Palacký University Olomouc

Transactions on Transport Sciences
Peer-Reviewed Open Access Journal
Vol. 2/2026 DOI: 10.5507/tots.2026.005
journal homepage: www.tots.upol.cz

Socio-demographic Attributes in Demand-Responsive Transport Modelling: A Comprehensive Synthesis of the Literature on gender, age and income

TIZIANA CAMPISI[a], ANTONIO RUSSO[a], GIOVANNI TESORIERE[a], CHIARA SPADARO[a], GUILHERMINA TORRAO[b]

a. Department of Engineering and Architecture, University of Enna Kore, Cittadella Universitaria 94100 Enna (EN), Italy
b. Department of Engineering Management, Aston University, UK

ABSTRACT: Urban mobility is essential for quality of life, especially for vulnerable groups such as the elderly, as it ensures autonomy and participation in social life. While income can influence the choice of private vehicles as a mode of transportation for regular trips, the gender gap in transport and safety issues related to public transportation should also be considered. One transportation mode that has emerged as a key solution in areas that are often underserved or characterized by territorial inequalities is Demand-Responsive Transport (DRT). DRT is an on-demand transport mode with characteristics that lie between conventional scheduled public transport and taxi services.

This study identifies and highlights the statistical correlations reported in the literature between the adoption of DRT and user demographic characteristics (gender, income, and age), in order to understand the contribution of these attributes to the uptake of such services. A total of 43 papers were reviewed, selected using targeted keyword combinations (e.g., "Demand-responsive transport" AND "gender") to ensure the relevance of the research findings. This approach enabled an analysis of the relationships between key user demographic variables and social equity in transport. The study examines how key sociodemographic factors—such as gender, age, and income—affect DRT adoption in the existing literature, comparing results from previous regression analyses to assess their influence. The results provide a foundation for advancing research that integrates urban mobility demand analysis with demographic and socio-economic factors influencing user needs. These insights can inform strategies to improve service provision by DRT operators and enhance integration with other transport modes, supporting the development of a more cohesive and inclusive mobility system.

KEYWORDS: Flexible mobility; socio-demographic factors; elderly people

1. INTRODUCTION

Scientific research has shown that certain social groups, such as the elderly and people with disabilities, are increasingly facing difficulties in participating in political, economic, and social life. As a result, their involvement and representation in policy-making processes remain limited. This exclusion raises critical concerns and generates social costs at both the individual and national levels (Kenyon, 2008; Gray et al., 2006). Such barriers are often rooted in inadequately designed legal frameworks, labour markets, and health systems, as well as in discriminatory attitudes and perceptions.

These issues have long been central to social and political agendas. However, one factor that has received comparatively little attention is the involvement of diverse user groups—including those in vulnerable situations—in transport and mobility decision-making processes, a topic that has gained increasing importance in recent years. Consequently, the concept of social equity has become a key objective in transport planning and project evaluation (Karner et al., 2024; Sharifi et al., 2024). Social equity encompasses multiple dimensions, extending beyond gender and age to include economic and cultural factors. Moreover, certain geographical areas exhibit low-demand characteristics that render traditional scheduled transport services economically unsustainable. This situation often encourages reliance on private vehicles, thereby undermining efforts to promote more sustainable transportation choices (Campisi et al., 2021).

Certain population groups, such as the elderly, face greater difficulties in selecting transport modes other than walking. Individuals aged 65 and over tend to travel less and prefer private transport to public transport, particularly in non-metropolitan areas (Moss & O'Neill, 2012; Costa et al., 2017; Jittrapirom et al., 2019). The literature further highlights how socio-economic and demographic factors—particularly income and gender—can significantly influence individuals' mobility behaviour and access to transport services. Travel preferences and mode choices vary according to income level and geographical context, while pronounced gender disparities persist, especially in relation to perceived safety and equitable access to opportunities. Analysing these dynamics helps to identify existing critical issues and potential interventions to promote more inclusive and accessible mobility.

However, a progressive reduction in public transport supply may lead these population groups to rely even more heavily on private cars, potentially resulting in negative impacts on road safety and access to essential services. To ensure the long-term sustainability of public transport, the current service model may need to be reconsidered. Among the proposed solutions, Demand-Responsive Transport (DRT) represents a particularly suitable option for less densely populated areas (Jain et al., 2017; Jittrapirom et al., 2019). This system, already implemented in several European cities, operates through vehicles that are activated only on demand, thereby reducing costs and optimising services for vulnerable users (Rossolov et al., 2025; Gkavra et al., 2024). Through a comprehensive literature review, this study aims to highlight the most significant contributions related to the use of on-demand transportation services. The various classes of models identified in the literature—including logit models, linear models, and latent class models—enable the analysis of relationships between individual user characteristics and mobility choices. This

article reviews studies that explicitly link sociodemographic attributes to user choice behaviour.

The research is based on a systematic literature review conducted using specific keywords and a structured selection of research articles from major scientific databases, namely SCOPUS and Web of Science (WoS). Section 2 examines the key social attributes considered in the study, focusing on the growing proportion of elderly people worldwide and their travel needs, which are shaped by both intrinsic and extrinsic factors, as well as women's travel needs and the relationship between individual income and transportation systems. Section 3 outlines the methodology adopted for bibliographic analysis and presents the main outcomes of the literature search. Section 4 provides a comparative summary of selected case studies from scientific literature. Finally, Section 5 discusses the findings and presents the conclusions.

