



Caregivers on the move: Gender and socioeconomic status in the care mobility in Bogotá

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ABSTRACT

The concept of mobility of care is relatively new and generating growing interest, because it allows a greater understanding of daily mobility and the differences in time use (TU) and unpaid workloads in the population. There is a large unexplored field of study in the relationships between the socioeconomic and gender characteristics of the population and care trips in large Latin American cities. This study uses the Mobility Survey for Bogotá – 2019 to characterizes travel for caregivers in the city, identifying trips made for care reasons, and then relating the analysis to variables of gender, age, socioeconomic status, occupation, and time and mode of transport used, in order to highlight and deepen the understanding of interdependence relationships between caregivers and care receivers. Results show that care work and care trips are carried out mostly by women, and we also find an unequal burden among caregivers and their socioeconomic conditions, with the lower strata population assuming a greater burden for care trips and time use when caring for others. Our findings contribute to the understanding of a phenomenon of growing importance and allow progress in the design and implementation of public policies towards a triple objective: transparency for care tasks and mobility, facilitation of their execution, and minimizing gender and socioeconomic status inequalities.

Introduction

In recent years, the subject of care is gaining momentum across multiple disciplines. New efforts are aiming at understanding the determinants of everyday activities which are indispensable to life, but long marginalized by mainstream social sciences. The gender-based and social class nature of activities such as buying groceries and caring for children, the elderly, or other dependents have kept these tasks out of recognition and most importantly policymaking debates. The push to study and recognize care tasks has often stemmed from feminist scholars across the economy, sociology, anthropology, and geography fields but transport studies have also taken a recent interest in the spatial distribution of care tasks and care-related trips. This turn in travel behavior studies was pioneered by the works by Sanchez de Madariaga (2013) and her use of the term “mobility of care”. Although there is still no consensus on the formal definition of that term, its introduction becomes important as it helps represent and visualize a large percentage of trips within the daily mobility of people that are devoted to access care tasks.

These kind of trips have been found to be overwhelmingly more frequent among women and other vulnerable population groups (Jirón & Gómez, 2018; Plyusheva & Schwanen, 2018; Sánchez-de Madariaga & Zucchini, 2020).

Studies assessing mobility of care allow us a greater understanding of daily mobility patterns and the differentiated dynamics of specific population groups in the city, in terms of the way of living and appropriating the city. This allows detecting inequalities in the assumption of daily tasks, in addition to a more complete view of the activity in the city. Given the quantitative importance of travel for care tasks, planning the city without taking this type of travel and its particular characteristics into account promotes a biased view of urban mobility that eventually perpetuates transport disadvantages, spatial injustice, and social exclusion (Lyons, 2003; Mackett & Thoreau, 2015; Montoya R & Escovar A, 2020).

To date, studies assessing mobility of care are still scarce and there remain many issues to resolve. Among them, the specific definition of the reasons for travel related to care, its relationship with

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sociodemographic variables such as age and social class, and the relationships of interdependence between caregivers and receivers. Most studies that address the issue are based on qualitative methodologies and focus on the experiences of certain population focus groups such as older adults (Croucher et al., 2020; Plyushteva & Schwanen, 2018), working mothers and fathers (Jirón & Gómez, 2018; Maciejewska & Miralles-Guasch, 2019; Barker, 2011), and bicycle users (Grant-Smith et al., 2017; Montoya-Robledo et al., 2020; Ravensbergen et al., 2020; Sersli et al., 2020). However, there is little current research focused on mobility of care over a broader perspective of the population, covering the general characteristics of mobility of care in cities, especially in Latin America (Boarnet & Hsu, 2015; Rosenbloom, 1987; Sánchez-de Madariaga & Zucchini, 2020; Zucchini, 2015).

For this reason, as its main objective, this article analyzes mobility of care from a quantitative perspective, in order to offer a better understanding of care activities in Latin America. Subsequently, mobility of care in Bogotá is analyzed to quantify its role in daily mobility and understand its unequal presence among the different social groups and socioeconomic classes: (1) which population groups assume a greater burden of care trips, (2) which gender or class aspects influence the distribution of these trips, or (3) what forms these trips, in terms of time taken and means of transport.

Theoretical framework

Care in the literature: Care work and mobility of care

The body of literature addresses the issue of care from two different perspectives: the analysis of care as a dimension of work, and more recently the issue of mobility of care. The first has focused mainly on studying the weight of care tasks in daily life, its relationship with paid and unpaid work, and the ways to measure it and include it in national economies, consequently. The second understands that each care-activity requires a trip in order to access it, and thus focuses on trips for care-related motivations as a proxy to understand the spatial dimension of care dynamics.

Care work

The dimension of care first appeared in the 1980 s in economic studies and does so from the perspective of feminist criticism (Duffy et al., 2013; Esquivel et al., 2012; Middleton & Samanani, 2021; Torns Martín, 2008). Care as a research topic stems from the recognition of domestic work that entails a greater workload for women (Benería, 1999; Bittman et al., 2005). However, the study of care is already advancing in the 21st century, and has taken its own direction by including dimensions, activities, and spheres of action beyond domestic work and home management (Carrasco, C, 2007), including the concern to quantify it.

To date there is no general consensus on a single definition of care. In its broadest sense, care activities are considered all those activities necessary to guarantee the well-being and development of people (Conradson, 2003), both in the public sphere provided by the State and institutions or by people privately employed for such purposes, that can be offered in a specific and controlled manner in terms of time and services. In the private sphere or domestic environment, daily care tasks are generally provided by members of the family, without express financial remuneration. These different meanings of care reflect the simultaneous existence of several care networks that are intertwined in their operations and daily life: (1) paid care “performed as a profession” (Araujo & Hirata, 2020), (2) unpaid care performed as an obligation, and (3) the community care provided as “help” which occurs mainly among population groups with fewer resources, therefore they do not have the possibility of paying for care, which is thus not provided within the family (Jirón & Gómez, 2018b; Torns Martín, 2008).

