to take a paratransit to get to a bus route. One advantage three-wheeler transport service (qingqi/rickshaw) was that one could rely on having a seat, which was not always the case on buses. As noted, the older persons were concerned about safety issues for all transport modes, including self-driving and walking. Even though most of the respondents did not use wheelchairs, they felt wheelchair access was an important criterion for public transport services.

In case of self-driving the great majority of the self-driving older persons were men. Many admitted that stress-factors affected their use of their vehicles, including busy traffic, physical or mental fatigue and fear of being robbed.

In the light of the findings, this study recommends policy makers to ensure safety and security issues are central to transport improvement plans designed to increase the access and mobility of older persons. Elderly women travel less than men and are likely to benefit from socially-inclusive policies to facilitate and encourage travel in a safe environment.

Transport services drivers, conductors and support crews need training in appropriate behavior and the provision of priority seating for senior persons needs to be more clearly visible. Bicycle use by older persons in currently minimal, which may be associated with safety concerns. With dedicated, user-friendly cycling infrastructure it might be possible to promote healthy and sustainable mobility for all, including the elderly.

5. Limitation of the study

This was not a randomized study and cannot be considered representative of all older persons in Lahore. People interviewed were generally contacted while travelling, and so older persons unable to travel will not have been adequately represented. Due to the unwillingness of women to be interviewed, the sample was biased towards male respondents. Nevertheless, the study does shed light on the travel patterns and opinions of many elderly persons in Lahore.

6. Suggestions for future studies

A study designed to enable the participation of many elderly women is recommended to further understand their particular mobility characteristics and needs and so enable evidence-based policy initiatives.

References:

Adeel, M., 2016. Gender inequality in mobility and mode choice in Pakistan. Transportation 44(6), pp. 1519-1534. https://doi.org/10.1007/s11116-016-9712-8

Adeel, M., 2017. The suburban gated communities of Pakistan. Mint. Retrieved June 19, 2017 from http://www.livemint.com/Opinion/pMx54ufJlxwRElkJRifS2O/The-suburban-gated communities-of-Pakistan.html

Alam, A., Ibrar, M., Khan, P., 2016. Socio-economic and psychological problems of the Senior citizens of Pakistan. Peshawar Journal of Psychology and Behavioral Sciences 2 (2), pp. 249-262.

Ali, S.M., Hussain, J., 2001. Fertility Transition in Pakistan: Evidence from Census. The Pakistan Development Review 40: 4 Part II, pp. 537–550.

Alkire, S., 2016. Pakistan's Multidimensional Poverty Index. Oxford Poverty & Human Development Initiative (OPHI). University of Oxford. http://www.pk.undp.org/content/dam/pakistan/docs/MPI/Alkire_PakistanMPI_2016.pdf

Alsnih, R., Hensher, D.A., 2003. The mobility and accessibility expectations of seniors in an aging population. Transportation Research Part A 37 (10), pp. 903–916. https://doi.org/10.1016/s0965-8564(03)00073-9

Alsnih, R., Hensher, D.A., 2006. The mobility and accessibility expectations of seniors in an aging population. Transportation Research Part A: Policy and Practice 37(10), pp. 903–916. https://doi.org/10.1016/S0965-8564(03)00073-9

Anderson, M.K., 2010. Characteristics of trips and travellers in private and public transportation in the Danish travel survey data. Selected Proceedings from the Annual Transport Conference at Aalborg University, 16.

Ashiq, U., Asad, A.Z., 2017. The rising old age problem in Pakistan. Journal of the Research Society of Pakistan 54 (2), pp. 325-333. http://pu.edu.pk/images/journal/history/PDF-FILES/23-Paper_54_2_17.pdf

Aurat Foundation, 2012. Gender differences: Understanding perceptions. National baseline study. Retrieved March 20, 2018 from http://pdf.usaid.gov/pdf_docs/pnaec207.pdf

Balochistan Bureau of Statistics (BBS), 2014. Development Statistics of Balochistan 2013–2014. Quetta. Retrieved from http://www.balochistan.gov.pk/

Bari, F. 2017. Mobility in Urban Spaces. DAWN, August 25, 2017. Retrieved March 14, 2018 from www.dawn.com/news/1353807/mobility-in-urban-spaces.