2. BACKGROUND

2.1 - Mobility challenges and socio-demographic determinants of transport demand

The issue of mobility of people in vulnerable situations (e.g. elderly, disabled, children, pregnant women...) has always occupied a relatively subordinate position on the transport policy agenda (Rosenbloom, 2004; Whelan et al., 2006). In recent years, however, more attention has been paid to some of the goals of Agenda 2030 by defining actions and strategies to improve social inclusion and gender equity. These efforts are reflected in transport planning initiatives implemented at various territorial scales or in sectoral regulations.

Unfortunately, there is often no direct correlation between the strengthening of dedicated infrastructures and services necessary to ensure widespread accessibility and the "right to mobility" for weak users.

At the territorial level, imbalances are particularly evident in peripheral or inland areas due to both the structural lack of basic services in the social, health and transport sectors ('citizenship services') and the reduced presence of infrastructures and mobility services. As a result, disadvantaged populations in these areas face significant barriers to equitable access and inclusion. This research focuses on evaluating transport services that support the mobility of the elderly in inland areas of the island. This sector faces critical issues, including poor accessibility of public transport and the need to improve service frequency and reliability. It is essential to make public transport more inclusive and accessible, improving the quality of life of the elderly and their autonomy. Public stops and public transport may not be adequately equipped for older people (lack features like of ramps, priority seats, or age friendly design).

Elderly people may find it difficult to reach public transport stops, especially in rural areas or areas with unsuitable or poorly maintained roads (Zhang & Yang, 2024; Chang et al., 2025). Public transport services may therefore not run frequently or reliably enough to allow elderly people to plan their trips. Moreover, overcrowded public transport vehicles, can compromise comfort and safety, which further discourages use. Finally, public transport fares might be excessive for some elderly people with limited income. Besides, elderly people might find it difficult to use public transport information (timetables, routes maps, etc.) when this information is only available in digital formats.

Sociodemographic factors play a significant role in determining urban transport demand. Population size, population density, population age and motivations for daily travel directly influence the demand for transport and the choice of transport modes. The growing proportion of elderly individuals in the population introduces distinct mobility needs, requiring adaptations in public transport systems to ensure accessibility, safety and comfort for this age group.

According to the literature, income can have a knock-on effect on mobility behaviour. Those with a higher income are more likely to use private vehicles than local public transport, and they believe that subsidies are needed to encourage the use of public transport (Guzman et al., 2022; Giuliano, 2005). However, a review of the literature shows that these dynamics are not entirely balanced. For example, in the United States, there is a preference for using private vehicles even among low-income users. (Serulle & Cirillo, 2016; Russo et al., 2026). In contrast, in southern countries, this propensity for private car use is lower, so investments to improve public transport are desirable to ensure social and territorial accessibility for low-income users. Gender inequality between men and women is often reflected in social contexts rather than political, cultural and economic ones, but it can also be found in the transport sector in relation to accessibility to public transport (Lecompte et al., 2017; World economic forum, 2017). Although mobility habits have changed in general during the post-pandemic period, it is possible to consider that there are differences in mobility habits between genders. When using public transport, according to the literature review, women often feel unsafe and fear negative experiences such as violence and abuse. In fact, men travel more than women, allowing them more open and varied access to job opportunities (Gekoski et al., 2017; Sagaris & Tiznado-Aitken, 2020; Campisi et al., 2022;). A series of contributions in literature analyse not only the factors that contribute to the possible risks in the use of public transport, but also the design strategies that can improve these services. It is also clear that with the emergence of new technologies, it is possible to increase control of public transport and the feeling of safety on board for users. Several studies in the literature point out that not only socio-demographic factors but also other elements, such as the size of the city, region characteristics (e.g., urbanisation and population density), travel motivations and the accessibility of diverse modes of transport all play a fundamental role in the comprehensive analysis of transport supply and demand. In this context, this study aims to identify factors that influence transport demand by considering a specific segment of the population the elderly. It investigates socio-demographic variables that may influence modal choices. Furthermore, it supports the planning of complementary transport services in areas of low transport demand as better defined below.

2.2 Weak demand areas and Demand Responsive Transit services

Areas characterised by weak transport demand are expanding and are no longer confined to peripheral or rural regions but are increasingly found in inland and island areas as well. There is therefore little doubt that infrastructure and mobility services connecting peripheral areas to urban centres are essential for ensuring social equity and for mitigating the social exclusion of marginalised groups. The transport system plays a crucial role in facilitating social participation and reducing inequalities by improving accessibility for diverse user groups, particularly those in vulnerable situations or living in rural areas with limited public transport provision. Demand-Responsive Transport (DRT) services have been developed in recent years to provide greater flexibility in booking and destination selection and can be considered complementary solutions to conventional public transport (Campisi et al., 2023; Melo et al., 2024). DRT services make it possible to address transport demand in low-demand areas where traditional scheduled services are inefficient (Papanikolaou et al., 2017), improve access to essential services (e.g. hospitals) for vulnerable users (Ryley et al., 2014), and

