MOBILITY PATTERN FOR THE ELDERLY IN BRAZIL

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Abstract

In 50 years Brazilian population almost tripled from 70 million in 1960 to 190.7 million people in 2010. Also, elderly population has increased greatly, in 1960 seniors totaled 3.3 million (4.7% of the population) in 2010 reached 20.5 million (10.8% of the population) and it is expected that in 2020 will reach 30 million. The question arisen from this evidence is: Is the country prepared to meet the demands of this aging population? This work aims to answer this question, focusing on the field of urban mobility, because seniors of today have different demands, they want an active life therefore needing mobility. The population's age structure is described highlighting the elderly. It describes data analysis of three researches, making a cut to analyze the data for elderly: A survey about walk displacement patterns, IBGE's Census that for the first time, considered commuting time to work and a survey held in low income areas. It diagnoses the issue pointing the major difficulties challenged by seniors. This raises the need of specific public policies regarding seniors in the country especially towards mobility. And finally, points international best practices and proposes measures that need to be taken to meet such needs.

Key Words: Elderly, Mobility, Accessibility, Urban transport

1   Introduction

According to World Health Organization - WHO (2014), in almost every country, the proportion of people aged over 60 years is growing faster than any other age group, as a result of both longer life expectancy and declining fertility rates. This population ageing can be seen as a success story for public health policies and for socioeconomic development, but it also challenges society to adapt, in order to maximize the health and functional capacity of older people as well as their social participation and security. It is important to prepare health providers and societies to meet the specific needs of older populations.

Nowadays, the most rapid demographic changes are occurring in developing countries, with predicted increases of 200-400 percent in their older populations during the next years. However, older people in many developing countries do not have access to the same level of income security and health care that older people in industrialized countries enjoy (WHO, 2000).

This fact reinforces the need to develop studies focused on the elderly population in developing countries, because a huge part of literature about mobility characteristics of an aging population is dominated by North American and European studies, but seniors in developing countries have social conditions and transportation systems very different from those found in these developed countries.

Just considering the last 60 years, Brazilian population increased from 51.9 million to 200.4 million people, life expectancy has grown from 43.3 to 73.62,

and fertility rate reduced in more than two thirds decreasing from 6.2 to 1.8 children per woman. Mortality rate has decreased in the middle of the twentieth century in Brazil due to a reduction in infectious and parasite diseases, and an increase of access to antibiotics and health care and a better sanitary system. On the other hand, birth rates were still high in between 1950 and 1970, thus Brazil experienced a great growing rate in population. However in the late 1960's with the introduction of oral contraceptives, growing rate started to decrease, due to the reduction of fertility rate. This explains why, 60 years later Brazil's aged population is growing very fast (IBGE, 2010; IBGE, 2014).

From 1992 to 2012 the population over 60 years old has increased 117% from 11.4 million to 24.8 million, representing 11.34% of Brazil's population. Also, the amount of elderly living alone has more than tripled from 1.1 million to 3.7 million. IBGE projects that in 2034 they will represent 39.2% of the population, and that life expectancy will increase from 75 to 81 years (PNAD, 2012).

The question that arises from this evidence is: Is Brazil prepared to meet the demands of its monumental elderly population in the near future? This paper aims to answer that question, focusing on the field of urban mobility, because the elderly of today have changed their demands, they long for active lives with social participation and, for this, they need mobility.

A key factor influencing active ageing is transportation, including accessible and affordable public transport. In particular, being able to move through the city determines social and civic participation and access to community and health services. For older people, transportation can mean the difference between positive social interaction and isolation. (WHO, 2007; WHO, 2002)

Occasionally, seniors might need to switch modes or change their travel behavior. Specialists in the field suggest that the aging population faces many challenges, due to their need of independence on car as main mode of transportation, which affects directly their health. Burkhardt (2000) points out significant declines in driving beginning around age 75. The temporal relationship of adverse effects of driving cessation is unclear, because increased depressive symptoms following driving cessation may lead to decreased activity, but decreased activity itself may exacerbate feelings of depression (Marottoli et al., 2000). In a study held in Minessota, USA, nevertheless, a minority of seniors use public transport, the ratio of public transport users among seniors is greater than within the entire population, such phenomena can be related mainly to lower income and disability (WASFI, LEVINSON, EL-GENEIDY, 2012).

Still regarding disabilities, according to Transportation Availability and Use Survey, American elders with disabilities were found to leave their homes on average four days per week, less frequently than the young people with disabilities or seniors with no disabilities (Sweeney, 2004).

If there is lack of transportation or adequate means of obtaining information to allow people to meet and connect, the urban facilities and services that could support active ageing are simply inaccessible. (WHO, 2007).

In this context, this research paper is divided into several sections. It first starts with a section that describes Brazilian population age structure profile highlighting the elderly and showing its evolution and needs. The second section includes considerations about of the relationship between elderly, transport and public policies. The third section includes definitions and the research design describing the study area. The fourth section describes data analysis of three secondary researches conducted, making a cut to specifically analyze the data for elderly: Survey about mobility pattern of walk displacements in Recife in 2006, IBGE's national household survey, held in 2010, that for the first time,

considers commuting time to work and a survey held in low income areas in Recife in 2011. The fifth section includes the analysis and discussions, including diagnose of the issue pointing the major shortcomings and difficulties challenged by seniors. Finally the paper ends with a set of conclusions derived from the analysis, including several public policies recommendations for elderly in the country and international best practices and proposes measures that need to be taken to meet such needs.

2 Population's age structure perspective and the need for urban mobility

In agreement with World Health Organization (2015), most developed world countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person, but like many westernized concepts, this does not adapt well for developing countries. At the moment, there is no United Nations standard numerical criterion, but the UN agreed cutoff is 60+ years.

In consonance with Brazilian law No. 8.842 (1994) regarding the National Policy of the Elderly, is considered elderly person someone over sixty years old. Despite these classifications for seniors that use only age criterion, it is worth noticing that individuals differ from each other, regarding a socio-economic, demographic and epidemiological point of view.

It is important to notice that Brazilian population structure is evolving to what today is observed in developed countries, where the pyramid's base is narrower and the apex is wider (see Graphics 1 and 2). In consonance to Carvalho and Garcia (2003), from the late 60s, women's fertility in Brazil started fast and widespread to decline, as a consequence the population started to age very fast. It will necessarily be faster and hold bigger structural changes, demographically speaking, than what occurred in First World countries for two reasons: the decline of fertility in the country occurred at a higher rate and comes from a younger population than in developed countries.

