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Analyzing Mobility Gaps Between People with and without Disabilities using Oaxaca-Blinder Decomposition Method

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Abstract

Some population groups have lower propensity to be mobile than others. The reasons for this divergence in tendencies are difficult to assess namely since some of these groups have vulnerability features and are typically less observed and analyzed in regular surveys. The aim of this research is to compare the mobility of people with and without disabilities. Data from the 2019 Origin-Destination survey for Montreal City (Canada) allows to calculate four mobility indicators. 54% of the people with disabilities are immobile during a typical weekday compared to 17% for the other group. To understand the source of the mobility gap, two estimations with Oaxaca-Blinder decomposition method are used. It has been found that a portion of this gap is explained by different characteristics of the two groups (proportion of older adults, workers, and people with driver license). The gap is also explained by disparities between people with similar characteristics. Women and older adults with disabilities are less mobile than women and older adults without disabilities. The analysis of people with and without disabilities satisfaction suggests that the perception of PT is a factor associated with the mobility gap between the two groups, but further research will be necessary.

Keywords: Mobility disparities; Mobility indicators; Decomposition methods; People with disabilities; Satisfaction; Public Transportation

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1. Introduction

In Canada, one person over five aged 15 years and older has a disability that limits its daily activities (Statcan, 2018). Nevertheless, it is rare to see a person in a wheelchair in the subway or a person with trisomy 21 at the bus stop. These people are often forgotten because they are rarely present in regular public transit services. Moreover, mobility is essential for social participation and access to opportunities, and this is also true for PWDs (people with disabilities) (Bascom & Christensen, 2017; Ipsen & Repke, 2022; Levasseur et al., 2015). Does the mobility behaviour of people with disabilities really differ from those of people without disabilities or is it just a matter of perception? Unfortunately, mobility gaps between people with and without disability are hard to assess since only few surveys are conducted including both groups and other surveys targeting either group are difficult to compare. Furthermore, the determinants of mobility gaps are also important to study. Indeed, it is possible to question the sources and the consequences of these mobility gaps: social factors (legislation, inclusiveness, community, etc.), environmental factors (accessibility of the built environment, access to the destination, etc.) and individual factors (physical and mental abilities, demographic characteristics, etc.) or they are related to the composition of the groups studied. This is the central topic of this paper. It first presents some background elements relevant to the research, then focuses on the context and the methodology, continues with the presentation of the results, and closes with a discussion on the various findings and research perspectives.

2. Literature Review

The literature review shortly presents some background elements related to mobility disparity faced by PWDs. Decomposition methods are also discussed justifying the use of the Oaxaca-Blinder methods in the context of this research.

2.1. Mobility Disparities Faced by PWDs

Most people are aware that PWDs face more challenges and barriers in their daily life and that mobility is not an exception. It is often mentioned that elevators in metro stations or access ramps in buses are essential, but mobility disparities are more diverse than that. Figure 1 shows the different categories of disparities faced by PWDs in relation with transportation modes and access to destinations. Table 1 presents examples of mobility disparities, by category, found in the literature. All these disparities may have an impact on mobility indicators. Nevertheless, characteristics of users not related with disabilities also may have an impact on mobility indicators. For example, the elderly tend to be more immobile than people from younger generations.