achieve significant efficiency gains through the integration of passenger and freight transport (e.g. DRTLs) (Meinhardt et al., 2022; Cavallaro & Nocera, 2023; Ennas et al., 2024;). With respect to compatibility between DRT and public transport systems, several studies have examined case studies and scenario analyses based on agent-based simulations, which allow DRT services to be integrated into scheduled networks and capture interactions between operators and users (Ronald et al., 2015). The contribution of DRT services has also been assessed in relation to the three dimensions of sustainability, with particular emphasis on social sustainability. In this regard, DRT characteristics align closely with Goal 11 of the United Nations' 2030 Agenda (United Nations, 2015). To promote socially sustainable development and improve transport accessibility for all users, it is essential to consider sociodemographic factors such as age, gender, and income disparities, which significantly influence transport mode choice, particularly in relation to public transport. Women often experience higher levels of fear and face greater risks while travelling than men, primarily due to gender-based violence and harassment on public transport (Alfaro et al., 2024). Similarly, elderly individuals tend to use bus services less frequently, despite often having a greater need for public transport due to limited access to private vehicles and the presence of multiple mobility barriers (Davey, 2007; Currie & Delbosc, 2010). Public transport is frequently the only viable travel option for low-income users (Giuliano, 2005). Considering the three sociodemographic attributes examined—age, gender, and income—it is therefore essential to analyse both the quantitative and qualitative impacts of these factors on the adoption of on-demand transport services.

3. METHODOLOGY

Transport managers and operators need to consider both demand and supply by placing greater emphasis to social aspects in the calibration of modal choice modelling and implementing more equitable and sustainable transport services. In this Section the main elements of methodology are described.

This research aims to systematically investigate the contribution made by the literature in terms of the relationship between DRT adoption and the sociodemographic variables: age, gender, income. To obtain a comprehensive representation of the literature, a SLR was carried out according to the following steps:

- Identification: definition of the main component of literature review, being search methods, engine, keywords and scope.
- Screening: reviewing the titles, abstracts, and full texts of the identified studies to determine their relevance.
- Eligibility.
- Inclusion.

3.1 Research motivations

The research questions to be discussed in this contribution are the followings:

RQ1: How has the scientific literature used logit models to describe DRT adoption?
RQ2: Do the examined models yield a significant relationship between the sociodemographic attributes of gender, age, income, and DRT and DRT use?

Scientific contributions examined in the review relate to the calibration of regression models, in logit form, within finite choice sets, where the use of an on-demand service is one of the alternatives.DRT adoption can be modelled naturally using logit models because user choice is either a binary variable (adopt/not adopt) or an ordinal variable, expressing, for example, how much a service is appreciated, using ordered logit models. Logit models directly estimate the probability of adoption as a function of individual characteristics, allowing the evaluation of the marginal effect of socio-demographic variables such as age, gender, and income on choice behaviour. Furthermore, they do not impose error distributions other than the logistic one, making them flexible and interpretable; the scientific literature on logit models is solid, and the various functional forms in which they are presented are supported by solid hypotheses (Cascetta, 2013). Finally, the logistic form guarantees probabilities between 0 and 1 and easily interpretable coefficients.

The ability of these models to correlate the (manifested or declared) choices of individuals with the attributes examined makes this model fit very well inside the topic. Specifically, the models sought belong to one of the following classes:

- Binary/Multinomial Logit Model: The generic individual choices a single alternative: with two options (binary) or more than two (multinomial). It estimates the probability of choice as a function of the individual's characteristics and/or the alternatives, assuming logistically distributed and independent errors. It relies on the assumption of independence of irrelevant alternatives (IIA);
- Nested Logit Model: It extends the multinomial logit by grouping "similar" alternatives into nests. It allows for correlation between alternatives within the same nest, relaxing the independence restriction of irrelevant alternatives.
- Mixed Logit Model: It allows some coefficients to vary across individuals according to specified distributions, capturing unobserved heterogeneity and correlation of choices over time. It is more flexible than the standard logit.
- Ordered Logit Model: Logit model for ordinal dependent variables (categories with a natural order). Estimates the probability that an observation falls into each ordered category based on the explanatory variables.

The models identified may also refer to the class of latent cluster models. These are statistical models that assume the existence of latent classes (defined as homogeneous groups of individuals that cannot be directly observed) within the population. Each class has its own choice probability and coefficients, and class membership is estimated as a probability. Latent class models are also typically formulated as logit models within each class. In logit models (binomial, multinomial, nested), a single set of coefficients is estimated for the entire population; in mixed logit models, continuous variation of parameters is studied; in latent class models, the discrete heterogeneity is evaluated, through the estimation of multiple sets of parameters, one for each latent class. They allow you to identify distinct behavioural segments

The models thus defined are disaggregated; their treatment makes it possible to analytically define the relationship between utility/probability of choice associated with the adoption of the DRT by the individual user and the reference attribute among those studied (age, gender, income) (Cascetta, 2013).

3.2 Search strategy

This analysis utilised two international reference databases: Scopus and Web of Science (WOS). They are chosen because they are leading bibliographic indexing platforms and provide high-quality standard in the selection of sources. Both offers provide broad, multidisciplinary coverage, including contributions relevant to the study of the relationship between the adoption of on-demand transport services and users' attrib-

utes. Also, the databases collect articles and contributions from various disciplines related to the topic under discussion, such as transportation engineering, urban and regional planning, and transportation economics. To further refine the search and avoid including irrelevant results, the selection was limited to the "Title," "Abstract," and "Keywords" fields. This strategy ensures that the identified articles explicitly present the terms under investigation in the most significant passages of the text, thus ensuring greater consistency and relevance to the study's objectives.

