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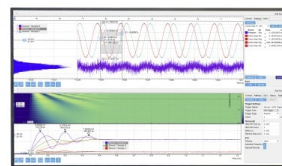
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# Gender Equality on Developing Transport System in Sicily: A Consideration on Regional Scale

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## Abstract

The development of transport technologies and systems, taking into account individual and/or shared mobility systems, should involve not only the characteristics of the places where it develops, but also the characteristics of road users. The increase in transport supply makes it easier to achieve job opportunities and thus increases the potential for wealth. The development of different forms of mobility also offers better access to areas, such as education centers, and limits the disparity between road users of different age groups and gender. The presence of children and income characteristics are factors that can influence women's mobility choice such as using public transport, owned/shared micro mobility, or e-bikes. The study in this paper defines in a first phase some considerations on gender equality through describing some case studies from the South of the world. A questionnaire, including 1150 women over 18 years old in the use of the different modes of transport in the region of Sicily in southern Italy, was carried out. The results highlight the critical issues that often lead to different perceptions of safety on board or gender equality considering both the passenger's and the driver's point of view. The limits of the research are related to the analyzed sample. The work shows a first step of investigation aimed at future research actions to reduce gender inequalities, providing the basis for the definition of ad hoc strategies by local authorities and dedicated vouchers or fares by operators of transport services for women.

**Keywords:** Gender equality; Mobility choices; Descriptive statistics

## 1. INTRODUCTION

Globally, gender and socio-economic inequalities lead to differences between countries in terms of access to places and different modes of transport. The UN Sustainable Development Goals 2030 recommend safe, accessible, and sustainable public transport, particularly for vulnerable road users. Several studies in the literature show that the evolution of transport is linked to the evolution of technology and planning; however, the economic reasons, lack of infrastructure and socio-cultural problems slow down the spread of sustainable mobility. Land use and transport planning often are related and connected by a cause-effect relationship: the historical growth of transport is in this sense driven mainly by other social factors, such as economic growth, spatial division of labor, large-scale social integration and gender equality [1]. The socio-economic aspect derives from a disparity in wages between men and women. In general, these differences are stronger in low-income socio-economic areas in agreement with [2] who found that women generally travel less than men but spend more on transport than men, although their journeys may be shorter. This has led to less transport being accessible to the workplace. In addition, it has been found that there is a relationship between

gender inequalities and lower socio-economic areas. Urban and social factors influence the choice of transport mode and often variables such as gender, age and degree of disability affect walking in open urban areas or by transport [3]. Gender equality can also influence the development of the Transit-Oriented Demand (TOD) of a mixed-use commercial or residential area designed to maximize the use of public transport [4].

In accordance with [5] the use of public transport or simply moving around the streets is related to the fact that women and girls often engage in multi-purpose, multi-stop trips to do household chores, work, and study. Every nation cannot claim to be truly sustainable unless it closes the gender gap in the use of mobility. 70% of the world's poor are women today. Women walk distances that are between 11 and 16% longer than men, make about 15% more journeys than men and only 3% of them commute by bicycle [6].

According to [7], the problem of gender and transport links in low- and middle-income countries is linked to the Millennium Development Goals (MDGs), which indicate gender equality and sustainable development as two central priorities. Therefore, some critical issues related to gender equality and the development of smart cities and smart mobility in the South need to be underlined.

In some countries like Latin America and the Caribbean, women are the main users of public transport. During their use, they face problems such as sexual harassment or lack of infrastructure adapted to their needs. In other regions, however, the number of new drivers is growing twice as fast among women as among men, sometimes exceeding the number of male drivers [8].

The growth in mobility can be related to the popularity of smartphones and companies that provide mobility on demand. Several studies focus on the correlation of technology evolution and mobility but few on how gender can influence the use of technology and mobility. According to [9] it can be said that little attention is paid to how it affects access, safety, ease, or comfort of mobility for women, whose travel needs are genuinely different from men. For instance, the mobility of women in Pakistan is limited by social standards and security concerns. Social norms against women who come into close contact with unrelated men and the discomfort, social stigma and fear of harassment limits women's mobility and use of public transport. This restricts their choices to participate in the workforce, continue their education, or engage in other independent activities. The government has sought to address women's concerns through transport policy by introducing separate sections in buses for common use and buses for women only. However, challenges remain for the safety and comfort of women on public transport. Like many Southern (developing) nations, Pakistan is characterized by a lack of mass transport that meets gender needs and experiences of harassment limit women to exploring potential growth opportunities [10]. In accordance with [11] typical mobility characteristics of women was identified using Pakistan's first rapid transit bus (BRT) in Lahore to understand the challenges they face and recommend measures to improve urban mobility. This public transport system is optimal not only for gender-equal mobility but also on the level of service of the infrastructure stands, especially if associated with routes with intersections in roundabouts with dedicated lanes [12,13].