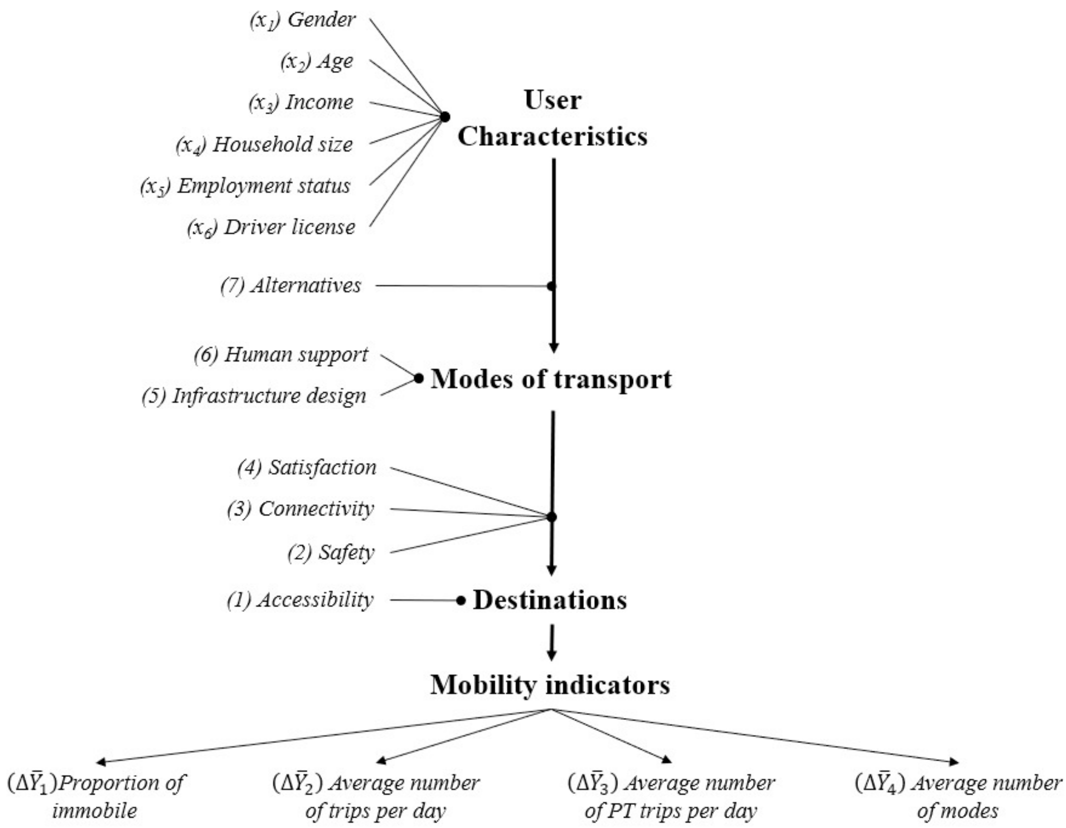

Fig. 1. Visual representation of mobility disparities and mobility indicators

Table 1 reveals that PWDs face different types of mobility disparities. Unfortunately, mobility disparities between people with and without disabilities are hard to quantify since they are mostly qualitative, or data are missing. However, it is possible to quantify the mobility gap based on mobility indicators calculated for the two groups. In this research, four indicators are used: Proportion of immobile, average number of trips per day, average numbers of PT (public transportation services) trips per day and, average number of modes per day. If mobility gaps are identified for an indicator, it may be a sign that there is a disparity related to transport supply, but other types of disparity may influence mobility behaviours of PWDs. These other disparities will be discussed in the discussion of this article.

Table 1. Mobility disparities faced by PWDs identified in the literature

Categories	Descriptions	Disparities	References
(1) Accessibility	Transport infrastructure allows people to reach a destination (grocery, work, hospital, etc.)	Less accessible job using public transport	(Grisé, Boisjoly, Maguire, & El-Geneidy, 2019)
		Pedestrian network less accessible to reach building and activities	(Vale, Ascensão, Raposo, & Figueiredo, 2017)
		Wheelchair users do not reach their destination in 20% of cases	(Meyers, Anderson, Miller, Shipp, & Hoenig, 2002)
(2) Safety	Device and procedures put in place to ensure the user's safety during their travel	More safety devices are needed for PWDs (curb distance, tie-down-equipment, driver assistance, ramp slopes/surface, etc.) and they are not always available.	(Meyers et al., 2002; Wretstrand, Ståhl, & Petzäll, 2008)
(3) Connectivity	The transportation network design allows users to travel without taking detours	Smaller accessible pedestrian network length	(Vale et al., 2017)
(4) Satisfaction	Satisfaction of the transportation service by users regarding waiting time, frequency, comfort, etc.	PWDs' comfort depends on specific infrastructure elements (ramp design, suspension, door width, designated spaces, etc.) that are not always present	(Wretstrand et al., 2008)
(5) Infrastructure design	Transport infrastructure design free of barriers	Wheelchair users frequently fac physical barriers using PT	(Meyers et al., 2002)
(6) Human support	Human support available and trained to help users.	Bus driver's attitude and unawareness of their need is a barrier for the use of PT by PWDs	(Park & Chowdhury, 2018)
		Some wheelchair users report no personal assistance using PT	(Meyers et al., 2002)
		Behaviour of drivers has an important impact on PWDs' safety and comfort	(Wretstrand et al., 2008)
(7) Alternatives	Number of mobility alternatives users can consider for their trips	More captive users of a single mobility mode	(Benjamin et al., 1998)