Beyond the exact definition, one of the existing consensuses is that care is still carried out mainly by women (Araujo & Hirata, 2020;

Carrasco, 2007; Esquivel et al., 2012; Jirón & Gómez, 2018b; Segovia & Rico, 2017). As a consequence of the results of previous studies, care has been studied from the gender gap perspective, and in its relationship with domestic work and unpaid work. Several investigations focused on the definition of a care economy and how to measure it. These efforts have been focused on how to calculate its economic value to be able to include it as a productive activity (Araujo & Hirata, 2020; Duffy et al., 2013), highlighting the time spent on these activities as a key variable for its measurement (Torns Martín, 2008).

Mobility of care

As a consequence of advances in care research, more recently from the fields of geography and urban studies, the subject is being approached from a spatial perspective and related to mobility and the use of the city. In this way, from the concern to make transparent the workload generated by care trips the specific name of care mobility was adopted by Sánchez de Madariaga (2013) and subsequently by Zucchini (2015). This theoretical proposal consists of treating the mobility of care as a container of travel reasons grouping a multitude of specific motivations with one element in common: being related to the activities carried out by adults for the care of minors and other dependent people, including home maintenance.

However, at a global level, both in Europe, as well as in Latin America, and the United States, the contributions to research on mobility of care come mainly from studies of daily mobility with a gender perspective. Within these categories, the majority using qualitative methods analyze the relationship between travel patterns such as modal choice and degrees of mobility and immobility, of different population groups by age (Delclòs-Alió et al., 2020; Marquet et al., 2020), gender, social status (Jirón, 2007), and those generated by the presence of children in the home (Scheiner, 2014, 2020), or choosing to use a specific mode of transportation such as walking, cycling, or public transportation (de la Paz Díaz Velásquez, 2017; Gutiérrez, Andrea and Reyes, 2017). Others approach mobility of care on a general scale using quantitative or mixed techniques, using general mobility or time use surveys. In this line, gender differences in daily trips are analyzed mainly in urban environments and various modes of transport and their impact on the use of the city and time use (Delclòs-Alió et al., 2022; Delclòs-Alió & Miralles-Guasch, 2018; Gómez-Varo, et al., 2023; Herrmann-Lunecke et al., 2020; Marquet & Miralles-Guasch, 2014b, 2015a; Martínez & Santibáñez, 2015; Miralles-Guasch et al., 2016; Montoya R & Escovar A, 2020; Sagaris & Tiznado-Aitken, 2020; Sandip Chakrabarti, 2019). Comparative studies that stand out use age and gender (Cubells et al., 2020), time and distances between cities, and they are set in different countries ((J. Gimenez-Nadal et al., 2016; J. I. Gimenez-Nadal & Molina, 2016) in which travel times are compared by age and gender, and the relationships between gender, daily commuting times, and times dedicated to housekeeping and child care tasks are explored (Boarnet & Hsu, 2015; Sandip Chakrabarti, 2019). These studies tend to show the incidence between greater responsibility in care tasks and the degree of mobility or immobility.

Among the investigations that specifically address the mobility of care, there are also mostly studies based on qualitative methods such as focus groups, mobility biographies, ethnographic techniques, participant observations, and interviews, in which analysis in specific population groups is undertaken involving caring for others, especially children, people of different ages (Croucher et al., 2020; Plyushteva & Schwanen, 2018), gender (Barker, 2011; Rosenbloom, 1987)(Barker, 2011; Rosenbloom, 1987) and socioeconomic status (Gilow, 2019; Jirón & Gómez, 2018b), and what bicycle use implies for this type of trip (Montoya-Robledo et al., 2020; Ravensbergen et al., 2020; Sersli et al., 2020). To a lesser extent, quantitative characterizations are carried out, based on mobility and time use surveys, which seek to highlight the gender differences that care tasks signify (Jiron & Carrasco, 2020; Sánchez-de Madariaga & Zucchini, 2020; Zucchini, 2015), especially regarding children (Demoli & Gilow, 2019; Maciejewska & Miralles-

Guasch, 2019).

In Latin America, research is related to the concern to generate clues for urban planning and the definition of public policy (Montoya-Robledo et al., 2020; Jirón M, 2007a; Jirón, 2017; Jirón & Imilán, 2019; Jirón & Singh, 2017), both linked to the minimization of socio-spatial inequalities and to encouraging sustainable mobility and the use of active modes of transport among women and for the development of care activities (Delclòs-Alió et al., 2022; Herrmann-Lunecke et al., 2020; Montoya-Robledo et al., 2020; Sagaris & Tiznado-Aitken, 2020).

Methodology

Geographical scope of study: The city of Bogotá

This study focuses on Bogotá (the capital of Colombia), the largest and most populated city in the country. It has an area of 1,775.98 km², of which 307.36 km² covers urban areas, where a total of 7,166,249 inhabitants live (Nacional, 2018), thus becoming one of the great Latin American metropolises.

Data sources

The data were obtained from the Mobility Survey – 2019 (Alcaldía Mayor de Bogotá et al., 2019; Secretaría Distrital de Movilidad et al., 2019), selecting the data collected for the municipality of Bogotá, which represents a total of 17,557 household surveys. Additionally, a total of 142,566 origin–destination surveys were carried out through interception in streets and different vehicles. For our analysis we excluded the trip motive: “return home” which has reduced the total trips for analysis to 59,414 trips down from a total of 106,403 trips (Secretaría Distrital de Movilidad et al., n.d., 2019).

One of the main strengths of the Bogota official travel survey is that trips are included regardless of their duration. This is a differential fact with respect to mobility surveys carried out in other cities of the world, in which trips with durations of less than five minutes are usually ignored. (Sánchez-de Madariaga & Zucchini, 2020; Zucchini, 2015). In this way it is possible to include in the analysis short-term trips generally associated with active modes of travel such as walking (Delclòs-Alió et al., 2022; Marquet et al., 2017; Rietveld, 2000), often related to care trips (Herrmann-Lunecke et al., 2020; Marquet & Miralles-Guasch, 2014b; Montoya-Robledo et al., 2020; Sagaris & Tiznado-Aitken, 2020). In addition, the 2019 edition of the Mobility Survey for Bogotá is the first one in which care is explicitly included as a reason for travel (Secretaría Distrital de Movilidad, 2020.). However, due to the lack of definition of the concept for the collecting process, care trips are frequently erroneously classified under “To look for/leave someone”, “To look for/leave something” and “other travel reasons”. For this reason, a reclassification of care mobility trips has been carried out, also grouping those trips classified in the “other” category that clearly expressed a reason for care.