The study highlights important trends and mobility difficulties typical of women when using the BRT in Lahore. Addressing the mass urban mobility problems of women could improve their educational and economic prospects. The results showed that the main problems are related to harassment in stations and buses (younger users were more affected), limited facilities for the elderly, lack of sitting/waiting places near the entrances/exits of BRT stations, limited dedicated space in buses and ticket offices during rush hours.

Generally, women in the Southern countries have high constraints on travel and work outside the home [14]. The socio-cultural norms in these countries primarily held women responsible for household as well as family caring activities. Often, they are the targets of sexual assaults that are related to transport provision and delivery systems [15,16,17]. Yet, due to the nature of responsibilities, often they are forced to take short but more frequent trips than men [18]. Moreover, land use, physical layout and design of road networks, interior design of the bus as well as design of the bus stops and connecting sidewalks greatly affect the needs

of women, composed of easiness, comfort, and safety [19,20]. However, the public transit infrastructures (i.e. footpaths, bus stops, routes, and buses) are designed in such a way that are insensitive to their abiding needs [21]. Therefore, a diligent attention needs to be paid in the design of infrastructures with an account of their common need profile along with a special provision for pregnant women and those who travel with children [22]. Research carried out in Europe has been addressing gender equality objectives for several years now. Some strategies such as gender impact assessment are linked to social impact analysis and strategic environmental assessment and is a tool that can be integrated to analyze transport planning and equality [23]. The model was developed over ten years of research into how to implement gender equality objectives in transport planning. The model is goal-driven, goal-oriented and adapted to planning practice by improving the results of transport planning and providing an assessment of whether or not the various strategic actions are moving in the desired direction [21].

The state-of-the-art review given above clearly shows that the services designed for women are used by men instead, further widening the gender gap in our cities. Detailed empirical studies in developing and developed countries can establish the reasons for this gender model, so that they can be solved to create gender equality in urban mobility [22]. In terms of transport planning in accordance with [24] it is necessary to evaluate in a shared way not only the design but also the cost and safety aspects. In terms of technological development in accordance with [25,26,27,28] it is necessary to equip cities with real-time data acquisition systems through sensors and ITS systems[29,30,31], and to disseminate the use of applications on smartphones and tablets to improve reservations and to spread the concept of mobility as a service (Maas) which allows a reduction of waiting times and the choice of the type of the most performing vehicle/vehicles to be adopted during the selection of an itinerary [32]. Although the use of private vehicles is now within everyone's reach in Western countries, there is a need to encourage sustainable forms of mobility that reduce traffic congestion and reduce noise and environmental pollution. Against this backdrop, the study in this paper focuses on a statistical evaluation of the perceptions of a sample of women in the use of the different modes of transport in the region of Sicily in southern Italy. This analysis allows to plan mitigation actions favoring the choice of infrastructural and ad hoc service solutions and allowing a greater gender equality. The following sections describe the sample and the proposed survey and provide the results of the research in statistical terms, discussing the limitations and future research steps and what has been achieved in the final part.

## 2. METHODOLOGY

In statistics, random sampling corresponds to an extraction from a population distributed according to its law (density function) of a certain number of individuals/objects. The choice of the sample in random sampling is left to chance and should not be influenced, more or less consciously, by the person carrying out the survey. The essential characteristics of simple random sampling are: (a) all units of the population are equally likely to be part of the sample; (b) each sample of amplitude has the same probability of being formed. In the present work, the sample was selected at random with a number of 1150 of women over 18 years old and living in Sicily. This age group was considered in order to be able to compare the mode of transport with a private vehicle, since in Italy the driving license is obtained at the age of 18. The sample was reached through the administration of an online questionnaire on google platform and disseminated through social channels (e.g. Facebook, whatsapp, etc.). The questionnaire was considered as a closed form information acquisition tool with one-choice questions or judgement on a Likert scale [33]. The questionnaire was grouped in three sections as given follow:

- section 1: socio-demographic data
- section 2: travel habits
- section 3: analysis of the problems and feelings related to the different modes of transport investigated.