The search criteria were performed considering the string represented in Fig. 1. The keywords were composed by identifying two main thematic areas: the first explicitly referred to the DRT, also considering the on-demand bus service option, often used in the literature as a synonym (Liyanage & Dia, 2020); the second area, instead, referred to the topics covered in terms of sociodemographic attributes. The keywords used and the appropriate Boolean indicators are shown in Fig. 1.

3.3 Exclusion criteria and data extraction

To ensure the accuracy and relevance of the final corpus of analysed studies, a systematic selection and filtering process was applied. First, all duplicate records resulting from queries across different search engines were eliminated, thus avoiding repeated counting of the same contributions. Articles for which the full text could not be found were excluded, as the absence of the entire content prevented a thorough evaluation of their methodology and results. Furthermore, works that were clearly irrelevant to the study's focus were removed, as well as those that, despite addressing related topics, did not present data or results useful for the purposes of this analysis. Editorials, introductory notes, and other non-peer-reviewed contributions were excluded, as they did not provide empirical evidence sufficient to support the systematic review's conclusions.

Of the articles eligible for final analysis, contributions were evaluated based on the methodologies adopted, sequentially assessing:

- Whether or not the contribution under review addressed the topics of age, income, or gender.
- Whether the contribution under review used one or more of the methodologies listed in Section 3.1.
- If the answer to the previous question was yes, how and to which of the attributes studied (age, gender, income) did it refer.

The analysis was conducted using the two search engines mentioned above. A total of 134 contributions were found, distributed as follows: 36 papers on Scopus and 98 on WOS. Duplicate contributions were identified before the screening phase. 27 contributions appeared in both search engines. Excluding duplicates, total number of works screened is 107. The next step was to identify non-retrieved items, to verify whether full text was present. A total of 43 records could not be retrieved for full-text assessment.

Contribution content was evaluated within the subset of 64 contributions to assess their consistency with the research topic. Specifically, it is appropriate to define several subsets. The contributions analysed were all conference papers or journal articles, therefore not editorials, and all are eligible for the final study due to their editorial format. Of these contributions, 21 were excluded because they were outside the topic of interest. This high number is explained by the fact that the search and extraction were performed semi-automatically, and consequently, the search may find results that do not fit the inclusion criteria. There are also papers in which the importance of, for example, DRT for the elderly is declared in the abstract, but the topic is not explored in depth in the text. The remaining 43 contributions have been documented in Russo et al. (2026). Of these 43, 28 did not carry out the types of modelling identified in the research. Overall, the remaining 15 contributions are those discussed in this paper. These contributions use one of the models described in Section 3.1 to analyse the adoption of a DRT system as the dependent variable, with at least one of the attributes referring to age, gender, and income as the independent variable.

4. RESULTS AND DISCUSSION

The 15 contributions obtained from the review process are described in this section. The dependent variables considered in the studies are all proxies for DRT adoption. Independent variables may have different forms. The independent variables assume different forms: the gender attribute is inherently categorical, whereas age and income are continuous variables that are often analyse categorically by grouping them into classes. (e.g. age groups).

Given the heterogeneity of the variables adopted, and the profound differences among the models used, it is impossible to carry out a direct comparison of attribute values. Instead, it is possible to classify whether the DRT proxy variables used are positively or negatively correlated with the attributes (if expressed by continuous variables) or with specific ranges of them (if expressed by discrete or dummy variables).

For each of the models analysed, the alternative studied is also specified. This section describes the 15 case studies analysed. In general, all the services have been reported in Table 1 and are classified considering seven elements namely:

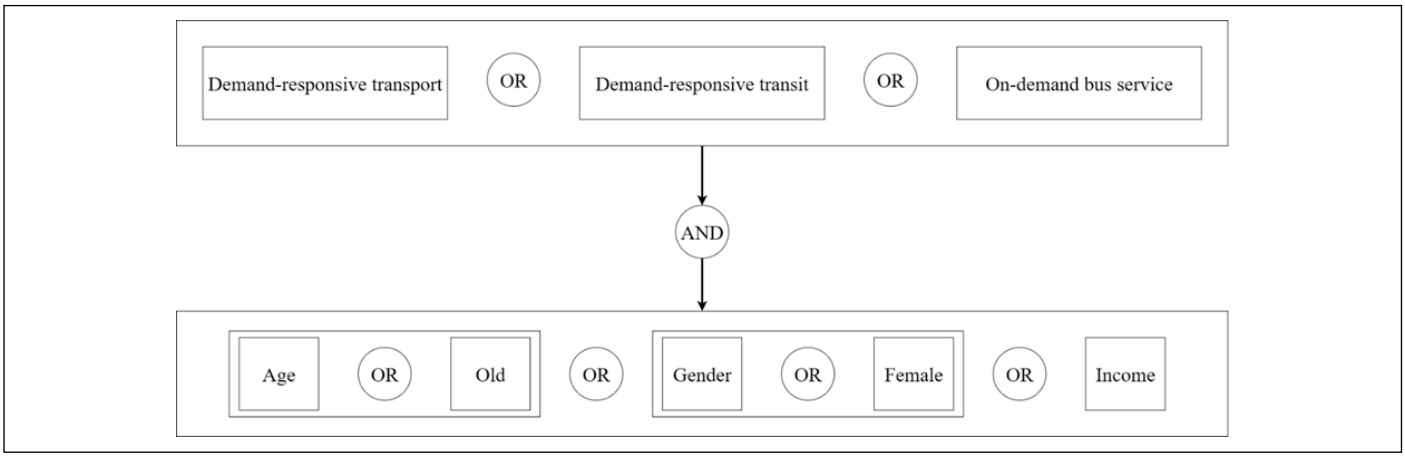


Fig. 1 Keywords structure

- The main characteristic of the case study (whether it is a study of an already operational service or a mathematical model/analysis).
- Year of publication of the research.
- Geographical area of the case study analysed in the contribution.