Definition of variables

Our definition of care trips includes all those trips made with or by people for the well-being of others, and to facilitate their movement, experience, and appropriation of the city, leaving aside the tasks of domestic work and home administration. Likewise, although care exists in the institutional sphere, this article analyzes daily care trips, leaving paid care work trips aside.

In this way, for the analysis of mobility of care in Bogotá, initially all return trips home were eliminated, and then the trips were stratified based on the following variables: age, gender, occupation, socioeconomic status, mode of transport used, length of trip, and time spent yesterday caring for others (in hours).

Travel motive: The survey includes 17 travel purposes, which are detailed in the Table S1 found in the Supplemental material. For the

present analysis, we excluded the “return home” purpose, and grouped the remaining categories as follows: work, study, received health care, leisure, recreation and sport, formalities, shopping, other, and care of people. The “care of people,” travel motive in turn groups together the categories “To look for/leave someone”, “To look for/leave something” understanding the inherent need for companionship or forced travel on behalf of others. In addition, care trips include trips classified as “other travel reason” but which, according to the description included in the survey, involve a trip to care of others, such as: “Accompanying elderly person with disability”, “Accompanying the child to the clinic”, “Take granddaughter to the garden”, which are detailed in the Table S2 found in the Supplemental material.

Age groups: the age group 30 to 45 years is the most frequently studied in the literature, as it is considered the population group that assumes the most care tasks and spends the most time caring for others (Zucchini, 2015). However, following the recommendation of Croucher et al., (2020) and Sánchez de Madariaga & Zucchini (2020) the present study expands this range, including a total of six age groups: 1) children and adolescents (under 18 years), 2) older adults (from 61 to 75 years and over 75 years), and adults in productive age, separated into three groups, 3) from 18 to 30, 4) from 31 to 45, and 5) from 45 to 60 years.

Sex: the sociocultural patterns associated with gender are a key variable to analyzing differences between caregivers, and to characterize both care and mobility of care (Araujo & Hirata, 2020; Jirón, 2017; Jirón & Gómez, 2018b, 2018a; Sánchez de Madariaga, 2013; Segovia & Rico, 2017; Torns Martín, 2008). For the present analysis, use the sex variable which collects information for the entire survey sample (Secretaría Distrital de Movilidad et al., 2019.), and refers to the physical and anatomical conditions of the individuals. It is classified into two categories: male and female.

Occupation: the mobility survey includes 24 different occupations aggregated that for the present analysis where are further grouped into 7 categories; studying; working; being dedicated to the home, permanently disabled, retired, and/or unemployed are disaggregated into “other occupations”. It is important to clarify that the category of worker refers to paid employment.

Socioeconomic status: Socioeconomic status is a classification used in Latin America as a way of determining social class (Araujo & Hirata, 2020). In Colombia, it is a measurement of residential properties, which combines variables of the conditions of the property and the environment where it is located, and relates the value of the property to the payment capacity of households, for which it is used as a measure to identify socioeconomic conditions of households, beyond the salary earned (Marquet et al., 2017; Pineda Duque, 2016; Ríos Bedoya et al., 2016). The strata are classified into 6 categories, with the first having the lowest socioeconomic conditions and the sixth being the highest.

Transport modes used: the survey includes 32 different modes of transport, which were reclassified into 5 categories: walking, bicycle, public transport, private transport, and others.

Travel times: these are calculated from the continuous variable “duration of the trip” generated from the reported time of start and end of the trip. The times are grouped into six ranges, including trips of less than five minutes: short trips (up to 5 min), between 5 and 15 min, between 15 and 30 min, between 30 and 60 min, between 1 and 2 h, and longer than 2 h.

Time spent caring for others the day before: this variable allows us to approach the use of time in direct relation to caring for others, it is included in the analysis independently and is assessed in relation to people and not to trips made. The variable is continuous and is presented in hours and minutes separately, for which the values are initially added to obtain total data in hours. Based on this, 4 time ranges are generated, based on what is stated by Pineda and Munévar (Araujo & Hirata, 2020; Pineda Duque, 2016) and the relationship with the work schedule of 8 or 8.5 h a day: Short time (<3 h), Half day (3 to 8 h), Full time (8 to 12 h) and Exclusive dedication (longer than 12 h).

Analysis

The results section combines bivariate statistical analysis (BSA), and the use of multivariate models to understand the distribution of care mobility travel burdens among population groups in Bogotá. To do this, care trips are first identified and their distribution among population groups is observed using a chi-squared test. Next, three multivariate models are used to estimate the chances of making a care trip, the number of hours dedicated to daily care, and the number of minutes spent on care trips per day. Model 1 estimates the opportunity to carry out a care trip using a binary logistic regression (0 = no-care trip; 1 = care trip). Model 2 estimates the number of hours dedicated to care tasks using an ordinary least squares (OLS) linear regression model. The same type of model is applied in model 3, which estimates the total daily time spent on care trips. All the models are adjusted for the variables of gender, age group, main occupation, and social stratum. Likewise, an interaction between the variables of age, occupation, and stratum with the variable of sex is used to isolate and understand the gender gap in the distribution of trips and care tasks. All analyses were performed using SPSS v21.

Results

Care trips and Bogotá mobility

Of all the trips taken in Bogotá in a day, care trips represent 11.8%. That represents the fourth most frequent trip motivations after trips for work (32.3%), study (16.7%), and leisure (14.0%). Within the categories of care trips, the majority are identified as chauffeuring or leaving someone (9.66%) (Fig. 1).

Care distribution among the population

Table 1 summarizes the distribution of care trips in relation to their category: gender, age groups, main occupation, stratum, and population, showing the interaction of the variable sex, with age and stratum, exposing the number of people surveyed, and the percentage that each group represents in each information category. In terms of total trips, men have slightly lower trip levels than women (2.51 vs. 2.57). If we look only at care trips, we see that this difference is significant ($p < 0.001$), since while care motives represent 11% of journeys for women, they only represent 6.2% for men.