The details of the first section investigated the age group and the level of education. In section 2 the reasons for daily travel were investigated as the different modes of transport available to women living in the region of Sicily varied. Some of these modes of transport are not yet widespread in some cities in the South of the island. The frequency of travel was investigated in order to understand the number of trips made by different modes of transport. The practice of rental or sharing mobility have been investigated. In section 3 the problems related to each mode of transport and the feelings (fear, safety, and gender equality) experienced during the use of each mode of transport in the analyzed territorial context were investigated. Table 1 is a schematization of the proposed questions. The descriptive statistics was adopted to define as a first step of the survey some main survey criteria and to provide a classification, a synthesis and a representation of the data learned from the study of a specific part of the population, i.e. a sample related to women over 18 .

**TABLE 1.** The characteristics of survey data groups in three sections

Section 1		Section 2				Section 3				
Variables	Scale	Variables		Scale	Variables	Scale				
1.A	Age	single closed response	2.A	Main reason of movement considering these different transport modes	2.D	Criticalities related to each transport mode	single closed response	3.A	Safe perception for each transport modes	Likert scale
1.B	Degree of Education		2.B	Use frequency	2.E	Ownership and rent experience		3.B	Gender equality considering passenger position	
1.C.	Job		2.C	Transport modes experience				3.C	Gender equality considering driver position	

### 3. RESULTS AND DISCUSSION

In accordance with the 2019 statistical data provided by ISTAT (National Institute of Statistics), the analysis of the structure of the population of Sicily by age considers three age groups: young people 0-14 (21.2%) years, adults 15-64 (65%) years and the elderly 65 years and over (13.18%). The female population is formed by 2.581.646 women who make up 51,4 % of the Sicilian population. The highest percentage of women is in the 40-49 age group. Considering the first section of the investigated survey, the sample was characterized in terms of age for the:

- 25% from range 18-30
- 50% from range 31-45
- 20% from range 46-65
- 5% from range >65

Probably this is due to the little-used diffusion channels of the over-65s. As far as the qualification is concerned, about 55% of the investigated population has a diploma, while 37% have a degree and 8% have a doctorate or master's degree. The working career has been characterized by 30% of employees, 10% of freelance professionals, 45% of housewives and finally 15% of pensioners/retiree. As you can see the trend is representative with most housewives according to what recorded in the South of Italy in the twentieth century. This value reflects the lack of care that women do not receive during maternity or the need to stop working to spend time looking after children and the home. As far as the results of section two are concerned, it was recorded that the use of the bike is mostly related to leisure and generally confined to a few

days a week for about 48% of the sample interviewed. Approximately 10% use public transport to travel on a daily basis, mainly for work. The use of the private vehicle remains the one that records a greater percentage with 60% of the sample who use the car daily for shopping and to accompany their children and 30% to go to work. As far as sharing mobility is concerned, only 5% for leisure travel and 10% for work. Even lower values have been reached for the use of micro mobility vehicles, in fact only 3% of the population habitually use PMV (personal mobility vehicle) and 15% sporadically. The purpose of moving with these means is related to leisure. The Figure 1 below shows how the percentages of vehicle choice and frequency have been distributed as the age varies.