Bauer, M.J., Adler, G., Kuskowski, M.A., Rottunda, S., 2003. The influence of age and gender on the driving patterns of older adults. Women & Aging 15(4), pp. 3-16. https://doi.org/10.1300/J074v15n04_02

Beirão, G., Sarsfield Cabral, J.A., 2007. Understanding attitudes towards public transport and private car: a qualitative study. Transport Policy 14 (6), pp. 478–489. https://doi.org/10.1016/j.tranpol.2007.04.009.

Blood, P.R., 1995. Pakistan: A Country Study. Washington, D.C.: Federal Research Division, Library of Congress: For sale by the Supt. of Docs., U.S. G.P.O, 1995 Pdf. Retrieved June 30, 2018 from https://www.loc.gov/item/95017247/

Boschmann E.E., Brady, S.A., 2013. Travel behaviors, sustainable mobility, and transit-oriented developments: a travel counts analyses of older adults in the Denver, Colorado metropolitan area. Journal of Transport Geography 33, pp. 1–11. https://doi.org/10.1016/j.jtrangeo.2013.09.001

Buehler, R., Nobis, C., 2010. Travel behavior in aging societies: comparison of Germany and the United States. Transportation Research Board 2182, pp. 62–70. https://doi.org/10.3141/2182-09

Charlton, J.L., Oxley, J., Fildes, B., Oxley, P., Newstead, S., Koppel, S., O'Hare, M., 2006. Characteristics of older drivers who adopt self-regulatory driving behaviours. Transport Research Part F 9 (5), pp. 363–373. https://doi.org/10.1016/j.trf.2006.06.006

Choo, S., Sohn, D., Park, M., 2016. Mobility characteristics of the elderly: A case for Seoul Metropolitan Area. KSCE journal of Civil Engineering, 20(3) pp. 1023-1031. https://doi.org/10.1007/s12205-016-0651-x

Collia, D.V., Sharp, J., Giesbrecht, L., 2003. The 2001 national household travel survey: A look into the travel patterns of older Americans. Safety Research 34 (4), pp. 461–470. https://doi.org/10.1016/j.jsr.2003.10.001

Correspondent, 2017. Lahore continues to be robbed blind ongoing year. Express Tribune December 27th, 2017. Retrieved June 8, 2018 from https://tribune.com.pk/story/1593458/1-lahore-continues-robbed-blind-ongoing-year/

Daniel, B., Pokriefke, E., Risser, R., 2013, Mobility patterns in the ageing populations, Consol work package 2 – summary report.

Department of Environment, Transport and Regions (DETR), 2000. National Travel Survey: 1997/99 Update. Government Statistical Services, London, the United Kingdom.

Dobbs, L., 2005. Wedded to the car: women, employment and the importance of private transport. Transport Policy, 12 (3), pp. 266-278. https://doi.org/10.1016/j.tranpol.2005.02.004

Earth Policy Institute (EPI) from World Bank, 2014. Motor Vehicles (per 1,000 people), World Development Indicators, updated 9 April 2014. Retrieved April 5, 2018 from www.earth-policy.org/datacenter/xls/book_tgt_transportation_14.xlsx

Feng, J., 2016. The influence of built environment on travel behavior of the elderly in urban China. Transportation Research Part D: Transport and Environment http://dx.doi.org/10.1016/j.trd.2016.11.003

Figueroa, M.J., Nielsen, T.A.S., Siren, A., 2014. Comparing urban form correlations of the travel patterns of older and younger adults. Transport Policy 35, pp. 10–20. https://doi.org/10.1016/j.tranpol.2014.05.007

Gallup Pakistan, 2016. Short roundup on transport infrastructure in Pakistan year 2000-2015. Big Data Analysis Edition 2. Based on Pakistan Economic Survey 2015-2016. Retrieved July 10, 2018 from http://gallup.com.pk/wp-content/uploads/2016/11/Gallup-Pakistan-Big-Data-Analysis-Series-Edition-2-on-Transportation-Infrastructure-in-Pakistan-2000-to-20151.pdf

Glasgow, N., 2000. Older Americans' patterns of driving and using other Transportation. Rural America, 15 (3), pp. 26-31.