Among the contributions analysed in this paper, it is possible to identify the main characteristics of each service, as well as recurring trends and gaps. Among the relevant elements, it is noteworthy that the issue of technological accessibility is often addressed in relation to specific groups of users who are less inclined to use digital technologies (Jevinger & Syensson, 2024). Attention is also paid to the variables that influence the dissemination and use of these on-demand systems. The use of these services is strongly correlated with socio-demographic variables such as age and stage of life (Vij et al., 2020; Knierim & Schlüter , 2021), but also with risk prevention and perception. These latter variables highlight the central role played by public authorities in managing risk perception and guiding users towards modal choices (Ross et al., 2021).

Another recurring theme concerns the administrative and regulatory context: in Europe, few countries have a well-defined regulatory framework for on-demand transport systems, a condition that can facilitate the integration of DRT into the existing public transport system. This highlights the crucial role that legal recognition plays in the dissemination and effectiveness of DRT services.It appears that in medium-sized cities where the transport system consists of official urban services and a vast network of informal services, despite the lack of a well-defined regulatory framework, the provision

References	Theoretical/Applied	Year	Geographical area
(Wang et al., 2015)	APPLIED (investigates how individual level factors influence the use of DRT systems in rural Lincolnshire in England by applying an ordered logit model to a survey of DRT users in the county)	2015	Lincolnshire, England
(Li et al., 2019)	THEORETICAL (Analyse the factors influencing the attraction of CB to commuters, which is tied to the ordered mode shift decisions)	2019	Beijing, China
(Vij et al., 2020)	THEORETICAL (understand consumer demand and willingness to pay for ODT in Australia)	2020	Australia
(Gadepalli et al., 2020)	APPLIED (it addresses the gap by presenting a methodology to derive a comprehensive understanding of socio-economic and travel demand characteristics of all transit users in Visakhapatnam)	2020	Visakhapatnam, India
(Wong et al., 2020)	THEORETICAL (it identifies factors influencing the elderly's willingness-to-travel)	2020	Hong Kong
(Ross, 2021)	THEORETICAL (Measure chronic regulatory focus, perception of health-related risk of using public transport, and choice of public transport mode. The choice is between buses and DRT, and separately, between taxis and DRT)	2021	Tel-Aviv, Israel
(Knierim & Schlüter., 2021)	APPLIED (it examines whether people who show characteristics that indicate a mobility deficit are more willing to access the DRT system Eco Bus in a rural area of Germany)	2021	Northeim, Germany
(Wang et al., 2022)	APPLIED (analyse results of small-scale pilots on-demand ride services and investigate people's latent attitude)	2022	Detroit and Ypisilanti, Michigan (USA)
(Van Kuijk et al., 2022)	THEORETICAL (Explores the user preferences for shared modes as first and last mile option to connect activity locations. We have focussed on local public transport in the Utrecht province, The Netherlands, which includes bus and tram lines)	2022	Utrecht, Netherlands
(Jaber et al., 2023)	APPLIED (examines differences in travel behaviour between DRT and PT and determines the level of services satisfaction)	2023	Palestine
(Khan et al., 2023)	APPLIED (It defines perceptions towards several service performance attributes of three ridesharing services that serve in the University of Texas at Arlington community.)	2023	Texas
(Altarifi et al., 2023)	THEORETICAL (a Stated Preference survey was conducted to determine public transportation users' willingness to use BRT. Two models were used to understand user preferences for work-related trips)	2023	Amman, Jordan
(Hussain et al., 2023)	THEORETICAL (investigate traveller's willingness to use demand responsive transit (DRT) to address transportation challenges in Karachi)	2023	Karachi, Pakistan
(Li et al., 2024)	THEORETICAL (investigate preferences and mode choice between DRT and PT)	2024	University of Shanghai, China
(Jevinger & Svensson., 2024)	THEORETICAL (it investigates these factors in a hypothetical DRT service, in the age groups 6–17, 18–69 and over 70 years)	2024	Skane, Sweden

Table 1. A classification of case studies analysed identified through the literature

of on-demand services is still guaranteed to meet emerging needs (Gadepalli et al., 2020). The Palestinian context, on the other hand, focuses on local public transport, which is likely to be used irregularly, especially in rural areas and for short journeys, with significant influences between gender and low-income issues. In fact, the adoption of effective transport policies is recommended to promote sustainable development. (Jaber et al., 2023) Other examples show that although the on-demand service has not been officially incorporated into the transport system, it is flexible to user requests and needs and particularly user-friendly, proving suitable even for specific clusters of users who are less inclined to use digital technologies (Wang et al., 2015).