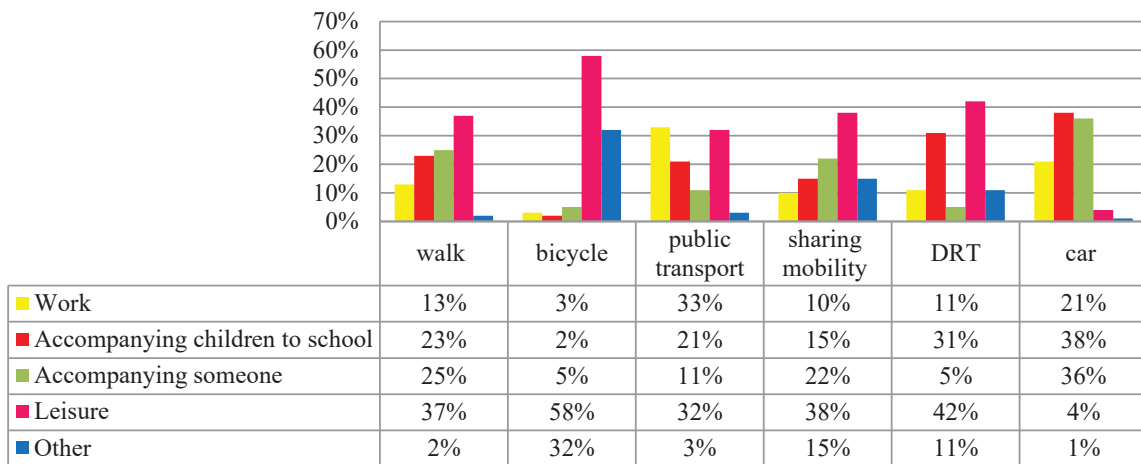


FIGURE 1. Reason of movement related to the investigated sample

On the other hand, in terms of time and in particular considering the frequency of movement, Figure 2 shows the distribution obtained.

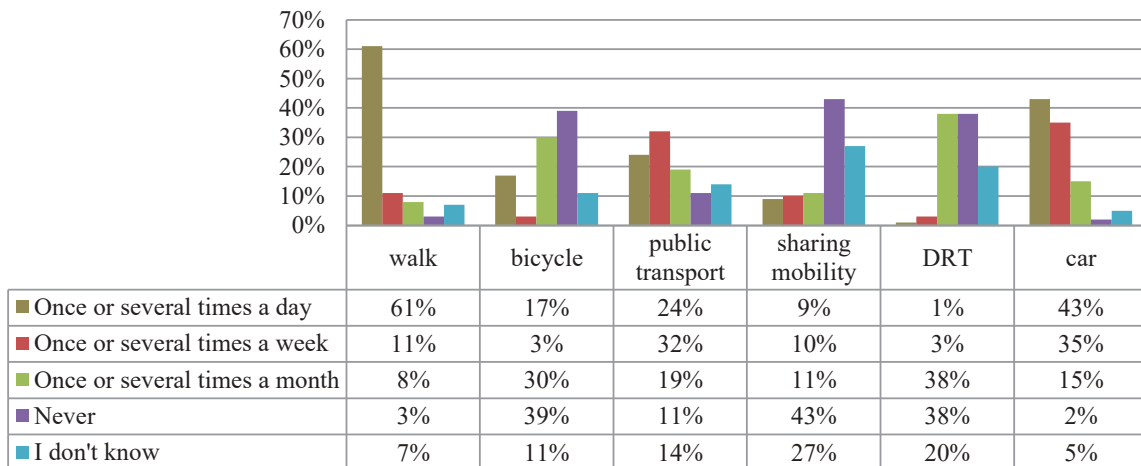


FIGURE 2. Frequency of movement considering the investigated sample

The sample examined had at least 95% experience of travelling on the subway. The values are reduced considering car-sharing (only 30%) and e-bike (43%). The third section of the questionnaire concerned the feelings of safety as a passenger of all forms of mobility and gender equality as passenger and driver. The judgement was expressed on a Likert scale in 5 intervals from 1 as a bad judgement to 5 as a very good judgement. In terms of safety, it can be seen from Figure 3 that the most common and least innovative means of transport have an almost uniform distribution in judgement.

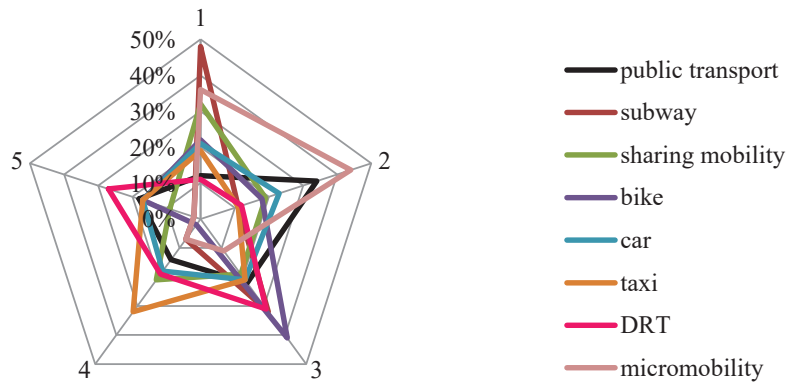


FIGURE 3. Transport user safety perceptions

On the other hand, for micro-mobility, shared mobility and the sub-way, the safety judgements of the most common and less innovative means of transport have an almost uniform distribution between 1 and 2. As far as gender equality is concerned, there are differences between the passenger and the driver, in the first case the judgement with the highest percentage of positive responses is to be attributed to the private vehicle instead of the worst to micro-mobility. In the case of the driver the equality is more judicious for the car and the bike, while the lower values for subway and sharing mobility. The DRT transport shows positive judgements in terms of the more heterogeneous driver like described on figures given below.