Although there are no large differences between groups regarding the number of daily trips, the differences are multiplied when we only

analyze care trips. Thus, the population groups that have a higher percentage burden in journeys for care are found among the groups of adults of intermediate age (from 31 to 45, and from 46 to 60 years), followed by the age group considered elderly (from 61 to 75 years), which coincides with the average retirement age in Colombia. In relation to the main occupation, among people dedicated to the home, 22.1% of their trips are for care, and in direct relation to age, for retired people the percentage of trips for care represents 10.7 % of their trips. It is interesting to note that women from the lowest social strata travel more for care than the higher strata, and as socioeconomic stratification increases, the percentage of trips for care decreases considerably. In contrast, for men, the percentage of trips for care remains around 6% for all socioeconomic strata.

Table 2 shows the effects of the main sociodemographic variables studied on the probability of making a care trip (Model 1, binary logistic); the number of hours dedicated to care on the previous day (Model 2, linear least squares); or the total number of minutes spent on care trips (Model 3, linear least squares). The three models estimate the effect of each of the variables of: main occupation, age ranges, gender, and social stratum on the main variable, as well as the effects of the interactions of gender by occupation, gender by age groups, and gender by social stratum. To help interpret the interactions, we present the estimated marginal effects calculated at the sample means, which represent the expected value indicated in each category of the interacting variables. Table 2a..

Model 1 explains the possibility of taking a care trip, and in terms of main occupation demonstrates those being dedicated to the household are 5.13 times more likely to take a care trip than the reference group (ref) of students ($p < 0.001$). In the same way, retired people ($OR = 3.56p < 0.001$) and those not occupied ($OR = 3.20p < 0.001$) also stand out in the probability of them taking a care trip with respect to students, and even to a higher degree than those recognized as employed. Age highlights the greatest weight of care trips in the group aged 31 to 45 years ($OR = 2.14p < 0.001$), while for gender it is verified that women are more 54% more likely to take a care trip than men ($OR = 1.54p < 0.001$). Finally, a clear trend is found between the strata of 4, 5, and 6 in performing fewer care trips as the stratum number increases.

When we focus on the estimated marginal values of the interactions (Fig. 2) we observe that by age group and gender, the group with a greater likelihood of taking a care trip is that of women in the age range 31–45 years, for which care trips represent 19.78% of all their trips when we adjust for the effect of the rest of the control variables. On the contrary, the group with women aged over 75 years performs a sparse number of care trips (3.56%). In terms of gender, it highlights that in the

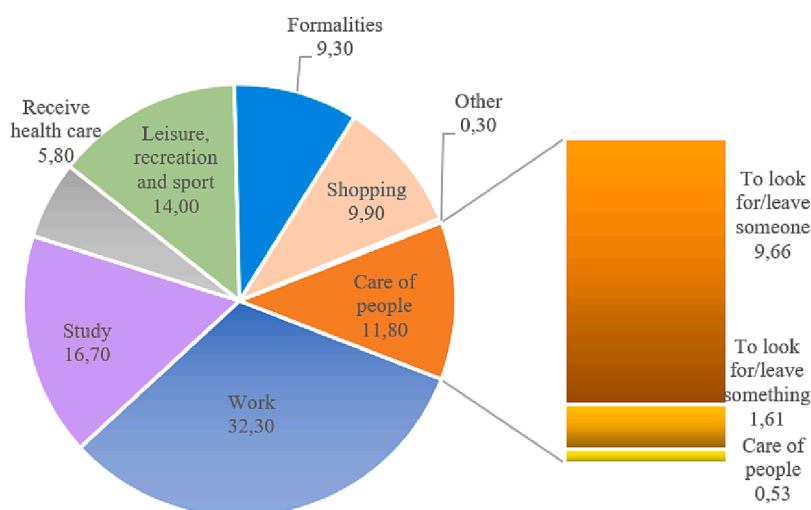


Fig. 1. Trips by motive in Bogotá (%).Source: Own elaboration from the Mobility Survey for Bogotá – 2019.

Table 1

Characteristics of the sample and types of trips.

Socioeconomic variables	Persons N	%	Trips N	Average daily trips/ person	Care Trips %* p**
Age					0.000
<18 years	8530	20.4	19,348	2.27	3.2%
18 to 30 years	9412	22.5	23,880	2.54	8.4%
31 to 45 years	9212	22.0	24,444	2.65	12.6%
46 to 60 years	8183	19.6	21,906	2.68	10.3%
61 to 75 years	5203	12.4	13,707	2.63	9.6%
> 75 years	1315	3.1	3118	2.37	5.6%
Sex					0.000
Male	20,020	47.8	50,199	2.51	6.2%
Female	21,835	52.2	56,204	2.57	11.0%
Principal occupation					0.000
Student	10,287	24.6	24,024	2.34	3.0%
Worker	20,482	48.9	52,603	2.57	6.9%
Dedicated to the home	5799	13.9	15,758	2.72	22.1%
Retired	2037	4.9	5629	2.76	10.7%
Not occupied	1652	3.9	4271	2.59	14.5%
Permanently disabled	267	0.6	643	2.41	10.0%
Other activity	1331	3.2	3475	2.61	11.5%
Stratum					0.000
1	5279	12.6	13,025	2.47	10.7%
2	13,006	31.1	31,950	2.46	10.2%
3	14,744	35.2	37,334	2.53	8.0%
4	6099	14.6	16,285	2.67	6.6%
5	1503	3.6	4189	2.79	6.3%
6	1224	2.9	3620	2.96	5.6%
Sex × age interaction					0.000
Male < 18 years	4389	0.2	9937	2.26	2.9%
Male 18 to 30 years	4641	0.2	11,649	2.51	5.3%
Male 31 to 45 years	4391	0.2	11,257	2.56	8.0%
Male 46 to 60 years	3596	0.2	9499	2.64	7.6%
Male 61 to 75 years	2372	0.1	6347	2.68	8.7%
Male > 75 years	631	0.0	1510	2.39	6.1%
Female < 18 years	4141	0.2	9411	2.27	3.5%
Female 18 to 30 years	4771	0.2	12,231	2.56	11.5%
Female 31 to 45 years	4821	0.2	13,187	2.74	16.8%
Female 46 to 60 years	4587	0.2	12,407	2.70	12.4%
Female 61 to 75 years	2831	0.1	7360	2.60	10.4%
Female > 75 years	684	0.0	1608	2.35	5.0%
Sex × stratum interaction					0.679
Male #1	2576	0.1	6053	2.35	6.0%
Male #2	6253	0.3	14,973	2.39	6.1%
Male #3	7026	0.4	17,751	2.53	6.5%
Male #4	2893	0.1	7763	2.68	6.2%
Male #5	709	0.0	1989	2.81	6.0%
Male #6	563	0.0	1670	2.97	5.3%
Female #1	2703	0.1	6972	2.58	15.2%
Female #2	6753	0.3	16,977	2.51	14.0%

