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**The role of gender in spatial accessibility and  
mobility of care: An exploratory mixed-  
methods analysis in rural villages of South  
Tyrol (Italy)**

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## Abstract

Spatial accessibility and daily mobility are influenced by various constraints such as spatial, temporal, and transport factors. Each individual faces their own. Men and women exhibit distinct travel behaviours. However, these gender differences are often overlooked in transportation policies, leading to unequal access to essential services, especially for women. Indeed, women have more spatial constraints, they often rely on public or active transport for shorter, more frequent trips related to unpaid work like shopping or childcare, namely the mobility of care. Research on spatial accessibility and mobility tends to overlook gender disparities, further perpetuating the exclusion of women's experiences. So, this thesis aims to address these gaps by examining gender dynamics in spatial accessibility and *mobility of care* in rural areas, considering the specific case of South Tyrol (Italy), considering several rural municipalities.

This research is based on a mixed-method approach, combining quantitative analysis of gender disparities in spatial accessibility and mobility of care with qualitative exploration of caregivers' experiences. The former relies on a sample of 119 individuals, tailored to the analysis of either spatial accessibility or mobility of care, while the latter is derived from 12 conducted interviews. Findings reveal significant correlations between spatial-temporal constraints and gender disparities in spatial accessibility, with women bearing a disproportionate burden of care-related travel. Furthermore, the care-related trips present physical, psychological, and social challenges that cannot be overlooked.

To promote a more equitable distribution of care responsibilities and address accessibility disparities, there is a need for a comprehensive approach involving balanced employment practices, age- and child-oriented urban planning, and gender-inclusive perspectives in transportation planning. This transformation should extend across various disciplines to create a more inclusive society.

## Abstract in italiano

L'accessibilità spaziale e la mobilità quotidiana sono influenzate da vincoli spaziali, temporali e di trasporto che ognuno affronta in modo diverso nel tentativo di raggiungere le proprie destinazioni necessarie. Uomini e donne mostrano comportamenti di viaggio distinti in termini di modalità di trasporto, tempi, destinazioni, distanze e scopi del viaggio (cfr. Craig & van Tienoven, 2019; Kwan, 1999). Tuttavia, queste differenze sono spesso trascurate nelle attuali politiche dei trasporti, con implicazioni come la povertà di tempo e l'accesso disomogeneo ai servizi essenziali, soprattutto per le donne. In molti paesi occidentali, gli uomini sono più propensi a viaggiare con automobili private, mentre le donne spesso si affidano ai trasporti pubblici o alla cosiddetta 'mobilità attiva'. Inoltre, le donne si dedicano tipicamente a viaggi afferenti a tipi di mansioni non retribuite come andare a fare la spesa o la cura dei bambini, riflettendo la divisione del lavoro di genere all'interno delle famiglie e delle società (Madariaga, 2013). Di conseguenza, le esigenze di mobilità quotidiana delle donne sono spesso caratterizzate da viaggi più brevi, più frequenti e spazialmente dispersi, che possono anche comportare il trasporto di carichi ingombranti (si pensi a un passeggino o alle borse della spesa) e l'accompagnamento di bambini o anziani. Tuttavia, la pianificazione convenzionale dei trasporti si è storicamente concentrata sulle attività di pendolarismo durante i periodi di punta, tipiche di chi lavora in maniera retribuita fuori da casa, trascurando la natura di genere delle mobilità relative ai compiti di cura dei bambini e alle responsabilità domestiche, che richiedono certamente anche spostamenti. Infatti, l'accessibilità spaziale e la mobilità della cura sono ben lontane dall'essere neutrali dal punto di vista di genere.

Allo stesso modo, anche a livello accademico, la ricerca sull'accessibilità spaziale e la mobilità è spesso influenzata da una disparità di genere. I dati sulla mobilità esistenti spesso mancano di qualità, portando ad una sottorappresentazione o addirittura esclusione di determinati gruppi, in particolare le donne. I dati utilizzati per lo sviluppo di prodotti, servizi e trattamenti tendono a non considerare le donne in quanto gruppo sociale. Inoltre, sebbene diversi studi abbiano analizzato le differenze di genere nelle modalità di viaggio, molti meno studi sono stati condotti riguardo all'accessibilità spaziale e alle mobilità associate della cura (mobility of care), specialmente in aree rurali dove i vincoli temporali e spaziali tendono ad aumentare a causa delle distanze maggiori da percorrere per raggiungere servizi essenziali.

Questa tesi si propone quindi di approfondire le dinamiche di genere dell'accessibilità spaziale e della mobilità della cura quotidiana in contesti rurali, prendendo come riferimento

il caso dell'Alto Adige. Per raggiungere questo obiettivo, la tesi adotta un approccio misto, combinando analisi quantitative e qualitative. Per la parte quantitativa, l'analisi si basa su un campione di 119 individui, adattato in base all'analisi condotta. Per quanto riguarda invece la parte qualitativa, sono state condotte interviste a 12 persone.

Attraverso questo approccio, questa ricerca mette in luce la correlazione tra vincoli spazio-temporali e significative disparità di accessibilità spaziale tra uomini e donne nella società. In particolare, gli aspetti spaziali e temporali dell'accessibilità pongono sfide significative per chi abita in ambito rurali. Gli uomini tendono ad impegnarsi in attività più lunghe e fisse a causa del lavoro a tempo pieno, mentre le donne dedicano più tempo ad attività di cura per gli altri, un aspetto spesso influenzato dal loro status di lavoro part-time. Tuttavia, anche se l'accessibilità spaziale per le donne tende a diminuire a causa dell'alto coinvolgimento nella mobilità della cura, spesso le destinazioni per svolgere quelle attività domestiche o di cura sono percepite positivamente come "terze località" (*third places*). Andare a fare la spesa o accompagnare i bambini nelle loro attività (scolastiche, ludiche, mediche) tende a favorire la socializzazione e la costruzione della comunità. Ciò è particolarmente rilevante per le *caregiver* che trascorrono una grande quantità di tempo quotidiano a casa. In questa ricerca è emerso che i vincoli domestici continuano ad essere principalmente assegnati alle donne, influenzando il maggior tempo trascorso "recluso" a casa o nelle loro mobilità esterne, principalmente per ragioni di cura degli altri membri delle loro famiglie.

Questa mobilità della cura, prevalentemente a carico delle donne, è permeata di sfide fisiche, psicologiche e sociali, le quali non possono essere trascurate, come la diminuita concentrazione durante i viaggi che incrementa il rischio di incidenti, ponendo un pericolo per le *caregiver*, le persone che esse accompagnano e più in generale tutti coloro che si trovano sulla stessa rotta. Ulteriormente, un punto chiave che richiede un cambiamento significativo riguarda le condizioni di impiego, dove le responsabilità domestiche e di cura sono spesso attribuite alle donne a causa del minor tempo dedicato al lavoro retribuito extra-domestico. Questa dinamica contribuisce alla distinzione tra i generi nei viaggi legati alla cura.

Nonostante la grande rilevanza dei viaggi legati alla cura, questi viaggi sono spesso trascurati nella pianificazione dei trasporti, mentre i viaggi per l'impiego sono ben considerati. Questa negligenza aumenta la dipendenza delle donne dalle auto private, con rischi significativi, specialmente quando viaggiano con bambini. Affrontare queste problematiche e promuovere

una distribuzione più equa delle responsabilità di cura richiede una riconsiderazione profonda delle norme sociali e delle aspettative di genere.

Nelle conclusioni si suggerisce che è necessario un approccio integrato alla mobilità, che coinvolga condizioni di lavoro più equilibrate, pianificazione urbana orientata alla famiglia e inclusione di prospettive di genere nella pianificazione dei trasporti. Questa trasformazione dovrebbe estendersi attraverso i vari campi disciplinari coinvolti nello studio e nella pianificazione di mobilità e trasporto così da affrontare efficacemente le disparità di accessibilità e promuovere una società più inclusiva.



# 1. Introduction

## 1.1 Background and motivation

Every individual faces an own set of transport, spatial, and temporal constraints when trying to access necessary destinations. Men and women exhibit distinct travel behaviours in terms of transportation modes, timing, destinations, distances and purposes of travel (e.g. Craig & van Tienoven, 2019; Kwan, 1999). However, these differences are often overlooked in current transport policies, leading to implications such as time poverty and uneven access to essential services, particularly for women. In many Western countries, men are more likely to travel by car, while women often rely on traveling by public or active transport (e. g. Hanson, 2010; Miralles-Guasch et al., 2016; Rosenbloom, 2021). Moreover, women typically engage in unpaid labour trips such as shopping or childcare, reflecting the gender-based division of labour within families and communities (Madariaga, 2013; Ravensbergen et al., 2023). Consequently, women's daily mobility needs are often characterized by shorter, more frequent, and dispersed trips, often involving carrying bulky loads and accompanying children or elderly relatives. Thus, gender significantly influences spatial accessibility and mobility, shaping various aspects of daily travel patterns. However, this gendered nature of responsibilities related to childcare and household maintenance, which also necessitate travel, is often overlooked in the traditional transportation planning which has historically centred around peak-period commuting activities (e.g. Madariaga, 2013; Ravensbergen et al., 2023). Consequently, the spatial accessibility and mobility of care are far from gender neutral.

Similarly at academic level, spatial accessibility and mobility research is often affected by a gender gap. Existing mobility data often lacks quality and openness, leading to underrepresentation or exclusion of certain groups, particularly women. This reveals the pervasive omission of women in data used for development, services and treatments. In the realm of transport geography and planning, where historically a high proportion of men dominate, this gender bias results in recommendations and conclusions that neglect the needs of many women. While some studies have started acknowledging aspects of this gap, there is a need for a systematic and comprehensive guide that encompasses all facets of data collection in the context of gender and everyday mobility (Kawgan-Kagan, 2023). Moreover, as several studies considered gender differences in travel patterns and modes, much less studies are made regarding the spatial accessibility (see Section 2.1) and mobility of care

(see Section 2.3), especially in rural areas where temporal and spatial constraints tend to increase due to the further distances to cover to reach essential services.

Furthermore, the role of gender in spatial accessibility and mobility of care is significant due to its relevance at both global and local levels. As such, this research touches upon several Sustainable Development Goals (SDGs) of the United Nations (United Nations, 2015). First, the United Nations recognizes that marginalized groups, including women, face challenges in accessing mobility services, which can lead to exclusion. Moreover, transportation plays a pivotal role in gender equity, presenting distinct challenges for women, both as contributors to and users of sustainable transport. So, the thesis aligns with SDG 11 “Sustainable cities and communities”, which focuses on providing safe, affordable and accessible transport systems, particularly emphasizing the expansion of public transport to cater to the needs of vulnerable populations, including women. Also, the thesis contributes to addressing gender equity issues, aligning with SDG 5, which underscores the importance of recognizing and valuing unpaid care and domestic work for promoting gender equity. Additionally, it includes SDG 10 that aims to empower and promote the inclusion of individuals from diverse backgrounds, irrespective of age, gender, disability, or socioeconomic status. This aspect includes both women and inhabitants of rural areas who face challenges related to temporal, spatial and economic constraints in daily mobility and accessibility.

Integrating these SDGs into the research framework highlights the relevance in addressing gender differences in spatial accessibility and mobility of care within transportation systems for advancing these broader objectives of sustainability and equity.

## **1.2 Objective of the research**

The objectives of the thesis are to investigate the gender dynamics of daily spatial accessibility and mobility of care in rural areas. The study is grounded in the conceptual framework of accessibility as defined by Geurs and van Wee (2004), which defines accessibility as “*the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)*”. For the purposes of this study, this definition will be specifically referred to as “spatial accessibility”. Additionally, the study draws upon the concept of the mobility of care, as outlined by Madariaga (2013), which encompasses all travel necessary for the execution of care work. Specifically, care work is defined as the unpaid labour undertaken

by adults responsible for children and other individuals incapable of independent physical mobility, as well as the tasks required for household maintenance (Madariaga, 2013).

Thus, the thesis aims to address the following research questions:

1. *What are the main aspects of spatial accessibility and mobility of care according to literature?*
2. *What are the primary gender-based differences in the spatial accessibility in the rural village of Mühlwald (South Tyrol, Italy)?*
3. *What are the main gender differences in the mobility of care in the rural village of Mühlwald (South Tyrol, Italy)?*
4. *What are the experiences and challenges related to the mobility of care in rural villages in South Tyrol?*

To achieve this goal, the thesis adopts an exploratory mixed-method approach, combining quantitative and qualitative analyses. The quantitative analysis encompasses both spatial accessibility and mobility of care, using data gathered from a travel diary survey conducted in the rural village of Mühlwald (South Tyrol, Italy). The sample comprises 119 surveys, with 51 male and 68 female respondents, which are adjusted according to the research objectives.

In addition, following the quantitative analysis of gender-based differences, the thesis conducts a qualitative exploration of caregivers' experiences and challenges in implementing the mobility of care. Semi-structured interviews have been conducted in six rural municipalities in South Tyrol that share similar characteristics with Mühlwald. Here, the sample encompasses 12 women aged 25 until 55-year-old and involved in the mobility of care. The interviews aim to explore challenges and experiences and understand perspectives on alleviating these challenges, particularly through promoting gender equity in domestic and caregiving responsibilities.

### **1.3 Structure of the research**

In line with the research objectives, the thesis follows a structured progression outlined as follows. Chapter 2 initiates with an in-depth literature review focusing on the concepts of spatial accessibility and the mobility of care. This section provides a comprehensive understanding of the theoretical framework underpinning the study. Then, Chapter 3 transitions to the methodological aspects of the research, delineating the mixed-method approach adopted. Detailed explanations are provided regarding the research process,

including data collection methods, sampling procedures, and the instruments utilized for both quantitative and qualitative analyses. Building upon the methodological foundation established in Chapter 3, Chapter 4 introduces the case study conducted in South Tyrol, dividing it in study area for the quantitative and qualitative research, furnishing contextual information essential for comprehending the intricacies of the research context. Next, Chapter 5 reveals the quantitative findings derived from the analysis, elucidating general gender differences in spatial accessibility, and exploring gender disparities in the mobility of care. In Chapter 6, attention shifts to the qualitative findings, where challenges and experiences encountered during caregiving-related trips are systematically categorized. Additionally, this chapter sheds light on perspectives aimed at mitigating the challenges associated with the mobility of care. To sum up, Chapter 7 discusses the results obtained from both quantitative and qualitative analyses, fostering a holistic understanding of the research findings. In conclusion, Chapter 8 encapsulates the thesis providing concluding remarks, offering insights into further research considerations, and presenting recommendations for future policy and practice.

## **2. Literature Review**

### **2.1 The concept of spatial accessibility**

Throughout this study, the term "accessibility" is referred to as "spatial accessibility". While the cited authors discuss accessibility in general, this study employs the term "spatial accessibility" to ensure clarity in its use.

This section aims to provide a clear understanding of spatial accessibility by comparing it to the concept of mobility and elucidating the distinctions between the two concepts. The definition of accessibility and its components, and various measures for assessing it, are discussed. The section also addresses the constraints faced by individual within society, highlighting the need to comprehensive accessibility solutions to promote equity for all.

#### **2.1.1 Definition of spatial accessibility**

Accessibility, as defined by Hansen in 1959, refers to the "potential for interaction," while mobility pertains to the "potential for movement" (Hansen, 1959). So, good mobility refers to the ability to move around, while poor mobility indicates the inability to do so. In contrast, good accessibility means having easy access to necessary destinations, with options nearby

and various modes of transport available. Poor accessibility, on the other hand, implies distant destinations, limited choices, and restricted modes of transportation (UC Davis Institute of Transportation Studies, 2019). It is important to note that spatial accessibility and mobility, although related, can exist independently. For instance, urban areas might have good accessibility despite limited mobility options, whereas rural areas might offer good mobility but lack diverse destination choices. Understanding these distinctions is crucial in transport planning, as the approach varies significantly based on whether the focus is on mobility or accessibility. Also David Banister (2008), compared mobility to accessibility by highlighting this latter as a key element in transitioning from conventional planning to a sustainable approach<sup>1</sup>.

In this context, accessibility is defined as people's ability to obtain what they need (Handy & Niemeier, 1997), which contrasts with traditional mobility that centres on people's ability to move around. Mobility-oriented planning often prioritizes vehicle convenience, leading to increased roads and congestion, creating a harmful cycle (UC Davis Institute of Transportation Studies, 2019). The use of private cars has spread social networks and consumption practices through urban sprawl, everyday commuting between home and work, and the occasional touring and consuming of new places (Larsen, 2013).

Whereas accessibility-oriented planning prioritizes "liveability" by focusing on people's needs and reducing the necessity to drive. By emphasizing accessibility, there is a potential decrease in driving demands, leading to reduced road construction needs and breaking the vicious cycle of congestion. This approach involves creating shorter distances to essential destinations, fostering the concept of "neighbourhood life" where social networks are based on close geographical proximity (Larsen, 2013). Examples like "Stadt der kurzen Wege" (Wegener, 1999), the 15-minute city, and remote work align with accessibility-oriented planning. These concepts aim to fulfil people's needs without compelling them to travel long distances. On the contrary, constructing remote residential districts increases mobility without significantly improving spatial accessibility since people must cover large distances to access necessities like workplaces and services.

Thus, the desired paradigm shift necessitates transitioning from high-carbon lives, characterized by daily commuting and extensive travel, to more sustainable low-carbon lifestyles (Larsen, 2013). Moreover, it is relevant to redefine transport planning, focusing on

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<sup>1</sup> According to Banister (2008), the sustainable approach requires actions to reduce the need to travel (fewer trips), encourage modal shift, reduce the length of trips, and encourage greater efficiency in the transport system.

spatial accessibility in order to enable people to access what they need without relying heavily on mobility and thereby contribute to a more sustainable and environmentally friendly environment.

### **2.1.2 Components of spatial accessibility**

Grounding on the abovementioned concept, spatial accessibility may be operatively defined as “*the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)*” (Geurs & van Wee, 2004). Accordingly, the level of spatial accessibility experienced by an individual depends on four components: the land-use, transport, temporal and individual components (see Figure 1).

1. **The land-use component** regards the availability, quality, and spatial distribution of opportunities (as shops, jobs, other facilities) in a place. It includes the spatial distribution of provided destinations and their characteristics, such as the placement of offices, schools, and their respective qualities and capacities. Moreover, it comprises the spatial distribution of the demand for activities and their characteristics, such as the locations of residences and the people who reside there. Consequently, the dispersion of available opportunities significantly impacts the accessibility level to those opportunities. Additionally, the spatial distribution of the demand for these opportunities also plays a role in determining accessibility, particularly when there are limitations on the capacity of these opportunities. For instance, if all employment opportunities and residential areas are evenly spread across a given region, each resident enjoys an equivalent level of access to job opportunities. Conversely, when all jobs are concentrated in the central area of a region, individuals living in proximity to the centre have high access to employment opportunities, while those residing on the outskirts experience lower spatial accessibility levels (Geurs & Ritsema van Eck, 2001).
2. **The transport component** comprises the temporal and monetary costs and effort demanded for an individual to travel from origin to destination using a specific (combination of) transport mode(s). So, it consists of the supply of the infrastructure, its location, and characteristics such as travel speed, timetables and costs and its demand. The ease to travel from an origin to a destination can vary among individuals due to elements such as the amount of travel time (i.e. includes

transfers, congestions, parking, waiting), travel costs (i.e. includes the fixed costs like driver's licence, car purchase, insurance and variable costs like fuel, parking and fares), and effort (i.e. includes the physical effort, safety, reliability, stress and accident risk; Geurs & Ritsema van Eck, 2001).

3. **The temporal component** reflects the time available to participate into activities; as well as the time the availability of these activities to be performed at different times of the day or weeks or seasons (e.g., opening hours of facilities). The time component is strictly related to the land-use component, since an individual is only able to be at one location at a given time and the travel to it consumes time. Hägerstrand (1970) introduced the space-time studies which are now included in the concept of accessibility.
4. Finally, **the individual component** includes the needs, abilities, and opportunities of the individuals depending on their specificities. Regarding the first element, people have different needs for travel and access to opportunities which depend on age, income, education level, phase in life, and household situation. For instance, households with children will have a need for access to school. Concerning the second element, the abilities of people are related to the level of physical and psychological capacities. For instance, owning a private car or having physical disabilities to ride a bike. Whereas the third element, namely opportunities, are related to the economic aspect of income and travel budgets. For instance, an individual who cannot afford to own a private car is thus dependent on public or active modes of transport.

According to Geurs & van Wee (2004), the accessibility of a location is the result of these four components. Besides influencing spatial accessibility, these four components influence each other.

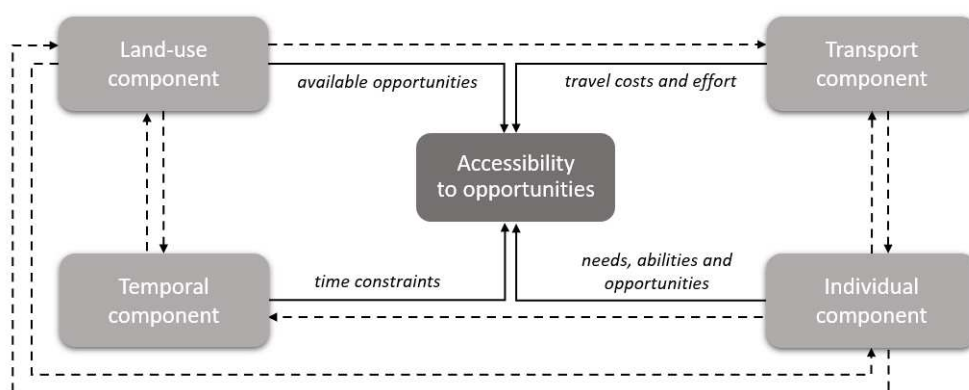


Figure 1. The concept of accessibility according to Geurs and Van Wee (2004)

For instance, the distribution of opportunities influences the spatial distribution of the transport demand, but it may also impose time restrictions and influences the needs of individuals. Moreover, accessibility may also influence the components since it influences for instance the travel demand and people's economic and social opportunities.

### **2.1.3 Person-based perspective of spatial accessibility**

According to the four components, spatial accessibility can be analysed through a **person-based perspective** that considers the accessibility at the individual level, such as the activities in which an individual can participate at a given time. This type of approach is founded in the space–time geography of Hägerstrand (1970) that measures limitations on an individual's freedom of action in the environment, i.e. the location and duration of mandatory activities, the time budgets for flexible activities and travel speed allowed by the transport system. This person-based approach stands as an effective tool for uncovering the constraints and limitations experienced by individuals, the central focus of this study. Critics have previously argued that this approach, characterized by its space-time prism<sup>2</sup>, appeared overly focused on the physical aspects of mobility while neglecting the emotional and personal dimensions of people's experiences (Baker, 1979). However, it is essential to recognize that this approach effectively merges the dimensions of space and time, providing a framework for understanding the individual mobility constraints by treating activities as dynamic processes (Lenntorp, 1999; Thrift N., Pred A., 1981). Moreover, this approach transcends the boundaries of a mere modelling technique, functioning as a philosophical perspective and a mode of understanding mobility. From this approach emerges the person-based perspective, which stands out for its capacity to acknowledge the diverse spatial and temporal constraints that influence individuals' accessibility. Unlike other measures, it does not assume people in the same area have equal opportunities to move, access services, or choose travel modes. Indeed, understanding individual spatial accessibility requires considering not just spatial and temporal constraints, but also transport-related limitations that vary among individuals. By taking into account these multifaceted factors, a holistic understanding of individual accessibility can be achieved, recognizing the unique needs, abilities, and opportunities of each person.

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<sup>2</sup> The space-time prism is a three-dimensional geometric shape that visualizes the limits of an individual's movement in both space and time. The base of the prism represents the geographical area where the person is located at a specific point in time, and the vertical axis represents time. The space-time prism shows the feasible locations a person can reach within a certain duration, taking into account factors such as travel speed, mode of transportation, and geographical obstacles.



#### 2.1.4. Individual spatial accessibility constraints across social groups

Understanding the daily spatial accessibility of various social groups in a shared geographical area requires a nuanced exploration. Dianin et al. (2022), emphasise that an individual's spatial accessibility is intricately woven into a complex interplay of spatial, temporal, and transportation constraints. Certain journeys might be inaccessible to some individuals due to unique limitations not experienced by others.

A comprehensive understanding of individual spatial accessibility necessitates a review of existing literature, particularly focusing on socio-demographic factors influencing these constraints. The following section enlighten the transport, temporal and spatial constraints experienced by different social groups.

##### 1. *Transport constraints*

The main transport constraints regard the speed of the travel and the monetary cost of the travel. The former directly impacts travel time while the latter affects the out-of-pocket costs. Both these transport constraints are influenced at individual level by a series of factors.

The **speed of the travel** is significantly influenced by the access to private car (Jones & Lucas, 2012; Morris et al., 2020), since the car is often more flexible and quicker than other transport modes (especially in non-urban areas). Some population groups such as the elderly, young people, low-income households tend to have limited access to private car, either because they cannot drive, or because they have no driving license or cannot afford the costs of owning a car (Brown, 2017; Grisé et al., 2019). As such, these population groups mostly rely on public transport, which can lead to additional constraints for some of them. For instance, people that have to travel during off-peak hours have limited services available; foreigners face linguistic and informational barriers, while women and transgender people tend to perceive stronger fear and insecurity (Delbosc & Currie, 2011; Mackett & Thoreau, 2015; Preston & Rajé, 2007). High-speed trains railways (HSR) are noted for their advantages in terms of travel time savings, attracting passengers based on factors such as travel time, service frequency, comfort, and reliability (Ren et al., 2020). However, HSR are mostly connecting relevant urban areas without considering residents of rural areas.

The **monetary cost of travel** is influenced by the condition of forced car ownership, which affects in particular individuals who need to own a car to meet their daily needs but would prefer to avoid it because of economic restrictions (Mattioli, 2021). Furthermore, high-speed train fares can be significantly higher due to the speed advantage, making travel cost an important factor for mode choice and thus marginalized due to their inability to afford HSR

services (Ren et al., 2020). Population groups such as low-income households, especially living in suburbs or rural areas are often taken as examples, since they highly depend on private car but have limited capacity to afford it (Carroll et al., 2021; Currie & Delbosc, 2009; Mattioli, 2021; Morris et al., 2020).

## *2. Time constraints*

Another relevant constrain regarding an individuals' spatial accessibility is the time constraints that comprise the duration of activities, and the degree of time fixity of activities. All of them influence the transport choices of individuals, and they also limit the possibility to access opportunities. The main factors influencing these three kinds of time constraints are the following.

The **degree of participation in discretionary activities** tends to lead to higher spatial accessibility (Dharmowijoyo et al., 2020; Fransen et al., 2018). Due to social and economic reasons, groups such as low-income people, elderly and more generally people without access to private vehicles tend to participate less in such activities (Krizek & Waddell, 2002; X. Lu & Pas, 1999; Shergold & Parkhurst, 2012). Furthermore, the occupational status (part-time or full-time workers) plays a relevant role since the more time an individual has to engage in fixed activities, the less time is available to perform complementary activities (X. Lu & Pas, 1999; Neutens et al., 2013).