Another consideration that emerged from the analysis of the contributions concerns the need to develop planning models for on-demand transport systems that are oriented and targeted to user needs and inclusive from various points of view (Li et al., 2019; Gadepalli et al., 2020; Altarifi et al., 2023). However, it is also essential to consider the perspective of service operators, providing for the adoption of political and administrative support measures, such as subsidies, to assess the overall economic and social impact of such policies on the public budget. A significant example in this regard is the measures adopted in Hong Kong, where, together with current transport policies, efforts are being made to respond more effectively to the mobility needs of the elderly population. (Wong et al., 2020). Other contributions propose strengthening the integration between public transport and shared mobility, such as the example of the province of Utrecht (Van Kuijk et al., 2022).

The contributions identified demonstrate a wide range of models they reference. Basic binary logistic regressions are often used when there are only two independent alternatives: as an example, the binary logistic regressions of Jevinger and Svensson, 2024, were based on the alternatives "would travel by DRT at least every month" and "would travel less or not at all by DRT"; same regression are also made by Gadepalli et al., 2020; Wong et al., 2020; Jaber et al., 2023. Several works include multinomial logit models (Van Kuijk et al., 2022; Altarifi et al., 2023; Hussain et al., 2023), but also nested logit models are calibrated, when alternatives seem to show correlation (Hussain et al., 2023; Van Kujik et al., 2022). Authors also used ordered logit models, for example, to include frequencies of use as dependent variable (Wang et al., 2015), or to understand explore choices between ordered decisions (Li et al., 2019). Modelling of heterogeneity among respondents is also made, using mixed logit models (Van Kujik et al., 2022; Altarifi et al., 2023), Multilevel Mixed-Effects Ordered Logit

Reference	Choice analysed	Model	Gender	Age	Income
Altarifi et al., 2023	Use of bus on demand combined with DRT, compared with other modal choice	Multinomial Logit Model/ Mixed Logit Model	Male -	Young +	High Income -
Gadepalli et al., 2020	Choice of bus over informal DRT	Logistic regression	Female +	Low Age +	Low Income +
Hussain et al., 2023	Use of DRT over other modes	Multinomial Logit Model/ Nested Logit Model	Male +	Young +	Low Income +
Jaber et al., 2023	Probability of being an irregular user of DRT	Binary regression model	Male -	ND	High Income -
Jevinger & Svensson, 2024	Propension towards DRT	Binary Logistic Regression	ND	Age +	ND
Khan et al., 2023	Probability of being satisfied with paratransit service	Latent Class Cluster Analysis	Female +	ND	Low Income +
Knierim & Schlüter, 2021	Probability of using DRT service	Linear regression analysis	ND	High Age + (if coupled with village); High Age - (otherwise)	ND
Li et al., 2019	Probability to transfer from a mode to Customized Bus	Ordered Logit Model/ Multilevel Mixed-Effects Ordered Logit Model	Male +	Age +	Low Income -
Li et al., 2024	ADRT over traditional bus	Integrated Choice and Latent Variable Model	Male +	Young +	High Income +
Ross, 2021	Propension towards DRT in COVID-19 pandemic	Linear regression	Female -	High Age +	ND
Van Kuijk et al., 2022	Modal preference for DRT services	Multinomial logit (MNL), nested logit (NL), panel-effect, and mixed logit (ML) models.	ND	Young Age + High Age +	Low Income -
Vij et al., 2020	Frequency of On-demand transportation use	Latent class choice models	Male +	Young/Middle +	High Income +
Wang et al., 2015	Propensity to travel by DRT (from 1=never/infrequent, to 5=4 times per week or more)	Ordered Logit Model	Female +; Male + (if coupled with age)	Male + (if coupled with age)	ND
Wang et al., 2022	Acceptance of shared mode	Latent class cluster analysis in multinomial logit form	Female -	ND	ND
Wong et al., 2020	Probability of making a trip by accessible taxi	Binary Logistic Regression	ND	Age +	ND

Table 2. Classification of models proposed and on the impact of Gender, Age and Income attributes +=the attribute positively influences the choice of the alternative connected to the DRT; -=the indicated attribute negatively influences the choice of the alternative connected to the DRT ; ND=Not defined/significant)

Model (Li et al., 2019), or analysis of latent classes among respondents (Vij et al., 2020; Wang et al., 2022; Khan et al., 2023; Li et al., 2024). One contribution also focused on linear regression analysis (Ross, 2021). Table 2 highlights the main elements of the contribution. The table is organised as follows: the first column indicates the reference of the paper; the second column indicates the choice studied within the paper; then the model or models used for the specification are indicated (Multinomial Logit, Mixed Logit, etc.); finally, each of the three final columns is associated with one of the three attributes, and expresses the relationship between the indicated attribute and the choice within the calibrated model. It is therefore specified whether, in the model studied, gender, income, and age determine an increase or a decrease in the probability associated with the DRT.

The analysis of the selected contributions confirms that individuals' socio-demographic characteristics are one of the main determinants of the adoption of on-demand transportation services.

Age emerges as an important attribute a in almost all the studies reviewed. Studies show that younger users, university students, young professionals, and early-career workers tend to demonstrate a greater propensity for innovative and flexible modes, including automated DRT solutions or those integrated with other forms of shared mobility. In the latent class choice model of Vij et al., 2020, the attribute "Under 30 years" is characterized by a negative parameter for all classes (Early adopters, Potential early majority, Potential late majority, Potential laggards) except for the class "Innovators" which serves as a reference level; similarly, the attribute "Over 65 years" shows a specular behavior, with a parameter always negative, except for the reference level.