Table 1 (continued)

Socioeconomic variables	Persons N	%	Trips N	Average daily trips/ person	Care Trips %* p**
Female #3	7718	0.4	19,583	2.54	9.4%
Female #4	3206	0.1	8522	2.66	6.9%
Female #5	794	0.0	2200	2.77	6.7%
Female #6	661	0.0	1950	2.95	5.9%
TOTAL	41,855	100	106,403	2.54	

* Percentage of care trips with respect to the total number of trips made when return home has been excluded.

** ANOVA of a factor on the variable Percentage of care trips.

Source: own elaboration from Mobility Survey for Bogotá – 2019.

two age groups where caregivers are more frequent, women always have a higher probability of taking a care trip than men (19.75% vs. 13.83% in 31 to 45 years; 14.94% vs. 9.14% in 18 to 30 years). Gender and stratum highlight the great difference between women of low (16.91% and 15.55%) and high stratum (8.26%). This means that women of low stratum perform almost double the number of care trips than women of high stratum, a dynamic that is not observed to the same extent among men, where most strata show values around 10% for travel care.

In model 2, it is identified that people dedicated to the household allocate more time (in hours) for the care of others (coef = 1.13p < 0.001). By observing the interactions in model 2 (Fig. 1), one can see that women dedicate more time as caregivers than men (coef = 0.30p = 0.008), regardless of age, stratum, and occupation. However, the group of women of 31 to 45 years shows greater dedication in time as caregivers (coef = 0.97p < 0.001), followed by the group of 18 to 30 years. Likewise, women of lower strata spend more time as caregivers (1.88 h for stratum 1 and 1.80 h for stratum 2), showing a significant reduction with respect to women in higher strata (between 1.21 and 1.23 h for strata 4, 5, and 6).

Model 3, which shows the daily minutes taken for care trips, underlines the data of the previous models, giving evidence that people dedicated to the household spend 9.4 times more time as caregivers than those who study or work (p < 0.001). This preponderance is also evidenced for retirees (coef = 4.59p < 0.001) and persons who are not occupied (coef = 5.67p < 0.001). Women, as with the other two variables, dedicate 2.74 times more time than men for care trips (p = 0.003). In relation to age, people between 46 and 60 years (coef = 3.67p < 0.001) dedicate more time to care trips; however, by relating age with gender (model 3 in Fig. 2) it is observed that women of age between 31 and 45 years dedicate more time to this type of trip. Likewise, women of stratum 1, not only take more care trips, they spend more time on this type of trip, showing a considerable reduction as socioeconomic stratum increases, while for men data between strata are similar.

Care trips, travel time, and modal choice

Finally, Table 3 shows the transport modes used for care trips, compared to the trips made for all other reasons, all classified by time range. It is noteworthy that almost half of the travel reasons are performed by walking (48.6%). The other half of the trips are developed mainly by private (23.3) and public transport (23.1%). There is a decrease in travel times for care trips, among which 38.02% take <15 min, and 65.8% <30 min, which could explain the increase in walking. It draws attention to the reduced use of the bicycle, which only brings together 4.3% of care trips despite its short duration.

Discussion and conclusions

This study presents a contribution to the literature on the analysis of

Table 2
Relationship between socioeconomic variables and mobility of care.