Golob, T.F., Hensher, D.A., 2007. The trip chaining activity of Sydney residents: a cross-section assessment by age group with a focus on seniors. Journal of Transport Geography 15 (4), 298–312. https://doi.org/10.1016/j.jtrangeo.2006.09.005

Hahn, J., Kim, H., Kim, J., Ulfarsson, G.F., 2016. Trip making of older adults in Seoul: Differences in effects of personal and household characteristics by age group and trip purpose. Journal of Transport Geography 57, pp. 55-62. https://doi.org/10.1016/j.jtrangeo.2016.09.010

Hakamies-Blomqvist, L., Wahlstrom, B., 1998. Why do older drivers give up driving? Accident Analyses & Prevention 30(3), pp. 305–312. https://doi.org/10.1016/S0001-4575(97)00106-1

Haustein, S., Siren, A., 2015. Older people's mobility: Segments, factors, trends. Transport Reviews 35 (4), pp. 466–487. https://doi.org/10.1080/01441647.2015.1017867

Hess, D.B., 2009. Access to public transit and its influence on ridership for older adults in two US cities. Transport and Land Use 2 (1), pp. 3–27. https://doi.org/10.5198/jtlu.v2i1.11

Hildebrand, E.D., 2003. Dimensions in elderly travel behaviour: A simplified activity-based model using lifestyle clusters. Transportation 30 (3), pp. 285–306. https://doi.org/10.1023/A:1023949330747

Hu, X., Wang, J., Wang, L., 2013. Understanding the travel behavior of elderly people in the developing country: a case study of Changchun, China. Procedia - Social and Behavioral Sciences 96, pp. 873 – 880. https://doi.org/10.1016/j.sbspro.2013.08.099

Hwang, H.L., Wilson, D., Reuscher, T., Yang, J.J., Taylor, R., Chin, S.M., 2015. Travel patterns and characteristics of the elderly subpopulation in New York State, ORNL/TM-2015/83 Retrieved April 12, 2018 from https://www.osti.gov/scitech/servlets/purl/1185940

Japan International Cooperation Agency (JICA), 2012. The project for Lahore urban transport master plan in the Islamic Republic of Pakistan: final report volume I&II, Retrieved April 5, 2018 from JICA online library website: http://libopac.jica.go.jp

Johnson, J.E., 1998. Older adults and the decision to stop driving: The influence of family and friends. Community Health Nursing, 15(4), pp. 205–216. https://doi.org/10.1207/s15327655jchn1504_2

Khyber Pakhtunkhwa Bureau of Statistics (KPKBS), 2014. Development Statistics of Khyber Pakthunkhwa. Peshawer. Retrieved from http://kpbos.gov.pk/development-statistics.Php

Marottoli, R.A., Ostfield, A.M., Merrill, S.S., Perlman, G.D., Foley, D.J., Cooney, L.M., 1993. Driving cessation and changes in miles driven among elderly individuals. Gerontology 48(5), pp. S255–S260. https://doi.org/10.1093/geronj/48.5.S255

Matthies, E., Kuhn, S., Klöckner, C.A., 2002. Travel mode choice of women the result of limitation, ecological norm, or weak habit? Environment and Behavior 34 (2), pp. 163–177. https://doi.org/10.1177/0013916502034002001

Mohammadian, K., Karimi, B., Pourabdollahi, Z., Frignani, M. 2013. Modeling Seniors' Activity-Travel Data. Research Report No. FHWA-ICT-13-026.

Mollenkopf, H., Marcellini, F., Ruoppila, I., Széman, Z., Tacken, M., 2005. Enhancing Mobility in Later Life: Personal Coping, Environmental Resources and Technical Support the Out-of-home Mobility of Older Adults in Urban and Rural Regions in Five European Countries. IOS Press, Amsterdam 340 p.