Furthermore, Word Bank (2011) affirms that population's aging speed in Brazil will be significantly higher than the one observed in more developed societies during the last century. For example, it took more than a century for France being able to see its population over 65 years increases from 7% to 14% of the total. In contrast, this same demographic shift will occur in the only two decades (between 2011 and 2031) in Brazil.
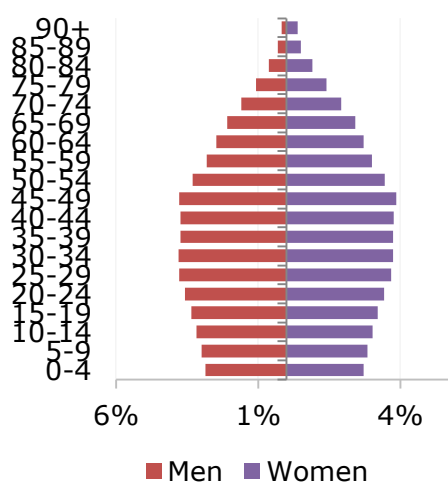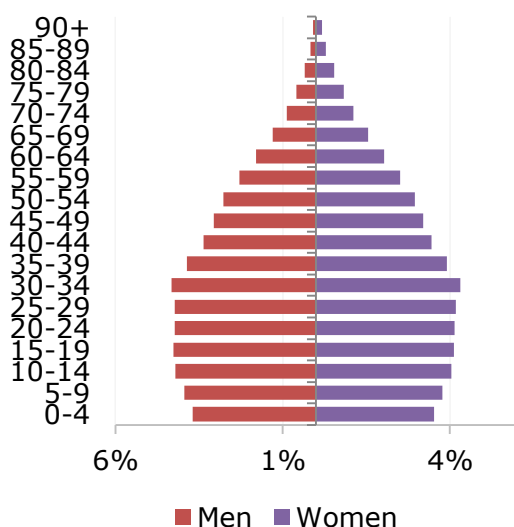
Graphic 1 - Population pyramid 2015   Graphic 2 - Population pyramid 2030

According to projections of the Brazilian Institute of Geography and Statistics – IBGE (2013), Brazil's elderly population is expected to reach 23.9 million (11.71% of total) in 2015, achieving 41.5 million (18.62%) in 2030 and 73.5 million (33.7% of total) in 2060.

Conforming to the National Household Survey 2009 (IBGE, 2010a), women are majority (55.8%) among the elderly, as well as whites (55.4%). Senior's education in Brazil is still considered low: 30.7% were under one year of schooling. Just fewer than 12.0% lived with a per capita household income of up to ½ minimum wage and about 66% were already retired.

In the evaluation about their general health, the elderly, besides considering the fact of having a disease, also pondered about their participation in society. In a subjective health status assessment through their own perception, even though 77.4% of the elderly have declared suffering from chronic diseases, 45.5% reported their health as being very good or good (IBGE, 2010a).

It is worth noticing that seniors of today have different demands, they want to have an active and social life and for this, they need mobility. According to Rosenberg and Everitt (2001), the elderly of the future are likely to have a number of different characteristics from those of the past. They are likely to have more time to devote to leisure and recreational activities, and because of better education, and income, and increased opportunities that they will have become used to, they will have different demands.

Another evident difference for aging elderly nowadays is the fact that they are, like no other previous, adapted to automobiles, which makes it difficult to care of their transportation needs, when they lose their ability to drive. According to Marottoli et al. (2000), given the link between activity level and health status and well-being, as well as the reliance of older persons on driving to meet their transportation needs, we hypothesized that driving cessation would contribute to a decline in out-of-home activities. Younger people, with fewer physical limitations, may have a wider range of transportation options including walking, biking, and using public transportation. Older persons with limited mobility may be less inclined to use these options, especially in bad weather. As a result, driving cessation may constrict the activity levels of older individuals.

This problem is magnified in underdeveloped and developing countries due to the poor quality of the public transportation offered which besides having few links and restrict accessibility, have not adapted its structure to meet elderly needs. WHO (2007) affirms that boarding and disembarking from vehicles is one major issue. The design of public transport vehicles presents barriers to older people (e.g.: the high steps on the buses; buses aren't adapted for wheelchair access). According to Global Age Watch Index 2014 of HelpAge International (2014), in Brazil only 45% of people over 50 are satisfied with the local public transportation systems.

As reported by World Health Organization (2002), accessible and affordable public transportation services are needed in both rural and urban areas so that people of all ages can fully participate in family and community life. This is especially important for older persons who have mobility problems.

In this context, IBGE (2010) has been warning that the country's age structure is changing and that the elderly group is now a significant part of the population and is increasing in relative importance in Brazilian society, as a result there are a number of new demands in terms of public policies and active participation by the elderly in social life.

3   Elderly, transport and public policies

Elderly have reduced mobility and depend on the conditions offered by the urban infrastructure that should provide the minimum conditions necessary for activities' performance to occur autonomously and safely. Thus the understanding of mobility limitations caused by aging is necessary for planning transport policies that meet the senior's specifics mobility needs (FERREIRA, 2012).

According to Federal Law No. 10.741 (2003) chapter X, regarding transport (Articles 39-42), people over 65 have the right to free urban public transportation (to use the service it is only required to present a document proving the person's age) and to 10% reserved seats in public transport vehicles, which should be properly identified by a sign reserving the seats for seniors. In interstate public transportation, the statute states reservation is of two free places for seniors with incomes equal to or less than two minimum wages and 50% discount, at least, in the amount of tickets to those who exceed the free places, with income below or equal to two minimum wages. Moreover, they are assured priority and security at boarding and disembarking procedures in mass transit system vehicles. Regarding parking priority, reservation is guaranteed for the elderly, under local law, 5% (five percent) of the public and private parking spaces must be positioned to ensure better convenience to the elderly.

Despite the Elderly Statute consider an elder individual over 60 years, the elderly can only exercise the right to gratuity in public transport from the age of 65. According to IPEA (2011), other gratuities and benefits are regulated by local authorities, ranging from place to place. In most transport systems, as there are no extra fare funds to cover the beneficiaries' expenses, the costs of providing gratuity for the elderly are repassed to the overall society by the general value of the fare.