	Model 1			Model 2			Model 3		
	Probability of making a care trip			Hours dedicated to care yesterday			Daily minutes spent on care trips		
	Is it a care trip? (0 = No; 1 = Yes)								
	Is it a care trip? (0 = No; 1 = Yes)			Total time in hours spent yesterday caring for others			Trip duration in minutes		
Variables independents	OR	P > z	95% CI	Coef	P > z	95% CI	Coef	P > z	95% CI
Age									
< 18 years	=ref			=ref			=ref		
18 to 30 years	1.32	0.008	[1.08; 1.62]	0.30	0.002	[0.11; 0.49]	1.17	0.147	[-0.41; 2.75]
31 to 45 years	2.14	0.000	[1.73; 2.66]	0.65	0.000	[0.43; 0.88]	3.19	0.001	[1.35; 5.04]
46 to 60 years	1.80	0.000	[1.44; 2.25]	0.39	0.001	[0.16; 0.62]	3.67	0.000	[1.77; 5.58]
61 to 75 years	1.28	0.046	[1.00; 1.63]	0.24	0.065	[-0.02; 0.49]	2.33	0.030	[0.23; 4.44]
>75 years	0.69	0.034	[0.49; 0.97]	-0.22	0.217	[-0.58; 0.13]	-2.43	0.107	[-5.39; 0.52]
Sex									
Male	=ref			=ref			=ref		
Female	1.54	0.000	[1.22; 1.95]	0.30	0.008	[0.08; 0.52]	2.74	0.003	[0.91; 4.57]
Occupation									
Student	=ref			=ref			=ref		
Worker	1.50	0.000	[1.24; 1.83]	0.08	0.390	[-0.11; 0.28]	0.00	0.998	[-1.59; 1.59]
Dedicated to the home	5.13	0.000	[4.03; 6.52]	1.13	0.000	[0.82; 1.44]	9.40	0.000	[6.84; 11.97]
Retired	3.56	0.000	[2.75; 4.62]	0.49	0.001	[0.19; 0.79]	4.59	0.000	[2.05; 7.12]
Not occupied	3.20	0.000	[2.55; 4.02]	0.26	0.055	[-0.01; 0.53]	5.67	0.000	[3.44; 7.91]
Permanently disabled	1.36	0.296	[0.76; 2.42]	0.11	0.702	[-0.46; 0.68]	-1.70	0.477	[-6.38; 2.98]
Other activity	2.92	0.000	[2.26; 3.79]	0.45	0.006	[0.13; 0.77]	4.00	0.002	[1.42; 6.58]
Stratum									
Stratum 1	=ref			=ref			=ref		
Stratum 2	1.05	0.556	[0.90; 1.21]	0.08	0.348	[-0.08; 0.24]	0.33	0.620	[-0.97; 1.63]
Stratum 3	1.04	0.559	[0.90; 1.21]	0.01	0.870	[-0.15; 0.17]	0.71	0.280	[-0.58; 2.00]
Stratum 4	0.98	0.824	[0.83; 1.16]	-0.05	0.599	[-0.24; 0.14]	0.96	0.220	[-0.57; 2.49]
Stratum 5	0.89	0.351	[0.69; 1.14]	0.01	0.958	[-0.29; 0.31]	0.93	0.441	[-1.44; 3.31]
Stratum 6	0.80	0.122	[0.61; 1.06]	-0.12	0.463	[-0.45; 0.21]	0.17	0.898	[-2.43; 2.78]
Sex by age									
Female /18 to 30 years	1.52	0.002	[1.16; 1.99]	1.03	0.000	[0.77; 1.30]	2.97	0.009	[0.75; 5.19]
Female /31 to 45 years	1.35	0.037	[1.02; 1.79]	0.97	0.000	[0.66; 1.27]	4.37	0.001	[1.80; 6.94]
Female/46 to 60 years	0.83	0.202	[0.62; 1.11]	0.00	0.982	[-0.32; 0.31]	0.88	0.514	[-1.76; 3.52]
Female/61 to 75 years	0.67	0.011	[0.49; 0.91]	-0.79	0.000	[-1.14; -0.45]	-2.88	0.053	[-5.79; 0.04]
Female/>75 years	0.57	0.019	[0.35; 0.91]	-1.39	0.000	[-1.87; -0.90]	-3.41	0.099	[-7.46; 0.64]
Sex by occupation									
Female/Worker	1.05	0.716	[0.81; 1.35]	0.42	0.002	[0.16; 0.69]	-0.03	0.977	[-2.25; 2.19]

(continued on next page)

Table 2 (continued)

	Model 1			Model 2			Model 3		
	Probability of making a care trip			Hours dedicated to care yesterday			Daily minutes spent on care trips		
	Is it a care trip? (0 = No; 1 = Yes)								
	Is it a care trip? (0 = No; 1 = Yes)			Total time in hours spent yesterday caring for others			Trip duration in minutes		
Variables independents	OR	P > z	95% CI	Coef	P > z	95% CI	Coef	P > z	95% CI
Female /Dedicated to home	1.21	0.197	[0.91; 1.62]	1.71	0.000	[1.34; 2.08]	-0.19	0.906	[-3.26; 2.89]
Female /Retired	1.30	0.143	[0.92; 1.85]	1.34	0.000	[0.92; 1.77]	5.01	0.006	[1.43; 8.59]
Female/Not occupied	1.10	0.531	[0.81; 1.51]	1.02	0.000	[0.63; 1.42]	1.23	0.465	[-2.07; 4.53]
Female / Permanently disabled	3.04	0.003	[1.45; 6.36]	1.22	0.006	[0.36; 2.08]	5.91	0.110	[-1.34; 13.2]
Female/Other activity	1.19	0.309	[0.85; 1.67]	1.43	0.000	[1.00; 1.87]	2.25	0.211	[-1.28; 5.79]
Sex by stratum									
Female/2	0.86	0.096	[0.72; 1.03]	-0.15	0.175	[-0.37; 0.07]	-2.06	0.026	[-3.9; -0.25]
Female/3	0.58	0.000	[0.48; 0.69]	-0.27	0.015	[-0.49; -0.05]	-4.61	0.000	[-6.41; -2.82]
Female/4	0.48	0.000	[0.38; 0.59]	-0.62	0.000	[-0.88; -0.36]	-5.76	0.000	[-7.89; -3.63]
Female/5	0.47	0.000	[0.34; 0.66]	-0.63	0.003	[-1.05; -0.22]	-5.66	0.001	[-8.94; -2.38]
Female/6	0.55	0.001	[0.38; 0.78]	-0.53	0.019	[-0.98; -0.09]	-5.35	0.003	[-8.92; -1.79]
Constant	0.04	0.000	[0.03; 0.04]	0.13	0.095	[-0.02; 0.29]	1.41	0.033	[0.11; 2.70]

Source: Own elaboration from the Mobility Survey for Bogotá – 2019.

care mobility, emphasizing gender differences and using a quantitative methodology. The results allow us to broaden our understanding of mobility and care work beyond the Europe and North America spheres, providing a necessary perspective from the Latin American city. In Latin American the study of daily mobility has been initiated from the implications of gender (Jirón Martínez, 2007; Jirón, 2017; Montoya R & Escovar A, 2020) and in relation to the different active modes of transportation and public transportation (De la Paz Díaz Velásquez, 2017; Delclòs-Alió et al., 2022; Herrmann-Lunecke et al., 2020; Montoya-Robledo et al., 2020; Sagaris & Tiznado-Aitken, 2020), but without delving into the relationships of caregiving in mobility. Thus, these reflections contribute to the identification of differential patterns in the mobility of caregivers in the aim of guidelines for the implementation of public policy and actions in urban planning, which promote greater equity in terms of the experience and appropriation of the city both by women as the main caregivers, as well as by the cared-for subjects.

Mobility of care represents a total of 11,8% of the total trips analyzed for Bogotá, although this proportion varies according to gender, age, and socioeconomic status. Thus, groups such as domestic workers spend a third of all their mobility focused on care. The exact percentage of trips dedicated to care depends largely on the geographical, cultural, and socioeconomic contexts of the population, but also on the survey methodology. In this context, other studies such as the work of Sánchez de Madariaga & Zucchini (2020) have estimated the weight of care mobility in other settings finding for instance that 29% of trips in Madrid (Spain) could be classified as mobility of care.