2.2. Decomposition Methods

Decomposition methods are used to validate the source of gaps between groups. The Oaxaca-Blinder decomposition can explain the difference in dependent variable for two distinct groups (Blinder, 1973; Oaxaca, 1973). Initially, in 1973, this method was developed to explain the gap in salaries between men and women. The purpose was to find out if the gap was attributable to the composition of the groups (study level, age, experience, etc.) or if the gap was a sexism effect (Blinder, 1973; Oaxaca, 1973). Subsequently, this method has been used in many fields such as health (Bauer, Göhlmann, & Sinning, 2007; Taber, Robinson, Bleich, & Wang, 2016), land studies (Munn & Hussain, 2010), immigration (LaLonde & Topel, 1992), transportation (Etezady, Shaw, Mokhtarian, & Circella, 2021; Verreault & Morency, 2015), etc. The application of this method has been greatly simplified by software implementations in Stata

(Fairlie, 2005; Jann, 2008; Watson, 2002) or R (Hlavac, 2018). With either software, it is possible to easily obtain the basic difference, endowment, coefficient, and interaction terms to explain the gap. The basic difference represents the effect of variables that are not included in the model. The endowment terms quantify the effect of group composition. For example, if the gap in the average number of trips per day between men and women is studied and there are more men with a driver's license explaining the gap than it is an endowment effect. The coefficient term quantifies the effect attributable to discrimination. In the same example, if women with driver licenses make less trip than men with driver licenses, it is a coefficient effect. Finally, the interaction term quantifies the effect of interaction between endowments and discrimination. When the model is not able to assign the effect to discrimination or groups composition, the interaction effect is high. So, the purpose is to minimize the third term. Mathematically, the gap between the two groups ($\Delta\bar{Y}$) is noted as:

$$\Delta\bar{Y} = \bar{Y}_A - \bar{Y}_B \tag{1}$$

If $\bar{Y}_A$ and $\bar{Y}_B$ can be expressed as a linear regression $\bar{Y}_A = \bar{X}_A'\hat{\beta}_A$ where $\bar{X}_A'$ is the mean values of explanatory variable and $\hat{\beta}_A$ is the coefficient of the regression. Thereby, equation (1) can be transformed as:

$$\Delta\bar{Y} = \left(\hat{\beta}_0^A - \hat{\beta}_0^B\right) + \bar{x}_1^A\hat{\beta}_1^A - \bar{x}_1^B\hat{\beta}_1^B \tag{2}$$

Equation (2) can be rearranged to obtain the four terms (basic difference, endowments, coefficients, and interaction) as shown in equation (3):

$$\Delta\bar{Y} = \left(\hat{\beta}_0^A - \hat{\beta}_0^B\right) + \hat{\beta}_1^B(\bar{x}_1^B - \bar{x}_1^A) + \bar{x}_1^B\left(\hat{\beta}_1^A - \hat{\beta}_1^B\right) + (\bar{x}_1^B - \bar{x}_1^A)\left(\hat{\beta}_1^A - \hat{\beta}_1^B\right) \tag{3}$$

Other methods are also found in the literature, like the econometric model of Havet, Bayart and, Bonnel (2021). The authors use this model to explain mobility gaps between men and women. Another interesting method is the APCC (Age Period Cohort Characteristic) model (O'Brien, 2000). This model is used to explain the variation between cohorts of different groups for indicators of mobility (average numbers of trips, proportion of immobile, etc.). This implies having access to chronological data. In her thesis, Plouffe (2014) exploited these methods to explain the evolution of various travel indicators over a 20-year period accounting for age, gender, and cohorts.