Still regarding senior's rights, Federal Law No. 10,048 (2000) defines that every vehicle for public transport should be planned in order to ease the access for people with mobility difficulties, which implies the Government can only accept vehicles free of barriers, in order to facilitate boarding and disembarking of such persons in each fleet renewal. However, the fulfillment of this law cannot be observed daily, since the buses have high steps and standard seats.

It is worth to highlight some specific laws and programs of Recife, a city located in State of Pernambuco that was chosen for a more specific data study.

State Law No. 14.218 (2010) established a program called PE Conduz, a free special assistance service that provides suitable and affordable vehicles for comfortable and safe transport of disabled people with severe mobility impairment and who have no conditions to get around independently in other public transportation means. This service is available from house to health treatments or education centers and covers the entire metropolitan region.

According Recife's Municipal Law No. 17,834 (2012) is guaranteed free urban public mass transportation in Recife to those over sixty (60) years. However this gratuity is only valid for the complementary municipal transportation system (inter neighborhoods and feeder lines), because public passenger transport system lines only allow gratuity for people over 65.

There is also a municipal Law 17,116/2005, the elderly have guaranteed gratuity in pay-and-display areas, in special parking spaces, located at the ends of blocks to allow greater accessibility and security to the elderly.

4   Study area

Recife's Metropolitan Region is mainly an urban region with some rural sections at the fringes. It is located in State of Pernambuco in northeastern Brazil and is composed by 14 municipalities featuring the largest urban agglomeration in the North-Northeast regions and the fifth largest in Brazil with a population of about 4 million inhabitants (IBGE, 2014). Recife is also the third more densely inhabited metropolitan area of the country, surpassed only by São Paulo and Rio de Janeiro, and the fourth largest urban network in Brazil (IBGE, 2013).

The occupation and land use in RMR does not obey the center-periphery pattern (European) or the periphery-center (US). Slums and poor communities are scattered throughout the city in conurbation with the richest neighborhoods (Lima et al, 2014a).

Public transport in Recife's metropolitan area currently consists of subway, light rail, bus, bus rapid transit and shared bicycles. In the late years, some bicycle lanes have been built and some attention has been driven towards pedestrians, but still biking is dangerous because the network is not enough and the drivers show no respect and so is walking for most sidewalks are in terrible conditions.

This research makes data analysis of three secondary researches conducted, making a cut to specifically analyze the data for elderly: Survey about mobility pattern of walk displacements in Recife in 2006, IBGE's national household survey 2010 and a survey of the population with low income rates in Recife in 2011

5   Researches' analyses

Research 01: Analyzing pattern of walk displacements in Recife in 2006

A household survey was conducted in 2006, in the north-west area of Recife, to understand the displacements' on foot characteristics and reasons as well as the conditions under they occur. A four-part survey was developed for the study. Among the data, 38 people were aged over 60 years old and answered the questions about their travel preferences, motivations, and behavior. The first part contained questions requesting information about their travel behaviors by foot, including origin and destination, frequency and means of transportation used. The second part investigated the reasons for these displacements and their conditions, using a 6-point scale with 1 = Excellent, 2 = Great, 3 = Good, 4= Regular, 5 = Bad and, 6 = Very Bad. The third part focus on important aspects of sidewalks, by assigning importance according a 7-point scale (7 = very important, 1 = unimportant). The last part of the survey contained demographic questions, including age, sex, marital status, income, occupation, and education level.The sample consisted of 16 men (42.11%) and 22 women (57.89%); 25 were in the 60- 70 years age group and 13 in over 70 years. Only 03 of them lived alone. In respect to the compositions in terms of income and education, that enables the understanding of living standards, since the factor "income" showed a possible social exclusion and the education level clarified the skill level to use this income; it is observed that 60.52% of the elderly had incomes up to R$ 699.00 and 44.74% had 0-4 years of study (See graphics 3 and 4).
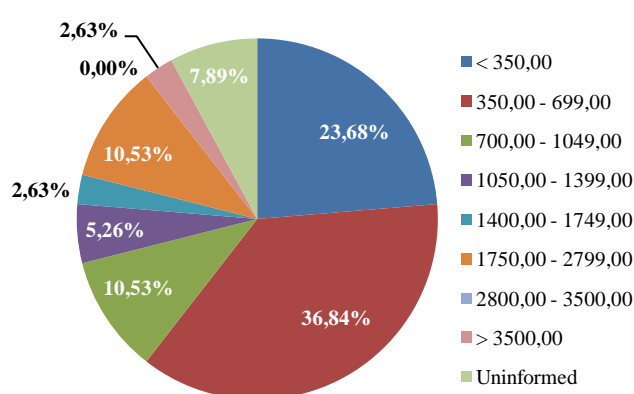
Graphic 3 - Family income (R$)
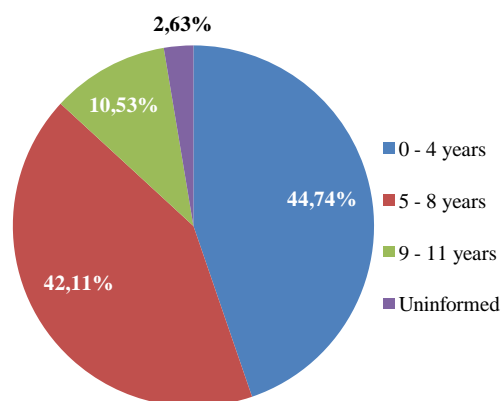
Graphic 4 - Years of study