When analyzing which population segment engages in a greater weight of care trips in Bogotá in terms of gender and age, it is evident that women take on the most responsibility for care. This is consistent with studies in other Latin American cities and also worldwide (Araujo

& Hirata, 2020; Jirón, 2017; Sánchez de Madariaga, 2013; Sánchez de Madariaga & Zucchini, 2019; Sánchez-de Madariaga & Zucchini, 2020; Segovia & Rico, 2017; Torns Martín, 2008) in relation to gender differences in the development of care tasks and care trips. For Bogotá it is evident that there is an unbalanced distribution of the burden generated by the care of others. Women not only make more trips for care reasons, they also spend a greater amount of time on these trips and on care tasks compared to men, and this difference is in evidence beyond age, socioeconomic status, or occupation.

In relation to the main occupation, those who care of others the longest and have more care trips, identify themselves as dedicated to the home, retired or not employed, unlike those employed as workers. This suggests that the work involved in care is still not clearly identified or understood, which leads to a difficulty in accepting the unequal burdens assumed by caregivers (Duffy et al., 2013; Esquivel et al., 2012; Middleton & Samanani, 2021; Torns Martín, 2008).

Similarly, the age group of 30 to 45 years makes the most care trips while spending more time on these trips and taking care of others, as evidenced by Sánchez-de Madariaga & Zucchini (2020) regarding Madrid, although the representative participation in these activities of older people in the age range of 60 to 75 years (indicative of retirement) is noted as an interesting fact. Therefore, many of the people considered elderly in Colombia can be classified as caregivers, rather than care receivers. This finding confirms for the Latin American case what was noted by Croucher et al. (2020) for England, and Plyusheva and Schwanen (2018) for Manila and London. This finding also opens a window towards new specific studies of this age group in order to investigate the reasons that make them assume a role of caregivers, and if they respond to the search for economic, social, and family integration at this stage of life. In addition to the contribution that caregiving activities can bring to their health in terms of physical activity and social

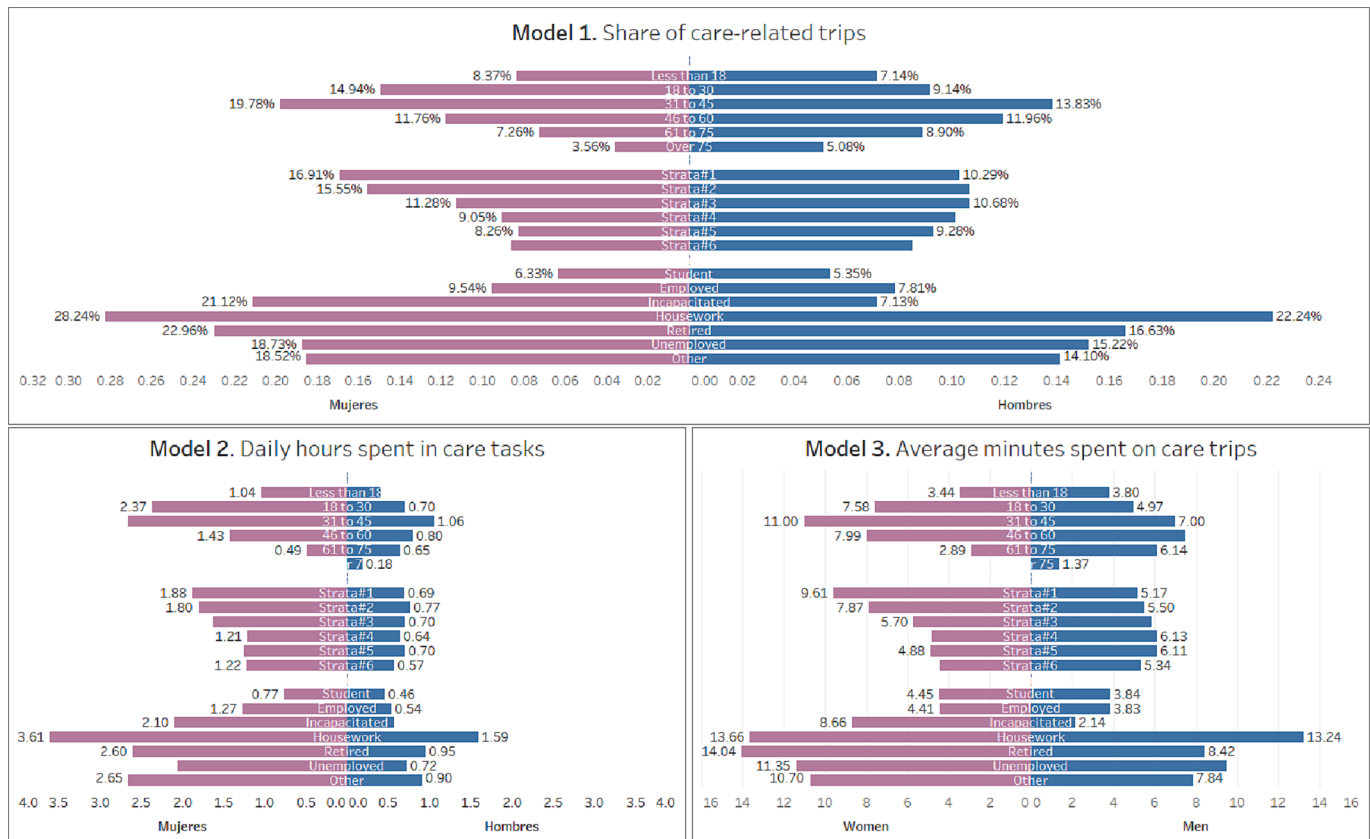


Fig. 2. Interactions between care trips, care times, gender, age, stratum, and occupation. Source: own elaboration from Mobility Survey for Bogotá – 2019.

Table 3

Mode of transport and time ranges on care trips and non-care trips.