3. Context

This research focuses on the city of Montreal (Quebec, Canada). The Montreal regular transportation network is composed of four metro lines with a total of 68 stations, and an 1800-bus system, all operated by the STM (Montreal transportation authority). In 2021, only 16 of the metro stations are accessible by elevators and 14 others are in the process of becoming accessible (STM, 2022). This lack of accessibility to the metro network is the result of construction dating from the 1960s (Hagg, 2009). At that time, the medical perception of the handicap was ubiquitous to the detriment of the principle of universal design (Lid & Solvang, 2016). Fortunately, in 2004, the article 67 of section V of the law E20.1 was put in place by the government of Quebec to accelerate and guarantee the universal accessibility of public transit infrastructure (Government of Quebec, 2004). Nevertheless, the bus network is almost fully accessible with all buses and 89% of bus stops accessible (STM, 2022).

PWDs who live in Montreal can also count on the STM paratransit services for their mobility. This paratransit service has similar characteristics to those found in the United States (Lave & Mathias, 2000). With a reservation, eligible users can benefit from an adapted transportation service for trips with an origin and a destination of their choice in the served area. The Montreal paratransit service covers an area wider than the Montreal Island, but the users must be resident of the Island to be admissible. Furthermore, the paratransit service is provided at the same fare as the regular transit network and within the same operating hours. The STM paratransit service has approximately 25,000 active users that conducted more than 3 million trips in 2020.

4. Methodological Framework

The methodology section is divided in two parts: datasets and, application of Oaxaca-Blinder decomposition method. Figure 2 summarizes the methodological steps of this research.

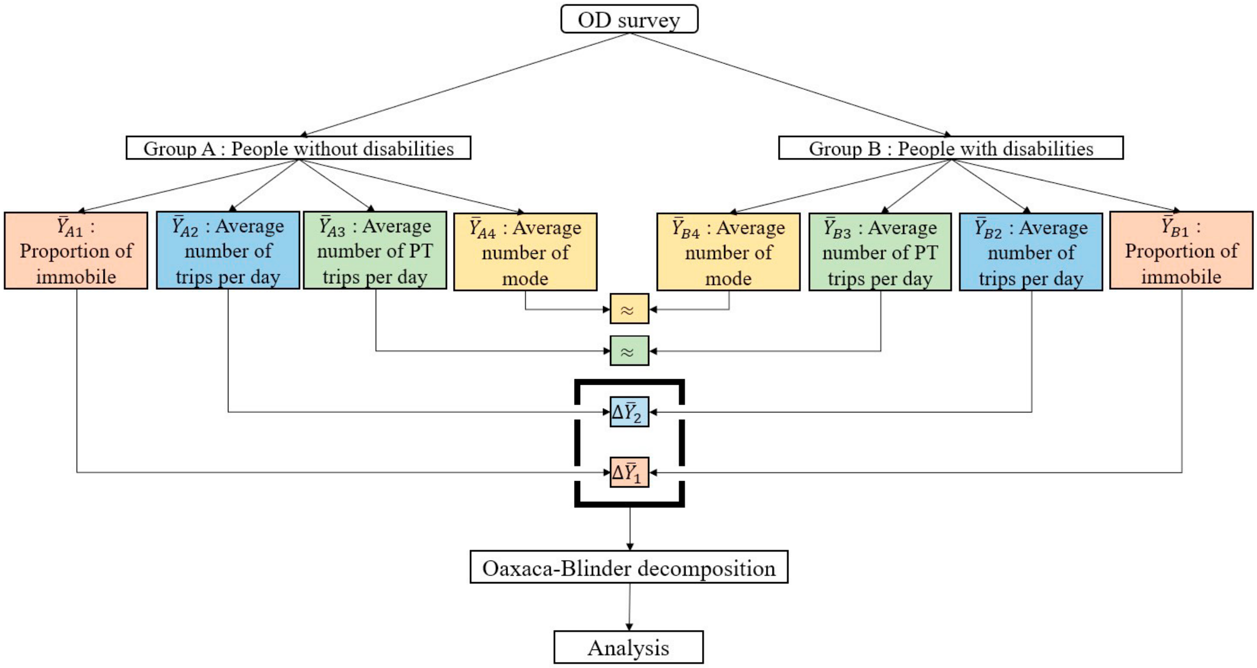

Fig. 2. Methodological step of the research

Four mobility indicators were calculated for the two groups studied, but significant differences were only observed for the first two indicators. Thus, the Oaxaca-Blinder decomposition method was applied only to the first two indicators, namely the proportion of immobile and the number of trips per day.