Seniors evaluated the sidewalks near their homes, and to 50%, the sidewalks were classified as bad or very bad (See graphic 5). The main problems mentioned were holes, difference in level and existence of obstacles, revealing the low quality of infrastructure for walk displacements. The most important characteristics for a sidewalk were: low risk of being run over, having a good surface to walk and low risk of falling. One important characteristic, in the context of developing countries, for walking that is worth mentioning in the need to feel safe against robbers, highlighting the insecurity felt by respondents, that was a very important factor for 13.16% of respondents (See graphic 6).
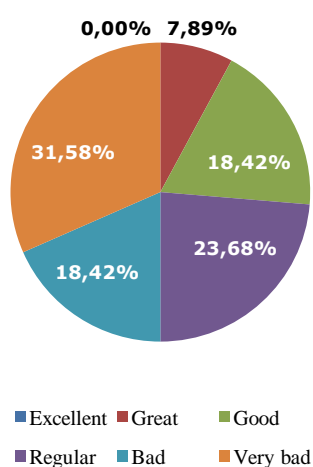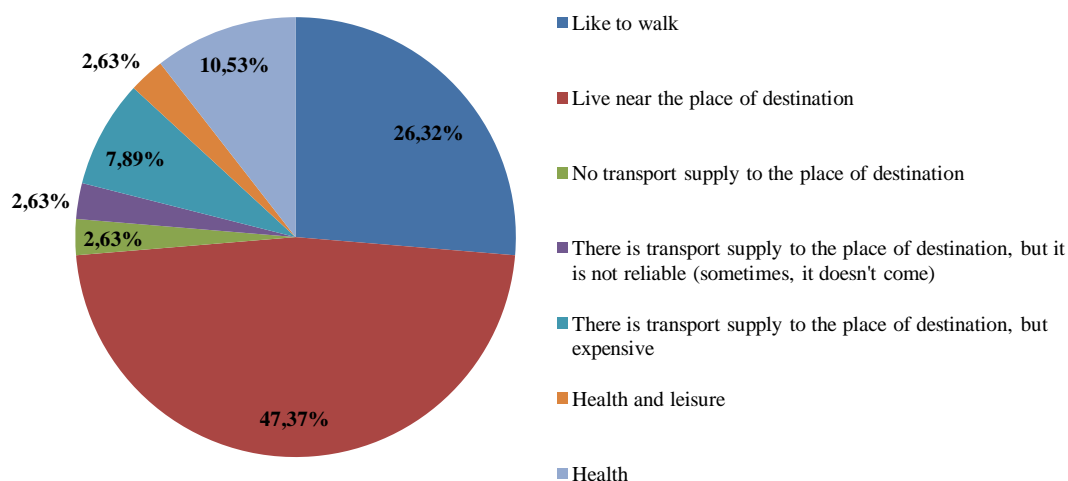

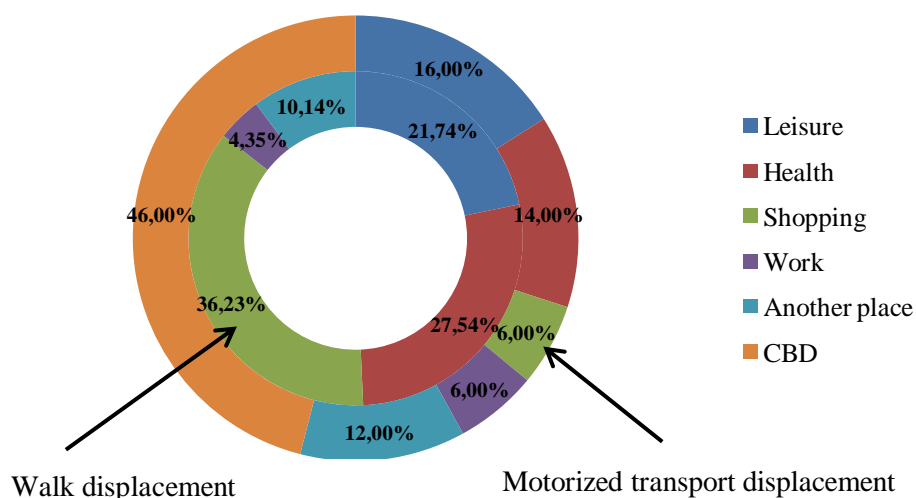Graphic 5 - Evaluation of sidewalks
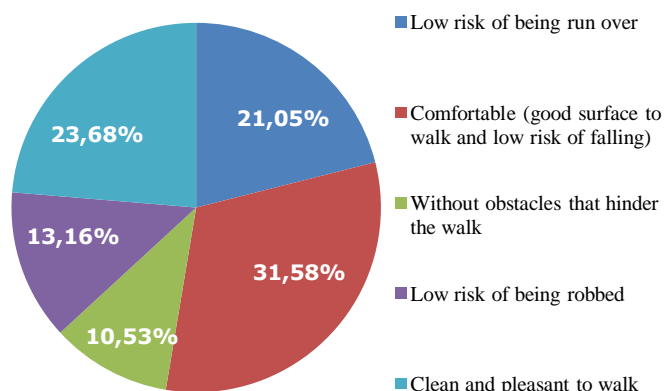
Graphic 6 - Most important characteristics for walk

The elderly also responded about the reasons that led them to moving around on foot. Most opted for this type of transportation mean when the destination was close, but there were also those who preferred walking due to the absence or inefficiency of public transport to the destination intended (See graphic 7). Inefficient transport systems worsen the socio-spatial inequalities and push the fragile environmental balance conditions in the urban space, which requires, by governments, the adoption of public policies aligned with the larger goal for building a sustainable urban mobility from an economic, social and environmental point of view (IPEA, 2011).

Legend:
- Like to walk
- Live near the place of destination
- No transport supply to the place of destination
- There is transport supply to the place of destination, but it is not reliable (sometimes, it doesn't come)
- There is transport supply to the place of destination, but expensive
- Health and leisure
- Health

Values shown: 26,32%, 10,53%, 2,63%, 7,89%, 2,63%, 2,63%, 47,37%

Graphic 7 - Reasons to move by foot

About the main destinations of the elderly, it is evident the importance given to items of leisure, health and shopping (See graphic 8). The need to having access to services is evident from the large portion of displacements bound to the city center.

Legend:
- Leisure
- Health
- Shopping
- Work
- Another place
- CBD

Values shown (outer): 16,00%, 14,00%, 6,00%, 6,00%, 12,00%, 46,00%
Values shown (inner): 21,74%, 27,54%, 36,23%, 4,35%, 10,14%

Walk displacement

Motorized transport displacement

Graphic 8 – Destinations

The biggest walk travel rates were associated to shopping and leisure activities, highlighting both the high frequency with which the elderly seek these activities and the importance given to it being close (See table I).