**Coupling constraints**, namely the limits caused by the needs of other people or by the opening hours of facilities, affect the amount of activities carried out and the amount of opportunities encountered by an individual during the day. On the one hand, coupling constraints related to individuals encompass all the fixed activities a person has to perform to meet the needs of others (Hägerstrand, 1970; Schwanen, 2008). It is typical for e.g. parents and other adult members of households with more children, who have to escort them to their daily activities with side effects on their own spatial accessibility (Kwan, 1999; Neutens et al., 2011). This issue is strictly linked to the activities that are typically assigned by society to gender. In demographic terms, it affects in particular women, who are more often engaged in childcare (Kwan, 1999; W. Lu et al., 2014; Pillay, 2003). On the other hand, coupling constraints related to opportunities are influenced not only by the individual time budget but also by the time-related availability of the facilities (e.g., the opening hours of grocery shops). A temporal mismatch between fixed or flexible activities and the opening hours of opportunities affect negatively accessibility, especially for people with a full daily schedule (Kim & Kwan, 2003; Neutens et al., 2012; Schwanen & De Jong, 2008).

Finally, the **digitalization of daily activities** plays an increasingly important role for spatial accessibility and especially for the degree of time fixity of activities. As highlighted by Shen et al. (2020), the possibility to access forms of digital work, digital services and e-commerce platforms allows for a flexible management of time, with positive implications for accessibility (Kwan, 2007; Miller, 2005). Some population members tend to be excluded from such benefits, like people who cannot telework, live in places with an insufficient digital infrastructure, or are not familiar with digital technologies (Cavallaro & Dianin, 2022). However, difficulties in balancing digital work and home responsibilities remain, especially for working mothers (Kwan, 2007; Schwanen & De Jong, 2008).

### *3. Space constraints*

Finally, the third constraint regarding an individuals' accessibility is the space constraint. This includes the amount of opportunities at the origin and destination, and the distance between the activities of the daily schedule.

For instance, the **residential location** is one of the main determinants of the amount of opportunities and the distance to reach them for an individual on a daily basis. At a macro level, a rural residential location tends to guarantee a sufficient access to basic facilities whereas more specialised opportunities are typically located in urban centres (Næss, 2006). Moreover, it is quite predictable that the distance from opportunities results in a, on average, longer trip length for rural dwellers than for their urban counterpart (Kim & Kwan, 2003; Mercado & Páez, 2009; Næss, 2006). Also at the micro level, living in e.g. marginal neighbourhoods or hamlets may further affect the access to basic services and the average distance travelled (Ta et al., 2021). Nevertheless, the implementation of virtual access may make the distance between the residential location and the opportunities less decisive (Cavallaro & Dianin, 2022; Schwanen & De Jong, 2008).

**Out-of-home constraints** such as moving to the workplace or to the grocery store might increase the daily amount of opportunities that can be met in the free-time window among fixed activities. Men, young, employed and high income people spend more time out-of-home than women, elderly and low-income people and households with more children (Dharmowijoyo et al., 2016; Susilo & Avineri, 2014). Consequently, the latter social categories tend to experience more limited individual accessibility.

Finally, **domestic constraints**, i.e. activities related to house maintenance and child-care responsibilities that are carried out inside the house, limit space-time accessibility because they lower the amount of opportunities daily encountered (Kwan, 1999; Schwanen, 2008).

The usually most disadvantaged socio-demographic groups in this case are mainly households with children (especially mothers) and low-income groups (that are not able to afford an assistant), but also siblings and grandparents (Dharmowijoyo et al., 2016; Schwanen, 2008; Schwanen & De Jong, 2008).

In summary, individual's spatial accessibility is influenced by multiple variables, including income and gender. This latter factor is explored further in the next section, highlighting its significant role in generating spatial accessibility differences.

#### **2.1.4 Gender-based differences in spatial accessibility**

Gender, among other variables, significantly shapes individual spatial accessibility differences (Kwan, 2000; Lucas et al., 2016; Sheller, 2018). The focus here lies in understanding how it influences the components of spatial accessibility (Geurs and van Wee, 2004). According to the literature, gender impacts spatial accessibility through six additional components, namely by modal choices, psychological influence, car availability, coupling constraints, domestic constraints and out-of-home constraints (see Figure 2).

For instance, a notable gender disparity exists in terms of **driving licenses and private car ownership**, particularly pronounced in the Global South (Hine & Grieco, 2003). Consequently, the availability of personal vehicles directly impacts the individual aspect of accessibility. Limited access to private cars influences daily transportation choices, often compelling women to adopt specific travel modes (Hine & Grieco, 2003).

Furthermore, the restricted availability of private cars has a **significant psychological influence** on women's travel behaviour, potentially leading to feelings of insecurity or discomfort when using certain transport modes. Women tend to be more psychologically affected when making travel decisions, driven by concerns about personal safety in public spaces, such as using public transport or walking alone in isolated areas, especially during late hours. This heightened perception of fear and insecurity can also sway their **mode choice**, discouraging the use of public transportation (Delbosc & Currie, 2011; Mackett & Thoreau, 2015). Women often allocate a substantial amount of time in their daily routines to fulfil roles such as **escorting children** to school or **accompanying family members** to various activities (X. Lu & Pas, 1999; Schwanen et al., 2008). Single mothers with young children, in particular, tend to undertake more trips than the average adult (Lucas et al., 2019). Additionally, socially assigned responsibilities for **domestic and childcare duties** (Kwan, 2000; Schwanen et al., 2008), as well as various **out-of-home constraints**, exert a significant influence on the land-use component of accessibility.

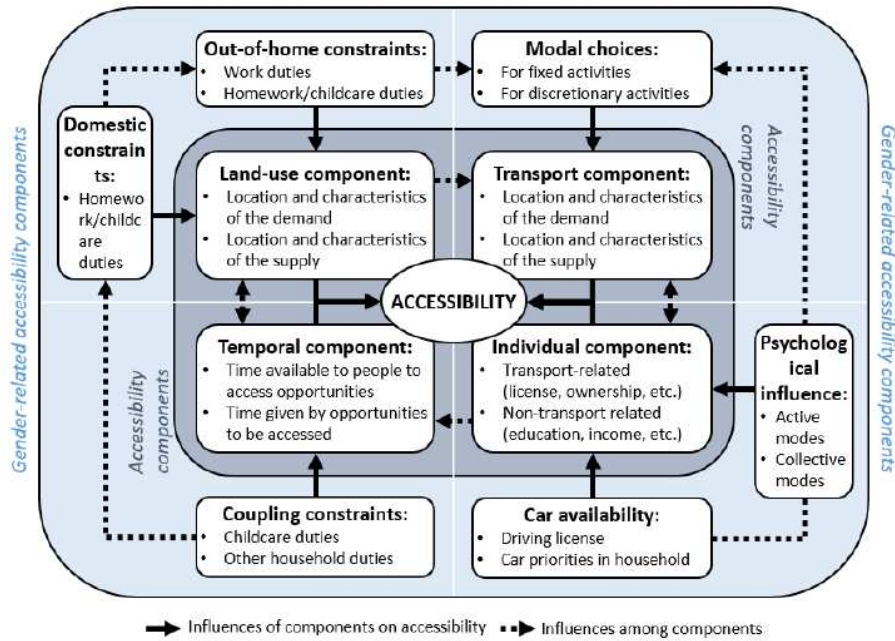


Figure 2. Gender-related accessibility components (elaborated by Dianin A. and Chizzali C.)

Moreover, women frequently engage in **multi-purpose trip chains**, combining various activities within a single journey. For example, they may begin by escorting their children to school, proceed to the bank, and then go shopping. This practice has notable implications for their mode choices and overall accessibility (Lucas et al., 2019). So, women are often travelling under time pressure, and the scheduling in turn affects women's employment, such that it is more likely to be part-time and closer to home than men's employment.

The interconnected elements of domestic constraints, out-of-home responsibilities, and trip chaining can be collectively encapsulated within the overarching concept known as the “mobility of care”, a term introduced by Sánchez de Madariaga in 2013. This concept encompasses all travel associated with caregiving responsibilities, including unpaid duties related to children and other non-autonomous individuals, as well as tasks essential for household maintenance. Recognizing the multifaceted nature of gender-related influences on spatial accessibility and transportation choices, this concept adds a significant dimension to the research focus.

In the upcoming section, the dynamics of the mobility of care, will be further developed, shedding light on how these caregiving responsibilities contribute to shaping gender-specific spatial accessibility challenges and influencing transportation decisions. This exploration aims to provide a comprehensive understanding of the diverse factors at play, contributing to a comprehensive perspective on gender, accessibility, and mobility.

## **2.2 The concept of mobility of care**

In the context outlined, understanding mobility of care is crucial, as it stands out as a major factor shaping gender disparities in spatial accessibility. This section thoroughly explores this concept, focusing on the significant role women play in caregiving activities. The discussion begins by offering a precise definition of the term “mobility of care” and will then delve into important insights drawn from existing literature. Moreover, the prevalent travel modes adopted during mobility of care are reported, enriching the comprehension of the complex interplay between gender, mobility and accessibility.

### **2.2.1 The umbrella concept of mobility of care**

The term mobility of care, coined by Sanchez de Madariaga (2013), encompasses all the travels necessary for the execution of care work. Care work is understood as the unpaid labour carried out by adults responsible for children and other individuals incapable of independent physical mobility, as well as the tasks required for maintaining the household (Madariaga, 2013). This encompasses travels related to a) domestic and b) caregiving responsibilities. The former typically include shopping for daily necessities (excluding leisure shopping), household upkeep, organization and administrative errands (distinct from recreational errands). The latter mostly refer to escorting those who cannot move on their own and visit to care for sick or elderly relatives (different from leisure visits). Conversely, the mobility of care excludes all the employment, education and leisure travels, as well as those carried out for paid employment tasks in the care service sector, whether in the private or public domain (Madariaga, 2013). In this context, the term "caregiver"<sup>3</sup> refers to every individual that is involved in some kind of care-activity, including both domestic and caregiving responsibilities. Figure 3 visually summarises the role of the mobility of care within the different kind of travel purposes as schematized by Madariaga (2013).

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<sup>3</sup> This definition slightly differ to the definition of the Camera dei Deputati. Specifically, this latter focus mainly on the "family caregiver" (Camera dei deputati, 2023) who assumes responsibility for the care of another dependent individual. In this research, the caregiver that provide care for an independent spouse, mainly due to the socially assigned gender roles, is also considered.

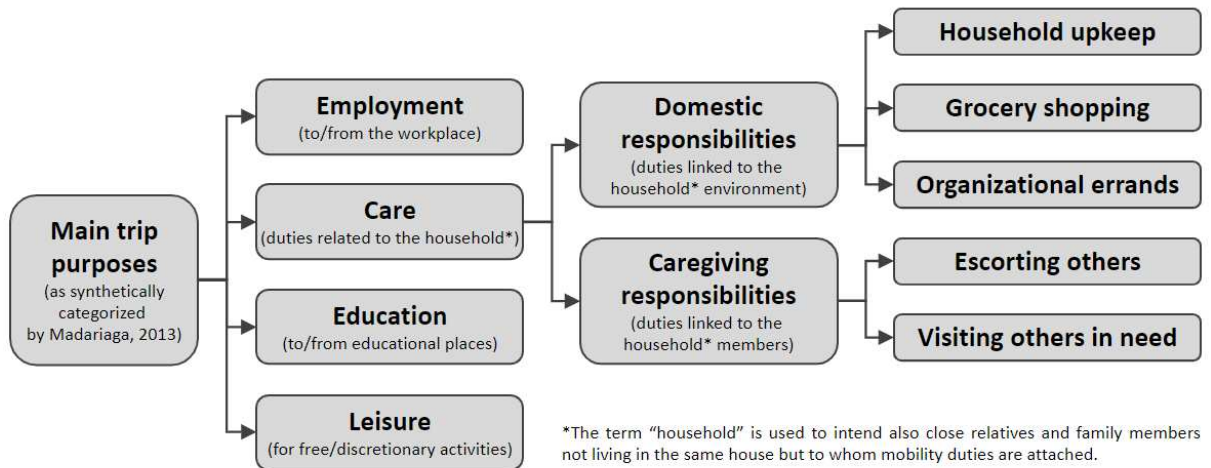


Figure 3. The mobility of care within the classification of trip purposes (elaborated by Dianin A. and Chizzali C.)

Since the “mobility of care” is a relatively recent umbrella concept, its literature includes diverse kind of studies, which focus on specific subtopics such as the household-serving tips (Craig & van Tienoven, 2019; Han et al., 2019; Mauch & Taylor, 1997; Taylor et al., 2015) or the escorting duties, especially those concerning children (Han et al., 2019, Plyushteva & Schwanen, 2018; Schwanen, 2007). According to the literature, the mobility of care tends to be less considered in than the employment-related mobility in transportation planning (Grant-Smith et al., 2017; Madariaga, 2013; Ravensbergen et al., 2023). In several cases, care trips are overlooked in travel surveys because of their typically short distance and tendency to be made on foot (in urban areas), or because they are often performed in a trip chain in which only the origin and destination are considered, while the intermediate stops for care duties do not (de Madariaga & Zucchini, 2019; Maciejewska & Miralles-Guasch, 2019; Mauch & Taylor, 1997; Ravensbergen et al., 2023). Moreover, care trips are often not explicitly addressed in surveys as an own trip purpose. Rather, they are hidden under other categories like leisure or personal travels. According to de Madariaga (2013), these tendencies and lacks in data collection have contributed to the underestimation, devaluation, and invisibility of the mobility of care in transportation planning, especially when it comes to public and active transportation.

Moreover, **the mobility of care, when disaggregated by gender, emerges to be predominantly carried out by women** (Craig & van Tienoven, 2019; Han et al., 2019; Madariaga, 2013; Mauch & Taylor, 1997; Motte-Baumvol et al., 2017, 2017; Murillo-Munar et al., 2023; Ravensbergen et al., 2023; Viana Cerqueira & Motte-Baumvol, 2022). That is without distinction between single or partnered mothers (Han et al., 2019; Mauch & Taylor, 1997), or among working parents. Indeed, even if the amount of working hours is similar,

women tend to spend more time accompanying others (Han et al., 2019). Shuman et. al (2022) found that the gender discrepancies in mobility of care is more evident during peak-hours. Some studies have shown that fathers are more likely to escort children in the morning when school and work starting hours are compatible, whereas it is less probable that they will escort them in other time slots that are not compatible with the work (Motte-Baumvol et al., 2017; Schwanen, 2007; Yarlagaadda & Srinivasan, 2008).

This pattern reflects the ongoing higher responsibility of mothers concerning domestic and caregiving responsibilities (Taylor et al., 2015) which, in turn, affects women's working conditions, as they often opt for part-time employment (de Madariaga & Zucchini, 2019; Havet et al., 2021; Kwan, 1999; Schwanen, 2007; Viana Cerqueira & Motte-Baumvol, 2022).

### **2.2.2 Modes of transport of the mobility of care**

Limited research questions which modes of transport are more used to perform the mobility of care, although extensive research has examined gender differences in modal choices. Despite women generally use public transport more than men (Hanson, 2010; Miralles-Guasch et al., 2016; Revell et al., 2021), this is often not valid for the mobility of care. In Western world nations, the private car emerges as the most commonly utilized mode of transport for caregiving activities. Studies have shown that private car usage is prevalent in these contexts (Carver et al., 2013; Craig & van Tienoven, 2019; de Madariaga & Zucchini, 2019; Hagberg & Holmberg, 2017; Madariaga, 2013; Ravensbergen et al., 2023), while active modes like walking and bicycling, as well as public transport, are less common choices for the mobility of care (Grant-Smith et al., 2017; Ravensbergen et al., 2020).

Conversely, in Global South nations, public transport and informal transport services such as shared taxis, rickshaws, or motorbike taxis are commonly used modes of transport for women, also for caregiving purposes (Turdaliev & Edling, 2018). Additionally, walking is a prevalent mode of transport, especially for short distances in these regions. Despite the general trend of women using public transport more frequently, the choice of transport mode for caregiving tasks varies significantly based on cultural, economic, and geographic factors, highlighting the need for context-specific analyses in understanding mobility patterns.

The prevalence of **private car** in Western countries is mainly linked to comfort and space-time flexibility. The provision of comfort is a crucial factor for care trips, as it is often necessary to carry items such as infant seats or shopping bags (de Madariaga & Zucchini,



2019; Grant-Smith et al., 2017; Ravensbergen et al., 2023). As a result, parenting tends to increase dependence on private cars for daily mobility (Camilleri et al., 2022; Plyushteva & Schwanen, 2018; Schwanen, 2011). Moreover, a growing income and car ownership often lead to a greater likelihood of car travel, especially for school trips (Yarlagadda & Srinivasan, 2008). As regards the flexibility, care trips are often executed within trip chains that require a significant degree of space-time flexibility. Private cars better responds to this need, optimizing time and ensuring punctuality in e.g. escorting their children to school and then reaching other destinations (de Madariaga & Zucchini, 2019; Maciejewska & Miralles-Guasch, 2019; Schwanen, 2011).

**Active modes** of travel, such as walking and cycling are also common modes of travel for domestic and caregiving responsibilities, especially in countries where the law and custom do not allow women to drive. These modes are preferred for short distances (de Madariaga & Zucchini, 2019; Miralles-Guasch et al., 2016; Montoya-Robledo et al., 2020; Murillo-Munar et al., 2023; Ravensbergen et al., 2023). While walking is practical in urban contexts, it requires constant surveillance when escorting children and it can be physically demanding when carrying heavy loads (Gilow, 2020). Cycling is considered beneficial for short care trips, especially in urban and suburban areas (Ravensbergen et al., 2020; Schwanen, 2011). Nonetheless, studies indicate that women in particular tend to choose cars over bikes due to safety concerns and the difficulty of transporting children or groceries, especially if these trips are within trip chains (Dickinson et al., 2003; Emond et al., 2009; Montoya-Robledo et al., 2020; Ravensbergen et al., 2020).

Compared to other modes of transportation, the use of **public transport** for the mobility of care has been underexplored. Nevertheless, some examples may be mentioned. For instance, informal transport services, such as *marshrutkas*<sup>4</sup>, rickshaws or motorbike taxis are dominant for women's travel in Global South nations (Turdaliev & Edling, 2018). Additionally, research has explored the potential role of demand-responsive services in meeting women's transportation needs (Al-Rashid et al., 2020, Guiliano, 1979). Other studies have further developed this line by examining to what extent domestic and caregiving trips rely on PT and identifies barriers like perceived unsafety of women in public spaces (De Madariaga & Zucchini, 2019), and the need to fulfil (hardly predictable) trip chains. Furthermore, other

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<sup>4</sup> *Marshrutkas* are essentially shared minibuses or vans that operate along specific routes, picking up and dropping off passengers at designated stops. They are known for their flexibility, as they can navigate through narrow streets and reach areas that might be challenging for larger buses. *Marshrutkas* are widely used in both urban and rural areas, providing a vital means of transportation, especially in regions where formal public transportation systems might be limited or underdeveloped.

studies have linked the mobility of care with the principles of “child-friendly cities”, emphasizing the importance of considering children’s rights in public transport planning, so as to meet also women's travel needs (Grant-Smith et al., 2017). Grant-Smith et al. (2017) highlights also the difficulties associated with performing multimodal trips when carrying children, prams, or shopping bags or the discomfort related to waiting for public transport with children in bad weather or unsafe environments.

### 2.2.3 Spatial context of mobility of care

The mobility of care is mainly explored in urban contexts (e.g. Kwan, 1999; Madariaga, 2013; Motte-Baumvol et al., 2017; Murillo-Munar et al., 2023; Plyushteva & Schwanen, 2018; Ravensbergen et al., 2020, 2023; Schwanen, 2007; Schwanen & De Jong, 2008; Shuman et al., 2022), and less in suburban (Dickinson et al., 2003; Havet et al., 2021; Maciejewska & Miralles-Guasch, 2019;) or rural areas (Carver et al., 2013).

These studies carried out in urban areas show that domestic-related care trips, such as grocery shopping or other errands, are often carried out by active modes in urban areas due to shorter distances and flat terrain (Schwanen, 2011; Hagberg & Holmberg, 2017). Nevertheless, the frequent visit of local grocery stores has shifted to fewer, larger trips to bigger shopping centres (de Madariaga & Zucchini, 2019), leading to an increase in car usage for these trips. In a similar way, concerns about safety have led to a growing trend of escorting children are by car, even for short distances (Carver et al., 2013).

**Suburban** areas, characterized by lower density, triggers the use of car due to longer distances, extended travel times and the flexibility private vehicles offer for trip chaining (de Madariaga & Zucchini, 2019, Maciejewska & Miralles-Guasch, 2019; Havet et al., 2021). Moreover, cultural norms emphasizing child safety often prompt caregivers in suburban areas to opt for the car as their preferred mode of transportation (Schwanen, 2011). Moreover, limited access to essential services and a lack of nearby public transport that often affect western suburbs further promote car dependence, leading to a doubling of care-related trips made by car compared to urban centres (de Madariaga & Zucchini, 2019).

In **rural area**, especially in mountainous areas where elevation might impact care trips and modal choices, the mobility of care is less explored. While studies like Carver et al. (2013), Vovsha & Petersen (2005), or Miralles-Guasch et al. (2016) have compared gender differences in travel patterns between urban and rural contexts, few have specifically focused on mobility of care. Carver et al. (2013) and Vovsha & Petersen (2005) provide instead a more direct focus on rural care trips. They highlight how the distances between origin and

destination increase—markedly in rural areas also for care trips. For instance, the distance between home and school may double compared to the urban areas (Carver et al., 2013). However, they also note that urban children are more likely to be accompanied by car than rural children, who often rely on school buses (Carver et al., 2013; Vovsha & Petersen, 2005). These findings refer to a very limited group of studies, therefore they cannot easily generalise.

Furthermore, nation-wide reductions in bus subsidies, rural communities (especially in the UK), particularly those without car access (predominantly comprising older individuals, people with disabilities, and those with low incomes), face diminished public transport options. With reduced bus services, there is a growing reliance on community transport – local, not-for-profit initiatives, predominantly managed by volunteers. While community transport is often categorized as informal, it deviates from the entrepreneurial model typical of many informal transport schemes. Instead, these schemes originate within communities and are characterized by a care-driven ethos. Volunteers, constituting the backbone of these initiatives, contribute skilled labour as an expression of caring about, caring for, or care giving. This distinctive framing unveils the undervaluation of community transport, evident in both the underfunding of labour and the schemes themselves, as well as the lack of recognition they receive (Ravensbergen & Schwanen, 2023).

In summary, research on the mobility of care has primarily on urban areas, emphasizing the predominance of private cars, as well as the opportunities and challenges of active modes and public transport. Suburban areas have also been studied, although more limitedly, and they tend to exhibit an increasing car dependency in care trips due to extended travel distances/times, limited public transport access, and modified habits regarding e.g., grocery shopping. Finally, the mobility of care is currently underexplored in rural areas, especially in those areas with challenging topographies. Therefore, it is hard to make a generalisation of findings, although some studies have revealed how care-related services like school buses may relieve caregivers of part of their duties.

The empirical analysis of this research aims to open a discussion around the underexplored elements, by focusing on the mobility of care in a rural study area in South Tyrol (Italy), and the challenges faced by caregivers in such area.

## **2.3 Gender equity in spatial accessibility and mobility of care**

### **2.3.1 Definition of equity**

Equity is a term that is occasionally conflated with "equality," which implies equal treatment, rights, and opportunities for all individuals. However, equity, directs our attention toward disparities experienced by different individuals and groups, as well as what they should rightfully receive or enjoy (Bruzzone et al., 2023). The Cambridge Dictionary (2023) defines equity as "the situation in which everyone is treated fairly according to their needs, with no group of people receiving special treatment."

Equity can typically be examined through three distinct dimensions:

- i) distribution (concerned with the allocation of benefits and burdens, or the provision of 'goods' and 'bads' to individuals),
- ii) recognition (which deals with how individuals are addressed and interact, both as individuals and as members of specific groups), and
- iii) representation (involving the ability of individuals and groups to influence decisions that affect their lives (Bruzzone et al., 2023)).

### **2.3.2 Distributive justice**

When equity is considered within the context of distribution, it encompasses a wide range of topics. Transport planning plays a crucial role in the allocation of various tangible assets (e.g., transportation infrastructure) and intangible benefits (e.g., travel speeds and accessibility) to the population. Simultaneously, transport infrastructure can result in negative impacts, such as noise pollution, local air pollution, climate-related consequences, and safety risks.

Vulnerable social groups are often affected by the disbenefits of the mobility resources and the accessibility that these provide. Sheller (2018) states that socio-demographic characteristics such as class, ethnicity, nationality, age, gender, and capabilities to move, influence an individuals' mobility and, consequently, accessibility. According to Sheller's theory, individuals vary in their mobility capacity; some are confined or immobile, while others can move with varying degrees of freedom, at different speeds, with diverse levels of safety, flexibility, ease, friction, and exposure to danger. Thus, the transport component of spatial accessibility is not a passive artifact but actively shapes societal privilege and disadvantage. Indeed, as stated by Martens (2021) the transport planning is a mean to

promote socio-economic equity; whereas equity may be an impact of or a goal for transport planning.

To analyse the concept of distributive justice further, the definition of accessibility by Geurs and van Wee (2004) is adopted, which describes accessibility as "*the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)*" (Geurs & Van Wee, 2004, p. 128). In this context, it is essential to recognize that spatial accessibility naturally varies across society, and providing equal access to all destinations for all people is an impractical goal (Van Wee, 2022).

Disparities in the distribution of goods and services does not necessarily mean inequity. However, disparities in spatial accessibility between social groups are often perceived as unfair and give rise to considerations of justice, often framed by the application of a normative benchmark. In essence, inequality becomes inequity when it is linked to what is morally proper or just. So, the achievement of a morally proper distribution of goods and burdens among members of society is relying on normative judgments, which can be influenced by cultural factors (Van Wee, 2022).

### **2.3.3 The need for gender equity**

Gender disparities in spatial accessibility and the mobility of care are intricately linked to deep-seated societal inequities. These disparities frequently arise from entrenched norms, cultural biases, and systemic inequalities that limit opportunities and resources available to individuals based on their gender. Women, in particular, often face unique challenges related to caregiving responsibilities, resulting in limited access to essential services, education, and employment opportunities. Social expectations and traditional gender roles further perpetuate these disparities, restricting women's mobility and access to public spaces. Economic disparities and unequal distribution of resources also compound the issue, creating barriers to affordable transportation and hindering women's ability to participate fully in societal activities.