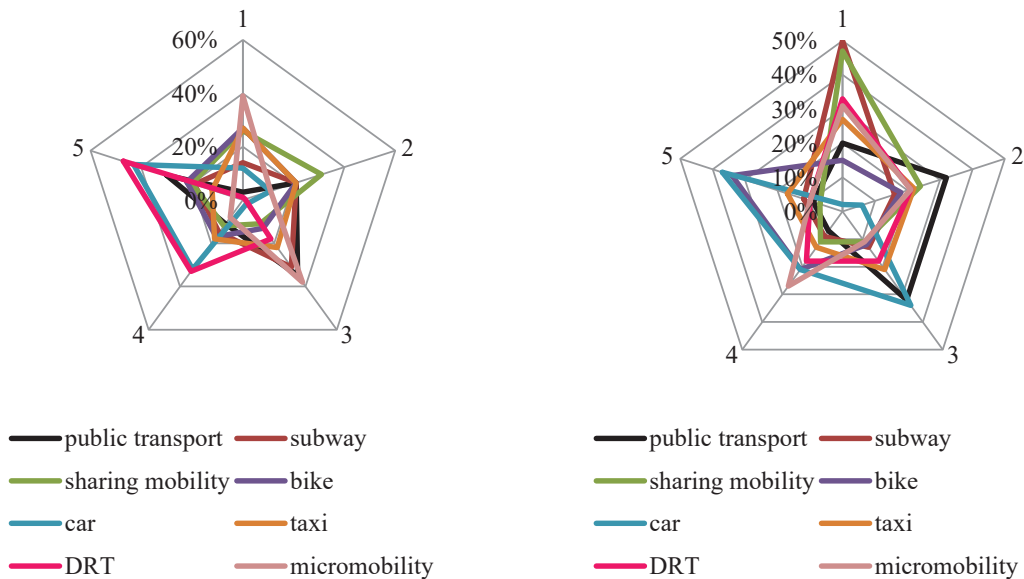


FIGURE 4. Gender equality perception like passenger (a) and driver (b)

#### 4. CONCLUSIONS

The evolution of transport systems and mobility planning have made it possible over the years to encourage people to move, taking into account the different reasons for moving and promoting sustainable forms of mobility with a low environmental and economic-social impact. The perception of safety while waiting for the vehicles in recent years has grown, which has been addressed with the installation of sensors and greater control at night. Due to the development of technology, the perception of safety on board has also increased

in some vehicles that in turn increases the sense of comfort during the trip. Unfortunately, the infrastructure of Sicily still needs to be subjected to numerous maintenance and controls in order to provide high standards of safety and level of service. Different scenarios such as the COVID 19 pandemic or other scenarios linked to natural disasters (floods, earthquakes, etc.) drastically reduce the possibility of being able to move. Mitigation actions have been put in place in recent years to reduce the risk during travel considering both the safety of users and the level of service of transport infrastructure and services. Unfortunately, in many parts of the world there is still a lack of gender equality linked to the use of different types of transport. In accordance with Agenda 2030, these differences will have to be overcome by the Local Administrations to promote actions to encourage the different forms of mobility by women. The diffusion of the possibility of driving by women, a greater control of the infrastructure with real time systems and a continuous monitoring by managers and police bodies but also reduced tariff policies for women mothers and workers will allow a better diffusion of sustainable mobility. The results could be also useful for transport agencies and operators to incorporate gender-sensitive measures in future BRT systems or shared mobility, in particular in developing countries. This analysis is preparatory ground to the implementation of regional transport systems pursuing the principles of Maas (Mobility as a service) for the improvement of the transport offer for the user, reducing waiting times and promoting multimodality where possible. The present work lays the basis for future research developments and calls for an assessment of the choice of local transport modes, evaluated through chi square evaluation [34] and logit-type models [35].

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