Table I – Walk displacement trip rates by destination

Destination	Total trips	Total number of persons who made non-motorized trips	Monthly trip rates	Daily trip rates
Leisure	164	38	4,3158	0,1962
Health	40	38	1,0526	0,0478
Shopping	239	38	6,2895	0,2859
Work	20	38	0,5263	0,0239
Another place	137	38	3,6053	0,1639

With regard to motor transport, it offers accessibility to greater distances, especially the city center and the work place. High trip rate with destination to the city center reveals a considerable need to access services and activities (See table II).

Table II – Motorized trip rates by destination

Destination	Total trips	Total number of persons who made motorized trips	Monthly trip rates	Daily trip rates
Leisure	28	28	1,0000	0,0455
Health	17	28	0,6071	0,0276
Shopping	03	28	0,1071	0,0049
Work	90	28	3,2143	0,1461
Another place	43	28	1,5357	0,0698
CBD	130	28	4,6429	0,2110

This data confirms what many studies say about the older people's preferences for public transport. It is possible to see in Graphic 9 that 72% of the elderly chose public transport. According to Su and Bell (2009), with reduced mobility, older people have different travel characteristics compared with younger people. For them, public transport and walking are more important for reaching independence, since their driving ability is decreases with the time.
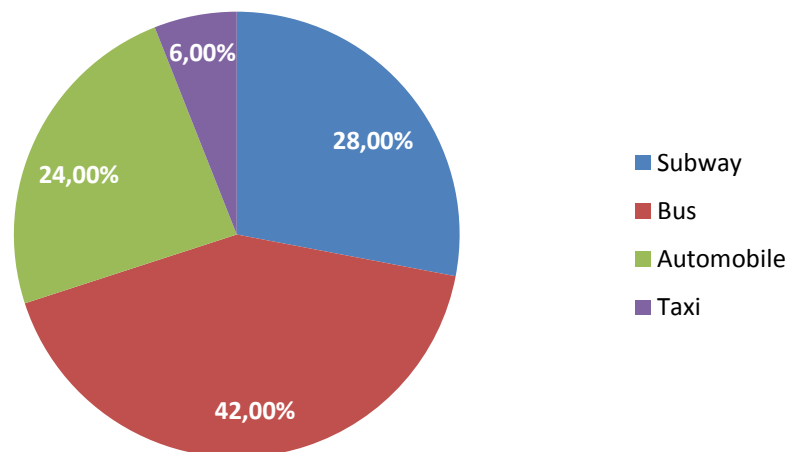
Graphic 9 - Displacement motorized transport by mode

Among motorized transport means, cars were mostly used revealing a preference for door-to-door displacements. Nevertheless, most of the shifts were performed by means of public transportation (See table III).

Table III – Motorized trip rates by mode

Mode	Total trips	Total number of persons who made motorized trips	Monthly trip rates	Daily trip rates
Subway	77	28	2,7500	0,1250
Bus	100	28	3,5714	0,1623
Automobile	106	28	3,7857	0,1721
Taxi	04	28	0,1429	0,0065

Research 02: Analyzing Microdata from IBGE

In 2010, Brazilian Institute of Geography and Statistics has, for the first time, included transport data into Brazilian Census, when commuting times to work were collected in the survey. Although people are entitled to retire once the minimum age required is reached, a considerable share of the population continues to engage in some kind of productive activity. In Brazil, for the group of people aged 60 and older, 23.9% did not receive retirement or pension, while 7.8% accumulated retirement and pension. Proportion of seniors 60 years or older who accumulated retirement and pension was different by gender, with 2.6% of men and 11.9% of women in this condition. The high proportion of seniors aged 60 and older who did not receive retirement or pension plan (23.9%) is possibly related to participation in labor market, since occupancy rate for this group was 27.4% but for those who were not retired nor pensioners the occupancy rate reached 45.1%. It is also important to highlight that 15.6% of the retired elderly aged 60 or older were working in the reference week, 23.2% were men and 9.5% were women. Average time devoted to work for persons over 60 years was 34.7 hours, below average working time for the overall employed population (IBGE, 2014).

Many of these seniors work in the informal market. In 2013, 69% of the elderly in the labour market worked informally, still there was a decrease with respect to 2004, when the index reached 80.4%. Their attraction to the informal market can be justified by the ending of a career or a return, as retired, to the labour market, either way social protections of formal labour aren't the main attraction for the elderly (IBGE, 2014).

Thereby, Census 2010 (IBGE) data regarding travel time to work has been analyzed to the Metropolitan Area of Recife comparatively with the person's age. As it can be observed in Graphic 10, the older people grow the more likely they are to work closest to their home, or even at home, having a bigger share in the zero to five minutes , that pattern can also be observed for young people aged 15-19 years. Furthermore, for 1 to 2 hours and more than 2 hours the inverse pattern can be observed, those groups are more likely to be less represented in comparison with younger adults. The pattern for that latter group was observed to be extremely similar for all five year ranges from 20 to 59 years, and therefore have been combined to ease the graphic's comprehension.
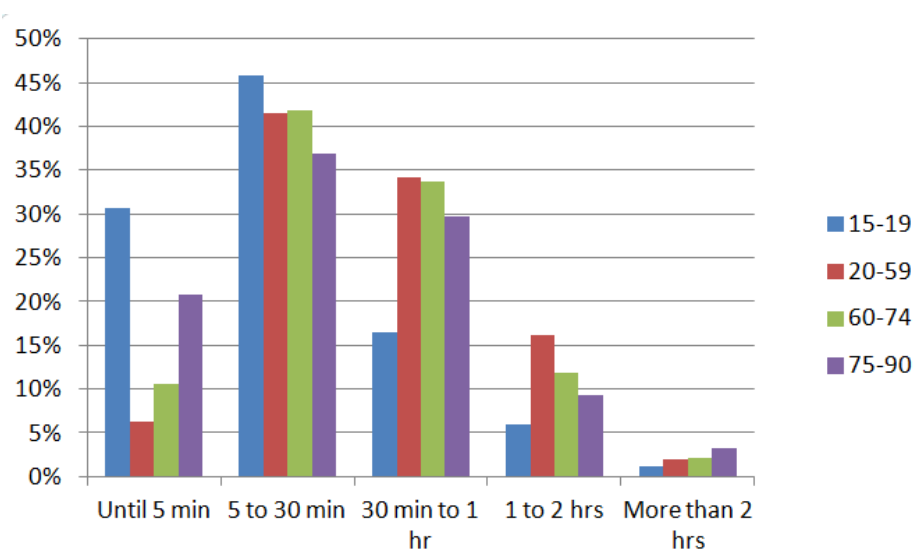
Graphic 10 - Travel time to work for young people, adults and elders in percentage, data from IBGE 2010