Moreover, transportation systems and urban infrastructures are often designed without considering the specific needs and safety concerns of women, exacerbating their vulnerability and limiting their freedom of movement. Lack of accessible public transportation, inadequate lighting in public spaces, and concerns about personal safety further restrict women's mobility, particularly during specific times of the day. Addressing these disparities requires a comprehensive approach that challenges societal norms,

promotes gender equity, and ensures accessible and safe transportation options for everyone, regardless of their gender. Only by dismantling these underlying inequities can societies truly achieve equal access to mobility and caregiving responsibilities for all individuals.

### **3. Methodology**

The following methodological part is divided into three main parts: 1) mixed methods, 2) quantitative research and 3) qualitative research. First, a short framework and definition of the mixed methods used for this study is outlined. This approach is used to get a comprehensive and deeper understanding of the topic.

Then on the one side, the quantitative research is structured into two parts, regarding i) the gender-related differences in daily spatial accessibility and ii) the gender-related differences in the mobility of care. The quantitative research is based on data collected in the rural village of Mühlwald in South Tyrol through a travel diary survey implemented by a separated project named RAAV (see Section 3.3).

On the other side, the qualitative research delves deeper into the mobility of care through semi-structured interviews in rural villages of South Tyrol that aim to understand the experiences and challenges of individuals involved into the mobility of care and these challenges could be alleviated. (see Section 3.3).

#### **3.1 Mixed methods**

Mixed methods research, born out of a need to overcome the limitations of relying solely on qualitative or quantitative approaches, integrates both methods within a single study. This approach, popularized in the late 20th century by scholars like John Creswell (Creswell & Clark, 2007), allows researchers to address complex research questions more comprehensively.

However, the implementation of mixed methods has experienced several challenges, primarily stemming from what is known as the "paradigm wars" among purists in both quantitative and qualitative research (Oakley, 1999). Quantitative purists, often identified as positivists, argue for the treatment of social observations as entities similar to how physical scientists handle physical phenomena. They maintain a belief in the separation of the observer from the observed entities, advocating for objectivity in social science inquiry. On the other hand, qualitative purists, also known as constructivists and interpretivists, reject

positivism. They assert that multiple constructed realities exist, question the possibility of fully differentiating causes and effects, and favour an inductive approach where explanations emerge from the data. Qualitative purists also express a preference for a writing style that is detailed, rich, and thick, eschewing a detached and passive approach in favour of direct and somewhat informal expression (Johnson & Onwuegbuzie, 2004).

As a result of these considerations, proponents of purism put forth the "incompatibility" thesis, asserting that the philosophical foundations of quantitative and qualitative research, namely positivism and relativism, are so inherently divergent that integrating them into a single study is unfeasible. This assertion is based on the belief that the distinct languages employed in these approaches make translation between them impossible (Johnson & Onwuegbuzie, 2004; O'Reilly & Kiyimba, 2015). However, contemporary research challenges this notion, suggesting that mixed methods can be regarded as a viable third approach, allowing for the integration of both quantitative and qualitative methodologies. This shift is associated with the emergence of pragmatism, emphasizing the compatibility of both methods to attain a comprehensive understanding of the research issue (Walliman, 2021). Importantly, the aim of mixed methods is not to replace either of the two approaches but to leverage their respective strengths and mitigate limitations.

So, mixed methods research is formally defined here “as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (Johnson & Onwuegbuzie, 2004).

In this study, the chosen approach for employing mixed methods is the sequential explanatory method (Walliman, 2021). This entails initially collecting and analysing quantitative data, followed by the incorporation of a qualitative method to provide additional explanation and interpretation of the results.

## **3.2 Quantitative study**

### **3.2.1 Data collection**

The quantitative research relies on data gathered through the RAAV<sup>5</sup> project. The Rural Areas and Autonomous Vehicles (RAAV) project seeks to explore the potential transformation of limited accessibility in rural areas by investigating the spatial accessibility

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<sup>5</sup> For more information about the project check out the following websites: <https://pf.fwf.ac.at/en/research-in-practice/project-finder/52219> or <https://www.eurac.edu/en/institutes-centers/institute-for-regional-development/projects/raav>.

implications of automated vehicles (AVs). The data were collected via a travel diary survey conducted in the municipality of Mühlwald.

### 3.2.2 Sampling

Every household of the municipality of Mühlwald received an invitation letter and each resident had the option to voluntarily participate in the travel diary survey. Therefore, the sampling method employed was non-probabilistic, specifically utilizing voluntary response sampling, commonly known as self-selection sampling. This method relies on individuals' voluntary decision to partake in a survey or research study. Over the years, this approach has gained prominence, particularly with the widespread use of online surveys and social media platforms. Its popularity surged in the digital age, facilitated by the accessibility provided by the internet and online survey platforms.

Voluntary response sampling allows researchers to swiftly reach a broad audience at a relatively low cost. However, participants are not selected by the researchers; instead, they choose to engage based on their interest, motivation, or personal perspectives related to the survey topic. While cost-effective, this approach leads to sample bias, rendering it non-representative of the entire population (Hassan, 2023).

A total of 119 surveys were conducted, encompassing 20 minors (<18 years old), 79 adults (aged 18 to 65 years), and 20 elderly individuals (>65 years old). Of the respondents, 51 were male (including 13 minors, 29 adults, and nine seniors) and 68 were female (comprising seven minors, 50 adults, and 11 seniors). The survey results underscored a notably higher level of participation from females, particularly among the adult age group (see Figure 4).

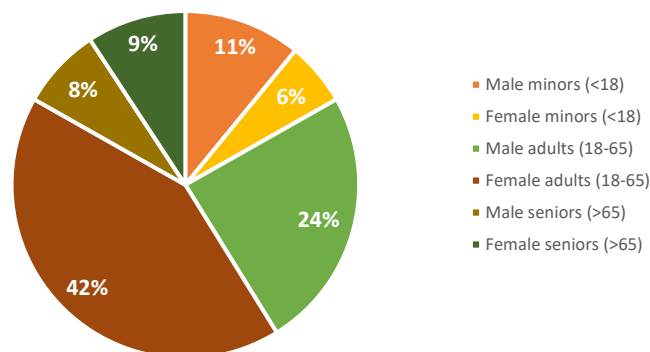


Figure 4. Demographic distribution of survey respondents across age groups and gender



However, the sample is adapted in order to achieve the best analysis possible to the objectives of both topics: gender-related differences in spatial accessibility (see Section 5.1) and mobility of care (see Section 5.2).

### **3.2.3 Travel diary survey**

The survey has the structure of a travel diary survey which aims to understand the individual travel behaviour of the residents. The RAAV travel diary comprises three distinct sections, each serving a specific purpose. The initial segment, the travel and activity diary, requires respondents to chronologically document their activities and travels throughout typical weekdays.

The second section delves into broader socio-demographic aspects. Additionally, inquiries about personal mobility, such as car ownership and possession of a driver's license, are included.

The third section is dedicated to exploring participants' attitudes and intentions concerning their mobility choices. Rooted in the Theory of Planned Behavior<sup>6</sup> (Ajzen, 1991), this section probes factors considered significant for using public transport. It also delves into participants' opinions regarding public transport, as well as the choices made by their relatives, family members, friends, or acquaintances concerning public transport usage.

After collecting the travel diary surveys and transferring the data into the database, the statistical analysis regarding gender-related differences in spatial accessibility and mobility of care is conducted using SPSS (Statistical Package for the Social Sciences). SPSS allows to perform in-depth statistical analyses on the collected data, enabling to identify patterns, and trends within the respondents' mobility behaviours through descriptive statistics. The use of such software simplified the process to draw meaningful conclusions from the extensive dataset.

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<sup>6</sup> The Theory of planned behaviour (TPB) states that the beliefs influence behaviours. More specifically, the attitude, subjective norm and the perceived behavioural control shape the behaviour. The attitude includes the set of beliefs regarding the consequences of a certain type of behaviour weighted by the perceived relevance of such consequences. The subjective norm includes the set of beliefs regarding the expectation of relevant other (e.g. friends, relatives or institutions) weighted by the motivation to satisfy such expectation for each other relevant person. The perceived behavioural control includes the control beliefs and perceived facilitation (Ajzen, 1991)

### **3.3 Qualitative study**

#### **3.3.1 Data collection**

The decision to undertake a more comprehensive exploration of the mobility of care arises from the identified gender-related differences, particularly noting a substantial gap in aspects related to caregiving mobility. Upon closer examination and analysis of these disparities within the realm of the mobility of care, it becomes evident that there exists a notable divergence in engagement among various socio-demographic groups. Consequently, to gain a deeper understanding of this phenomenon, the qualitative research aims to further explore the experiences and challenges faced by individuals involved in caregiving mobility.

The qualitative data collection for this research is executed through semi-structured interviews, specifically conducted in rural municipalities in South Tyrol. This approach is chosen to capture the context-specific aspects of caregiving mobility within these settings. Moreover, the semi-structured nature of the interviews allows for flexibility, ensuring that participants can share their experiences authentically, providing valuable insights into the particulars of mobility of care in rural communities.

#### **3.3.2 Sampling**

The data collection process employs purposive sampling, a method where participants are deliberately selected based on criteria relevant to the research question (Tongco, 2007). Following the initial selection of the first two individuals meeting the specified criteria, a snowballing approach is implemented. This strategic approach leverages the social networks of the initially selected participants to expand the sample size, capturing a more diverse range of perspectives and experiences within the targeted context (Naderifar et al., 2017).

The criteria for participant selection in this qualitative analysis are derived from the quantitative findings of the mobility of care. Specifically, the study focuses on adult women residing in households with three or more members, as this demographic demonstrates significant involvement in caregiving practices. While this remains a primary focus, the sample is inclusive of other categories that meet dual criteria: active involvement in one or more aspects of the mobility of care, such as domestic and caregiving responsibilities (refer to Figure 3) and residing in areas of South Tyrol classified as peripheral or ultraperipheral

from the Italian National Strategy for Internal Areas (SNAI)<sup>7</sup>. This classification underscores the substantial distance from major urban centres, necessitating significant efforts such as extended travel times and limited public transport availability to access essential services and opportunities (Agenzia per la Coesione Territoriale, 2020). Specifically, for the qualitative analysis, respondents reside in either Badia, Corvara in Badia, La Valle, Laion, Marebbe, San Martino in Badia. These municipalities are classified either as peripheral or ultraperipheral. Only for Laion, the classification is “intermediate”. However, the considered hamlet within this municipality is Albions, which has rural characteristics. This ensures consistency with the characteristics of Mühlwald and allows for the identification of similarities with the quantitative analysis.

This comprehensive approach ensures exploring caregiving dynamics within a diverse range of contexts.

The number of interviewed individuals is 12 women aged 25 until 55-year-old and involved in the mobility of care. All interviews are conducted in the minority languages prevalent in South Tyrol, namely Ladin and German. This deliberate choice in language inclusion aims to capture the diverse perspectives and experiences of individuals residing in these rural areas. Furthermore, the seven of the 12 interviews are carried out face-to-face, whereas the remaining five are performed by phone. The face-to-face interviews allow for richer communication due to the non-verbal, and more detailed communication and due to the built bond and trust during the meeting. However, it is relevant to note that the presence of the interviewer in this context may influence the participant’s responses or behaviour, leading especially to social desirability or self-censorship (Walliman, 2021). Moreover, face-to-face settings require a higher level of complexity in regard of the coordination of schedules and travels, which can be time-consuming and costly for both interview and interviewee. The time constraint is especially present in this research due to the complex schedules that caregivers handle.

Also for the interviews carried out by phone, several implications are encountered. Despite being more convenient for both the interviewer and interviewee and the fact that participants

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<sup>7</sup> The SNAI is a territorial policy aimed at improving the quality of services to citizens and economic opportunities in inland territories at risk of marginalisation. In this context, a general definition of 'Inner Areas' is presented, understood as that majority part of the Italian territory characterised by significant distance from the centres of supply of essential services. The Italian municipalities are categorized into: urban centres and “other municipalities”. These latter are again divided into 1) peri-urban areas, 2) intermediate areas, 3) peripheral areas and 4) ultra-peripheral areas. The classification of the municipalities is obtained through an accessibility indicator computed on the minutes of travel time to most near urban pole (Agenzia per la Coesione Territoriale, 2020).

might feel more comfortable due to the increased perceived privacy, the difficulty to create a bond or to be aware of body language is limiting the interpretation of the responses.

### **3.3.3 Semi-structured survey**

The semi-structured surveys have been designed with the overarching goal of gaining a deeper understanding of the experiences and challenges encountered by individuals engaged in the mobility of care. Hence, the questions aim to be well-formulated, clearly worded and open-ended in order to elicit spontaneous and vivid responses from participants, allowing for a rich exploration of their personal narratives (Kallio et al., 2016). By adopting this approach, the interview serves as an active tool capable of extracting new concepts and insights that may not have been apparent through more rigid questioning methods. This methodology aims to capture the intricacies of the interviewees' experiences, ensuring a comprehensive and multifaceted exploration of the mobility of care.

The interview process allows an exploration of the respondents' perspectives. This dynamic interaction involves probing not only into predefined topics but also encourages the generation of spontaneous follow-up questions, facilitating the understanding of various aspects.

The initial segment of the interview is dedicated to unravelling the intricacies of daily trips associated with caregiving responsibilities. This includes an examination of the frequency of such trips, the challenges encountered, personal experiences during these journeys, and the identification of aspects that demand substantial time and energy in the execution of caregiving activities.

The subsequent phase of the interview shifts focus to digital services and their potential role in bridging the gender gap in the mobility of care. In this context, the utilization of online services such as banking and grocery shopping, as well as the prospect of car-pooling for escorting someone or escorting them via autonomous vehicles is questioned. Specifically, the questions explore the advantages and disadvantages of employing digital services in caregiving scenarios, addressing concerns, and highlighting potential benefits that may emerge from their integration.

Finally, the interview takes a forward-looking perspective, engaging respondents in envisioning the future of the mobility of care through the enhancement of digital services.

This entails a discussion on potential changes, improvements, or concerns in the conditions of individuals involved in the mobility of care. By probing into future scenarios, the interview aims to capture insights that extend beyond the present, providing a holistic understanding of the evolving landscape of caregiving mobility in the context of advancing digital services.

## 4. Case study: rural municipalities of South Tyrol

### 4.1 The region of South Tyrol

The study area for this research are rural municipalities within the region of South Tyrol, in Northern Italy. The territory is predominantly characterized by its alpine geography, with the Dolomites playing a significant role in shaping the region. The mountainous landscape, marked by deep valleys and steep slopes, has led to specific settlement patterns. Communities are often situated in valleys, taking advantage of more habitable conditions and arable land. The mountainous terrain, however, poses challenges for infrastructure development, particularly in terms of constructing and maintaining active transportation networks.

The region's territorial dynamics are influenced by its proximity to the border between Italy and Austria (see Figure 5). This has historical implications, as South Tyrol is influenced by Italian and Austrian language and cultures. The interplay of these influences is evident not only in architecture and cultural practices but also in the multilingualism of the population, with both German and Italian widely spoken. The distinctiveness of the region's territorial dynamics is further highlighted by the presence of minority Ladin-speaking communities in certain areas (Steininger, 2010).

Economically, South Tyrol exhibits a diversified landscape. Traditional sectors



Figure 5. Location of South Tyrol (Italy); (Source: Wikipedia, South Tyrol)

such as agriculture, including fruit orchards and vineyards, coexist with a growing tourism industry and industrial sector. (Steininger, 2010).

In terms of demographics, South Tyrolean population amounts at 534.147 people at the end of 2022, with an average age of 43,5 years and an average household size of 2,3 members. The share of foreigners in the regions is about 9,9% of the total populations (Astat, 2022a). This percentage influences the growing population within the region. Moreover, compared to the national average, South Tyrol continues to show a positive picture both in terms of care during pregnancy and the outcome of births. The birth rate of 9.7 newborns per 1,000 inhabitants remains the highest in Italy in 2021 (the national average is 6.8 newborns per 1,000 inhabitants; Astat, 2021).

While most rural villages accommodate essential amenities such as the church, kindergarten, elementary school, it is noteworthy that for library, medical facility, post office, bank or hospital it is often necessary to travel several kilometres (Astat, 2022b). Moreover, the substantial differences in elevation of most villages make it arduous, if not nearly impossible, to reach essential services within and without the municipality.

## 4.2 The rural municipality of Mühlwald



Figure 6. Location of the municipality of Mühlwald (Source: Mühlwald's municipality website, 2023)

The area of the quantitative study is the rural municipality of Mühlwald, nestled in the Pusteria Valley within the Autonomous Province of South Tyrol, Italy. This municipality shares its borders with North Tyrol, Austria (as indicated by the red region in Figure 6). The province predominantly comprises rural and mountainous terrain. Consequently, elevation plays a crucial role in shaping various activities such as agriculture, mobility, and accessibility. Encompassing an area of 104.52 km<sup>2</sup>, the municipality spans the entirety of the Mühlwald Valley, branching from Tauferer Tal to Lappach at its uppermost point. Within the municipal

boundaries, there are two smaller villages, Mühlwald Dorf (see Figure 7) and Lappach,

housing a total population of approximately 1,401 residents (734 males and 667 females). Furthermore, the municipality comprises five dispersed hamlets: Fraktion Lappach, Gornenberg, Brunnberg, Mitterberg, and Kofelberg. Mühlwald boasts a population density of 13.44 individuals per square kilometre. (ASTAT, 2022; Gemeinde Mühlwald, 2023).



Figure 7. The village of Mühlwald Dorf (Source: Pustertal website, 2023)

Demographically, Mühlwald stands out with a substantial working-age population and households larger than the regional average. Approximately 64% of its residents are aged between 18 and 65, surpassing the South Tyrolean average of 60%. Moreover, the average household size in Mühlwald is 2.7 members, higher than the regional average of 2.3 members. Most amenities in Mühlwald are centred around Mühlwald Dorf and Lappach villages, as well as along the main road traversing the municipality (ASTAT, 2022).

Due to its low population density, sparse housing, and expansive land areas, the municipality of Mühlwald has designated as a peripheral area by the SNAI (Strategia Nazionale Aree Interne; Table 1.).

Municipality	Classification SNAI	*Km <sup>2</sup>	*Residents		
			Total	Males	Females
Mühlwald	E - Peripheral	104.52	1,401	734	667

\*Data refers to 31.12.2023 (<http://dati.istat.it/Index.aspx>)

Table 1. Characteristics of the municipality of Mühlwald

### 4.3 The rural municipalities of the Badia and Gardena Valley

For the qualitative research, the areas considered are both rural municipalities within the Badia valley and at the beginning at the Gardena Valley. The valleys are characterized by

their glacially carved terrain, with deep valleys and steep terrains. The Badia Valley stretches approximately 50 kilometres from north to south, while the Gardena Valley extends about 25 kilometres from east to west. Economically, tourism plays a significant role in the Badia Valley and the Gardena Valley, providing employment opportunities and driving economic growth in the region. However, also the manufacturing and agriculture is prevalent (Pescosta, 2015).

The municipalities under consideration are classified according to the SNAI as either "peripheral" or "ultraperipheral." The exception is the municipality of Laion, which is classified as "intermediate." However, it is important to note that our focus is directed towards the hamlet of Albions within Laion, which stands as an isolated and rather peripheral compared to the rest of the municipality. Albions is home to approximately 300 inhabitants (Val Gardena, 2024). Table 2 provides a detailed overview of the considered municipalities, their corresponding SNAI classification, area size, and demographic residential breakdown by total, male, and female residents.

Municipality	Classification SNAI	*Km <sup>2</sup>	*Residents		
			Total	Males	Females
Badia	E - Peripheral	83.18	3,525	1,743	1,782
La Valle	E - Peripheral	38.92	1,398	725	673
Marebbe	E - Peripheral	160.32	3,163	1,605	1,558
San Martino in Badia	E - Peripheral	75.94	1,757	899	858
Corvara in Badia	F - Ultraperipheral	38.92	1,396	682	714
Laion	D - Intermediate	37,53	2,770	1,398	1,372

\*Data refers to 31.12.2023 (<http://dati.istat.it/Index.aspx>)

Table 2. Characteristics of the considered municipalities in Badia and Gardena Valley

## 5. Results of the quantitative study

This section presents the quantitative findings from both studies, namely the gender-related differences in daily spatial accessibility and the mobility of care.

The Section 5.1 examines the overall gender disparities in daily spatial accessibility within the rural area of Mühlwald. This analysis involves a comprehensive assessment of six key components influencing accessibility: car availability, modal choice, psychological factors, domestic constraints, out-of-home constraints, and coupling constraints (see Figure 2). The



insights gained from this examination serve as the foundational framework for the succeeding analysis of the mobility of care.

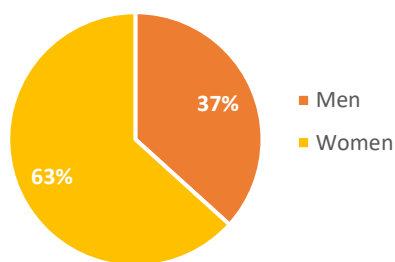
The subsequent Section 5.2 delves into the gender differences evident in the mobility of care, namely to all daily trips related to domestic and care responsibilities. This encompasses activities such as shopping for daily necessities, household upkeep, organizational errands, and assisting individuals who cannot travel independently, as well as visits to care for sick or elderly relatives. So, this analysis aims to capture the aspects of daily mobility, specifically in the context of caregiving responsibilities and associated domestic tasks.

## 5.1 Gender differences in daily spatial accessibility

This analysis regarding gender differences in daily spatial accessibility starts with an illustration of the sample of respondents, which differs from the total sample of the data collected since only the relevant individuals for this study are considered, namely adults between 18 and 65 years old. Then, the results for each analysed gender-related component that influences spatial accessibility are described.

### 5.1.1 Sample of respondents

The quantitative analysis regarding the gender-related differences in daily spatial accessibility focuses on adult residents of Mühlwald, ranging in age from 18 to 65. The sample encompasses 79 adults, of whom 29 identified themselves as male, while 50 identified as female (Figure 8). This selection aimed to



highlight gender differences prevalent within this age group. Children and youth attending school often share similar habits, while retired individuals over 65 also commonly experience comparable spatial accessibility challenges in terms of space and time. However, adults between 18 and 65 frequently encounter varying spatial accessibility due to distinct working conditions, household responsibilities, and car availability, among other factors.

### 5.1.2 Units of analysis

The analysis on gender differences in spatial accessibility considers all individuals within the sample of respondents, namely all adults ranging from 18 to 65 years, as the primary

units of analysis. The examination extends to crucial elements for the study, encompassing socio-demographic characteristics, activities, and trips undertaken by respondents. This comprehensive approach aims to thoroughly examine the six gender-related components that have an influence on accessibility.

### **5.1.3 Results in gender-based disparities in accessibility**

The next sections aim to uncover gender-related disparities in spatial accessibility through descriptive statistics. The six recognized gender-related differences that significantly influence spatial accessibility are explored: car availability, modal choices, psychological influences, coupling constraints, domestic constraints, and out-of-home constraints (see Figure 2).

#### *1. Car availability*

In the analysis of car availability among women and men, various factors have been taken into account, including possession of a driving license, the presence of a private car within the family, and the perceived dependency on the car (see Figure 9). These factors are crucial as they collectively influence car availability.

In terms of driving license, 90% of women compared to the 100% of men possess it. Although a significant proportion of women in the study area possess driver's licenses, it is important to note that not all women have obtained one, even though they have the legal right to drive in this Western context. Furthermore, 86% of men compared to the 74% stated to always have a private vehicle available. This aspect enhances the gender-based divergence of car availability, highlighting that the priority for the car is given to the male household member. However, concerning the perceived car-dependency, 76% of men compared to the 46% of women feel very dependent on the private vehicle. This aspect might highlight the major household responsibilities attached to women, who need to travel less because of those responsibilities. It might also enhance that men rely more on car because of their full-time work.

These findings support the previous literature, which suggests that women generally have lower access to private vehicles compared to their male counterparts. However, it should be noted that the priority of car availability within a household depends on the needs of its members. As such, car availability is closely linked to trip length and perceived reliance on a car for daily needs and can significantly impact individual modal choice.

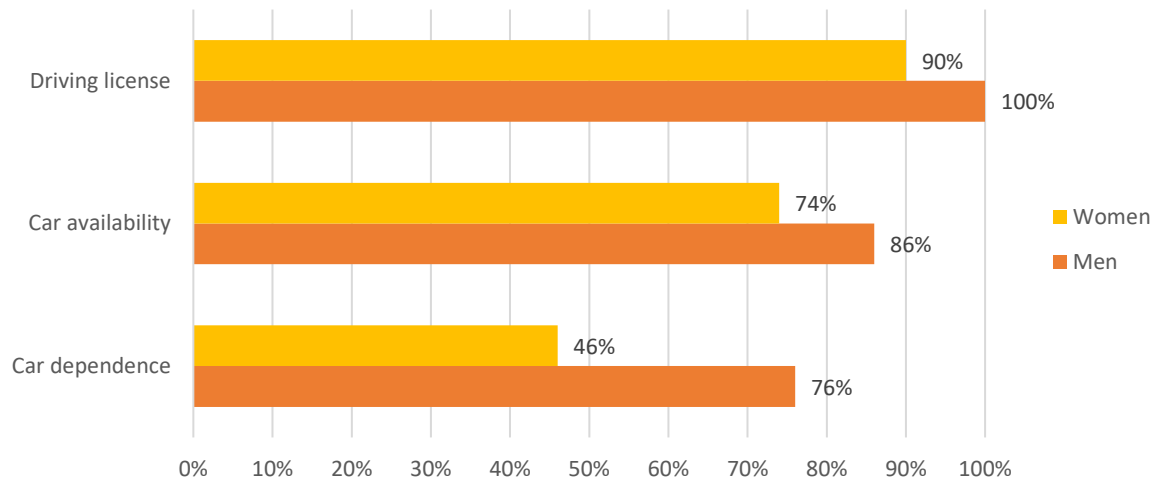


Figure 9. Gender differences in car availability

## 2. Modal choice

In terms of modal choice to perform their daily travels differs lightly from women to men. Considering the total daily trips of both categories, women carry out their daily travels for 63% by car, 19% by public transport and 18% by other means (such as bicycle, walking, etc.). On the other hand, men carry out 73% of their daily trips by car, 17% by public transport and 10% by other means.

Looking at gender-specific trends, 79% of men prefer private cars for their daily commute, whereas 66% of women opt for the same mode of transportation. Public transport is utilized by 24% of men and 28% of women. Notably, 34% of women choose to walk, while only 24% of men do so. Additionally, none of the women surveyed use bicycles for transportation, while 3.4% of men incorporate cycling into their daily travel choices (see Figure 10).