4.1. Dataset

The dataset used in this research is an extraction of the 2018 Montreal OD Survey supervised by ARTM (regional metropolitan transportation authority) (ARTM, 2018). This OD Survey has been conducted every five years since 1970, but the first time it included a question on disabilities was in 2018. This allowed the study of the travel behaviours of PWDs. Since the sample is weighed to allow for statistical inference at the total population level, it is possible to know which travel mode is used for an average weekday of fall. This dataset allows obtaining three mobility indicators for each group: proportion of immobile, average number of trips per day and average number of PT trips per day. With these three indicators, it is possible to perform three Oaxaca-Blinder decomposition and identify the source of mobility gaps between people with and without disabilities.

4.2. Application of the Oaxaca-Blinder Decomposition Method

The purpose of this research is to compare and explain mobility gaps between disabled people and non-disabled people. The (OB) Oaxaca-blinder method was selected with the use of R package from Hlavac (2014). Although four mobility indicators have been considered, only two significative mobility gaps have been identified between the two groups so, only two OB have been performed. Table 2 presents the variables used for the two OB applications and equation (4).

Table 2. Parameters of Oaxaca-Blinder decomposition method

	Dependent variable ($\Delta\overline{Y}_i$)	Indicator variable	Model type	Independent variables (x_j)
OB1	Immobile (1 = Mobile; 0 = Immobile)	A: People without disability B: People with disabilities	Logit model	x_1: Women (binary) x_2: Aged 65 and older (binary) x_3: Low income[1] (binary) x_4: Live alone (binary) x_5: Worker (binary) x_6: Driving license (binary)
OB2	Number of trips per day	A: Mobile people without disability B: Mobile people with disabilities	Linear regression model	

[1] Income of 30,000 Canadian dollars and less

$$\Delta\overline{Y}_2 = \left(\hat{\beta}_0^A - \hat{\beta}_0^B\right) + \sum_{j=1}^{6} \hat{\beta}_j^B\left(\bar{x}_j^B - \bar{x}_j^A\right) + \sum_{j=1}^{6} \bar{x}_j^B\left(\hat{\beta}_j^A - \hat{\beta}_j^B\right) + \sum_{j=1}^{6}\left(\bar{x}_j^B - \bar{x}_j^A\right)\left(\hat{\beta}_j^A - \hat{\beta}_j^B\right) \tag{4}$$

OB1: The aim of the first application is to explain the differences between people with and without disability in relation with immobility. For the dependent variable, one means that the person has declared at least one trip during the study day (mobile) and zero means that no trip has been declared (immobile). Given that the dependent variable is binary, the OD decomposition is used with a logit model.

OB2: In the second application, only the observations of mobile people are considered because the aim is to explain the difference in the average number of trips per day of individuals with and without handicap with no consideration of the mode used.

5. Results

The results are presented in two steps: 1) mobility gap between people with and without handicap 2) results of the two Oaxaca-Blinder decomposition applications to explain the mobility gap between the two groups.

5.1. Mobility Gaps

In total, 62,785 people have been declared as having a disability that limits their mobility in Montreal according to the 2018 OD survey. Figure 3 presents the proportion of people with and without handicaps, living on the Montreal Island, that have at least used the various modes once during the observation day.

