Abstract

The development of cities and transportation systems of the last few years made possible to expand the range of individuals, giving them the opportunity to locate their residence far away from the places where they carry out daily activities. The ability to make long journeys has become more and more an essential condition to access opportunities of the territory. This necessity can be connected to transportation social need, which scholars define both in terms of people requiring a public transportation service and number of trips they would make if they had minimal limitations on their mobility; accessibility refers to the ease of reaching goods, services, activities and destinations, which together are called opportunities. This research presents the application of a measure of transportation social need and accessibility for the city of Catania, in Italy. The measure of transportation social need, based on transportation and social disadvantage indicators, has been carried out with reference to Italian national statistical institute zonation of the city. A zonal accessibility measure, considering both private and public transportation and evaluating the ease of reaching desired destinations, have been calculated and an analysis of correlation among transportation social need measure and accessibility measures has been carried out in order to verify the strength of relation between them. Due to the high resolution level of the spatial analysis, manipulation of data and computation of indicators and measures was supported by a GIS approach. Three different public transport scenarios have been analyzed by performing a relative accessibility loss computation showing that improvements in public transport service lead to general improvements in relative accessibility loss.

Keywords: Transportation Planning; Social Exclusion; Accessibility
1. Introduction

Social exclusion is a phenomenon influenced by different condition related to quality of life, demographic issues, socio-economic aspects and location of activities and housing. In the last years a new interest in the issue of social exclusion and how it’s related to transport disadvantage has grown, and several studies have shown the interrelationship between poverty, transport disadvantage, access to activities and services, and transport related social exclusion (Lucas et al., 2001; Kenyon, 2003; Kenyon et al., 2003; Lucas, 2004; Currie et al., 2007). The possibility to have a good access, in a spatial sense of the term, to work places, education and healthcare services is in fact a key factor to achieve that the whole population could take part to the society (Ignaccolo et al., 2016). Public transport may be able to reduce the mobility gap experienced by several people to reach opportunities and services: physical (availability and accessibility of transport) and economic (cost of transport) barriers or urban structure mobility constraints as in the case of services located in places which are difficult to access; therefore, public transport is a key factor for the improvement of social inclusion. When public transport is poor a Transportation Social Need grows, which can be defined as the number of people in a given geographic area who are likely to require a public transportation service (Roñè et al., 2015). This need is strictly related to the concept of transport disadvantage (Lucas, 2004), which includes a set of individual characteristics related to: location analysis, such as travel time, cost and distance to key life opportunities such as employment, medical centers, shops, education centers and social networks. (Schonfelder and Axhausen, 2003; Dodson et al., 2006); physical and social characteristics of the user that could limit personal access, such as in the case of the elderly (Rosenbloom and Morris, 1998), unemployed youth (Currie et al., 2007), people with low-income, or with cultural and language barriers (Litman, 2010); transport opportunities access such as accessibility.

Due to all of these reason, the analysis of public transport disadvantage and social needs together with transport provision, and in particular access opportunities offered by the system, are essential in order to see where the system can be improved (Lucas, 2004; Currie et al., 2009) and to guarantee vertical equity among population.

This research is focused on the analysis of accessibility measures as tools to address the equity dimension of transportation through an application for the public transport services in the city of Catania, in Italy. This issue has been explored since a lack of accessibility has a serious impact on people's life and may prevent them from finding a good job, have a good education, reaching health care services, as well as having enough social contacts (Lucas 2012). The objective of the study is to analyze the connection between people’s social condition and accessibility to opportunities and services by public transport, with particular reference to the case of the city of Catania.

2. Methodology

2.1. Measuring transport need

The interest in the concept of a transport disadvantaged population has grown from the fact that traditional transportation planning methods usually aim to satisfy travel demand and do not take into consideration social-economic aspects (Hine and Mitchell, 2001). Actually, transport and social disadvantages interact to cause what can be called “transportation poverty” that leads to inaccessibility to essential activities and thus to social exclusion. Therefore, both a social disadvantage index (based on income, employment status, skills level, health problems, poor housing) and transport disadvantage indices (based on accessibility, car ownership, poor public transport services, high cost of fares, no information, fear of crime, etc.) should be taken in account together (Currie, 2010, Lucas, 2004).

In order to introduce a measure of transport disadvantage, Currie (2004, 2009, 2010) proposed an aggregate indicator based on social needs, called Transport Need Index (TNI), based on socio demographic data. The index consists of weighted indicators of social and transport needs that combines together characteristics of income, employment status, car ownership and health (Currie, 2009; Currie, 2010). The weights are derived from the degree of low trip making (Currie, 2007). Each indicator is normalized to values between 0 and 100. The final need index is a sum of the weighted normalized values. The structure of the index proposed by Currie was first used in some Australian cities and later applied in the city of Palermo in Italy (Amoroso et al., 2010) and Santiago de Cali,
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