Other information related to transport that can be retrieved from the Census 2010 is the household possession of automobiles and motorcycles. As it can be observed in Graphic 11 motorcycles are more popular in households were young adults from 20 to 50 years old live, with a clear peak at 30, and from that age starting to decline. It ascends again in after the age of 84, but that is just because the data has been assembled and has a bigger range than the other 5 year gaps. Regarding automobiles, on the other hand, the peak is reached in the age of 60, when people tend to have higher incomes, and then declines again, possibly because of vision deterioration, and other health problems.
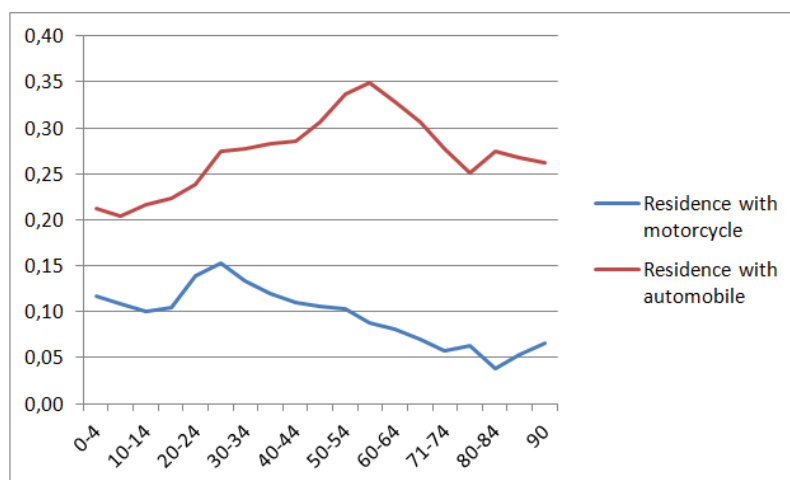

Graphic 11 - Residences with motorcycles and automobiles by age, data from IBGE

Graphics of 9 of the 14 cities constituting Recife's Metropolitan Area are presented in sections below to show similarities in variation in commuting times by age group in each municipality.

Abreu e Lima (Graphic 11), Itapissuma (Graphic 12), Moreno (Graphic 13) and São Lourenço (Graphic 14) are all in the Metropolitan Area northern part. They comprise the first section, all having a peculiar travel time characteristic, regarding the overall population: all of them have peaks at 5 to 30 minutes and in 1 to 2 hours of commuting time, which can be justified by jobs being mostly in the own municipality (therefore the peak at the second range), or in the capital, for which are needed 1 to 2 hours of travel time to reach.
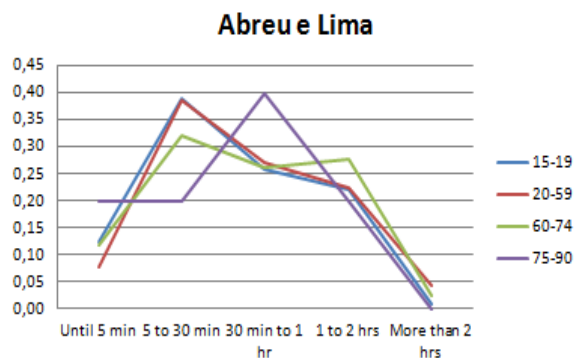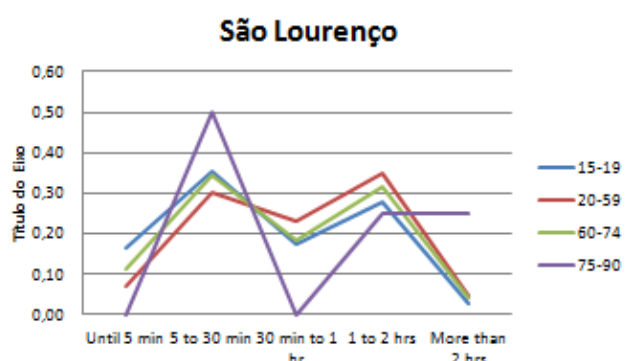

Graphic 11 - Travel time to work for Abreu e Lima in percentage, data from IBGE 2010
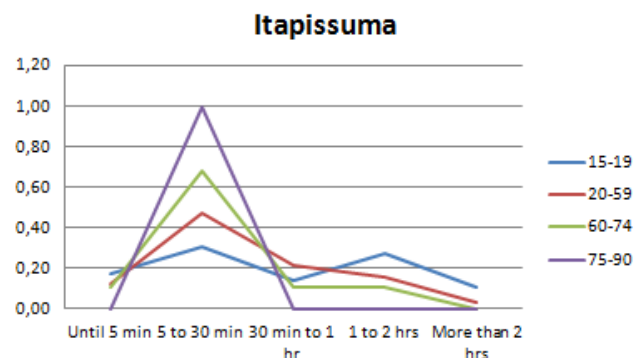
Graphic 12 - Travel time to work for Itapissuma in percentage, data from IBGE 2010
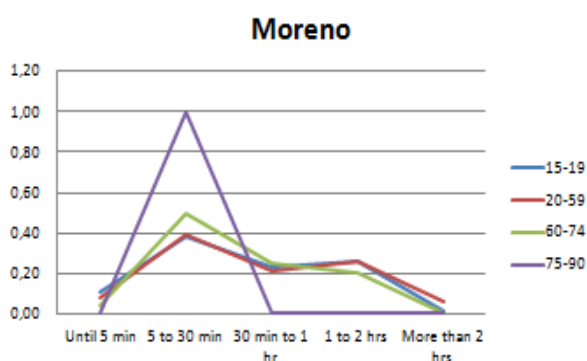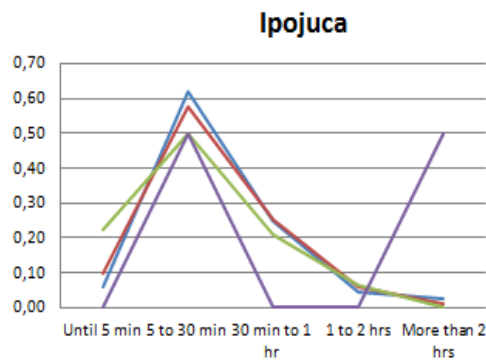