Moniruzzaman, M., Páez, A., Habib, K.M.N., Morency, C., 2013. Mode use and trip length of seniors in Montreal. Journal of Transport Geography 30, pp. 89–99. https://doi.org/10.1016/j.jtrangeo.2013.03.007

Nordbakke, S., Schwanen, T., 2015. Transport, unmet activity needs and wellbeing in later life – exploring the links. Transportation 42 (6), pp. 1129–1151. https://doi.org/10.1007/s11116-014-9558-x

Ohnmacht, T., Götz, K., Schad, H., 2009. Leisure mobility styles in Swiss conurbations: construction and empirical analysis. Transportation 36 (2), pp. 243–265. https://doi.org/10.1007/s11116-009-9198-8

Oxley, J., Charlton, J., Scully, J., Koppel, S., 2010. Older female drivers: an emerging transport safety and mobility issue in Australia. Accident Analysis & Prevention 42 (2), pp. 515– 522. https://doi.org/10.1016/j.aap.2009.09.017

Paez, A., Scott, D., Potoglou, D., Kanaroglou, P., Newbold, K.B., 2007. Elderly mobility: demographic and spatial analyses of trip making in the Hamilton CMA, Canada. Urban Studies 44 (1), pp. 123–146. https://doi.org/10.1080/00420980601023885

Pakistan Bureau of Statistics (PakBS), 1998. Population of 5-year age group, 5th population and housing census. Ministry of Statistics, Statistics Division, Islamabad. Retrieved April 5, 2018 from http://www.pbscensus.gov.pk/.

Pakistan Bureau of Statistics (PakBS), 2017. Provisional summary results of 6th population and housing census, Ministry of Statistics, Statistics Division, Islamabad. Retrieved April 5, 2018 from http://www.pbscensus.gov.pk/.

Pettersson, P., Schmöcker, J., 2010. Active ageing in developing countries? Trip generation and tour complexity of older people in Metro Manila. Journal of Transport Geography 18(5), pp. 613-623, https://doi.org/10.1016/j.jtrangeo.2010.03.015

Pucher, J., Renne, J.L., 2003. Socioeconomics of Urban Travel: Evidence from the 2001 NHTS. Transportation Quarterly, 57 (3), pp. 49-77.

Punjab Bureau of Statistics (PBS), 2014. Punjab development statistics 2014. Lahore. Retrieved from http://www.bos.gop.pk/publicationreports

Punjab Bureau of Statistics (PBS), 2015. Punjab development statistics 2015. Lahore. Retrieved April 5, 2018 from http://www.bos.gop.pk/publicationreports.

Rana, I.A., Bhatti, S.S., 2017. Lahore, Pakistan – Urbanization challenges and opportunities. Cities 72B, pp. 348-355. https://doi.org/10.1016/j.cities.2017.09.014

Rana, S., 2016. 40% Pakistanis live in poverty. Daily the Express Tribune, June 21, 2016. Retrieved June 30, 2018 from https://tribune.com.pk/story/1126706/40-pakistanis-live-poverty/

Rees, C., Lyth, A., 2004. Exploring the future of car use for an ageing society: preliminary results from a Sydney study. In 27th Australasian Transport Research Forum, Adelaide.

Rimmö, P., Hakamies-Blomqvist, L., 2002. Older drivers' aberrant driving behaviour, impaired activity, and health as reasons for self-imposed driving limitations. Transportation Research Part F: Traffic Psychology and Behaviour 5(1), pp. 47–62. https://doi.org/10.1016/S1369-8478(02)00005-0

Rosenbloom, S., 2001. Sustainability and automobility among the elderly: an international assessment. Transportation 28 (4), pp. 375–408. https://doi.org/10.1023/A:1011802707259

Rosenbloom, S., 2004. The mobility needs of older Americans. In: Katz, B., Puentes, R. (Eds.) Taking the High Road: A Metropolitan Agenda for Transportation Reform. Brookings Institution Press, pp. 227-254.

Saeed, Y., Shoaib, M., Ilyas, R., 2011. Discrimination and health status of elderly people in Chakwal: Pakistan. Academic Research International. 1, pp. 149-155.