In the logistic regression of Gadepalli et al., 2020, age showed a significant positive impact on the choice of bus over informal paratransit; however, the low value of its coefficients shows that its relative impact is lower than the other variables.

In the contribution of Van Kujik et al., 2022, two age-related attributes appear: "Age under or equal to 25 years" and another "Age over or equal to 46 years", and both are characterized by significant coefficients in the specification of the utility of DRT compared to the "No sharing" alternative, for the suburban case analyzed. Both coefficients are characterized by a positive sign, therefore showing attractiveness for young people and older people, and less attractiveness for middle-aged users.

In Altarifi et al., 2023, considering results of calibrations, Bus on Demand with BRT was more likely to be preferred by young students. In Hussain et al., 2023, the attribute Age=18-30 years has a positive coefficient for the DRT alternative in both the multinomial logit and the nested logit. Finally, in the latent class model of Li et al., 2024 the attribute "Age less than 25 years old" is characterized by a significant positive correlation with the variable "Flexibility Concern" and a negative correlation with the variables "Security Concern" and "Society Concern" in the structural equations.

Older people are more cautious, preferring established modes such as buses or taxis, and more frequently report barriers related to familiarity with technology, perceived safety, or the complexity of using apps. This trend is particularly pronounced in rural areas and small towns, where advanced age often combines with less access to digital information. Wang et al., 2015 explored the propensity to travel by DRT. In the proposed ordered logit model, in which the frequency of use of a DRT service is studied, the attribute "Pension Age" shows a significant negative coefficient, while the interaction attribute "Pension*Male" shows a positive coefficient, thus indicating different user behavior, as a function of age and gender.

In the regression proposed by Knierim and Schlüter , 2021, independent variables related to age are present in the various calibrations proposed for the study related to the propensity to use a DRT service. The Age variable appears in five of the six calibrations proposed, always with a negative coefficient; in the only calibration in which Age does not appear, a variable, Retired, appears with a negative coefficient. In one calibration, the variable Oldest (over 80 years old) appears, which has a positive but non-significant coefficient. The interaction attributes "Age*Village" and "Retired*Village" also appear; In the models in which they appear, the parameters associated with them have a positive sign, thus indicating that, while age generally has a negative effect on DRT adoption, its sign changes when users live in small towns.

Gender also appears to be a significant and cross-sectional variable. Several studies report that women report a lower willingness than men to adopt DRT services or forms of autonomous transport, mainly due to perceived safety, travel comfort, and the need for complex journeys (trip chaining) related to family responsibilities. Li et al., 2024 in the latent choice model calibrated to investigate the propensity to use Automated Demand Responsive Transit (ADRT), highlight how the attribute Gender female is characterized by a positive parameter in the structural equation of latent variable "Safety Concern", by a negative parameter in the structural equation of latent variable "Society Concern" and by a negative parameter referring the latent variable "Interest in new things", highlighting that female users are more concerned about ADRT safety, ethical issues and less interested, compared to male users, in new things. The attribute Gender male of the class membership model of Vij et al., 2020, shows parameters with negative sign for each class, in studying the adoption of on-demand transportation being the reference level the alternative "Early adopters".

Wang et al., 2022 conduct a latent class analysis in which the perception towards shared modes is studied through a membership model and a measurement model. In the membership model, the attribute gender Male has a negative sign with respect to the Shared-mode opponent membership, thus showing a greater male propensity to use shared modalities compared to female users. However, other studies conducted in contexts with already operating DRT report a less evident gender difference, suggesting that elements such as service quality, physical accessibility, and communication can mitigate disparities in adoption.

Altarifi et al., 2023, highlight that men were more likely to prefer their own private vehicles, when compared to ride-sourcing services or on-demand buses connected to Bus Rapid Transit (BRT); it is indicated that this preference is also shared by housewives and high-income users.

In the analysis proposed by Hussain et al., 2023, the choice of DRT is compared to other modal alternatives (DRT vs. carpooling vs. minibus vs. private car) through the calibration of different Multinomial Logit and Nested Logit models. Considering carpooling as the reference alternative, the Gender Male attribute, for the choice of DRT, has a positive sign, thus indicating a greater propensity of men to choose DRT over carpooling.

Income shows a more heterogeneous effect, dependent on the geographical context and the type of service. In studies conducted in cities in emerging countries or in areas characterized by a lack of public transport, low-income groups show a greater propensity towards DRT because it is often the only accessible alternative to private transport, especially where DRT is often associated with informal transport. This is the case in the contribution of Gadepalli et al., 2020, in which the Income attribute is characterized by a positive sign in the choice of bus over paratransit, in India. The probability of being an occasional user of DRT is the focus of the study

by Jaber et al., 2023, and the coefficient associated with the Medium Income and Low-Income attributes is negative. In the study by Hussain et al., 2023, low-income people are more inclined to use DRT service as it is more affordable and feasible than other modes. However, in studies on innovative and technologically advanced services the relationship is different: middle- to high-income individuals are more inclined to adopt, reflecting a greater willingness to pay, a higher level of digital literacy, and a lower perception of technological risk. In Li et al., 2024, through the calibration of parameters in latent choice model, high income people are less interested in safety concern (negative parameter), less worries about society concern (negative parameter), and more concerned in flexibility. High-income users appear to be among those most interested in ADRTs. Similarly, in the membership model of Wang et al., 2022, the Household Income attribute is characterized by a positive sign relative to the Shared-mode enthusiast class.