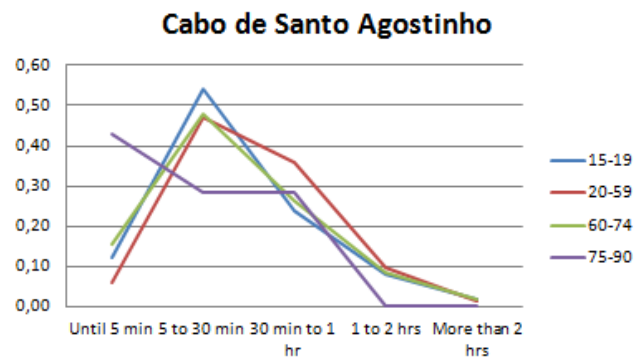Graphic 13 - Travel time to work for Moreno in percentage, data from IBGE 2010

Graphic 14 - Travel time to work for São Lourenço in percentage, data from IBGE 2010

Second section comprises Ipojuca (Graphic 15) and Cabo de Santo Agostinho (Graphic 16) in the south and Itamaracá in the north, all with a very high percentage of people, 85% of the people living in Cabo de Santo Agostinho and 98% of the people living in Ipojuca, in 2010, worked in one of the two municipalities (Lima et al, 2014b) and therefore have a much higher peak than the others in the second range; from 5 to 30 minutes.
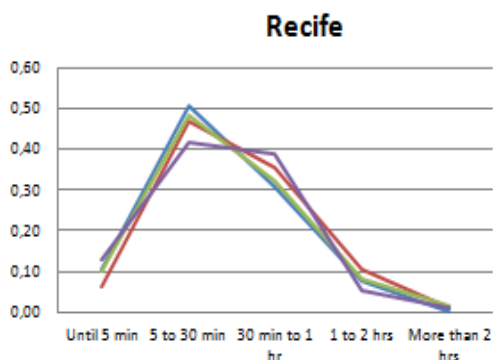
Graphic 15 - Travel time to work for Ipojuca in percentage, data from IBGE 2010

Graphic 16 - Travel time to work for Cabo de Santo Agostinho in percentage, data from IBGE 2010

At last, Recife (Graphic 17), Olinda (Graphic 18) and Jaboatão dos Guararapes (Graphic 19), the largest cities, also show a similar commuting pattern, where the peaks are almost continuous in the ranges of 5 to 30 minutes and 30 minutes to 1 hour.

Graphic 17 - Travel time to work for Recife in percentage, data from IBGE 2010
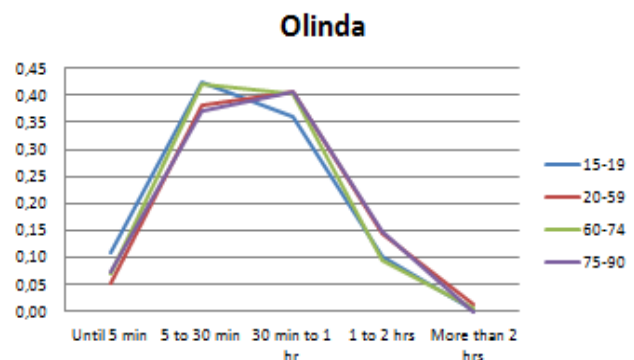
Graphic 18 - Travel time to work for Olinda in percentage, data from IBGE 2010
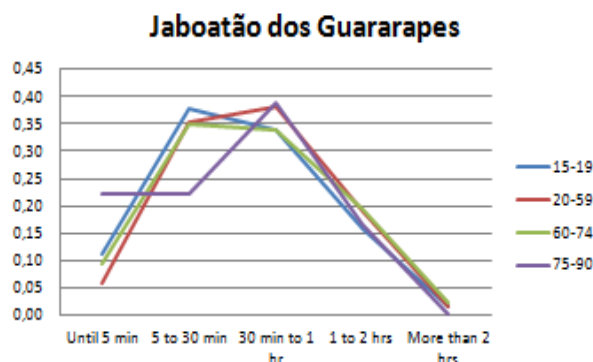
Graphic 19 - Travel time to work for Jaboatão dos Guararapes in percentage, data from IBGE 2010

Research 03: Analysing population with low income rates in Recife in 2011.
A survey held by researchers of Federal University of Pernambuco in two low income areas of Recife in 2011provided some information about impoverished seniors' mobility in Brazil. It consisted of eight focus groups from 8 to 10

individuals, summing 78 people interviewed, where data relating to accessibility was collected in respect of education, work, health and leisure activities. A general review of this study has been published in Maia et al. (2015), Lucas et al. (2013), as well as a study regarding income and travel times Lima et al (2014a). Looking specifically to the answers given by senior members, all participants above 60 years old related difficulty in accessing health facilities in night hours, specifically after 22:00 hours when the buses stop passing nearby the community. According to them, if someone needs to go to the hospital late in the night they have to rely on the good will of neighbors who own cars, public health system ambulances refuse to enter the area due to its stigmatization as a crime area.

The main travel reason for that group was accessing some kind of health care facility. One participant said she stopped going to therapy because she couldn't walk to the clinic. Other said she would most likely leave her home to go to the hospital or attend church services by walking about 2 kilometers several days a week. A male senior related scarcely ever going to the beach. Most members complained about never doing anything for having fun, and always staying indoors.

Lack of transportation options available was related as the main difficulty to reach an activity. A majority answered that they would rather walk then take public transport if the distance was not too big. Such behavior was explained by transportation waiting time at the stop. They found it was better to walk and be sure they would arrive in a certain time than being at the bus stop waiting.

6 Analysis and discussion

The first research addressed the problem of walk displacements. It showed how bad was elderly's perception about general aspects, like the risks of being run over and fall down, but also reported one specific view more related to underdeveloped and emerging countries, that is the risk of being robbed, since elderly are more vulnerable to such crime.

Su and Bell (2009), say that independent travel is important for older people and that the percentage of trips made by walking is not significantly decreasing with age. Thus, it is important to adopt public policies that interfere directly in externalities that could generate displacements possibilities restriction for this group.