		(1) < 5 mins	(2) 5 to 15 mins	(3) 15 to 30 mins	(4) 30 to 60 mins	(5) 1 to 2 hrs	(6) > 2 hrs	Total	% motive
0 Non-care trips	1 Public transport	0.21	4.54	18.21	36.67	52.38	18.66	17,832	41.4
	2 Private transport	0.49	2.00	5.62	5.62	3.56	1.39	8049	18.7
	3 Other	0.03	0.14	0.77	1.39	1.24	0.23	1636	3.8
	4 Bicycle	0.29	1.02	1.51	1.08	0.46	0.24	1983	4.6
	5 Walking	6.55	11.97	8.70	2.70	0.98	0.65	13,598	31.6
	Total	7.57	16.56	22.34	22.36	22.77	8.40	43,098	
1 Care trips	1 Public transport	0.29	1.41	4.74	6.81	6.93	2.98	1299	23.1
	2 Private Transport	1.03	4.22	7.47	6.13	3.26	1.19	1308	23.3
	3 Other	0.02	–	0.30	0.14	0.14	0.07	38	0.7
	4 Bicycle	0.68	1.55	1.21	0.45	0.14	0.23	239	4.3
	5 Walking	8.43	20.40	14.06	3.90	1.10	0.71	2728	48.6
	Total	10.44	27.58	27.78	17.43	11.58	5.19	5612	
Total								48,710	

Source: Own elaboration from the Mobility Survey for Bogotá – 2019.

integration.

To our knowledge, this study is the first to quantify the relationship between care tasks, and not only gender and age but also socioeconomic status. To date, this hypothesis has only been tested in specific qualitative studies such as those of Pineda Duque, (2016), Jirón Martínez, (2007), Jirón, (2017), Alcaldía Mayor de Bogotá et al., (2019), Demoli and Gilow (2019). Our results find a direct relationship between time spent on care, including care trips, gender and socioeconomic status, with a greater time burden on care and care trips made among lower compared to upper strata women. Thus, those who spend more time caring for others are women from lower strata, dedicated to the home, in the age group of 31 to 45 years, which could respond to the organization of care networks described by Jirón & Gómez (2018b) and analyzed by Gilow (2019). These care networks might grant that while women with better socioeconomic conditions seek institutional support and employ

women from lower strata to attend to these care tasks, women from poorer sectors resolve them as favors through family or even community support. Although other European and North American contexts reflect the same trends in relation to the predominance of women in caregiving and care travel, in Latin America there is also an additional impact of the socioeconomic conditions of these women, which opens a specific line of research that would be worth investigating not only in Bogotá, but also in other Latin American cities where it has been mentioned that the race or origin of the women has for the present an impact on caregiving relationships (Jirón & Gómez, 2018b).

Finally, it is evident that care trips are mostly local in nature and developed largely by walking and within a duration of <30 min, although most are <15 min. For this travel motive, there is a greater preference for walking, which places the majority of care trips in Bogotá within the sphere of proximity, sustainable, and healthy trips within the

reach of the majority of the population in line with studies done for Barcelona (Marquet and Miralles-Guasch, 2014, 2015; Marquet Sardà and Miralles-guasch, (n.d.); Miralles-Guasch & Marquet sardà, 2013), which require optimal conditions of the city's built environment, such as density, diversity and design (Marquet et al., 2017; Marquet and Miralles-Guasch, 2014). However, as noted by studies on modal choice and walking in several Latin American cities (Delclòs-Alió et al., 2022; Herrmann-Lunecke et al., 2020; Sagaris & Tiznado-Aitken, 2020), in this context modal choice may also be influenced by issues of segregation and social inequality, which conditions economic access to the private vehicle and favors the choice of active modes and public transport.

Our findings indicate that there are clear socioeconomic and gender-based disparities in the distribution of mobility and care-related tasks in Bogotá and recognize that a large part of care trips take place on foot and in short times. All this point to the need to recognize, visualize, and adapt the built environment to facilitate these indispensable trips care and to encourage active mobility among caregivers and cared-for subjects, promoting not only sustainable and accessible transportation, but also physical health. Therefore, from urban planning and public policy it is urgent to intervene in the generation or strengthening of accessible public spaces for all people regardless of their physical conditions or age, as a form of integration and mitigation of segregation and inequality.

While our study provides valuable insights into the mobility of caregivers in the context of Bogotá, further research is needed to fully understand the complexities of care-related travel. One potential avenue for future research is to explore the mobility of the cared-for subjects and the mobility patterns in the interdependence relationships, within the household members, on the community and in relation to the role of institutions. Considering the active nature of caregiving trips, another interesting research direction would be to investigate the environmental factors that impact walking of both caregivers and cared-for subjects, as they may present physical and age conditions that require special attention to promote walking trips through public space. Regarding cycling, despite the availability of cycling infrastructure in Bogotá, cycling is not widely used for care-related trips. Montoya-Robledo et al. (2020) have already identified gender patterns in cycling behavior among parents with children, indicating a need for further investigation into the intersection of gender and care-related bicycle trips. To better understand this phenomenon, future research could explore the factors that discourage the use of bicycles among caregivers, including road safety concerns, accident rates, and gender disparities.

Our analysis also revealed a higher reliance on private compared with public transportation. To better understand this phenomenon, it is essential to investigate how the mobility of care recipients, particularly those with motor disabilities, may impact travel mode choice. Existing studies on the mobility of people with disabilities have highlighted the challenges they face when using public transportation, underscoring the need for accessible and inclusive transportation options for all members of society (Paguinto et al., 2020; Ralph et al., 2022). By exploring these issues, policymakers and planners can work to create more equitable and sustainable transportation systems that support the mobility needs of all individuals, including caregivers and care recipients.

Limitations of this study

The present study has some limitations. First, the lack of specific definition and clear recognition of care trips minimizes identifying the real number of care trips made, for which this study presents an approach based on the identification and grouping of the named care reasons, obviously as part of the care trips. However, it is possible that other reasons for travel may mask other trips associated with care. Although the survey includes the reasons for care trips and trips of less than five minutes, a lack of sensitivity and understanding of the care issue is still identified, which is evidenced by the lack of additional variables, such as trips made by small children under five years of age, or the recording of trips made in the company of someone else, that would

allow studying the mobility of care in a more complete way, and the relationships of interdependence that are generated between caregivers and care receivers. It is also possible that, because this is the first edition of the Bogotá mobility survey that introduces the term “care of people” as a specific travel motive, these trips might have ended up underrepresented due to people being not familiar with it.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.trip.2023.100884>.

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