











After the utility analysis, transport mode choice probabilities were calculated using the equation 2, presented in the methodology. The variable distance was the reference to calculate the probabilities of choosing the transport mode among the 3 available (public transport, individual transport, and walking). Calculations were performed for the two genders and for all income levels, and results were plotted in a graph comparing probabilities of the elderly and non-elderly people, as shown in Fig. 1.

Results presented in Fig. 1 show a higher probability of choosing the walking mode in the group of non-elderly people than in the group of elderly people. This behavior was observed in all income level and both genders. In addition, elderly men present a higher probability of choosing individual modes when compared to elderly women, which was also observed in the study of Adler and Rottunda (2006).

Regarding the probability of choosing the walking mode in the three income levels, it was observed that as higher the income level, lower is the probability of choosing the walking mode. This result indicates a higher preference for motorized modes in the elderly group than in the non-elderly group.

As observed in the analysis of utility, the probability of choosing the walking mode is surpassed by the individual transport mode at shorter distances for men than for women, result observed in all income levels studied. A similar thing happens to distances that the probability of choosing the walking mode is surpassed by the public transport mode. Additionally, as the income level increases, decreases the distances in which the probability of choosing the public transport or individual transport modes surpasses the walking mode.

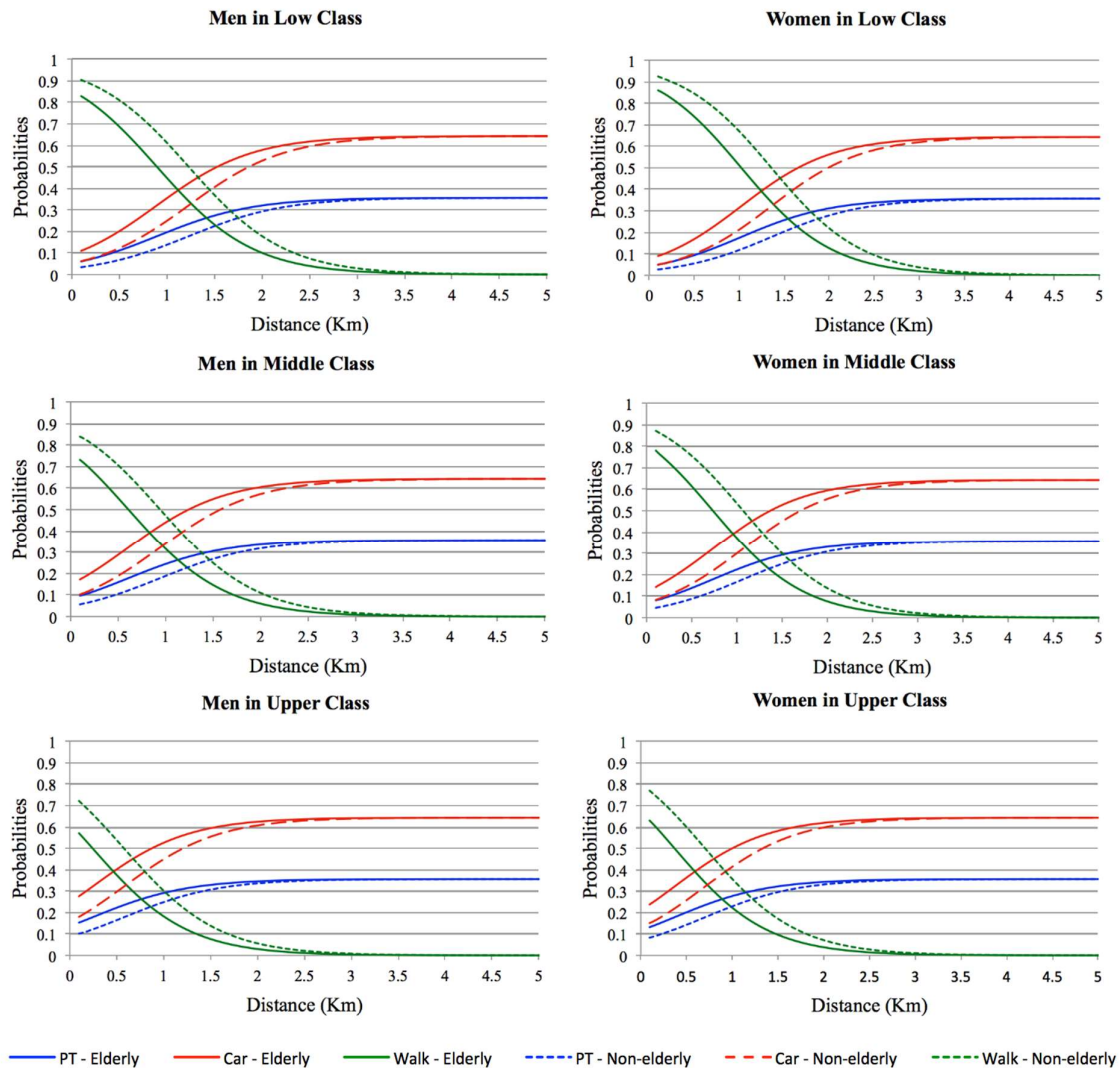


Fig. 1. Curves of probability vs. distance for each mode of transport.