For Mercado, Páez and Newbold (2010), urban planning and design that emphasize "walkability" of neighbourhoods should not only be a health concern but a transport issue for older people who would want to adopt more active transport (walking).The survey also showed low choice of taxi between the motorized transport means, which can be justified, according to Su and Bell (2009), because taxi is an expensive transport mode, so the elderly use taxi only when they have no other choice, when they need a car but cannot drive and there are no friends or relatives to help.

About the second research, according to De Palma and Rochat (2000), in a study held in Geneva, age is a key variable in trying to understand modal split. Young adults are more likely to use their own automobile to commute, whereas older people (seniors) tend to be more committed to public transport. Such behaviour might be due to the weight of recurrent constraints which tend to decline with successive life cycle stages of the household. Geneva, has a reduced fare to youngsters and seniors in public transport in the monthly and annual cards, this can also be a motivation for the elderly migration from automobile to public transport. In Brazil, such trend might be even higher due to the politics of free

pass in public transport for older people. Another factor that might contribute for the different travel times for the elderly is their willingness of using public transport for it provides a feeling of more independency and safety, more than 60% of the seniors indicated that they are either concerned or very concerned about the safety of driving Wasfi (2012).

Comparing with previous international studies, in Geneve no significant correlation between age and car ownership has been found (De Palma and Rochat, 2000). In Germany, however, a closer look at everyday mobility of elderly people revealed that men from 61 to 75 years owned a private car almost as often as the younger age groups. Only among the very old (more than 80 years of age), car ownership decreased sharply (Scheiner, 2006).

With respect to commute time to work the findings indicate a different pattern from the main adult population aging from 20 to 59, where the elderly tend, as the young people, to work closer or at home, commuting in 5 minutes or less. The number of persons living in a household with automobile has a peak at 60 years decreasing from that age. The number of households with motorcycles has its maximum at age of 30 and decreases after that early age.

The third survey, reveals that in poor areas, the most mentioned mobility problem was lack of transportation available at some hours of the evening especially for medical care. The lack of transportation, the fear of ambulances and taxis to enter the region and the reliance on the police and favors from motorized neighbors were the most frequent complain to this section of the population.

The set of data observed in these researches, allows highlighting the major shortcomings and difficulties challenged by seniors. The main difficulties of these elderly regarding displacements is a public transport system with vehicles there are not adapted to them, with high steps, drivers that drive in a non smoothly way causing passengers' instability, especially the older ones, small internal space reserved for them in front of the bus, and chairs there are not suitable. The number of buses with wheelchair access is still very small hindering the movement of people with disabilities, especially the elderly, as well as the blind, as there is no information system for them. The poor quality of the sidewalks is another major obstacle, especially the risk of falls, which are frequent and severe. These are the main reasons for the low mobility of the elderly limiting them to areas close to where they live.

6 Conclusion

This paper wanted to analyze the displacements and specific needs of the elderly population of Brazil. For that matter, the city of Recife in the North East Brazil has been chosen to host the case study. Three different researches have been held. The first research used Census data to extract commuting time to work and motorizing rates of elderly who are still working compared to the overall population. The second detailed pedestrian behavior of elderly people who in majority are already retired. And finally, the last research used focal groups to try to understand the most important travel issues to the poor seniors.

In terms of policy initiatives in transport, several recommendations can be done. Among them, there is the need to promote urban planning associated with urban transport. Data shows that people often walk to access activities located near their homes and, in this context, it is essential that the transportation planning would be associated with urban planning.

Other important public policy is to ensure that all city areas are covered by public transport, with good connections between buses and other means of transport.

In addition, is important to ensure that common destinations for older people, like health care centers, are well served.

It is also worth to mention the need of adapting vehicles, both public transport and cars, to elderly and disabled people needs by removing existing barriers. With regard to public transport infrastructure, we need to ensure full accessibility through ramps and elevators at stations, integrations and subway terminals.

According to Mercado, Páez and Newbold (2010), if the public transport meets the needs of the elderly, it will have high potential to attract those who are in this group and need to stop driving or are considering doing it, since it maintains its independence to do daily activities. Moreover, the anticipated increase in the number of potential riders among the elderly could justify investments in elderly-friendly public transit and contribute to transit's sustainability.

Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. In an age-friendly city, policies, services, settings and structures support and enable people to age actively by. In other words, an age-friendly city adapts its structures and services to be accessible to and inclusive of older people with varying needs and capacities (WHO, 2007).

Some international best practices of transportation are described in a study made by WHO (2007), entitled Global Age-friendly Cities: A Guide. The main characteristics cited were: Availability, affordability, reliability and frequency and travel destinations. About affordability, Geneva reported offering free transport for someone accompanying an older person. Concerning confiability, in Geneva, London, Moscow and Tokyo, people indicate that their public transport services are reliable.

The importance of this study is the need to analyze this issue from a emerging country perspective, which, in general, doesn't have well-structured public transport systems, and have seniors with very different social conditions from those found in developed countries. Understanding the problems of the elderly in Brazil is necessary to define the practices and public policies that would best suit our reality and needs.

As seen above the main question raised by the work "Brazil is prepared to meet the demands of mobility of this elderly population?" Can be answered in the negative, there is clear limitation for displacement needs so that the elderly can active in a social, cultural and economic way, and the same can be said for persons with disabilities. Guidelines to change the situation point towards adaptation of public transport system for elderly and persons with disabilities needs. Sidewalks need to offer a minimum standard of universal accessibility so that they do not pose a risk of life for the population, especially for the elderly. There should also be a good information system available for public transport that would enable the elderly to enjoy leisure, cultural and economic activities that the city offers.

Limitations for this work include the lack of mobility data, especially for elderly, the last OD research held in Recife was in 1997, and therefore the authors have chosen to use Census 2010 mobility dada, which data concerning mobility was very limited. More detailed data about the behavior of the elderly is essential to defining policies appropriate for them.

Possible extensions should be considered when the new promised OD for the region is ready, than a deeper look into the elderly mobility would be feasible. Also, when Census 2020 is ready an actualization of this study could be done, comparing the differences in commuting time and motorizing rate.

The development of studies about the reality of mobility of older people who live in rural areas is recommended, where the shortage of transport maximizes their mobility problems.

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