This aligns with existing literature showing that females tend to prefer transportation options like collective public transport or walking. Notably, none of the female respondents use bicycles, possibly due to safety concerns (Delbosc & Currie, 2011b; Mackett & Thoreau, 2015b; Ravensbergen et al., 2020), as well as the challenging mountainous terrain in the case study area. Furthermore, activities like cycling or walking in difficult terrains may be perceived as demonstrating strength, endurance, and an adventurous spirit, characteristics traditionally associated with virility or masculinity. As discussed in Section 2.3, women are more actively engaged in caregiving and domestic trips, involving tasks like carrying shopping bags or pushing a baby pram, making walking or biking challenging.

In addition, the modal choices are better understood by observing several complementary aspects, such as car availability and average length of a single trip. As regards the first aspect, women have lower access to cars compared to men. As for the second one, women travel shorter distances than men.

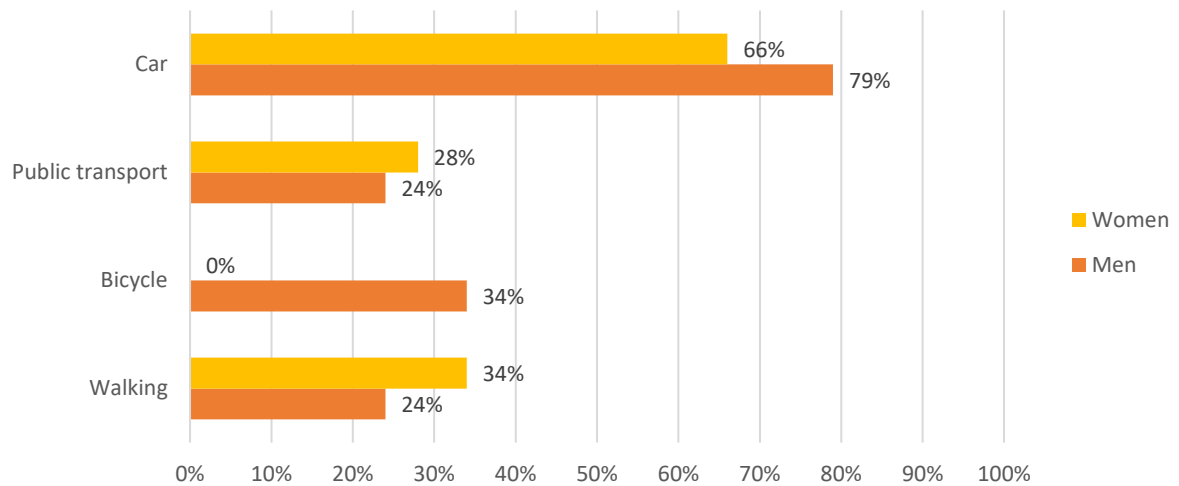


Figure 10. Gender differences in modal choice

### 3. Psychological influence

Psychological factors can significantly impact transportation choices, especially in the context of public transportation (hereinafter PT). Several indicators were considered to measure this influence, including the importance assigned to trip comfort, the effectiveness of PT in meeting travel needs, PT comfort, adaptability to fellow passengers, and overall satisfaction with public transportation. Respondents provided ratings on a scale from 1 to 4, with 1 indicating very important/good and 4 signifying not at all important/very bad for each indicator, depending on the question.

Notably, women rated the importance of trip comfort slightly higher, with an average score of 2.96, compared to 2.86 among men. When it came to the comfort of carrying out trips using PT, women rated it at 3.24, while men rated it slightly higher at 3.34. Effectiveness in meeting travel needs received a score of 2.66 from women and 2.72 from men. Adaptability to other passengers was higher among women (3.62) compared to men (3.31). Additionally, women reported an average satisfaction level of 2.48 with public transportation, slightly lower than the 2.64 reported by men (see Figure 11).

These results show minimal differences between men and women, suggesting that psychological factors play a relatively minor role in mobility differences between women

and men in this study. This observation could be attributed to the perception that the study area is not perceived as unsafe for women.

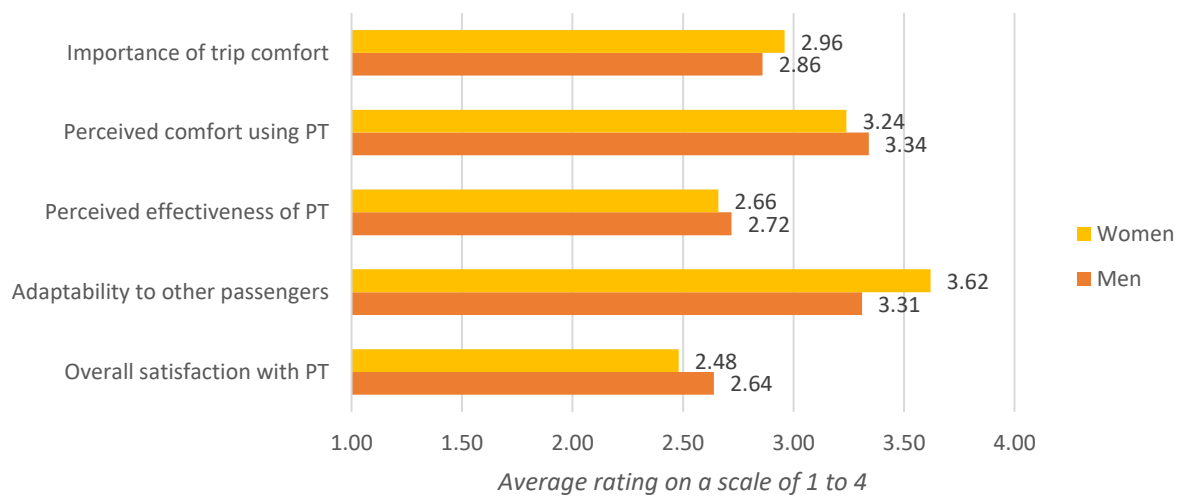


Figure 11. Gender differences in psychological influence indicators

#### 4. Domestic constraints

To ensure a fair assessment of the average time spent at home, the typical eight hours designated for sleep were excluded from the total time spent at home for each respondent. Consequently, the average time spent at home stands at 4h58min for men, in stark contrast to 7h40min for women (see Figure 12). These figures indicate a significant disparity, highlighting that women tend to spend considerably more time at home than men.

Remarkably, 10% of female respondents explicitly stated that their time at home is dedicated not to leisure, relaxing or eating but to domestic and caregiving duties. These disparities can be attributed to variations in household structures and working conditions between men and women.

The employment status further emphasizes these imbalances: only 20% of women are engaged in full-time jobs, contrasting sharply with the 69% of men in similar roles. Part-time employment is notably more common among women (48%) compared to men (10.3%). Female part-time workers spend 7h42min at home, in contrast to their male counterparts who spend 3h55min. Interestingly, both female and male full-time workers spend relatively similar durations at home: 4h44min and 4h28min, respectively. Unemployed and retired men spend an average of 9h10min and 9h57min at home, respectively, whereas women in these categories spend significantly more time at home: 13h45min and 11h33min, respectively. Furthermore, it becomes evident that female part-time workers and household keepers are living in households with minors.

That means, that a woman with children and a part-time job spends more time at home in comparison to another single female full-time worker. Consequently, women dedicating more time to domestic duties may encounter restricted access to opportunities outside the home. Conversely, men deeply engrossed in full-time employment experience significant time constraints, impeding their mobility and overall spatial accessibility to various opportunities.

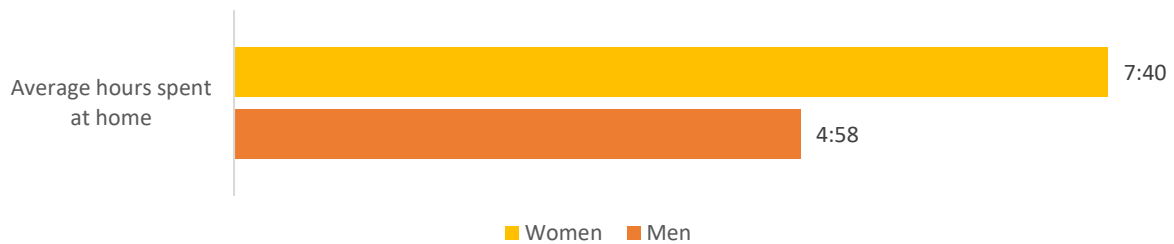


Figure 12. Gender differences in domestic constraints

### 5. Out-of-home constraints

To analyse the out-of-home constraints of the respondents, all trips are considered. However, 29 men travel daily, whereas two adult female respondents do not travel in a typical weekday. This can be related to their working condition since they fall into self-employment and household keeper categories, leading to their limited travel requirements.

Among travelling individuals, women cover on average a daily distance of 34 km/day, whereas men travel 48 km/day, showcasing a notable gender gap in mobility. Also, men travel a minimum of 5 km/day, whereas women's minimum travel distance is only 0.64 km/day.

Analysing individual trip distances provides further insights into these gendered mobility patterns. On average, women travel 10 km per trip, significantly less than their male counterparts who cover an average of 17 km per trip. The root of this disparity lies in the fixed locations of activities, especially workplaces. Men, on average, commute 21 km to work, while women travel an average of 12 km (see Figure 13). Thus, the workplace as a fixed activity's location affects the daily distance travelled and consequently, accessibility.

Moreover, women tend to make more trips daily, averaging 3.14 trips, albeit covering shorter distances. In contrast, men make fewer trips (averaging 2.79), but these trips tend to be longer. So, on the one side, women seem to reach these locations in a closer area than men do. On the other side, men commute longer paths to reach their workplaces, and this negatively affects their accessibility.

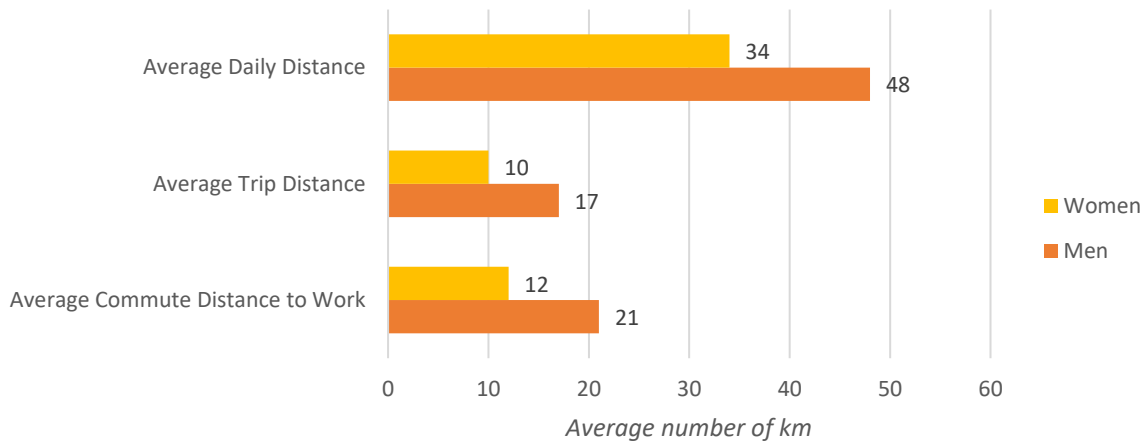


Figure 13. Gender differences in out-of-home constraints

## 6. Coupling constraints

Coupling constraints encompass activities individuals undertake to fulfil others' needs, often impacting women more due to domestic responsibilities such as babysitting and caregiving. Consequently, women tend to spend more time at home than men.

Examining activities related to escorting others, only 2.9% of men, compared to 28% of the female counterpart are involved in those activities (see Figure 14). In terms of individual trips, men are involved in 2 out of 27, while women undertake 25, further emphasizing the gender divide. These constraints predominantly affect women, amplifying their domestic responsibilities.

Within the affected female group, 77% are part-time workers, 15% are household keepers, and 8% are self-employed. This pattern suggests that full-time working women might face time constraints in escorting others. Men, primarily engaged in full-time jobs, also struggle to find time to accompany their children in their daily commitments. The stark gender differences underscore the intricate challenges women face, necessitating a nuanced approach in addressing these disparities in the next section which is focused on the so-called mobility of care.

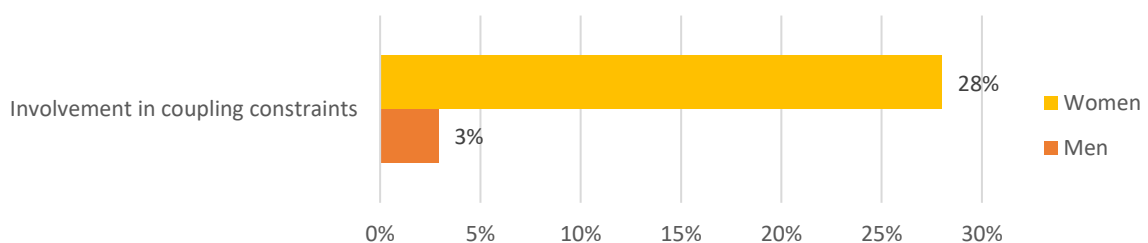


Figure 14. Gender differences in coupling constraints.

### 5.1.4 Summary of the results

The findings of this first part of quantitative research regards the different factors leading to spatial accessibility limitations for men and women. Men seem to spend more time out of home, travel further, which partially explaining their higher reliance on private car compared to women. These elements increase their cost of travelling and reduce their space-time flexibility. On the other hand, women tend to have lower space-time constraints related to work, the distance daily travelled is lower, but the time they spend for the so-called coupling constraints is significantly higher than for men, likely due to the socially assigned domestic and care responsibilities. Women frequently encounter the challenge of synchronizing their activities with their children's schedules, requiring a greater degree of flexibility. In this regard, the availability of a car can contribute to enhancing their flexibility (Bissell, 2018). However, women still have limited access to private vehicles.

It can be stated that one of the most evident differences between men and women regard coupling constraints. In this regard, to delve deeper in this aspect, the next section is focused on the mobility of care, that comprises the elements regarding coupling constraints such as escorting others, but also trips related to other care-giving or domestic-related purposes.

## 5.2 Gender differences in the mobility of care

### 5.2.1 Sample of respondents

Unlike some previous studies on mobility of care that have focused only on young adults (e.g. de Madariaga, 2013; de Madariaga & Zucchini, 2019; Ravensbergen et al., 2023) and in contrast to the previous analysis on gender differences in spatial accessibility focusing solely on adults, this section broadens its measurement by also including seniors over 65 years. This approach aims to provide a more whole understanding of individuals engaged in caregiving and escorting activities, considering factors like grandparents' involvement in caring for grandchildren. However, minors are excluded from the sample since they are less involved in the mobility of care but are rather receiving it.

Thus, this quantitative analysis encompasses a sample of 99 individuals, including both adults and elderly aged from 18 to over 65. The male respondents comprise 38 individuals, including 29

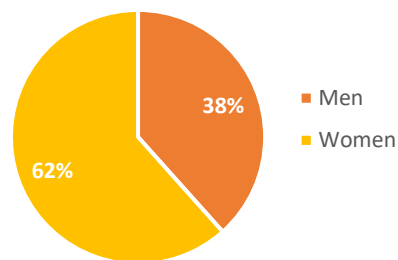


Figure 15. Gender distribution among the sample



adults and nine seniors. Similarly, the female respondents total 61, encompassing 50 adults and 11 seniors (see Figure 15).

### 5.2.2 Units of analysis

In the analysis to assess the gender differences in the mobility of care, the units of analysis consist in the single trips carried out by the sample. The total number of trips is 298, with 106 of them carried out by men (36%) and 192 by women (64%) (see Figure 16).

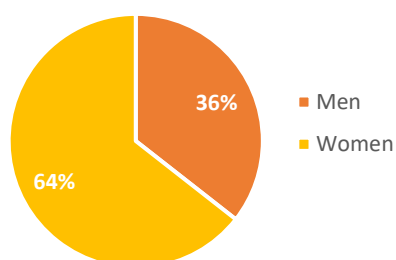


Figure 16. Gender distribution of the total trips

Each trip daily taken is categorized into the overall trip-purpose distinction made by de Madariaga (2013) reported in Figure 3 reorganising the trips of our database into employment, education, care, and leisure trips. To this end, two operative steps are needed.

First, the trip purposes defined in the database are translated into the four end purposes. The travel diary-survey (see Section 3.2.3) includes the following ten purposes:

1. *way home,*
2. *way to work,*
3. *business,*
4. *school/education,*
5. *escorting people,*
6. *grocery shopping,*
7. *care of relatives,*
8. *other private errands,*
9. *leisure/shopping,*
10. *others.*

The “way to work” trips fall into the employment purpose. “School/education” trips fall into the education purpose. “Escorting people”, “grocery shopping” and “care of relatives” are considered totally part of the care trips. “Leisure/Shopping<sup>8</sup>” trips are part of the leisure purpose. To categorize the “other private errands”, textual notes that have been taken during the survey are considered to include it into the appropriate purpose. Finally, the “way home” trips are addressed with a different logic, namely to the purpose that a person performs before and after the reported trips is known. For instance, a trip back home after an activity categorised as “at work” is translated into an employment-related trip.

This categorization process applies to single-destination trips. However, mobility of care sometimes occurs within trip chains. To account for this, trips are divided into two groups: standard trips with a single destination and chained trips with multiple stops. Standard trips

<sup>8</sup> All trips to a grocery shop are included into the grocery shopping, whereas trips to other shops, e.g. shoes or clothing are included into the leisure/shopping.

are categorized based on the previously mentioned logic. Chained trips, however, involve a hybrid trip purpose determined by the final destination and any intermediate stops. The final categorization includes seven purposes: employment, education, care, and leisure for standard trips, and employment-care, leisure-care, and employment-leisure for chained trips. In hybrid combinations, the first purpose denotes the final destination, while the second purpose represents intermediate stopovers.

### 5.2.3 Results in gender-based disparities in the mobility of care

Based on the methodological aspects described above, some general findings regarding mobility of care may be pointed out.

First, in the travel-diary purposes (see Figure 17), 20.3% of the trips are linked to caregiving, encompassing escorting people (11.3%), grocery shopping (8.7%) and care of relatives (0.3%). This is almost the same share of the way-to-work trips (21.7%), and about half of the share of the way-home trips (45.3%), which may be linked to several specific purposes.

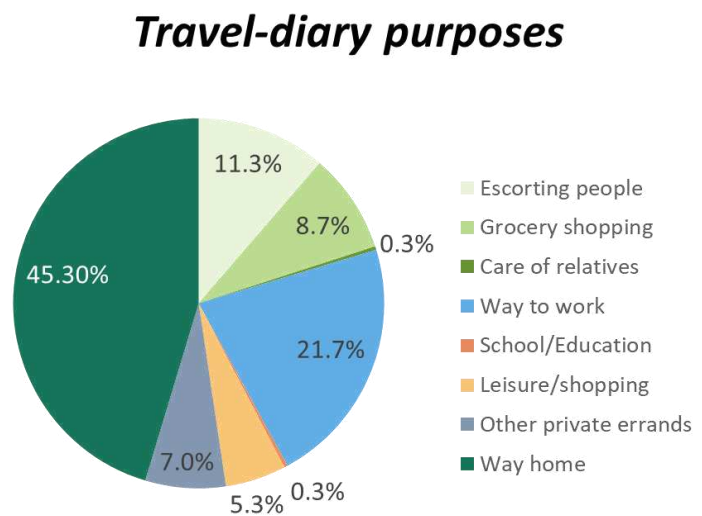
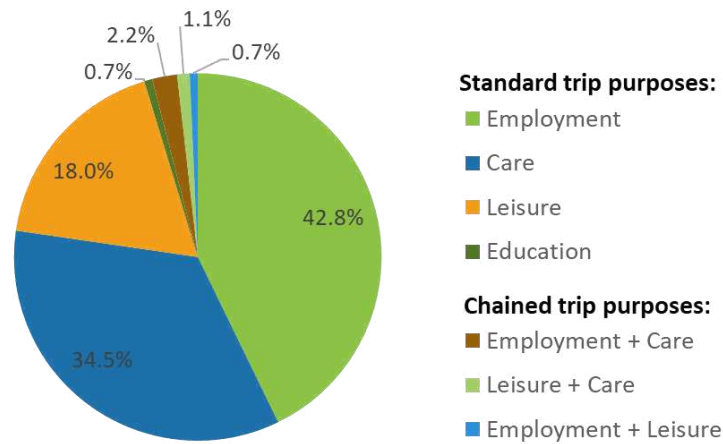


Figure 17. Original trip purposes of the 298 observed trips of the inhabitants of Mühlwald

Then, considering the reinterpreted trip purposes (see Figure 18) the care trips account for 34.5% of the total, whereas trips dedicated to employment constitute a higher share: 42.8%. When considering chained trips associated with caregiving—such as leisure-care (1.1%) and employment-care (2.2%)—the overall share of care-related mobility increases to 37.8%. This data underscores the comparable significance of care and employment trips, highlighting the essential role of caregiving within overall mobility patterns.

However, chained trips constitute a relatively low percentage of the total trips which differs from literature. In total, these trips comprise only 4%. Among these, 2.2% involve employment as the final destination with a stopover for caregiving purposes, while 1.1% regards leisure activities as final destination with a caregiving stopover. The limited incidence of trip chaining could be attributed to the socio-demographic characteristics of individuals engaged in caregiving.

## **Reinterpreted trip purposes** (de Madariaga, 2013)



*Figure 18. Reinterpreted trip purposes (according to Madariaga, 2013)*

Since the chained trips are not representative for the sample and the subsequent analysis, the focus is exclusively focused on standard trips (e.g. home to work), with a total of 298 individual trips forming the basis of our analysis.

In the following section, variables such as age, employment status, and household size are analysed by employing a gender lens. This allows a more in-depth understanding of their interconnected dynamics. These selected variables are of particular significance due to their substantial impact on the mobility of care, as outlined by de Madariaga and Zucchini (2019).

### **5.2.3.1 Socio-demographic variables**

#### **1. Gender**

Regarding the general differences among **genders**, the care-related standard trips predominantly involve women. Indeed, the mobility of care accounts for 43.2% of women's daily mobility, contrasting with 28.3% for men. Conversely, travel to and from work constitutes a larger portion of men's daily mobility at 50.9%, compared to the 38.0% attributed to women's mobility. This indicates that women undertake more journeys for caregiving activities than for employment-related purposes (see Figure 19) and it underscores the relevant role that employment plays in the mobility of care.

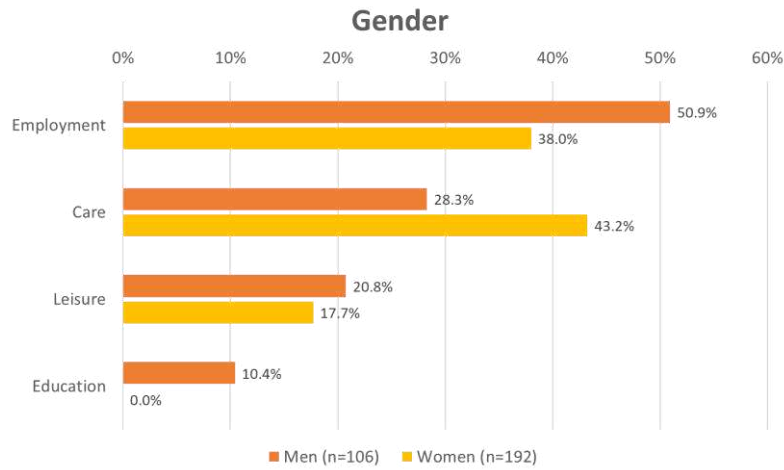


Figure 18. Share of trip purposes by gender

## 2. Age

When considering the **age**, adults over 65 years old are predominantly involved in the mobility of care. More specifically, trips related to care constitute 53.1% of their daily mobility, in contrast to the 34.9% recorded for adults between 18 and 65 years old. Notably, these latter adults category show a higher engagement in employment-related trips (51%), while those aged 65+ are mostly involved in caregiving-related trips or leisure activities, 53.1% and 46.9% respectively (Figure 20).

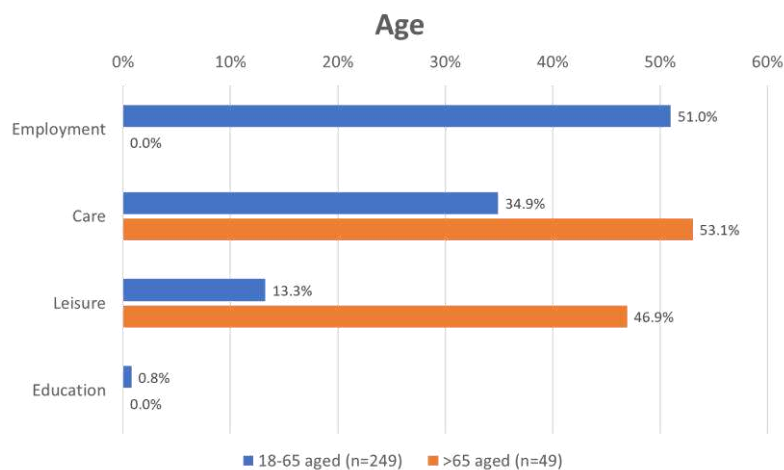


Figure 20. Share of trip purposes by age

However, a different result arises when separating age-related data through a gender lens, particularly for adults between 18 and 65 (see Figure 20). Within this range, a pronounced gender gap in the mobility of care becomes evident. Specifically, women dedicate 42.5% of their daily mobility to mobility of care, compared to men's 19.5%. Thus, for adult women aged between 18 and 65 years old, trips are closely approaching the share of employment-related trips. These latter are only for 1.2 percentage points higher. In contrast, men within

this age group exhibit a higher share of daily mobility attributed to employment-related trips, standing at 65.9%.

This gender gap not only diminishes but also undergoes a reversal among individuals over 65 years old. Within this age category, men's daily mobility is primarily characterized by 58.3% in the mobility of care, overcoming the 48% recorded for their female counterparts. The remaining portions are allocated to leisure-related trips. This inversion of the gender gap suggests distinctive travel behaviours and caregiving responsibilities in older age groups (Figure 21).

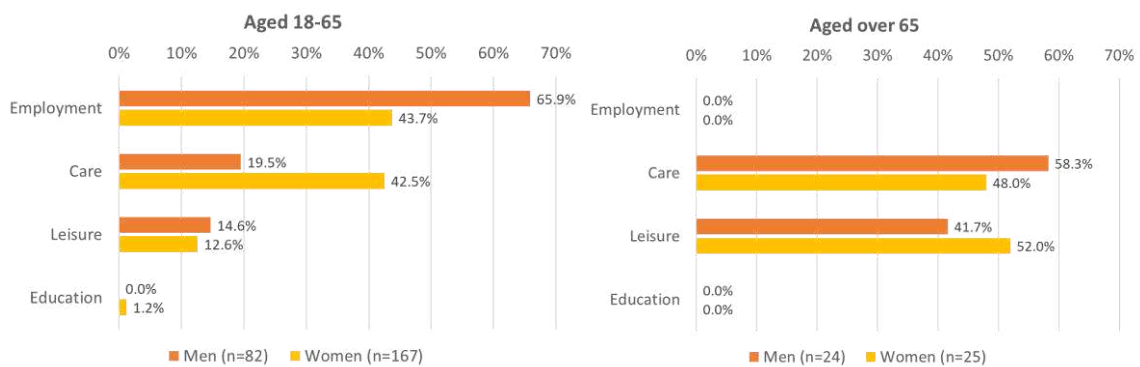


Figure 21. Share of trip purposes by gender among adults aged 18-65 and over 65 years old

### 3. Employment status

The analysis of the employment status needs methodological clarifications: the working conditions are divided into three different categories: 1) full-time worker, 2) part-time worker, and 3) others. The part-time worker include not only the individuals employed half of the day, but also self-employed individuals and the students due to similarities in their work hours. The primary contributors to the mobility of care are individuals categorized as "others", which comprises all people that are household keepers, retired, or not employed. This latter are accounting for 68.4% (see Figure Figure 22) to care-related trips of their total daily mobility. Also, the share of part-time worker is consistent in the care-related trips (35.4%). In contrast, full-time workers are predominantly engaged in employment-related trips (81.6%) with a comparatively lower involvement in care-related trips (3.9%).