Salahuddin, K., Jalbani, A.A., 2006. Senior Citizens: A Case Study of Pakistan. Journal of Independent Studies and Research 4(2), pp. 26-31. http://jisr.szabist.edu.pk/

Santos, M.D.D., Silva, M.F., Velloza, L.A., Pompeu, J.E., 2017. Lack of accessibility in public transport and inadequacy of sidewalks: effects on the social participation of elderly persons with functional limitations. Revista Brasileira de Geriatria e Gerontologia 20(2), pp. 161-174. https://dx.doi.org/10.1590/1981-22562017020.160090

Sathar, Z.A., Kazi, S., 1997. Women's autonomy, livelihood and fertility: a study of rural Punjab. Pakistan Institute of Development Economics. 19971809656.

Scheiner, J., 2006. Does the car make elderly people happy and mobile? Settlement structures, car availability and leisure mobility of the elderly. European Journal of Transport and Infrastructure Research 6 (2), pp. 151–172.

Scheiner, J., 2010. Social inequalities in travel behaviour: trip distances in the context of residential self-selection and lifestyles. Journal of Transport Geography 18 (6), pp. 679–690. https://doi.org/10.1016/j.jtrangeo.2009.09.002

Schmöcker, J., Quddus, M., Noland, R., Bell, M., 2005. Estimating trip generation of elderly and disabled people: analyses of London data. Transportation Research Record: Journal of the Transportation Research Board 1924, pp. 9-18. https://doi.org/10.3141/1924-02

Sindh Bureau of Statistics (SBS), 2013. Development Statistics of Sindh. Karachi. Retrieved from http://sindhbos.gov.pk/development-statistics/

Siren, A., Haustein, S., 2016. How do baby boomers' mobility patterns change with retirement? Ageing & Society 36 (5), pp. 988–1007. https://doi.org/10.1017/S0144686X15000100.

Smithers, R., 2017. Older people increasingly relying on offspring to drive them. The Guardian. Retrieved February 15, 2018 from https://www.theguardian.com/world/2017/aug/29/older-people-increasingly-relying-on-offspring-to-drive-them

Sohail, M., 2000. Urban Public Transport and Sustainable Livelihoods for the poor: A case study Karachi, Pakistan, WEDC, Loughborough University.

Straight, A., 1997. Community transportation survey. Retrieved March 27, 2018 from https://assets.aarp.org/rgcenter/il/d16603_commtran.pdf

Szeto, W.Y., Yang, L., Wong, R.C.P., Li, Y.C., Wong, S.C., 2017. Spatio-temporal travel characteristics of the elderly in an aging society. Travel Behaviour and Society 9, pp. 10-20, http://dx.doi.org/10.1016/j.tbs.2017.07.005

Tacken, M., 1998. Mobility of the elderly in time and space in the Netherlands: An analysis of the Dutch National Travel Survey. Transportation 25 (4), pp. 379–393. https://doi.org/10.1023/A:1005042614848

The Newspaper's Staff Reporter, 2015. Pakistan lacks policy for aged population. Daily DAWN, February 23, 2015. Retrieved June 06, 2018 from https://www.dawn.com/news/1165296/pakistan-lacks-policy-for-aged-population

The Organisation for Economic Co-operation and Development (OECD), 2011. Education at a Glance: OECD Indicators, OECD Publishing. http://dx.doi.org/10.1787/eag-2011-en

Truong, L.T., Somenahalli, S.V., 2015. Exploring frequency of public transport use among older adults: A study in Adelaide Australia. Travel Behaviour and Society 2 (3), pp. 148– 155. https://doi.org/10.1016/j.tbs.2014.12.004

United Nations, 2013. World Population Ageing (ST/ESA/SER.A/348). Department of Economic and Social Affairs, Population Division. Retrieved February 13, 2018 from http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeingReport2013.pdf

United Nations, 2017. Population Ageing Highlights (ST/ESA/SER.A/397). Department of Economic and Social Affairs, Population Division. Retrieved February 06, 2018 from www.un.org/en/development/desa/population/.../ageing/WPA2017_Highlights.pdf

Van den Berg, P., Arentze, T., Timmermans, H., 2011. Estimating social travel demand of senior citizens in the Netherlands. Journal of Transport Geography 19 (2), pp. 323–331. https://doi.org/10.1016/j.jtrangeo.2010.03.018