Literature considered highlights a greater attention on older people groups towards these services (Li et al., 2024; Wang et al., 2015; Gadepalli et al., 2020; Wong et al., 2020; Knierim & Schlüter, 2021; Wang et al., 2022; Altarifi et al., 2023). Regarding the income variable, several articles present different results, Li et al., 2019; Gadepalli et al., 2020; Van Kujik et al., 2022; Khan et al., 2023 specify how in general lower-middle income users are more interested in adopting on-demand services, explaining this element by the lower presence of the private vehicle consistent with the income possessed;; Vij et al., 2020; Wang et al., 2022; Jaber aet al., 2023; Li et al., 2024 specify how instead it is higher income users who show greater interest in these flexible modes, explaining it in the light of better knowledge of transport opportunities, ICT tools and because of the digital divide. Gender represents a critical element within the research. In the light of the criticalities highlighted in Background concerning the difficulties encountered by women while using the public transport, the results provided seem conflicting, considering that some attribute a positive contribution (Wang et al., 2015; Gadepalli et al., 2020; Knierim & Schlüter, 2021; Jaber et al., 2023; Khan et al., 2023) from the gender attribute Female, while others associate a negative contribution (Li et al., 2019; Vij et al., 2020; Ross, 2021; Wang et al., 2022; Li et al., 2024). It must be considered how, given the relativity characteristic of the utility functions investigated, women tend to associate a higher utility with the DRT alternative compared to public transport (bus) alternative. Conversely, the utility associated with DRT tends to be lower (or negative) when compared with private transport. This can be interpreted in the light of the safety problems highlighted in the Background; DRT, as a mode of transport with intermediate characteristics between the two mentioned above, expresses an equally intermediate condition (Hussain et al., 2023).

5. CONCLUSION

The analysis reveals a strong need to examine the relationship between sociodemographic attributes and the adoption of Demand-Responsive Transport (DRT) and similar services. In particular, age emerges as a key attribute, appearing in various specifications across all calibrated models. When considering the individual model results, the main conclusion concerns the central role of age, albeit expressed in different forms.

Although the literature has often highlighted the importance of DRT in mitigating social exclusion among older populations, the prevailing evidence indicates greater enthusiasm and flexibility among younger users in adopting sustainable mobility options. This trend may be further reinforced by the technological components embedded in many DRT systems, which can act as an additional barrier for elderly users. Income effects vary significantly across contexts. In settings where DRT is introduced as a highly innovative service with a strong technological dimension, higher income levels are positively associated with adoption. Conversely, in contexts where DRT functions as an informal substitute for scheduled public transport, or where private vehicle use is prevalent among middle- to high-income groups, lower income levels are associated with higher adoption rates. With regard to gender, the findings indicate that DRT adoption may be either encouraged or constrained by safety and security concerns.

These factors are particularly relevant for transport planners and service operators, who should systematically assess demand characteristics and actively engage potential users prior to service implementation. The results also highlight a growing interest in this topic within the scientific literature, with multiple calibrated models—despite methodological differences (e.g. stated versus revealed preference data, discrete choice versus latent class models)—consistently demonstrating the influence of the sociodemographic attributes analysed. The study underscores the need to address age, gender, and income considerations when implementing new services, in line with the objectives of the 2030 Agenda. Furthermore, the research emphasises the importance of comprehensively analysing demand in all its dimensions when designing new transport services.

The study has certain limitations, primarily related to the heterogeneity of the models reviewed, which prevents direct comparison of parameter estimates across studies. Consequently, the analysis was conducted qualitatively. In addition, only a limited number of major scientific databases were considered. Future research could incorporate additional variables—such as driving licence ownership, private vehicle availability, area of residence, proximity to public transport services, and the presence of disabilities—to further investigate social exclusion dynamics. Overall, the findings of this research are relevant for multiple stakeholders. For researchers, this study represents the first systematic literature review specifically focused on the relationship between sociodemographic attributes and DRT adoption. For public administrators, the results offer valuable insights into accessibility and territorial equity in public transport provision. For transport operators and managers, the study provides essential guidance on key factors to consider when analysing demand for DRT systems. Future developments of this research will explore alternative methodologies, model performance comparisons, and additional sociodemographic variables.

ACKNOWLEDGEMENTS

Research activities were supported by the MUR (Italian Ministry of University and Research) through SMART3R-FLITS: SMART Transport for Travellers and Freight Logistics Integration Toward Sustainability (Project protocol:2022J38SR9_03, CUP Code: J53D23009330008), financed by the PRIN 2022(Research Projects of National Relevance) programme. We authorise the MUR to reproduce and distribute reprints for Governmental purposes, notwithstanding any copyright notations thereon. Any opinions, findings, and conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the MUR.

CREDIT AUTHOR STATEMENT

This paper is the result of the joint work of the authors. In particular, the "Abstract" and "Background" were jointly written by the authors. TC and CS wrote "Introduction". AR with TC wrote "Methodology and Results". TC with GT and GuT wrote "Discussion and Conclusions".

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