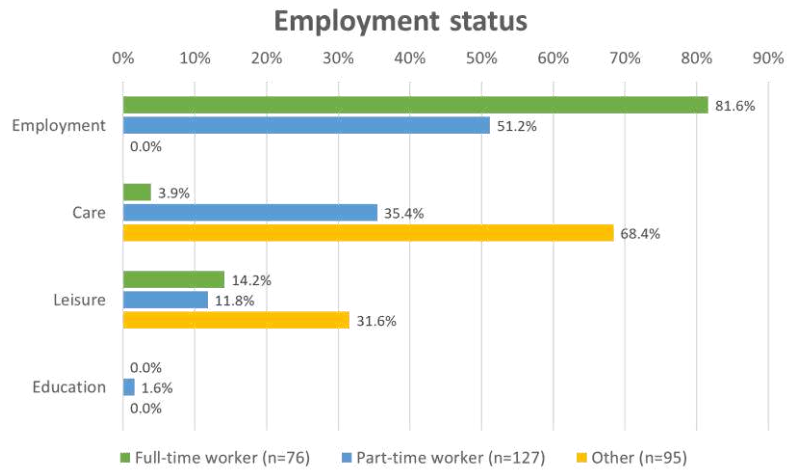


Figure 22. Reinterpreted trip purposes by employment status

If analysing these results by gender, different results are shown. While both genders working full-time contribute similarly to the daily share of mobility of care, with men at 4.1% and women at 3.7%, gender disparities intensify among part-time workers. Indeed, women spend nearly twice as much as men of their daily mobility in care-related trips, constituting 33.6% and 17.4% respectively. Furthermore, men dedicate most of their daily mobility to employment-related trips, for both working conditions (see Figure 23).

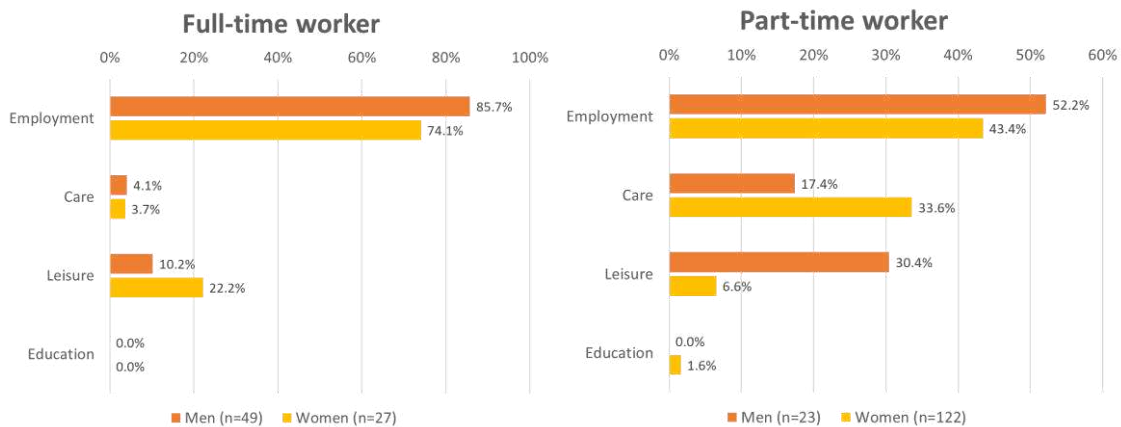


Figure 23. Trip purposes of full- and part-time divided by gender

Moreover, it is relevant to analyse and divide the categories of “others” to have a more holistic image of this category (comprising household keepers, retired, or not employed). Among the men, the majority is retired (81%) whereas the remaining share are unemployed (19%). Regarding women, 62% of them are retired, 34% are household keepers and 3% unemployed. That means that the household keepers also play an important role regarding the mobility of care and this category is only covered by women.

However, within this category that encompasses not employed individuals, retired people, or household keepers more men are involved into the mobility of care with 70.6% compared to the 67.2% of their female counterpart, whereas the remaining shares are reserved for leisure-related trips. Concerning this purpose, the share of women's daily mobility is higher (32.8%) compared to the male counterpart (29.4%; Figure 24).

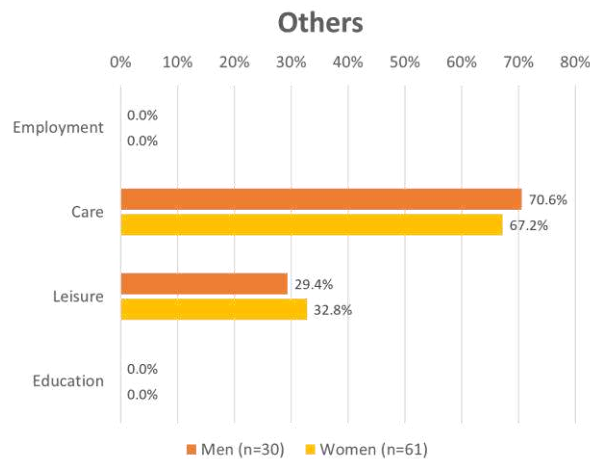


Figure 24. Trip purposes of "other" divided by gender

#### 4. Household

The household's size is classified in different number of household members in order to simplify the complexity. Specifically, households with one or two members are denoted as "<2 members", including households which represent mostly families without children, whereas all households with three members are denoted as "3 members". Households with more than three members are codified as ">3 members".

Precisely, the 43.1% of daily mobility of individuals living in a household of over three member is related to care-related activities, 35.1% for individuals living in a household with one or two members, 25.9% for individuals living with three members. When taking a closer look at households with one or two members, it emerges that only elderly over 65 years old or adult women between 18 and 65 years are involved. When considering the households with three or more members, both genders and both age categories are involved. The highest share of care-related trips is found for women living in a household of five household members (Figure 25).

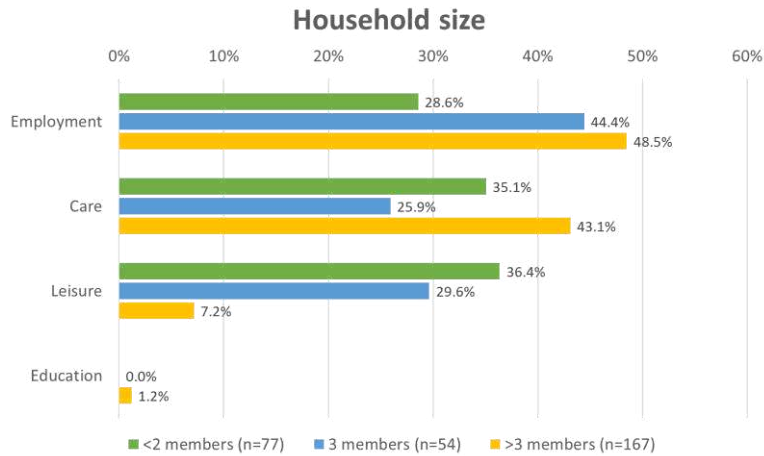


Figure 25. Share of trip purposes by household size

When examining households with just one or two members, gender distinctions in daily care-related trips appear to be relatively slight. Specifically, women contribute 29% of their daily mobility to such journeys, slightly less than the 32% attributed to men. It is important to note that this category predominantly encompasses young or elderly couples. The first subgroup likely engages in more domestic-related trips, such as grocery shopping, organizational errands, and household upkeep. Meanwhile, the second subgroup may also find involvement in caregiving trips to their grandchildren.

In households comprising three members, a more evident gender disparity emerges, particularly in caregiving responsibilities. Women contribute significantly, dedicating 31.3% of their daily activities to caregiving-related mobility, whereas their male counterparts contribute a comparably lower with 18.2%. This observation underscores the impact of the potential presence of a child, increasing the existing gender gap in care-related trips. Interestingly, the share of employment-related trips exhibits similarity between genders, while a more pronounced difference emerges in the realm of leisure-related trips (Figure 26).

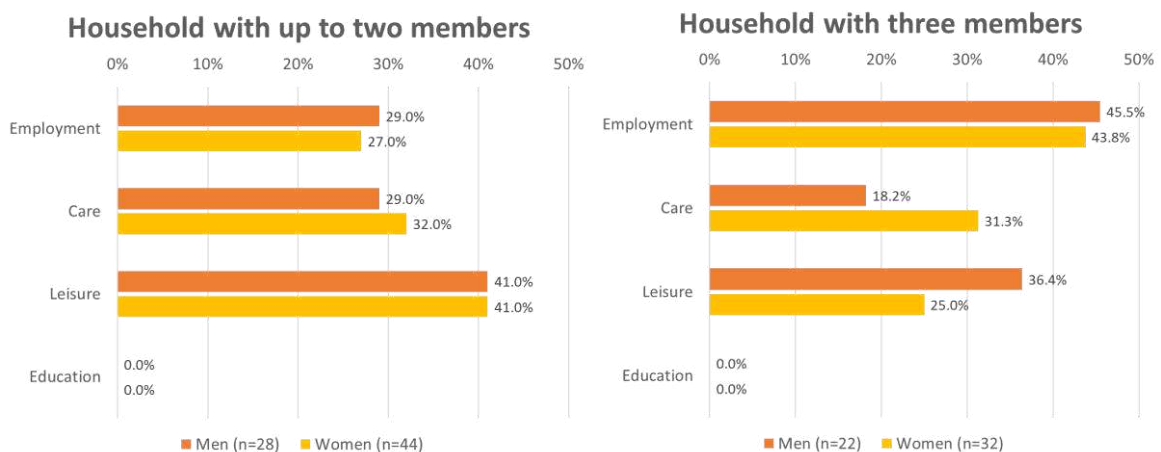


Figure 26. Trip purposes of household with <2 or 3 members divided by gender



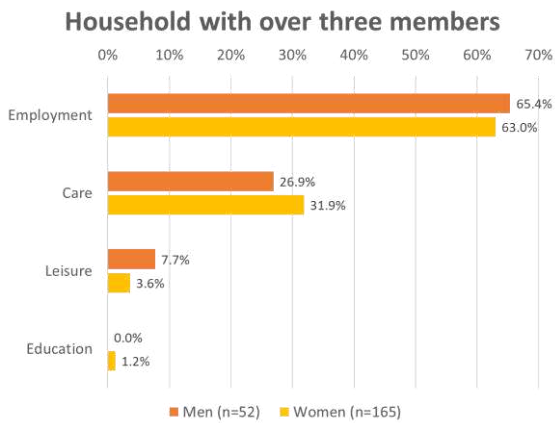


Figure 27. Trip purposes of household with >3 members divided by gender.

In households comprising three or more members, women take on a more significant role in caregiving-related mobility, accounting for 31.9% of their daily activities, compared to the 26.9% recorded for men. Conversely, men are more involved in employment-related trips within this context, representing 65.4%, while women 63% (Figure 27).

Further examination of household sizes through a gender lens necessitates an in-depth analysis of households with minor members. In the context of care-related trips among individuals residing in households with minors, women emerge as the primary contributors. Notably, females account for a substantial 75% of daily mobility dedicated to care-related journeys, while their male counterparts contribute a comparatively 27%. Consistently, men display a higher involvement in employment-related trips, constituting 69% compared to women's 25% (Figure 28). This pattern underscores the dynamics of gender roles within households regarding caregiving responsibilities.

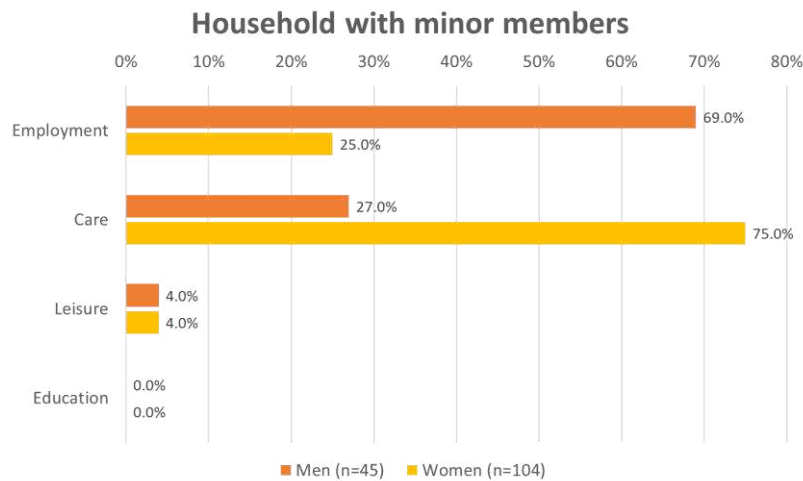


Figure 28. Share of trip purposes regarding households with minor members

### 5.2.3.2 Mode of travel and distance

To understand how the mobility of care is performed, two aspects that either regard or may influence the modal choices are considered, namely 1) the used mode of transport and 2) the

distance travelled. Concerning the mode of transport, three options are considered: 1) private car, 2) public transport, and 3) active transport (including walking and bicycling). This examination underscores the prevalence of specific modes for care-related journeys relative to other purposes. Concerning the distance travelled, they are categorised into four ranges: <5km, 5-15km, 15-25km, and >25km.

The first range represents a distance coverable by active modes. The second range covers a range of distances that might include travel between neighbourhoods or neighbouring areas, such as the closest urban hub of Sand in Taufers. The third range represents instead longer distances, such as travel between neighbouring cities, such as Bruneck. Finally, the last range regards even longer trips capturing considerable distances, such as travel between cities or regions.

### 1. Modal choice

In regards of mode of transport, the predominant choice for various purposes is the private car (exception for education purposes that involve public transport). In the context of mobility of care, the private vehicle stands out as the preferred mode at 56.6%. Notably, active modes also represent a substantial share in care-related trips at 36.3%. The examination of care-related and leisure-related trips in Figure 29 reveals comparable results regarding modal preferences.

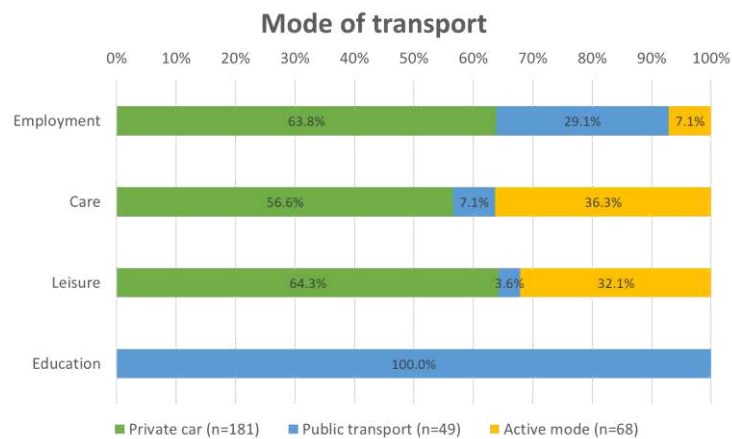


Figure 29. Share of mode of transport used for each trip purpose

When examining care-related trips through gender-specific perspectives, a considerable pattern is shown. Women evidence a greater inclination toward utilizing private cars for such trips, accounting for 61.4%, in contrast to their male counterparts who register at 43.3%. Conversely, men exhibit a preference for active modes, encompassing walking and cycling, constituting 43.3% compared to women's 33.7% (Figure 30). This divergence in

transportation choices may find its roots in the challenges faced by women when go across non-flat terrains, particularly when managing items such as shopping bags or baby prams. Whereas for men, this aspect the appears to be more liked.

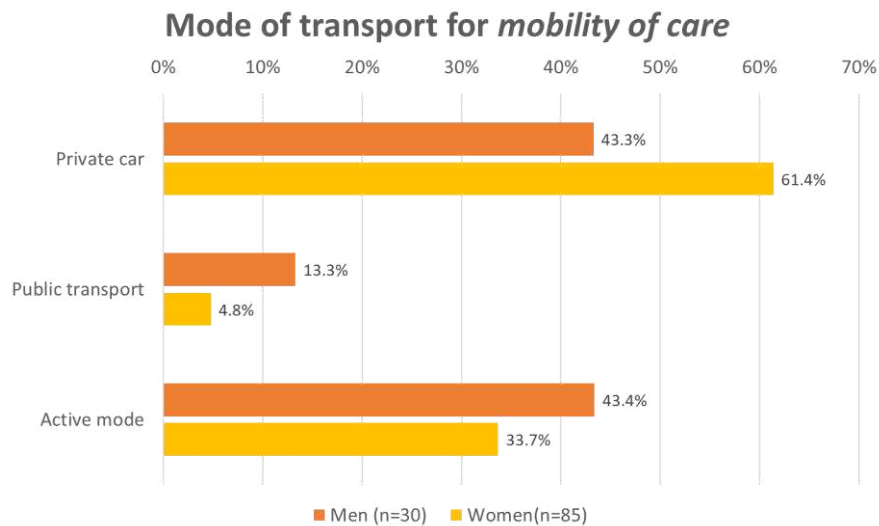


Figure 30. Share of transport mode used for mobility of care by gender

## 2. Distance travelled

Half of the trips made for the purpose of care are of five kilometres or less. This result is very similar to the leisure-related trips, which suggests that care and leisure activities are carried out near the residential place. In contrast, most employment-related trips are carried out within distances of 15 and 25 kilometres (Figure 31).

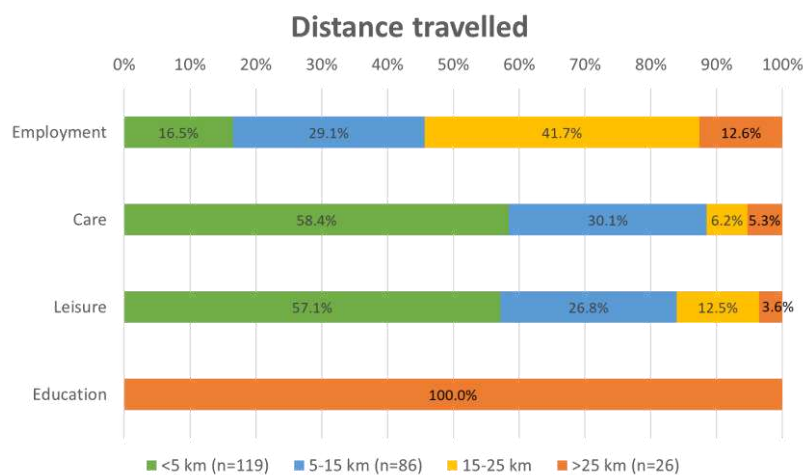


Figure 31. Distance travelled by trip purpose

When considering the distance travelled for the mobility of care of men and women, the results show us that women carry out for 62.7% of care-related trips within five kilometres,

compared to the 46.7% of men. Moreover, regarding the distances between five and 25 kilometres, no big differences are shown. However, regarding distances further than 25 kilometres, men show a higher involvement (13.3%) compared to the female counterpart (Figure 32).

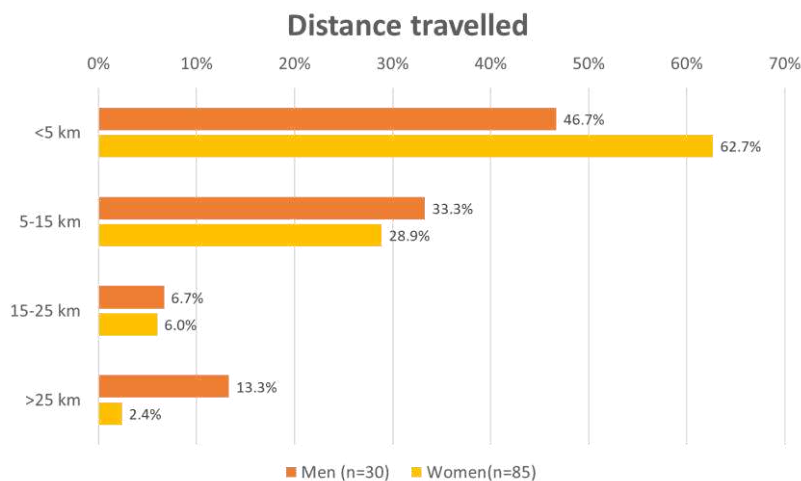


Figure 32. Distance travelled for the mobility of care by gender

#### 5.2.4 Summary of the results

The main results of the analysis of the gender-related differences in the mobility of care are several. First, the reinterpretation of our original trip purposes according to the approach of Madariaga (2013), the mobility of care accounts for 37.5% of all trips (including also the number of chained trips associated with caregiving) nearing employment-related trips (42.8%). The care-related trips play especially a key role in the daily mobility of adult women, while it is quite marginal for adult men. However, seniors are also strongly involved in care trips also due their lack of employment-trips.

The employment status proves to be one of the most significant determinants, with unemployed and /retired individuals, making several caregiving trips. Part-time workers also play a relevant role in the mobility of care, while full-time workers are mostly involved in employment- trips. However, it needs to be noted that the majority of part-time workers are female, while the majority of full-time workers in the sample are male.

Furthermore, larger households with more than three members have a higher involvement in care trips (covering 40.6% of all their performed trips). Nevertheless, the variable seems less determinant than the employment status. Indeed, also the members of small households with up-to-two members are significantly involved in care trips. This might be linked to domestic responsibilities such as grocery shopping or organizational errands, affecting also small

households without children to take care of. However, in each size of household, women are more involved in care-trips compared to their male counterpart.

Additionally, despite most care-related journeys are carried out within distances under 5 km, private cars remain the prevailing mode of transportation. That could be associated to the higher flexibility offered by the car, being more practical in transporting items such as shopping bags or baby prams as well as the mountainous terrain of the study area. Moreover, unfavourable weather conditions and concerns about safety further contribute to the inconvenience of relying on public transport, active modes, or multimodal choices. Thus, all these factors underscore the inclination towards private cars, which offer a high level of convenience.

## **6. Results of the qualitative study**

This section unveils the outcomes derived from the qualitative research, specifically from the in-depth semi-structured interviews. These interviews provide an exploration of the mobility patterns associated with domestic and caregiving responsibilities, shedding light on the challenges faced, experiences encountered, and perspectives on mitigating these challenges for caregivers residing in rural villages of South Tyrol. In a first section, the sample and units of analysis are illustrated, before the effective results of the qualitative analysis are shown. The results are divided into three main parts:

The first part includes the mobility of care patterns highlighted during the interviews, with a focus on what subcategories are mostly carried out and how this are carried out.

The second part regarding the challenges faced and experiences encountered in the mobility of care, which are divided into “around the trips” and “during the trips”. The former encompasses all the aspects of before and after the effective care-related trips, such as organizing the trip and exit children from cars. While the latter includes all those aspects encountered during the trips, such as difficulties of concentration due to the need to entertain children within the car.

The third part consider all the perspectives to alleviate the mobility of care. Specifically, the perspectives delve into the role that the digitalization of these activities could have and future perspectives on how the mobility of care could be better distributed among men and women, alleviating the burden socially assigned to mothers.

## 6.1 Sample of analysis

As illustrated in Table 3, the sample of respondents regard 12 women aged 25 until 55-year-old and involved in the mobility of care. The decision to include only women in the sample is due to their statistical relevance. Indeed, as observed in the quantitative part of the research, they are more likely to be involved in caregiving roles. Moreover, women in this age range are often primary caregivers within families. This age group is likely to include mothers who are actively involved in caregiving responsibilities for children and potentially other family members. Also, women are more likely to be juggling multiple responsibilities, including work and family. Understanding their mobility challenges is crucial in the context of balancing caregiving duties with other obligations in rural areas. Additionally, societal norms and cultural expectations often place a significant caregiving burden on women. Thus, focusing on the female social group allows exploring the specific roles, experiences, and challenges they face in providing mobility of care.

<b>Nr. of the respondent</b>	<b>Gender</b>	<b>Age</b>	<b>Employment status</b>	<b>Household size</b>	<b>Rural village</b>
<b>R1</b>	F	27	Part-time	4	Badia
<b>R2</b>	F	35	Part-time	4	Corvara
<b>R3</b>	F	34	Part-time	4	Badia
<b>R4</b>	F	53	Full-time	5	La Valle
<b>R5</b>	F	35	Part-time	4	Marebbe
<b>R6</b>	F	35	Not employed	4	Corvara
<b>R7</b>	F	35	Part-time	5	Laion
<b>R8</b>	F	34	Not employed	5	Marebbe
<b>R9</b>	F	27	Part-time	4	San Martino in Badia
<b>R10</b>	F	29	Not employed	4	San Martino in Badia
<b>R11</b>	F	28	Part-time	4	Badia
<b>R12</b>	F	31	Part-time	4	Badia

*Table 3. Demographic aspects of the respondents*

## 6.2 Units of analysis

The units of analysis for this qualitative analysis are semi-structured interviews carried out either face to face (7 interviews) or on the phone (5 interviews). The interview is structured as follows. First, the interviewer questions the respondents on a daily travel diary based with a specific focus of mobility of care, where they briefly illustrate their daily care-related mobility patterns. Second, they explain the biggest challenges encountered during these

kinds of trips. Third, the questions focused on how digitalization or online services could either facilitate the mobility of care or even avoid it. This part focuses particularly on three main topics: 1) on organizational errands and how these could be alleviated through online bureaucratic services, such as online banking or online postal services; 2) on grocery shopping for the whole family and how these could be facilitated through the implementation of online grocery services; 3) on the escorting of others that might include either children or elderly and how these trips could be facilitated by car-pooling or even avoided by autonomous vehicles.

To address these inquiries, each of the 12 interviews underwent transcription and subsequent classification into thematic content, aligning with the specific questions posed. The data were then coded based on key statements. To provide an overview and framework of the findings, quotes extracted from various transcribed interviews were selectively included in this research. This approach aims to present quotations as supporting evidence, facilitating explanations, and fostering a deeper comprehension of the main research outcomes.

## **6.3 Mobility of care patterns**

### *1. Domestic and caregiving responsibilities*

In the context of the travel diaries provided by respondents, a predominant pattern emerges regarding their daily mobility routines. Indeed, the great majority (12 out of 12) is involved in the caregiving responsibilities, such as accompanying or picking up their children at either nursery, kindergarten, or school. Moreover, for one respondent, visiting the old parent is also on their daily plan (1 out of 12).