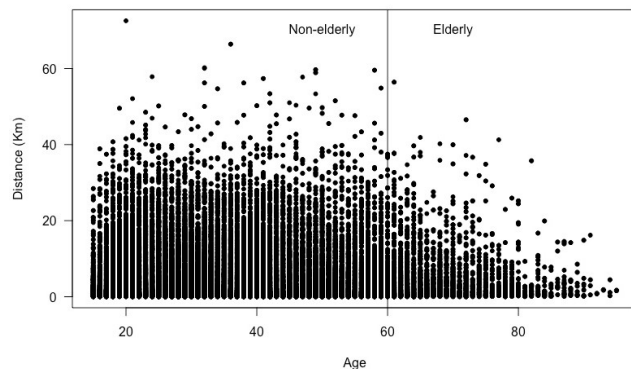
For a better understanding of the results, the variable distance was marked as points in every 500 meters up to the distance of 2.5 kilometers. These values were defined as the major references to the evaluation of the probabilities of choosing a mode in a certain trip performed and how the transport mode choice utility behaves in each one of these distances.

At 500 meters, only the elderly men in upper class did not present the walking mode as the one with highest probability of being chosen. In all other evaluated trip-makers' profile the walking mode was the mode presenting the higher probability of being chosen. This result can be explained by the behavior of older men who tend to financially maintaining a vehicle even while the cost of living increases caused by aging (Alder; Rottunda, 2006).

For 1 km distances, transport mode choice probabilities presented a greater variation among the trip-makers' profiles evaluated in the research. Gender did not affect the probability of choosing a motorized mode at the expense of the walking while the income level did affect. High-income level men, at any age, are more likely to choose individual transport or public transportation mode at the expense of the walking mode. Elderly women are more likely to choose individual transport or public transport while non-elderly women are still more likely to choose the walking mode. Elderly men and women in middle class are more likely to choose individual transport or public transport compared to the walking mode, while the non-elderly men and women in this income level are still more likely to choose the walking mode. Last, in the low-income class, all trip-makers' profiles are more likely to choose the walking.

For distances of 1.5 kilometers, only non-elderly women are more likely to choose the walking. Distances greater than 1.5 kilometer, all trip-maker's profiles were more likely to choose individual transport or public transport modes.

Differences in trip distances compared to age of the trip maker can be seen in **Fig. 2**, below. On the graph it is possible to observe a comparison of the trip distance



**Fig. 2.** Plot of trip-makers' characteristics in age vs. trip distance.

performed by trip-makers comparing elderly and non-elderly people, in which is shown that the older is the person, shorter are the distances traveled.

The result presented in the **Fig. 2** was expected because as people age, their mobility capacity decreases affected by their biological and physical conditions, like loss of musculature, bone fragility, and others (Fischer and Filho, 2010). Moreover, an impossibility of mobility negatively affects the elderly, isolating them from activities and social interaction offered in cities (Strohmeier, 2016).

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## CONCLUSIONS

This study aimed to identify trip-makers' characteristics that affect the transport mode choice in a comparison between two age groups, the non-elderly (up to 59 years) and the elderly (60 years old and older).

Five variables were calibrated in the model proposed by this study: income, age (elderly and non-elderly), gender, trip distance and mode of transport. Results showed that for both, the elderly and the non-elderly people, transport mode choice tends to be the individual transport mode first, followed by the public transport mode and lastly the walking mode.

Regarding trip distance by age, it was observed that non-elderly people tend to travel longer distances in their daily commutes, while the elderly people are more likely to do shorter trips in their daily commutes. This result may be related to physical and biological conditions of human aging, as well influenced by the quality of the urban environment present in the city.

In summary, mobility is an important tool to integrate the elderly people into the city and should be constantly planned, especially because of the increasing elderly population that has been observed in many countries lately. Withal, adequate mobility is important to secure access to different services and activities, as well, encourage the elderly population to take advantage of the city and its social environment.

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