Regarding the other part of the mobility of care, all respondents are involved in the grocery shopping (12 out of 12), whereas organizational errands and household upkeep are present but with a lower frequency.

To avoid single trips for each of these daily activities, the mobility of care is often carried out within a trip chain of more different destinations.

### *2. Trip chaining*

The fact that the respondents' daily mobility consists mainly of trip chaining with a care-related stop is not completely in line with the quantitative research on mobility of care in the municipality of Mühlwald. This discrepancy might be explained by the specific characteristics of the areas where the respondents live. These peripheral, or ultraperipheral

areas, lack primary services like nurseries or post offices. As a result, caregivers in these locations have to include additional stops in their daily mobility to access essential services, leading to a more complex pattern of trip chaining. The predominant trajectory in the daily mobility of respondents involves a sequence of stops: home, school, work, grocery shopping, school, home, children's activities/visiting someone, home (see Figure 33).

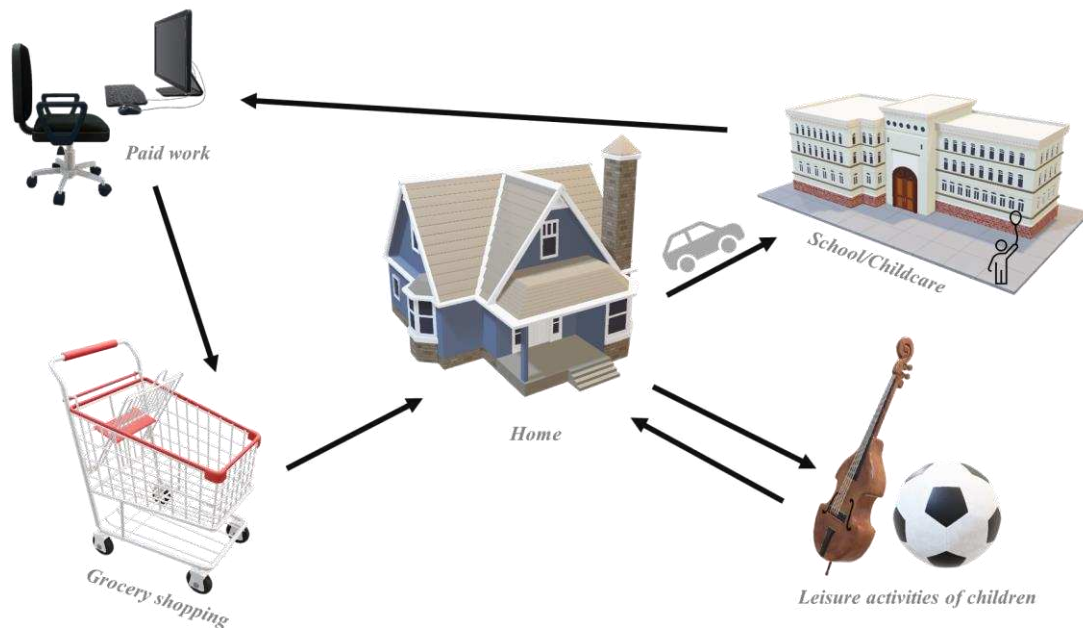


Figure 33. Representation of a typical daily pattern of a respondent (created by Chizzali Carolina).

This pattern reflects a practical response to the geographic and infrastructural context, where caregivers incorporate multiple stops into their daily routines to fulfil caregiving and domestic responsibilities and access necessary services.

### 3. Mode of transport

The interviews conducted revealed that mobility of care in South Tyrol's rural areas is primarily carried out by private car. The car travel emerges as a preferred mode of transportation for caregivers, not solely for its convenience but also for its unique combination of flexibility and time efficiency.

More specifically, respondents reflect the time constraints associated with accessing services that are not geographically proximate. One respondent expresses the desire for services to be closer to their location, emphasizing the potential time and cost savings, since traveling for care activities involves significant amounts of time, especially in these rural areas where services are located further away.



*“Certainly, having services closer would not only save me time but also reduce my expenses on gasoline. Additionally, going to [nearest centre] currently consumes half a day, factoring in the time spent traveling, staying there, and returning.” (R1; 2/12/2023)*

However, another caregiver suggests that *“Even though here in South Tyrol the services are actually well-distributed and not lacking. It's just the scattered residential villages” (R2; 7/12/2023)*. This dispersion and consequently the spatial mismatch to access necessary services forces rural dwellers to be reliant on private vehicles.

Moreover, the car provides caregivers with the flexibility to tailor their journeys to the needs and schedules of their families. Also, respondents appreciate the adaptability that a car affords, allowing them to make spontaneous stops, change routes, or adapt to unforeseen circumstances without the constraints imposed by fixed schedules or routes.

The challenges faced by individuals in managing care mobility are diverse, highlighting the difficulty of relying on cars due to the absence of public transportation options in rural settings. Moreover, owning a car involves also economic strain and financial implications associated with the exclusive use of cars for mobility.

One interviewee shared their experience, saying,

*“The challenge is always having to use the car. We initially wanted only one car for the family, but since they took away the bus, we bought another one to take the kids to kindergarten. This was also a difficulty, both economically and financially.” (R7; 21/12/2023)*

So, while cars offer flexibility and time-effectiveness in caregiving mobility, they simultaneously present challenges. Caregivers struggle with the responsibility of being sustainable models and contend with the economic and financial burdens associated with exclusive car usage. This aspect can be related to the concept of 'forced car ownership'<sup>9</sup> (Mattioli, 2021), which refers to households owning cars despite limited economic resources, creating a complex dynamic that impacts various aspects of daily life. This phenomenon is particularly relevant in rural areas where alternative transportation options are often scarce,

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<sup>9</sup> Research on “forced car ownership” highlights the economic strain experienced by households, where the possession and use of a car, typically seen as a durable good and a symbol of mobility, can paradoxically lead to material deprivation and vulnerability to external factors like fuel price increases. The economic stress resulting from it can have implications for the mobility of care in rural areas, where public transportation options are often inadequate, owning a car becomes crucial for accessing healthcare facilities, caregiving responsibilities, and other essential services.

making car ownership a necessity. Moreover, despite the car is seen as most convenient in terms of time and flexibility, it is also perceived as stressful and dangerous. So, even if caregivers try to explore alternative modes of transportation, such as active transportation, the constraints are related to lack of infrastructure or seasonal and weather conditions (see next Section).

#### **6.4 Challenges and experiences encountered in the mobility of care**

The interviews reveal a common experience where the mobility of care is not perceived as a burden but rather as an integral aspect of parenthood. Participants express a positive outlook, considering these responsibilities as meaningful and fulfilling. For instance,

*“You should appreciate that you can stay with the children. Also, taking them to music or swimming lessons is something you want for your children, not something that is imposed on you, so I don't see the reason to complain. When I accompany [my daughter] to swimming, I am happy because I think, "Wow, how nice, she is learning to swim". I never learned to swim, so I am happy for them. Also, going grocery shopping, I do it for the well-being of the family. It also makes me happy.” (R5; 20/12/2024)*

*“I also like to accompany them to watch them do their activities, like watching my daughter ice skate. It's right for children to have certain attentions at certain times.” (R11; 12/01/2024)*

This positive perspective reflects a genuine enjoyment and satisfaction in fulfilling caregiving responsibilities, where activities such as accompanying children to various events are seen as personally rewarding. However, it is important to note that this positive outlook does not negate the existence of challenges associated with the mobility of care.

These challenges and experiences can be broadly categorized into two main dimensions: a) those directly occurring during the trip itself, and b) those encompassing everything around the trips, such as the preparation before the trip or the handling of children in various settings like parking lots or grocery shops. Within each of these two overarching categories, the challenges and experiences can be further classified into three main distinct dimensions (see Figure 34):

**1) Physical aspects:** Challenges related to bodily exertion, energy expenditure, and the tangible demands of transporting children or managing various physical aspects during the

journey. This includes considerations such as the physical strain of carrying children, navigating through crowded areas, or dealing with the practicalities of parking.

**2) Psychological aspects:** Challenges and experiences that involve cognitive processes, decision-making, and mental strain associated with the trip. This encompasses factors like planning and organization, time management, and the need for concentration during the journey. Mental aspects also relate to the stress and cognitive load caregivers experience while fulfilling multiple roles, such as driving and attending to a child simultaneously. This includes frustration, or anxiety experienced during the trip, as well as positive emotions related to caregiving activities.

**3) Social aspects:** Challenges and experiences shaped by societal norms, expectations, and external factors influencing caregiving mobility. This category involves considerations such as societal perceptions of gender roles in care responsibilities, societal attitudes towards parents in public spaces, and the impact of societal infrastructure (or lack thereof) on the mobility of care. Societal aspects also encompass the broader social context influencing caregivers' experiences around and during the trips.

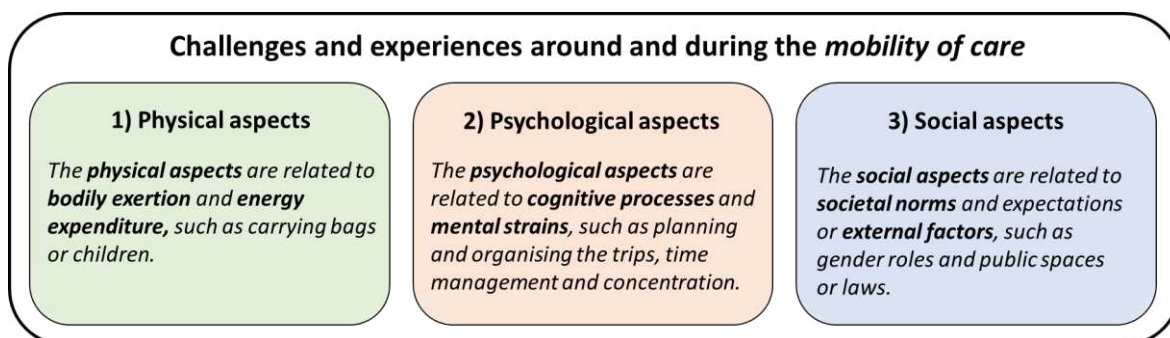


Figure 34. Categorisation of the challenges and experiences of mobility of care, derived from the findings.

### 6.4.1 Around the trips

#### a) Psychological aspects

Regarding the challenges around the trips, one of the main concerns to focus on are psychological related aspects, such as the **organization** before starting the trip. These aspects might involve the preparation of both children and the individuals involved: *“Organising and remember all the things that I need to carry with me for my daughters, such as the backpack, food, ice-skates, skis, and so on”* (R1; 2/12/2023) highlighting the difficulty of organizing and remembering all the necessary items for their daughters.

The complexity increases when multiple children are part of these trips. For instance, a respondent shares the intricacies of her journey, which includes bringing both an older son and a younger daughter:

*“I have to organize well to bring [minor daughter], like always eating at the same time, trying to always arrive [at kindergarten to pick up older son] on time because I have to eat with her, dress her, and go. If I were alone, everything would go faster, let's say.” (R6; 19/12/2023)*

So, being organized managing everyone's schedules and needs might be challenging, making sure everything and everyone is ready for the trip.

This challenge of the preparation of the trip is related to the need to be on time for the daily activities. Indeed, 10 out of 12 respondents highlight the struggle to be **punctual** for their children's activities or work (if care activities are included) as a significant obstacle. This challenge reflects the concept of “time-geography” of Hägerstrand, since being punctual aligns with the temporal constraints imposed by spatial and individual conditions.

Being punctual indeed involves also the foreseeing of possible obstacles along the way. For instance, the mention of traffic lights and traffic as potential “*obstacles that I might encounter on the way to school or to the hospital*” (R2; 7/12/2023) underscores the unpredictable nature of commuting and the need for caregivers to anticipate and strategize around these variables in order to be on time. This not only highlights the logistical difficulties involved in the journey but also sheds light on the psychological toll it takes, as caregivers struggle with the constant awareness of potential obstacles or unexpected events that could compromise their punctuality.

One narrative underscores the potential disruptions caused by unforeseen circumstances:

*“One afternoon, I had to pick up my daughter from daycare, and just before that, my other son had fallen asleep at home. But I was calm because I would be back within five minutes, truly five minutes. I left by car, stopped in front of the daycare, [...] Then my car wouldn't start, and my first thought was, 'I have [younger son] alone at home.' Then I shouted to a friend to give me a ride and left the car there. Fortunately, everything turned out fine. Luckily, he was still asleep.” (R7; 21/12/2023)*

Furthermore, an interviewee coping with a hip problem and reliant on crutches shared concerns about the heightened risk of slipping and injury. A recent incident vividly illustrated the vulnerability:

*"Like yesterday, I fell and couldn't get up anymore. If I had to call an ambulance, the whole sequence of daily activities [picking up the children from nursery and taking them to classes] would have been disrupted, or the day would have gone differently. Of course, there's always an alternative. It's not a matter of life or death. There's always help in some way." (R3; 16/12/2024)*

Since being punctual is “tiring” and “stresses a lot because the journey is different every day” (R6; 19/12/2023), it also becomes a mental burden which is associated with the mobility of care. The fact to be on time for the daily activities involves often to a **rush** in the morning to get children ready for activities, that can lead to stressful situations. One respondent highlights the intricacies of managing time, parental responsibilities, and the associated **stress**:

*“And what stresses me a lot in the morning is that they wake up at 7, but I try to dress them immediately because even if I leave at 8, it takes so long to get to kindergarten. I don't like to stress the children in the morning, but I have to do it to be punctual.”(R7; 21/12/2023)*

Another respondent acknowledges the difficulty children face in comprehending the morning rush:

*“You know, it's not so easy for them to understand this rush in the morning. It's not nice to do it like that but I need to because walking with all three children takes me always so long to arrive there [at nursery].” (R12; 30/01/2024)*

Often, there is not only one child to bring to their activities, but caregivers need to coordinate multiple family members:

*“Another challenge is that four people have to move for the activities of one person. When I arrive at kindergarten, everyone tells me that the other children are at home with their grandma or someone. In my case, it's different because I live far from the grandparents, and for those 10 minutes, you wouldn't ask someone to drive 30 km. So, taking everyone with you is challenging.” (R7; 21/12/2023)*

This narrative highlights the impact of one individual's actions on the entire family and the interdependence within the family system.

However, the **stress** does not end in the time frame before starting the trip but continue after it. For instance, assisting someone in and out of a car requires also emotional demands.

*“Escorting the elderly is taxing because they take a while to sit in or get out of the car. It requires patience, and although it's not a burden, it is objectively tiring. I also avoid unnecessary outings; for instance, I often leave my mother in the car when going to the pharmacy to save time.” (R4; 8/12/2023)*

Furthermore, grocery shopping poses mental challenges especially when accompanied by children. The additional responsibilities of managing the little ones while handling groceries contribute to the stress. For example, one respondent states that *“it's more stressful [with children] because you have to make sure they don't pull everything out, be attentive to what they're doing, and then also do the shopping”* whereas another one shared her experience with her little child that *“jumps and runs, and I always have to be careful. Then there's the bag, then I need to hold his [child's] hand...these are the stressful things.” (R12; 30/01/2024)*

#### *b) Physical aspects*

In addition, walking through the grocery store with children might be physically challenging because you need to have the children always under control and have possibly free hands at the same time in order to do the grocery shopping. For these cases, *“you have to organize well, like using a backpack or I often take the carrier for children so I can put one into it and the other in the stroller” (R6; 19/12/2023)*. Another participant shares her experiences doing these activities with children, that requires **multitasking**:

*“When I go grocery shopping, I carry [youngest child] on my back, [middle old child] in the stroller, and [older child] walks next to me. Physically, it's tiring; you get used to it, but clearly, you must assume that you can't stick to the list because they see things they want. Then I have to decide: OK, do I want to discuss for 10 minutes because they can't have that candy or chocolate, do I have the time? Occasionally, I also have that time, and we stay discussing for those extra 10 minutes. But often, I don't have that time, and I think, “OK, I'll spend these 2€ today,” even though when we get home, they've already forgotten about it... I always have to balance whether it's worth sitting there to discuss and having the patience to do it and accompany them with their frustration, or I have to pick up the frustrated child and take it out, or buy that chocolate.” (R7; 21/12/2023)*

Some state that *“If you go alone, you are twice as fast, but if you have to bring the children, it takes much longer” (R10; 11/01/2024)* to do the grocery shopping, whereas one caregiver states that *“Even when alone, I find it challenging to handle grocery shopping, both at the checkout and carrying items to the car” (R4; 8/12/2023)*.

So, traveling with other people pose additional concerns to the mobility of care. Especially when accompanied by children, the challenges faced by caregivers in busy parking lots are rooted in safety concerns. The **lack of infrastructure** designed to accommodate the needs of elderly individuals and children becomes evident, highlighting the absence of age-friendly and child-friendly urban planning. The caregiver's stress is heightened by the need to be constantly alert, since children often lack the awareness to recognize risks near streets:

*"[...] children often don't see these risks. When you park and get the children out, it becomes a stressful situation. Especially parking lots make me worry. You turn around for a moment, and a disaster can happen. I can't tell them to stay near because they can't see the danger."* (R2; 7/12/2023)

The process of assisting family members in and out of cars is not only challenging for children but also for elderly *"due to insufficient space to exit."* (R4; 8/12/2023) So, these caregiver's narrative reveals the constraints imposed by the built environment on their mobility, emphasizing the need for urban spaces that facilitate safe and efficient movement for diverse social groups.

#### **6.4.2 During trips**

When focusing only on the challenges and experiences during the care-related trips, it becomes evident that the nature of these aspects differs from the mode of transport.

Therefore, the following part is classified into:

1. Travel by private car
2. Travel by active modes
3. Travel by public transport

##### **1) Travel by private car**

###### *a) Physical aspects*

Traveling by car is more flexible and convenient for several reasons to carry out the mobility of care. As emphasized by one respondent, *"I travel by car for the sake of time"* (R5; 20/12/2024) speaks to the intrinsic time constraints faced by caregivers. In the realm of caregiving responsibilities, whether transporting children to activities or managing daily routines, the ability to minimize travel time becomes a strategic advantage, allowing caregivers to allocate more time to the activities themselves. The travel time is also related to the concept of affordance, which highlights that different commuting environments offer

different possibilities for action and shape individuals' perceptions of time. For instance, different mode of transport provides different travel time or time utility. In the case of parents, the use of a car in this scenario provides them flexibility and synchronization opportunities, allowing for a more manageable commute while balancing their children's activities (Bissell, 2018). Beyond the literal sense of saving time, car travel provides a level of convenience that aligns with the dynamic nature of caregiving. The ability to load and unload items, transport multiple family members, and navigate diverse terrains amplifies the utility of cars for caregivers, making it a practical choice in fulfilling their responsibilities. As one respondent shares *“Often, when taking my older daughter to her class, I try to combine more activities in one trip, such as grocery shopping or running an errand in the city”* (R3; 8/12/2023), participants employ the strategy of trip chaining, combining multiple activities in a single trip to optimize time and resources.

The physical environment of the car becomes a **temporary play area** during the trips, laden with toys, games and food. The tangible act of stuffing the car reflects a proactive approach to address the entertainment needs of children during trips:

*“We have the car stuffed with toys as if we were going to be on the road for months. Full of toys, games, a toy piano, a baby monitor, or for longer trips, even the iPad. My saviour, however, is crackers and chips. I have to say that the automatic transmission helps me a lot to grab things from the bag or elsewhere.”* (R3; 8/12/2023)

The caregiver's account of having the car filled with toys, games, and snacks reveal a transformation of the car into a private space, offering individuals autonomy, privacy, and a personalized environment. In this narrative, the caregiver's intentional act of stuffing the car with various items mirrors the customization aspect of **“mobile privatization”** (Bassett & Jones, 2019). By curating a space within the car with toys, a toy piano, and snacks, the caregiver creates a private shell conducive to caregiving responsibilities. This aligns with the broader societal trend where cars cease to be mere modes of transportation and instead become **extensions of personal space**, reflecting the need for control, comfort, and autonomy in the midst of caregiving duties. The caregiver's reliance on the car as a mobile sanctuary exemplifies how mobile privatization influences daily practices becoming a private space in public spaces.

#### *b) Psychological aspects*



Challenges encountered during trips regard not only the physical environment within a car but are often around the psychological aspects such as driving skills. This **skill** draws upon social theories of habit, which highlight that skills can enable change rather than hinder it. Skills are seen as transitional and adaptable aspects of our lives, rather than fixed elements that restrict change. This “**tacit knowledge**”, defined as a “mundane frame of reference within which ordinary persons routinely apperceive our phenomenal world” by Giddens (Bissell, 2018) can be experienced diverse in different situations. For instance, travelling with children might change the skills by making them vulnerable since another skill is asked, namely their entertainment. Caregivers employ various strategies, delving into the practicalities of managing children's engagement during journey. For instance, they resort to technology, such as cell phones and iPads, as entertainment tools. Despite personal reservations, caregivers recognize the necessity of such devices to ensure a smooth driving experience. One participant reflects,

*“Even if I do not agree in giving cell phones to little children, in that moments I really need to give it to my daughter and let them watch some videos or photos in order to be able to concentrate on the driving and what’s going on the street. I often feel that I’m not completely lucid if I am driving with my daughter sitting in behind.”*  
(R1; 2/12/2023)

The caregivers' reflections reveal also a mental load associated with driving while attending to a child's entertainment. The quote, *“I often feel that I’m not completely lucid if I am driving with my daughter sitting behind,”* emphasizes the challenges of dividing attention between the road and the child's needs.

So, maintaining **concentration** while driving emerges as a challenge for care related trips, especially during longer trips. Driving from Badia Valley to Brunico (approximately 30 kilometres), the closest place for a paediatrician, becomes a scenario where concentration is tested:

*“Because my daughter is restless, she cries, gets bored, and I have to console her while driving at the same time. I often find it dangerous, especially over longer distances. However, as they grow older, it gets much better. But I have to say that I don't enjoy driving, especially for this reason, but it is necessary in the places where we live.”* (R3; 8/12/2023)

The respondent emphasizes the potential danger associated with reduced concentration during longer distances. However, the level of concentration does not necessarily increase

for shorter distances. One caregiver acknowledges the chaos, stating, “[...] *even in the car, you know, they have this phase where they all want to sit in front; one wants to drive, the other opens the window, and they want to do everything themselves. Nothing goes smoothly, ever*”. (R8; 22/12/2023)

These statements align with concerns related to safety and the potential consequences of divided attention while driving. Also, the car trip becomes a stage where the caregiver performs multiple roles, such as driver, consoler, and mediator.

Another aspect regarding the drivers’ lack of concentration involves also parking-related challenges such as one states that “*I face difficulties when reversing the car. In those cases, I have to beg the children to be quiet because I need silence; otherwise, I can’t concentrate.*” (R9; 10/01/2024)

### *c) Social aspects*

The success of private vehicles within societies may be attributed to their symbolic and emotional character deeply ingrained in the collective imagination. Private vehicles ensure independence from others and are readily accessible. Moreover, owning a car signifies self-realization, contributing to increased prestige. Additionally, it satisfies socially recognized passions, such as the pleasure of driving and speed (Steg, 2005). A caregiver also states that “*I have to say that I like driving. I turn on the radio, listen to my favourite programs, and relax*”. Also “*driving is relaxing because it is one of the places where the children are safe, and I don’t need to worry about them*” (R3; 8/12/2023).

However, travelling by car is a practice that some residents find burdensome. A participant expressed this sentiment, stating,

*“These trips [of mobility of care] are not a big problem, but I have to say that when I came here to live, I often wished to live in the city because there you go out and can bike or walk anywhere without always having to take the car. Using this car, uh, I don’t want to say a problem, but if we can talk about a burden, it is. [...] Every time I have to use the car, it bothers me more than thinking about using the bike. Also, to be a role model for the children because they often say, “the car stinks” (R9; 10/01/2024).*

Moreover, other challenging aspects are parking-related factors, which add another layer of complexity to caregiving during trips such as briefly leaving children unattended in violation of parking laws. This aspect of **violating laws** is related to societal aspects due to its

connection to broader societal norms, regulations, and practical constraints that caregivers face in their daily lives.

The decision to leave children unattended is portrayed as a pragmatic response to time constraints:

*“[...] well, you always have to find parking, which is difficult. If you also have to get them all out to pick up [older son], what I do is leave them in the car even though there's a law that says you can't leave children in the car. Or that device you have to have in the child seat. At first, I thought it was something good, but meanwhile, I see that it's totally impractical because you don't actually use it. I used to do it [bringing children with her] at the beginning, but I had to leave 15 minutes earlier because going with the kids from the parking lot to kindergarten... so I park, go down, leave [older son], come back up, and in five minutes, I'm done. So, I'm actually violating a law, yes...” (R7; 21/12/2023)*

The Italian law 117/2018 (Gazzetta Ufficiale, 2018) appears impractical for parents navigating the mobility of care. This legislation mandates the use of anti-abandonment devices in vehicles for children under the age of four, aiming to prevent caregivers from accidentally leaving a child unattended. The law introduces a legal aspect to the practical challenges faced by caregivers, especially concerning parking and the implementation of anti-abandonment measures. In their attempts to efficiently manage parking and caregiving tasks, parents may find themselves dealing with the legal implications of this regulation. Thus, as observed also above, the mobility of care lead to violate some of the traffic regulations due to practical and time constraints.

Moreover, caregivers confess to occasionally postponing the task of securing the children with seat belts until reaching the kindergarten due to mental aspects. The reasoning behind this decision is *“because it's stressful for me, and I waste too much time” (R8; 22/12/2023)*. This aspect besides posing significant safety risks for themselves and other people, it also violates traffic regulations.

Furthermore, engaging in activities that reduce concentration while driving, such as tending to children or potential distraction from children can contribute to hazardous conditions on the road and it might be exacerbated due to unforeseen accidents during trips. For instance, a respondent shared her experience with her child vomiting in the car, which consequently had a car accident:

*“Once, I had an accident because my daughter threw up. Yeah, that was during the Covid-19 time, and both my daughter and I had the virus, and we absolutely needed to go for the test in order to not stay too much in quarantine. After the turnaround, my daughter vomited. I looked back, and the car in front of me stopped suddenly to let a pedestrian cross the pedestrian crossing, and at that moment, I rear-ended it completely.”(R1; 2/12/2023)*

## **2) Travel by active modes**

### *a) Physical aspects*

Even if a great part of the participants travels their care-related trips by a private vehicle, caregivers recognize the need for sustainable alternatives and are increasingly exploring modes such as active transportation. However, these choices are not without constraints, as **seasonal and weather conditions** play a pivotal role. Participants shared their attempt at using an E-bike in the summer and the convenience of the cable car in winter. However, weather conditions, particularly in winter, impose limitations on transportation choices. One participant emphasizes the desire for more bicycle-friendly infrastructure and expresses a willingness to use an E-bike even in winter if conditions allowed:

*“In winter, I can't use the E-Bike because the road is dirt, but if it could be paved or more bicycle-friendly, I would go even in winter, without a doubt. The cold doesn't scare me... it would give me more joy of life than having to use the car.” (R7; 21/12/2023)*

The unpredictable weather present for living in mountainous regions, ranging from rain to extreme cold and snow, underscores the necessity of cars for practical reasons: “[...] we live in the mountains, one day it's raining, the next day it's -20 degrees, then it's snowing. At the moment, a car is necessary.” (R10; 11/01/2024)

Moreover, also the children have a say regarding traveling by active modes, since:

*“In winter, I always have to use the car, while in summer, I usually take the bike with the trailer, putting them both behind, and travel almost everywhere. But as they grow, I noticed that if I use the bike as a means of transport, they accept it; for leisure, they start to get tired and want to do something else.”( R11; 12/01/2024)*

Furthermore, the **physical exertion** involved in transporting children becomes a noteworthy challenge. As one respondent aptly describes the experience, *“I always sweat. I mean,*

*carrying all three of them is not easy, and they don't weigh lightly, even when they are all seated in the baby pram. But well... instead of going to the gym... the effort is there. (R9; 10/01/2024)* This underscores the physical demands caregivers endure while fulfilling their responsibilities, highlighting the tangible efforts required in everyday care trips.

#### *b) Psychological aspects*

Furthermore, the dynamics presented by walking with children might include important conflicts and negotiations. The insistence of children of specific actions is challenging for the caregiver:

*"Then there are always argues like who can sit where, and so on. Well, then I start, and the whole way is an argument because "why can he hold your hand," "why can't I hold it," "I want to go there" and so on." (R12; 30/01/2024)*

### **3) Travel by public transport**

#### *a) Physical aspects*

Respondents shed light on the challenges associated with utilizing public transportation for older family members:

*"For my mother, I have often thought of having her take a bus for at least a part of the journey to avoid a trip to her house. However, even boarding a bus is challenging for an elderly person, and it's problematic. My mother wouldn't be able to climb those steps. Escorting her by bus to the hospital would also be complicated because the bus stop is a bit far, taking a considerable amount of time for an elderly person to walk, not to mention punctuality and waiting in the cold. It's difficult." (R4; 8/12/2023)*

The difficulty of boarding a bus is highlighted, with specific challenges such as climbing steps posing a significant obstacle for an elderly person. Escorting an elderly individual to the hospital by bus is deemed complicated due to the distance of the bus stop, which emphasizes the importance of spatial accessibility and comfort for elderly individuals.

#### *b) Social aspects*

Travelling by public transport might also be challenging when considering the transportation of multiple children, or baby prams or shopping bags. However, in rural areas, the main challenge is that public transportation may not be easily accessible. For instance, one participant notes the importance of public transit in facilitating trips but lament its

unavailability for certain routes, affecting their ability to navigate daily responsibilities efficiently.

*“When there was the bus line, I always took it to accompany my son to kindergarten. Often, I also brought the sled back because there was no bus on the way back. So, the bus was very important for us, but they removed it for a few people, only 300 people. We often went to kindergarten... even for the kids, it was something beautiful. I never had a problem with them. I also had more time to be with them and could say things like, "Look at that bird," without risking accidents.” (R6; 19/12/2023)*

The removal of the bus line and its impact on caregivers' daily routines can be analysed through a Lefebvrian lens, exploring how changes in urban transportation infrastructure reshape everyday life. The physical space, such as a bus line, can either enable or constrain people, leading to inequalities in spatial accessibility for travel. Moreover, the absence of the bus alters caregivers' mental space which reflects the spatial experiences and their perception. The removal of the bus line not only affects efficiency but also alters the quality of caregivers' experiences, limiting opportunities for positive social interactions and leisure during transit (Bissell, 2018).

So, even if caregiver express enjoyment in fulfilling caregiving responsibilities, various challenges are prevalent around and during the trips. These challenges and experiences are divided into three categories, namely physical, psychological and social aspects (see Figure 35).

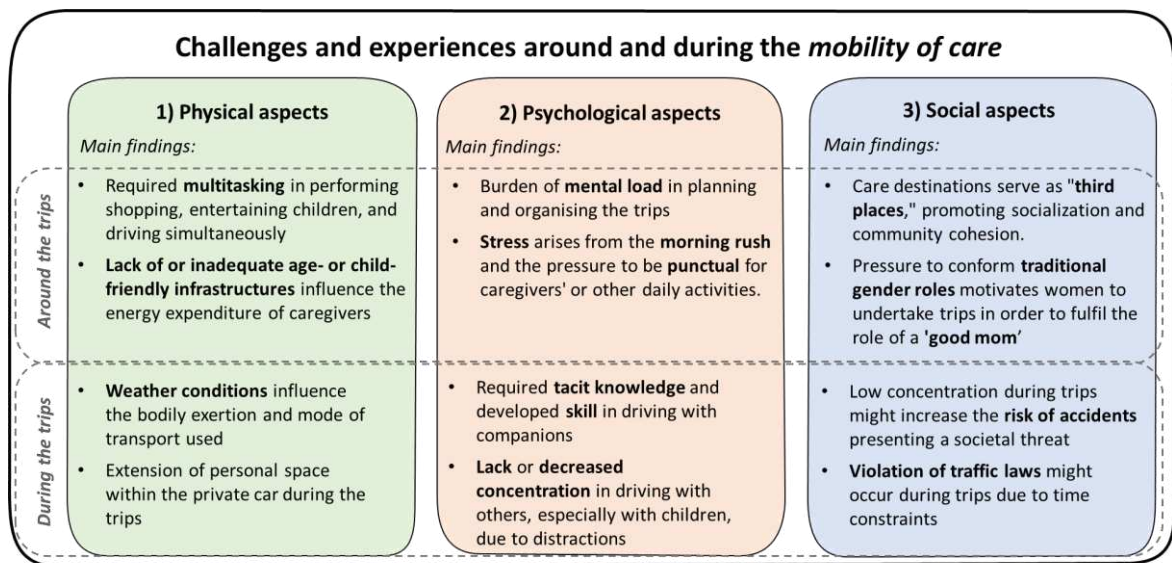


Figure 35. Main findings regarding the challenges and experiences around and during the mobility of care (Source: created by Carolina Chizzali)

## 6.5 Perspectives to alleviate mobility of care

As proposed by Shen et al. (2020), the possibility to access forms of digital work, digital services and e-commerce platforms allows for a flexible management of time, with positive implications for spatial accessibility (Kwan, 2007; Miller, 2005). Some population members tend to be excluded from such benefits, like people who cannot telework, live in places with an insufficient digital infrastructure, or are not familiar with digital technologies (Cavallaro & Dianin, 2022). However, in order to understand if digital or automated services might alleviate the mobility for both domestic and caregiving responsibilities, the last part of the semi-structured interview delves into it. Furthermore, it also delves into achieving a more equitable balance in the mobility of care between men and women.

### 6.5.1 Domestic responsibilities

The domestic responsibilities, which include organisational errands, household upkeep and grocery shopping for the whole family seems to be inclined in a change which could partially alleviate the burdens of caregivers. Indeed, respondents emphasise convenience of digital and online services, while others still value the personal consultation provided by in-person visits, especially for specific financial and administrative matters.

#### *a) Organisational errands*

Regarding digital services to carry out the banking or postal services, the majority of respondents express a preference for digital services to fulfil banking and postal needs, emphasizing the efficiency gained by avoiding physical visits:

*“You can do them when you have time; you don't have to stick to the opening hours of services. You can also do it in the evening if you forgot something, you can do it when the child is sleeping, you can do it in a much more flexible way, staying at home without having to go out and take the car for these things.” (R10; 11/01/2024)*

Some are concerned that the **human contact** gets less, but still prefer the online mode. For instance, one respondent states that “[...] maybe you lose human contact with bank employees, but I prefer doing them online instead of going there.” Also, “the disadvantages are that you reach a point where you no longer know who manages your money and your things.” (R3; 8/12/2023)

However, for certain services, such as child-related benefits, work-related consultations, and insurance matters, respondents find personal consultations preferable:

*“I need personal consultation, especially for child-related benefits, work, and other things. If I were to do it online, I wouldn't know everything I could request, or maybe I would forget. I prefer to invest time in physically going to these offices rather than taking the time to read through all the things I could request or need to do. It's important to know that everything is in order because if you don't apply, you don't get the money. I always go to the same person, and she knows me; she often tells me, "Ah, we've already done this, we still need to do this," and so on. A human relationship is established with them, and it is also nice for those who work there. I think that if you're used to working with people, suddenly no one comes [...] it's nice for those who work, it's nicer and always different”. (R5; 11/12/2023)*

Thus, some respondents prioritize in-person visits to ensure comprehensive understanding and guidance and to establish human relationships with the service providers. Indeed, respondents underline the importance of familiarity and personalization with the services providers.

#### *b) Grocery shopping*

This paragraph illustrates the insights into caregivers' preferences when choosing between traditional and online grocery shopping. The distinction between online and traditional grocery shopping varies for each caregiver, and the outcomes are not as clear-cut as they are for digital services related to organizational errands. Through the analysis, positive aspects about online and traditional grocery shopping arise.

Regarding the positive aspects about e-commerce, respondents highlight the convenience of digital services, emphasizing the desire for online shopping to be integrated into daily life, offering flexibility and spatial accessibility is highlighted:

*“However, in the future, I could imagine buying only online if local shops also offered the service, even if I had to do it myself, but I could do it from the couch in the evening. It often happens to me to order things on Amazon during those five minutes of respite while waiting for the doctor or for my daughters.” (R11; 12/01/2024)*

It aligns with the idea of mobile practices and the integration of technology into everyday routines. Also, it highlights the multitasking nature of online shopping, where individuals utilize brief moments of downtime for digital transactions. This behaviour resonates with the



concept of time-space compression<sup>10</sup>, emphasizing how digital services compress time and allow activities to be performed in non-traditional settings. (Bissell, 2018).

Moreover, online shopping transforms the conceived space of traditional retail (going to the store) into a lived virtual space accessible from various locations (waiting room, home). This aspect aligns with Lefebvre's idea that spaces are not only physical but also socially constructed and perceived, reflecting the intersection of physical and digital spaces in consumer practices (Schwarze, 2023).

Furthermore, the time spent waiting can be reduced by “consuming” it and being productive. So, time may be considered as a commodity which underlines the perception that it is a resource, like money, subject to calculation and a degree of personal control. The tendency to view time as a resource means that any apparent shortage of it results from one set of practices squeezing the time.

However, several respondents introduce critical aspects of the online shopping. One of the primary concerns revolve around emissions, products uncertainty, human contact, and pricing.

Emission concerns play a significant role in the decision-making process of how to shop the grocery. The worry about CO<sub>2</sub> emissions from constant delivery traffic prompts considerations about the ecological impact of online shopping:

*“I find online shopping worrisome as I observe constant delivery traffic at young people's homes, significantly contributing to congestion. From an ecological perspective, it causes enormous damage because mobile commerce has significant dimensions.” (R4; 8/12/2023)*

Also:

*“The idea of buying online also makes me doubt about CO<sub>2</sub> emissions; imagine if there's a truck constantly going from house to house. Even buying certain things like diapers or tissues from Amazon may be convenient, but I feel guilty because it's not sustainable, and I should support local shops. However, local shops don't provide the service, and the products are usually more expensive.” (R6; 19/12/2023)*

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<sup>10</sup> Time-space compression refers to the idea that advancements in technology and communication have effectively reduced the perceived distance between different locations on the planet and accelerated the pace of social, economic, and cultural interactions. This concept was popularized by geographer David Harvey in the late 1980s. (Janelle, 2001). Overall, time-space compression reflects the idea that the world has become smaller and more interconnected as a result of technological and social developments, making it possible for events and interactions to occur more quickly and efficiently across great distances.

However, a participant who got informed about the emissions caused by online shopping stated:

*“Initially, my main concern was emissions, having things brought from home to home. On the other hand, it should be calculated if it's indeed the case because I read once that if you calculate the electricity, it's more sustainable to have it delivered than to go to the store because there, you have to consider all the lights that are on, the time the store is open. So, I don't feel so guilty about it now, but it should be calculated.”(R7; 21/12/2023)*

The guilt expressed by the participants reflects the growing awareness of environmental issues and the desire to make sustainable choices. Guilt can be a powerful motivator for pro-environmental actions (Antonetti & Maklan, 2014). In this context, individuals feel guilty about contributing to CO<sub>2</sub> emissions through online shopping and express a desire to support local, sustainable options.

Besides the emissions of online shopping, a relevant part of the respondents highlights the uncertainty associated with online shopping, such as unintended bulk orders leading to excess. Moreover, the inability to physically examine products, raises concerns about the quality of the products: *“What if the vegetables are rotten when they arrive? In the store, I choose the pepper I like; if it's half rotten, I certainly won't take it from the store”*. Furthermore: *“If everyone received groceries, I don't know how many couriers there would have to be for everyone, and the risk of delivery delays could increase. This would also entail the risk of increasing food waste.”( R12; 30/01/2024)*

Uncertainty about the quality of products concern also clothes: *“[...] you only see the products online, and it's a bit blind. For example, with clothes, you see them, but you can't touch them, understand what material they are made of, or if they would be suitable or not.”* (R2; 7/12/2023)

Thus, online shopping introduces **uncertainties** related to the quality of products, reliability of delivery which are often related to the risks emanating from technological advancements and globalized markets (Beck & Beck, 2009).

Therefore, many individuals prefer to visit physical stores for their shopping needs for various reasons, including time constraints: *“In the end, you still have to take the time to make the shopping list. You're faster going there. It doesn't bother me. I think it would bother me more if my husband did it because, in the end, I know better what is needed or not.”* (R3; 8/12/2023) Or other prefer it traditional shopping *“because when you're there... and you see*

*something on offer or fresh, you take it: 'Ah, I could cook this tonight' you know, it's like that..." (R10; 11/01/2024).*

Moreover, respondents prefer traditional shopping due to the human contact, interactions with people, and the familiar engagement with cashiers. The physical act of shopping becomes a **social experience**, contributing to a sense of connection with the outside world.

*"I prefer the traditional way of grocery shopping, perhaps for the human contact, meeting people, and interacting with a cashier." (R4; 8/12/2023)*

*"[...] the absence of human contact represents a drawback for me. I appreciate seeking advice, meeting new people, and engaging in brief exchanges – interaction holds value for me. I am not fond of home delivery as it tends to foster isolation. Remaining confined to the home, completing all tasks within that space, and having minimal connection with the outside world is something I find unfavorable." (R12; 30/01/2024)*

The preference for going traditionally and physically to the grocery shop, driven by the desire for human interaction, aligns with the concept of going to a "**third place**" (Oldenburg & Brissett, 1982) to foster socialization and community. A grocery shop might be relevant for social interaction, but also for the development of a sense of belonging, particularly in rural settings, where communities are tight-knit, and individuals are acquainted with one another due to the smaller population size. People may appreciate the opportunity to meet and interact with neighbours, store staff, and fellow shoppers. So, encountering familiar faces, and engaging in small talk contributes to the social fabric of the community. For example,

*"I like going to town, meeting people, seeing someone, and having a chat or having a coffee. In fact, often when I'm at home for several consecutive days, I even look for an excuse to go shopping to get out. Where I live, there aren't many people, so for me, it's an excuse or a relief to go shopping." (R9; 10/01/2024)*

Moreover, the relevance of the grocery store as a "third place" is also expressed by caregivers who enjoy the experience of wandering through large supermarkets and the "getting lost" that contribute to a positive perception of physical shopping.

*"In reality, I enjoy going grocery shopping; it's not a hassle for me, even with the kids. I find it enjoyable, especially in large supermarkets where I can easily lose track of time. If given the choice, I wouldn't switch to online shopping. There was a rare occasion when I ordered certain crackers online because they were unavailable in-*

*store. However, that's an exception. Once, I also stocked up on diapers online, but generally, I prefer the experience of going to the store in person." (R3; 8/12/2023)*

The idea of "getting lost" in the context of grocery shopping may be due to the rich sensory environments of the stores, filled with a variety of sights, sounds, and smells. Moreover, individuals find joy in the abundance of choices and products available. Exploring diverse options allows consumers to express their preferences and shape their identity through consumption.

Shopping in a traditional way differs from online shopping because:

*"I often make impulsive purchases, picking up items that come to mind or are on sale. I find it tempting to buy things, especially if there's a discount, even if I don't actually need them. This tendency is more noticeable when I shop around meal times, as I often let the products on display influence my purchases." (R11; 12/01/2024)*

Moreover:

*"When I spot a croissant in the Despar, I think, 'That croissant looks delicious,' and I buy it. However, when it comes to online ordering, there's a concern about getting exactly what you ordered, especially for fresh food. What if the vegetables arrive spoiled? In the store, I can choose my peppers personally, and if one looks bad, I'll avoid picking it. So, no, I'm not a big fan of online shopping for these reasons." (R11; 12/01/2024)*

Thus, the digitalization of domestic responsibilities unveils different perspectives among caregivers in rural areas. The adoption of digital tools for organizational errands, such as banking and postal services, is favoured for its flexibility and efficiency. However, concerns arise, with some expressing the importance of personal consultations, especially for child-related benefits and work-related matters. Whereas online grocery options offer convenience, yet concerns about emissions, product uncertainty, and lack of human contact contribute to a preference for traditional shopping. Thus, the impact of environmental guilt is acknowledged and the complex interplay between technological advancements, individual preferences, and sustainability considerations is highlighted in the context of caregiving responsibilities and mobility in rural areas.

### **6.5.2 Caregiving responsibilities**

This paragraph explores the varied perspectives on caregiving responsibilities that involve the escorting of others but also the visiting of other individuals in need. More specifically, it

investigates about the driving for care-related trips, alternative transportation methods and autonomous vehicles (AVs), revealing a spectrum of opinions and considerations.

#### *a) Escorting children*

In terms of accompanying others, some participants find pleasure in driving, while others seem uncertain. To be more specific, caregivers express that driving by private car is a source of relaxation and is something they genuinely enjoy. The enjoyment of driving expressed by some respondents aligns with Urry's idea driving becoming a personal, enjoyable space, contributing to a sense of autonomy and privacy (Urry, 2001). Autonomous vehicles and alternative collective transportation may challenge this by altering the individualized experience of driving.

Regarding the implementation of AVs to facilitate or avoid care related trips, the prevalent concerns regard the safety. Fear of technological malfunctions leading to catastrophic consequences is articulated, highlighting a fundamental lack of trust in the reliability of AV systems.

*“I consider autonomous driving cars to be very risky. I'm concerned that there could be a flaw in the system, leading to a catastrophic incident like driving off a cliff and causing harm to everyone on board. Technology, in general, is prone to malfunctions, and if an error occurs, the consequences can be severe. While human drivers are not immune to mistakes, the potential damage caused by technological failures worries me, and I would feel frustrated. On a contrasting note, there are also instances of individuals driving under the influence, presenting another risk factor.”*  
(R1; 2/12/2023)

The potential consequences or people's dissatisfaction would be more significant if technology fails compared to human error. The resistance to trusting AVs is a recurring theme. Participants express discomfort at the idea of giving up control, even with the presence of current driving assist features. They prefer relying on human instincts and decision-making abilities.

*“I wouldn't feel comfortable relying on an autonomous car for my safety. Even with features like driving controls, sensors, and automatic speed adjustments on highways, it already makes me uneasy and feels like a loss of control. I think there are situations where the car may not fully comprehend external factors or road conditions that I, as a driver, can intuitively navigate. I still believe in the ability of humans to handle multiple factors simultaneously. The human need for control is*

*ingrained, and feeling helpless doesn't sit well with me. Whether it's flying, taking the bus, or any other mode of transportation, I prefer being in control, and I don't blindly trust someone else to drive.” (R4; 8/12/2023)*

The apprehension about the safety of AVs mirrors Ulrich Beck's concept of a "risk society" (Beck, 2009)<sup>11</sup>. In a society increasingly reliant on complex technologies, the potential risks associated with AVs become a source of collective anxiety, reflecting broader societal shifts in how risks are perceived and managed. Driving is not just associated with traditional risks such as accidents or road hazards. The introduction of AVs brings about new manufactured risks related to technology failures and uncertainties in how these vehicles interact with complex and dynamic traffic environments. Autonomous driving represents a paradigm shift where control is transferred from human drivers to artificial intelligence. The lack of control, both by individuals and society at large, contributes to the inherent risks associated with autonomous driving.

Acknowledging concerns, respondents recognize potential benefits, including time savings, enhanced company for children during travel, and an opportunity for parents to focus more on their children rather than the road.

*“You would gain time to do other things, but also the company that children could have or make in these cars could be interesting. Do you know how many friendships were born on buses while I was on the bus? With people I might never have met in person. Also, the responsibility for children, who start looking at the schedules, knowing when to go and where to wait.” (R5; 11/12/2023)*

*“I believe if an autonomous car enables me to relax or spend more time with my children, even if they are with me in the car and I don't have to focus on the road, it would be beneficial. Often, children demand attention with requests like ‘Mommy, I want that’ or ‘Mommy, look there’ and having the freedom to dedicate more time to them without the distraction of driving would be valuable.” (R7; 21/12/2023)*

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<sup>11</sup> Ulrich Beck's concept of the "Risk Society" offers a relevant lens for analysing contemporary challenges in car mobility. This framework expands the traditional notion of risk to include technological, environmental, social, and cultural dimensions. In the context of car mobility, concerns about technological risks, particularly with autonomous vehicles, align with Beck's idea that modernization introduces unforeseen risks. In essence, Beck's Risk Society framework provides a valuable perspective to comprehend the multifaceted risks in technological advancements, environmental issues, social dynamics, and cultural shifts within the evolving landscape of car mobility.

If analysing these statements through Lefebvre<sup>12</sup> lens, the spatial complexity of its physical, mental and social components become evident again (Bissell, 2018). Specifically, the infrastructural resources (AVs) create a different mental spatial experience of relax and socialization with children or with other passengers.

Besides having more time to socialise and resting within AVs, another positive consideration is given to the idea of AVs for short distances, especially for disabled or elderly individuals.

*“Perhaps for short distances, an autonomous vehicle could be convenient and ideal for disabled or elderly individuals. Not necessarily public transport, but a private AV for people in these conditions, used for instance for connecting a residential road to a village centre.” (R4; 8/12/2023)*

Other alternatives to the private vehicle for implementing the mobility of care is car-pooling. Mothers often collaborate to take turns accompanying each other's children to afternoon activities, showcasing the potential of car-pooling. This method is a practical solution to transportation challenges, but it comes with logistical hurdles and added responsibilities, particularly when additional siblings are involved. Indeed, despite its potential benefits, coordinating schedules, and addressing limitations on the number of children create complexities for this collective transportation approach.

*“We frequently coordinate with other moms, particularly for afternoon activities, taking turns accompanying each other's children. However, this arrangement works smoothly only when I don't have to bring my other daughter along; otherwise, it becomes chaotic.” (R6; 19/12/2023)*

The need for written authorizations and limitations on the number of children due to car seat constraints contribute to the complexity of implementing car-pooling.

*“We attempt to coordinate among ourselves to manage school drop-offs, but mornings pose a challenge due to varying free time slots. Organizing is difficult. On the return trip, it's feasible, but complexities arise as written authorization is needed to transport other children home. However, we consistently organize in small groups because regular cars can't accommodate more than two children with car seats. Even*

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<sup>12</sup> Henri Lefebvre's concept of space is articulated through a triad comprising the mental, social, and physical dimensions. Mental space encompasses subjective perceptions and symbolic meanings attached to places. Social space involves the interactions and power dynamics within a given spatial context, emphasizing the role of societal structures. Physical space refers to the tangible and material aspects, including the spatial layout and built environment. Lefebvre's framework emphasizes the interconnectedness of these dimensions, positing that a holistic understanding of space requires considering both its physical form and the mental and social processes that shape and give meaning to it. The production of space, according to Lefebvre, involves the dynamic interplay of the mental, social, and physical dimensions, offering a nuanced perspective on how individuals and communities experience and contribute to the ongoing construction of space.

*if a larger car is available, the shortage of car seats remains a challenge.” (R2; 7/12/2023)*

*“I could also ask a friend, 'Could you pick up [older daughter]?' and another friend, 'Could you pick up [younger son]?' But then? Do I continue like this every day of the week? For afternoon classes, carpooling works well. We coordinate among friends, and I would consider doing it even with moms I'm not acquainted with, as long as our daughters know each other.” (R3; 8/12/2023)*

Moreover, the challenge is not only during the trip, but there is also to consider the time-consuming nature of organizing car-pooling. A caregiver explains, *“Organizing these trips with other moms to take turns bringing the children to classes still takes a significant amount of time. As I mentioned, the process of coordinating and arranging everything requires a considerable time investment.” (R5; 11/12/2023)*

Analysing car-pooling and parental coordination from a social capital perspective reveals the inherent social resources, i.e. social capital (Bourdieu, 1986) embedded in these connections. The relationships and networks formed among parents for mutual support in transporting children to activities exemplify the social capital derived from these social ties. Furthermore, the ability of mothers to organize and coordinate car-pooling reflects shared norms and trust within the group. Trust is a form of social capital that allows individuals to rely on each other, ensuring a smooth and efficient collaboration. Also, social capital is built on the principle of reciprocity. In the case of car-pooling, mothers take turns accompanying each other's children. This reciprocal arrangement strengthens social ties and creates a sense of mutual support. Thus, Bourdieu's social capital theory provides a lens through which we can understand the relational dynamics and advantages embedded in the collaborative efforts of parents involved in car-pooling. The strength of these social ties contributes to the efficiency and effectiveness of the collective transportation approach.

However, taking on responsibilities for other children within the context of shared transportation arrangements, such as car-pooling, adds a layer of complexity to the collaborative effort. This aspect reflects the dynamics of interpersonal relationships and the varying attitudes of individuals toward assuming additional caregiving roles:

*“I take on the responsibility of caring for other children, including washing them after swimming class and acting as a babysitter not only for my daughter but also for others. However, the willingness to do so varies from child to child. Many moms avoid taking on these responsibilities, possibly due to personal conflicts or a desire*



*to maintain a certain image as a 'good mom.' Fortunately, I don't face these issues, and I appreciate it when someone picks up my daughter from daycare.” (R1; 2/12/2023)*

The statement highlights that, beyond the primary task of transportation, some parents find themselves taking on expanded care responsibilities. Obviously, the willingness to take on these additional responsibilities varies among parents. Nevertheless, car-pooling is not always and not for everyone an option.

Respondents also emphasise the significance of parental presence and involvement in the lives of young children in accompanying or picking them up from their activities. For example, a caregiver declares that *“When children are very young, it's preferable for one parent to be the one taking care of them. The farewell process is smoother when they still have a parent present.” (R9; 10/01/2024)* Or that, *“I don't feel comfortable having someone else take them to kindergarten when they're still little and need their mom.” (R6; 19/12/2023)*

Thus, the decision to personally accompany their children instead of carpooling with other families may be influenced by **societal expectations and cultural norms** regarding the definition of a "good mom" or "good parent." This projected gendered image that is assumed lead parents choosing to escort their children directly due to symbolic representations of responsible and attentive parenting, aligning with societal expectations and cultural norms related “good parenting”.

Permeated by patriarchal norms, the allocation of caregiving duties to women reflects a broader societal process of subjectivation. Indeed, gender roles are constructed and perpetuated within society, shaping individuals' identities and behaviours. In this context, women are socialized from a young age to internalize caregiving as a central aspect of their identity, reinforcing the notion that caregiving and domestic responsibilities are inherently feminine. This process of subjectivation not only impacts women's sense of self but also influences their roles within the family structure and wider society (Yaghoubi-Notash et al., 2020).

By adhering to these gendered expectations, women are not only fulfilling prescribed roles but also perpetuating traditional power dynamics. Thus, feminist theories contextualize the process of subjectivation within broader power structures that reinforce and reproduce gender inequalities (Butler, 2004; Datta, 2020). Furthermore, the association of caregiving with femininity and the expectation for women to prioritize family responsibilities over

personal aspirations reflects a form of gendered subjectivation that limits women's agency and autonomy (Clarsen, 2013; Joelsson & Scholten, 2019).

### *b) Escorting elderly*

Setting aside the context of escorting children and turning attention to the opposite end of the life cycle, namely escorting the elderly, the predominant challenges revolve around the deficiency of transportation services:

*"When my father was in his elderly years, I wished to take him to enjoy beautiful scenery or witness a sunset, but unfortunately, it wasn't possible. The healthcare service provided transportation to the hospital via ambulance, but that was the extent of it. If I wanted to create a pleasant afternoon or take him out for lunch, there was no available option. Establishing a collective service, perhaps funded to provide a car and driven by volunteers, could address this gap. Often, the elderly have simple wishes that could be collectively fulfilled by organizing trips, but the lack of suitable vehicles for rent or borrow hinders this. My father spent his last two years mainly at home or in the hospital due to the absence of appropriate transportation for the elderly or wheelchairs. Given their fragility, using a regular car and lifting them in and out can be quite painful for them." (R4; 8/12/2023)*

The lack of suitable vehicles for elderly individuals or those with mobility challenges to fulfil simple wishes, such as enjoying a sunset, or a pleasant afternoon is problematic. The challenges faced by the elderly in accessing suitable transportation relate to the concept of age-friendly cities. The absence of proper transportation infrastructure for the elderly reflects broader social considerations regarding inclusivity and spatial accessibility in urban planning. These aspects need to be especially considered due to the demographic change within our society. The proposal for a collective service to fund a vehicle, potentially operated by volunteers, emerges as a solution to address the transportation gap for the elderly. This aligns with the concept of collective action and community-driven initiatives to support and enhance the quality of life for older individuals (Ravensbergen & Schwanen, 2023). Moreover, by promoting collective governance and shared access to mobility resources, such as commoning mobility (Nikolaeva et al., 2019), the challenges experienced by the caregivers might be alleviated and the environmental burden due to the high amount of car mobility might be decreased.

So, regarding the caregiving responsibilities, respondents express both enjoyment and uncertainty about driving, emphasizing the relaxation and safety it provides. Concerns about

the safety of AVs are prevalent, reflecting a lack of trust in technology. Despite this, potential benefits of AVs are recognized, such as time savings and enhanced company for children. Car-pooling is considered a practical solution, showcasing social capital among parents, but it introduces logistical challenges and added responsibilities. Also, organizing car-pooling is time-consuming, and taking on additional caregiving responsibilities within shared transportation arrangements complicates the collaborative effort. Moreover, societal expectations and cultural norms influence decisions to personally escort children, symbolizing responsible parenting. Escorting the elderly also presents challenges due to deficient transportation services, highlighting the need for collective initiatives to address gaps in age-friendly cities.

### 6.5.3 Gender equity in the mobility of care

The majority of respondents revealed that traditional gender roles remain deeply ingrained in their households. Specifically, caregiving and domestic responsibilities are often assigned to the female partner, and they find it challenging to transfer these responsibilities to the male partner. For instance, the respondents firmly assert that the responsibility for grocery shopping is unlikely to shift to her partner due to his **lack of awareness** regarding essential household items:

*“I believe that the responsibility of grocery shopping won’t be transferred to my partner because he isn’t aware of when essentials like toothpaste or diapers are running out. He’s not familiar with our daughters’ clothing sizes and doesn’t even know where the girls’ socks are. However, I think it would be beneficial for him to integrate and be more involved in these aspects as well.” (R1; 2/12/2023)*

Whereas, other respondents reflect a changing landscape of gender roles, proposing that in a digital and online shopping scenario, both men and women could contribute equally:

*“If online shopping were the only option, and there’s a shopping list, I think both men and women could place orders. While women may have greater oversight of children, I don’t see a significant difference in grocery shopping. In fact, more and more men are cooking, right?” (R4; 8/12/2023)*

So, this highlights that activities such as grocery shopping are no longer exclusively tied to women. However, even if the actual task of online grocery shopping is assigned to the male partner, there isn’t an equal distribution of the **mental load**:

*"In general, I believe it's feasible to balance the workload between couples. However, achieving this balance is not solely about physical tasks; it involves mental load, which is often carried by mothers and consumes time. While progress can be made, achieving complete equality is challenging due to the constant mental reminders, such as thinking about tasks like going to the bank, purchasing specific-sized shoes, or preparing for upcoming events. True equality in managing this mental load still requires considerable time." (R7; 21/12/2023)*

The statement delves into the concept of "mental load," aligning with feminist theories that emphasize the unseen mental labour typically shouldered by women in overseeing household responsibilities (Dean et al., 2021). It underscores the ongoing challenge in achieving true equity, pointing out that addressing mental load requires a broader societal shift in norms and expectations. The acknowledgment of this aspect highlights the complexity of achieving equity, extending beyond the mere division of physical tasks to encompass a more profound transformation in gender roles and responsibilities.

Especially, the importance of the active involvement of the partner that is not usually involved in mobility of care is underscored:

*"I believe it's crucial for children to experience their fathers picking them up from kindergarten or school, as these seemingly small actions can greatly influence the relationship formed between them. Increased paternal involvement in these everyday matters is important, especially when children are accustomed to having only their mothers around. Such involvement can have a positive impact on their overall relationship."(R1; 2/12/2023)*

This statement emphasizes the idea is that fathers should be more engaged in these routine activities to break away from the conventional expectation that mothers are primarily responsible for such matters.

Nevertheless, one respondent mentioned that,

*"I firmly believe that the issue lies not in gender, whether male or female, but in the individual responsibilities and work undertaken. I don't perceive technology as an equalizer in caregiving mobility; instead, it originates within the individual, within the family itself. While certain responsibilities could be shared, how often are mothers initially contacted, for instance, by kindergarten or other institutions? It all begins with practices like breastfeeding, leading these activities to be almost*

*automatically associated with mothers. I view this not as a flaw in the system but rather as something inherent within the family dynamics." (R11; 12/01/2024)*

The statement suggests that the division of caregiving responsibilities is not solely a gender-based issue but is rooted in individual roles and tasks within the family and social norms. However, family and genders are two historically, socially, and spatially situated institutions that are mutually constructed.

Yet, a prevailing sentiment among the respondents suggests that the predominant factor contributing to mothers' heightened involvement in caregiving mobility is closely tied to the **employment status** of both parents. One of several participants mentioned, *"I undertake these trips because my partner works and doesn't have the time to do them. I am not employed; I stay at home, so I take on the responsibility for these tasks."* (R9; 10/01/2024)

Also in those cases where the female partner is employed, she is often assigned the primary caregiving responsibilities, primarily attributed to her fewer hours spent in paid work. This allocation of roles underscores the significance of **flexibility**, a factor that could also be linked to job precariousness.

*"I handle this type of mobility as I work part-time for three half-days a week, contrasting with my husband's full-time job. Notably, before maternity, I didn't have a steady job, leading me to stay at home during the first year with my younger daughter. Following the birth of my second child, I secured a part-time position, working three times a week from 8 to 12. The paramount criterion for accepting a job as a mom, for me, is flexibility." (R3; 8/12/2023)*

Other respondents highlight their agency and voluntary decision to work less and opt to spend more time with their children, also due to a lack of stable job possibilities.

*"I don't mind working less and having a more flexible job. In the end, we both desired children, so I willingly committed myself to them. Importantly, I didn't have to sacrifice any dreams or pursuits, as I didn't pursue higher education or have a fixed job previously. In reality, being with my children brings me joy; it aligns with my preferences." (R11; 12/01/2024)*

*"I do it because I work only in the morning. I opted for a part-time job to spend more time with my children. If both work the same hours, it's another story, but if one works part-time and the other full-time, I don't see the need to equalize involvement in these things." (R5; 11/12/2023)*

Thus, being part-time employed nearly automatically involve the responsibility for care-related mobility. Moreover, it touches on the negotiation of responsibilities within a family context and how a family structures their work arrangements.

*“This is how I perceive it: if the other person has time or if the mom is unable to go, you can step in, and it's fair to share the responsibilities a bit. However, it all depends on the available time. In my opinion, my husband works, and he isn't keen on handling these tasks.” (R12; 30/01/2024)*

These statements reflect the societal expectation that mothers should be available for mobility of care and in general domestic responsibilities can lead to discrimination in hiring. Indeed, the feminist theories emphasize how traditional gender roles and expectations hinder women's equal participation in the workforce (Schmidt et al., 2023) As one respondent states:

*“Mothers often face challenges in securing employment due to the need for caregiving responsibilities and employers frequently perceive these requirements negatively. However, if both men and women were equally responsible for such trips and being available for afternoon activities, it could potentially contribute to narrowing the gender gap in the workplace. Normalizing the concept of fathers going to work later because they have to take their children to school could be a step towards equality. Unfortunately, the reality is different; mothers are usually the ones who need to seek permission from employers if they wish to arrive later at work.” (R1; 2/12/2023)*

So, mobility of care patterns is clearly influenced by social structures, encompassing employment conditions and gender roles. The essential role of workplace flexibility for mothers in achieving a better work-life balance is evident. Also, the shared pursuit of flexibility among women, seeking approval to adjust work hours for family duties, underscores the enduring impact of traditional gender norms.

This intersection of gender roles, employment conditions, and caregiving mobility reveals itself, aligning with feminist theories that highlight the disproportionate burden on women in juggling work and caregiving.

## 7. Discussion of the results

### 7.1 Discussion of the results

This research brings to light the correlation between space-time constraints and significant spatial accessibility disparities among men and women in society. Specifically, the spatial and temporal aspects of accessibility pose significant challenges for rural residents. The residential location is intricately linked to out-of-home constraints, encompassing the diverse destinations for daily activities. It is known that rural residents need to travel further to reach essential destinations. Moreover, these out-of-home locations vary significantly between men and women due to their distinct priorities. Men typically face constraints related to paid labour, while women predominantly encounter constraints associated with unpaid labour.

These spatial dynamics are closely related with the temporal component of accessibility, encompassing the duration and fixity of activities. Men tend to engage in longer, fixed activities due to full-time employment, while women allocate more time to fixed activities for others, a pattern often influenced by their part-time employment status. This relationship is further connected to employment conditions, with women's part-time employment allowing for increased involvement in domestic and caregiving responsibilities, contributing to a higher degree of participation in the mobility of care, which is defined as all trips carried out for unpaid labour namely for children and other individual's incapable of independent physical mobility, as well as the tasks required for maintaining the household (Madariaga, 2013). Specifically, the so-called mobility of care represents 43.2% of women's daily travel, whereas it comprises 28.3% of men's travel. In contrast, commuting to and from work constitutes a larger share of men's daily travel, accounting for 50.9%, compared to 38.0% for women.

However, even though the spatial accessibility for women tends to decrease due to the high involvement in the mobility of care, often the destinations to carry out those domestic or care-related activities are often perceived positively as “third places” (Fullagar, 2019; Oldenburg & Brissett, 1982). Indeed, going to the grocery shop or accompanying children to their activities might foster socialization and community building. That is especially relevant for caregivers that spend a high amount of daily time at home. In this research, it emerged that domestic constraints continue being mostly assigned to women, impacting on the higher amount of time “confined” at home or in their outside mobilities, mainly due to

reasons of care for the other members of their families. Specifically, , the average time spent at home stands at 7h40min for women , in stark contrast to the at 4h58min for men.

Nevertheless, the mobility of care, primarily involving women in their out-of-home and coupling constraints, is not devoid of challenges. These difficulties around and during the mobility of care should not be underestimated, encompassing aspects related to physical, psychological, and social factors.

The physical challenges associated with the mobility of care are particularly pronounced in specific situations, such as the handling of shopping bags or manoeuvring baby prams. These physical demands pose particularly challenges for caregivers residing in rural and mountainous areas, where the terrain is uneven, necessitating a significantly higher expenditure of energy. Consequently, there is a heightened reliance on private cars, the predominant mode of transport for care-related trips. In fact, private cars are favoured for their ability to provide the flexibility needed for chained trips and carrying multiple items.

Despite the time efficiency and convenience they offer, private cars can also present economic challenges for caregivers and environmental issues for society as a whole. For instance, the car environment often transforms into a play area filled with toys and snacks, creating a mobile privatized space that provides entertainment needs for the children. This transformation might result in distractions for caregivers while driving, posing risks and potentially leading to accidents. This not only underscores the vulnerability of caregivers but also highlights the broader risks posed to society.

The psychological aspect relates to the spatial and temporal constraints experienced by caregivers. More specifically, caregivers tackle with the daily psychological challenge of maintaining punctuality within their out-of-home and coupling constraints. This punctuality is inclined to be compromised due to the need to organize and remember all essential items, particularly when multiple children are involved, and unforeseen obstacles present themselves during the journey. The coordination of time and parental responsibilities in these situations becomes a significant source of stress. Additionally, the multiple roles assigned to the caregiver, such as being both the driver and entertainer during the trips, contribute to feelings of frustration and heightened stress levels.

The social aspects considered encompass factors relevant to or influenced by society. Within this context, temporal constraints are evident as caregivers resort to violating norms and laws in the interest of saving time, such as leaving children unattended in the car or neglecting seatbelt use. Caregivers argue that these regulations prove impractical for individuals dealing



with time constraints and multiple chained trips. The violations of these laws and the challenge caregivers faced in maintaining concentration during trips unveil a societal-level risk.

To alleviate these challenges, a transition from private cars to alternatives become crucial for environmentally and socially sustainable development. However, this shift poses critical sociological considerations. On one hand, a move towards active modes of transport, like E-bikes, could occur if the infrastructure accommodates caregivers' needs, such as providing well-maintained paths throughout the year. Yet, this proves challenging in South Tyrol due to its mountainous terrain and varied weather conditions. On the other hand, motorized alternatives may include car-pooling and electric autonomous vehicles. While car-pooling is viewed as a practical solution, it introduces logistical challenges, especially in coordinating schedules and addressing limitations on the number of children. Car-pooling also reflects social capital, showcasing social ties and trust among parents, but it adds complexity when taking on responsibilities for other children. Moreover, respondents highlight the enjoyment of driving and its relaxation benefit. Regarding autonomous vehicles, despite the perceived positive aspect of more time to spend with children without the need to concentrate on driving, the majority express concerns about safety and uncertainties regarding technological failures.

This perceived risk of technological failure becomes particularly apparent when considering the concrete implementation of autonomous vehicles. In contrast, the accessibility of digital work, services, and e-commerce platforms is already present in caregivers' lives. However, certain population segments, such as those unable to telework, residing in areas with inadequate digital infrastructure, or lacking familiarity with digital technologies, may be excluded from these benefits (Cavallaro & Dianin, 2022).

Even though these digital services compress time and space, they do not relieve female caregivers of the psychological or mental load associated with balancing work and caregiving responsibilities, which includes organizing trips and managing personal and children's schedules. Several respondents note that this mental burden is often assigned to mothers, even when the actual travel is undertaken by the partner. This emphasizes the need for a broader societal shift in norms and expectations.

Another pivotal aspect necessitating a societal shift pertains to the employment conditions of both men and women. Respondents indicate that domestic and caregiver responsibilities are socially assigned to females due to their lower time spent in paid labour. Consequently,

being part-time employed or working from home almost automatically entails the responsibility for care-related mobility. Indeed, among adults working part-time, women spend nearly twice as much as men of their daily mobility in care-related trips, constituting 33.6% and 17.4% respectively. While both genders working full-time contribute similarly to the daily share of mobility of care. Thus, on the one side, women tend to work less in paid labour due to their increased involvement in care-related activities. On the other side, traditional gender roles hinder women's equal participation in the workforce (Samtleben & Müller, 2022).

In summary, the research reveals that the primary driver of gender-based spatial accessibility disparities in rural areas lies in the domestic, out-of-home, and coupling constraints. Men's greater involvement in paid labour activities and women's engagement in unpaid labour, specifically in the mobility of care, create this distinction. However, while employment-related trips receive substantial consideration in transport planning, care-related trips are often overlooked. This oversight results in a heightened reliance on private cars for women, posing significant dangers, especially when transporting children. To address these issues and foster a more equal distribution of caregiving responsibilities between men and women, a profound shift in social norms and gender expectations is needed. This transformation should extend across the realms of employment practices, urban planning incorporating child- and age-friendly principles, and the equal consideration of genders in transport planning.

## **7.2 Limits of the study**

The aforementioned results necessitate cautious interpretation, acknowledging that this mixed-method research is not devoid of limitations. Both the qualitative and quantitative research components face with limitations associated with sample size which can impact representativeness, generalizability, and robustness of the findings. Therefore, the study necessitates a cautious interpretation of the findings and emphasizes the need for future research to encompass more diverse and extensive samples. Furthermore, the context-specific nature of the study might challenge the replication of results in different context. This makes it difficult to validate findings through replication.

The following paragraphs outline the principal constraints inherent in both the quantitative and qualitative components.

### 7.2.1 Limits of the quantitative study

The quantitative study is carried out in Mühlwald. This small rural municipality in South Tyrol serves as a specific case study for understanding mobility patterns and challenges in a distinct regional context. It is crucial to recognize that Mühlwald may not fully represent all rural areas due to its characteristics. Specifically, the study area has a small population size (1,400 inhabitants) as well as the sample size is small for both quantitative analyses. The total collected travel diaries are 119, whereas the units of analysis for the spatial accessibility and mobility of care analysis varies. For the former, the units of analysis encompass 79 individuals that exclude the minors and elderly over 65 years of age since children and youth attending school often share similar habits, while retired individuals over 65 also commonly experience comparable accessibility challenges in terms of space and time.

For the mobility of care, the analysis encompasses a sample of 99 individuals, encompassing both adults and elderly aged from 18 to over 65. This approach aims to provide a more whole understanding of individuals engaged in caregiving and escorting activities, considering factors like grandparents' involvement in caring for grandchildren. The units of analysis for the mobility of care are the 278 trips carried out by the 99 individuals. This small sample raises concerns about the statistical reliability of our results. As such, generalisations are not possible until a larger dataset is available. An additional limitation is the unequal representation of both gender groups in the sample, since there is a higher share of female respondents comparing to their male counterpart. This also complicates the representativeness.

Moreover, in the analysis of the study of the mobility of care, the travel diary was not explicitly designed to investigate care mobility, as proposed by Madariaga and de Zucchini (2019). That is due to its origination from a distinct research project (FWF Research Radar, 2022). Nevertheless, the survey structure allows a relatively precise reinterpretation of the trip purposes, facilitating the identification of care-related trips. Yet, this reinterpretation is not without limitations, such as the reliance on textual notes for aspects like leisure shopping, which might be subject to a bias.

Finally, the presented gender-based differences regard the average values of selected indicators across the sample members. Other statistical measures could have shown (partially) different results. For instance, the coefficient of variation, the Gini index or the Palma ratio could be used to enrich the discussion and discuss the distribution of benefits and burdens over men and women (e.g. van Wee & Mouter, 2020)

### **7.2.2 Limits of qualitative study**

The main limits of the qualitative study also regard the representativeness and the generalizability. More specifically, the sample size of the study is small because it involves only 12 respondents. This aspect can limit the representativeness of the findings. In addition, the limited sample comprises exclusively women, due to the primary focus on them as the main caregivers. However, a more gender-balanced sample could enrich the understanding and implementation of the mobility of care. Moreover, only women part of the Italian, German and Ladin group are interviewed whereas the 10% of the South Tyrolean population that does not identify within these groups are not included in the sample.

In addition to that, the locations of the respondents vary across villages in South Tyrol, selected based on their classification as peripheral areas from the Italian National Strategy for Internal areas. Consequently, the qualitative research extends beyond the rural village of the quantitative research, namely Mühlwald. While this expansion enhances the richness and diversity of perspectives, it introduces challenges related to generalizability, since each rural community has its own dynamics, shaped by local culture, infrastructure, and socioeconomic factors. .

Finally, the interpretation of qualitative data might represent subjectivity and biases even if the author strains to put aside the pre-existing beliefs and hypothesis.

## **8. Conclusion**

An initial understanding of gender-based differences in spatial accessibility and mobility of care has been addressed in this study. The study illustrates the primary challenges and perspectives associated with the mobility of care, using rural areas in the region of South Tyrol as a case study.

The gender-based differences in spatial accessibility concern mainly the purpose of the domestic, out-of-home and coupling constraints, that differs between men and women. The former are mostly involved into employment related activities and trips, whereas the latter are mainly involved in the mobility of care, both within and outside home. Furthermore, the care-related trips involve several challenges and particular experiences for the caregivers, that encompass physical, psychological and social aspects.

## 8.1 Further research

In exploring further research directions, it is important to delve into specific areas that can enhance our understanding of gender-based disparities in spatial accessibility and mobility of care. These include investigating several aspects.

First, similar quantitative research with a more extensive sample size could help to gain a comprehensive understanding of the experiences related to the spatial accessibility and mobility of care in alpine areas. This would involve considering various socio-demographic factors, geographical areas, and challenges posed by mountainous terrains. Especially, the inclusion of other genders and not only women as well as the involvement of caregivers that do not identify within the three considered language groups (i.e. Italian, German and Ladin) will enhance the completeness and the depth of the findings. This is particularly relevant given the increasing presence of individuals from diverse social or ethnic backgrounds in rural areas, including in alpine areas. In the region considered, they are comprising approximately 9.9% of the region's population (Astat, 2022a).

Secondly, a comparative analysis between urban and rural settings would provide valuable insights into how gender-based differences in spatial accessibility and mobility of care vary across different anthropological environments. So, understanding the distinct challenges faced in both contexts can address targeted interventions and policies.

Third, exploring attitudes and preferences regarding active modes of transport, such as walking or cycling, in rural, and specifically mountainous, regions is crucial. Future research in this path could shed light on the feasibility and acceptance of such modes, influencing future infrastructure development and mobility planning.

Fourth, investigating the intricate relationship between mobility of care and employment is relevant. Indeed, understanding how employment conditions impact caregiving responsibilities and vice versa can provide insights into the broader dynamics shaping gender roles in both spheres. This becomes particularly pertinent and significant when looking also at the demographic changes in society and the expected increase of elderly population.

Finally, further research focusing on the proportion of road accidents occurring during care-related journey could provide valuable insights to ensure higher safety on roads. Thus, by identifying potential risks and contributing factors of these accidents might be the basis for developing preventing measures, contributing to the safety and well-being of both caregivers and children while traveling.

Each of these research directions could contribute to a more holistic understanding of gender-related spatial accessibility and mobility of care differences, taking into account diverse contexts, challenges, and safety considerations.

## **8.2 Recommendations**

This research highlights the intricate connections between gender-based disparities and various factors. Addressing these issues effectively necessitates increased awareness and attention from policymakers. Specifically, the involvement in the mobility of care is strictly related to the employment conditions. The results show that unemployed or part-time employed individuals are more involved compared to the full-time workers. This aspect leads to the thought that more time is at disposal for the care activities. However, feminist theories underscore how traditional gender roles hinder women's equal participation in the workforce, since they often struggle re-entering the labour market after having children. That leads to the traditional gender roles that expect men responsible to provide economically to the family whereas women are associated with domestic and caregiving responsibilities. Policymakers need also to be aware of the diminishing assistance from volunteers, grandparents, and other familial sources in providing care services for children in rural areas. Strengthening care services becomes thus crucial in light of these changing dynamics.

Due to their higher involvement in the mobility of care, mothers are more involved in the several challenges related to this mobility. Moreover, the conventional transport and urban planning use to focus more on employment-related trips and activities, often overlooking challenges related to care-related trips and activities. This lead also to an environmentally and socially unsustainable high use of the private car. Policymakers need to consider the economic stressors associated with car ownership and develop strategies to enhance transportation options, ensuring that individuals in rural areas can fulfil their caregiving responsibilities without sacrificing other essential needs.

Therefore, policymakers need to increase the attractiveness of active and collective modes for rural areas. Regarding the active modes, the widespread adoption of e-bikes is an opportunity to enhance the attractiveness of cycling for short care trips, particularly in rural areas where the slope may discourage traditional biking (MacArthur et al., 2018). Furthermore, also electric cargo bikes offer a practical solution for overcoming physical challenges like carrying shopping bags or transporting baby prams (Gruber & Narayanan, 2019). However, the success of promoting cycling (including e-bikes) depends on the

presence of adequate infrastructures, economic incentives, and sharing systems also in the countryside.

Regarding collective modes, additional challenges arise for rural public transport, such as the general lack and spatial dispersion of the demand, which typically makes frequent public-transport services financially unsustainable. However, “community transport” (diffused especially in the UK), which encompasses various not-for-profit schemes like dial-a-ride services, volunteer car initiatives and community buses. These services specifically target local transport needs not adequately served by traditional commercial or public transport, by complementing it at reasonable costs (Ravensbergen & Schwanen, 2023). Non-profit collective transport modes include also carpooling and ride-pooling networks (Aguilera & Pigalle, 2021; Masoud et al., 2017).

Therefore, this research shed light on the need for a higher female involvement into the decision-making processes of this transport and urban planning is needed. To work towards greater equity, it is relevant to reduce gender-related disparities at the highest decision-making levels. Ensuring that disadvantaged groups, such as women, have a substantial voice in decision-making processes is paramount. Moreover, decentralizing decision-making can help tailor transportation systems to meet the unique needs of individuals at the local level, acknowledging the existing spatial, temporal, and individual variations. A higher involvement of women could lead to a higher share of child-friendly and age-friendly principles in the transport and urban planning.

In conclusion, the most important and difficult step is a radical cultural change at societal level according to traditional gender roles. While change is definitely occurring, role differences and associated inequities are still present. Bringing attention to care work emphasizes what continues to be the central life experience of many women and is mainly carried out by women by reason of the gender division of labour.

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