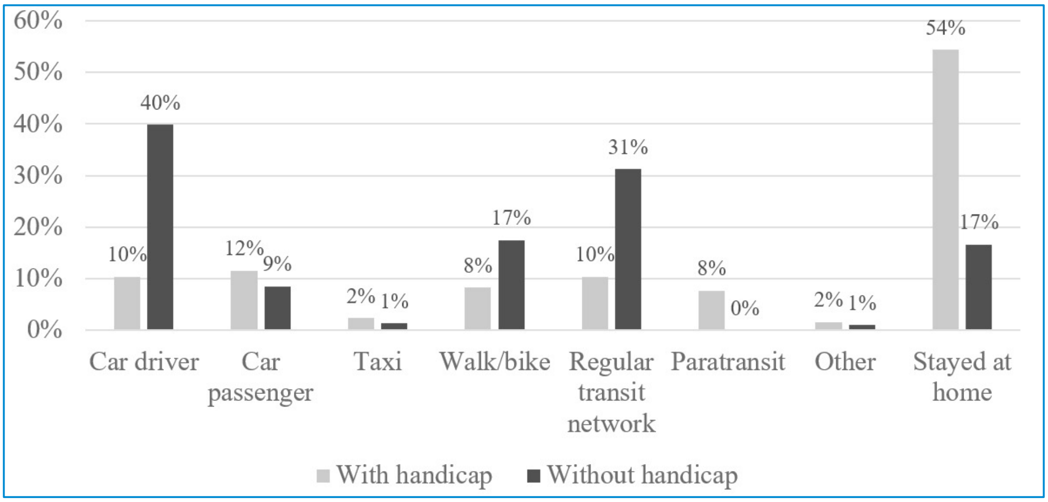

Fig. 3.Breakdown of people with and without handicaps that have used the designated mode at least once during the study weekday according to the results of the 2018 OD survey.

Figure 3 reveals that more than 50% of PWDs have declared no trips during the survey day versus 17% for people without disability. Also, 8% (5 023 people) of the population with disability have used paratransit during the day of observation. Apart from paratransit, PWDs also use the car as a passenger or driver and the regular transit network. It is important to mention that people that mention a handicap in the OD survey are not necessarily eligible to the paratransit service of the STM so, they must use other modes.

Table 3 presents the results for the mobility indicators used in this study. The first indicator is the proportion of immobile during a typical weekday of fall, as estimated by the OD survey. Immobile means that the person has declared zero trip during the survey day. The second indicator is the average number of trips per day. This indicator is only calculated using the people that made at least made one trip. The third indicator is the number of trips using public transit service (regular transit network and paratransit service). Again, the indicator only considers people that made at least made one trip using PT service during the survey day. Finally, the fourth indicator is the number of modes used during the day of observation. The aims of this indicator were to identify if PWDs are more captive to one mode than people without disabilities.

Table 3. Comparative summary of the mobility of people with and without disabilities according to the 2018 OD survey

	$\Delta\bar{Y}_1$ Proportion of immobile	$\Delta\bar{Y}_2$ Average number of trips	$\Delta\bar{Y}_3$ Average number of PT trips	$\Delta\bar{Y}_4$ Average number of modes
People with disabilities	54%	2.52 ± 1.50	2.064 ± 1.12	1.14 ± 0.40
People without disability	17%	2.85 ± 1.69	2.062 ± 1.14	1.19 ± 0.44

Table 3 shows a gap of 37% for the first indicator in favour of people without disabilities. A gap of 0.33 trip is also observed in the average number of trips. For these two gaps, it would be interesting to know whether it is attributable to the composition of the group or to disparity in mobility supply. However, gaps $\Delta\bar{Y}_3$ and $\Delta\bar{Y}_4$ are not significative so Oaxaca-Blinder method cannot be applied. Nevertheless, the lack of difference for these two indicators is interesting and an analysis on this subject is presented in the discussion section.

5.2. Oaxaca-Blinder Decomposition applications

To better understand the results (Table 4, Figure 5, Figure 6) short definitions are provided below. Note that for OB1, the results are in percentage because the dependent variable is binary. For OB2 the results are in number of trips.

Group A: Average value of the dependent variable for group A (people without a disability).

Group B: Average value of the dependent variable for group B (people with a disability).

Difference: Difference between the average value of the dependent variable for groups A and B.

Endowments: Part of the *difference* that is explained by the characteristics of the two groups. The smaller the p-value the more significant the endowments.

Coefficients: Part of the *difference* that is explained by a disadvantage of one of the groups. The smaller the p-value the more significant the coefficients.

Interaction: Part of the *difference* that is explained by the interaction between the endowments and the coefficients. The smaller the p-value the more significant the interaction.

Mean difference: Gap between the two groups for each independent variable, for example there is 6.94% more women in group B than in group A.

Beta difference: Quantification of the disadvantage of being in group B for each independent variable. Example: People with disabilities who are employed are 17% more likely to be mobile than people without disabilities who are employed.

Endowment's graph: Each band illustrates how much the gap between the two groups (*mean difference*) explains the difference in the dependent variable.

Coefficient's graph: Each band illustrates the intensity of the disadvantage related with each independent variable. If the band goes in the positive direction, group B is disadvantaged and inversely.

Interaction's graph: Each band illustrates the strength of the interaction between the endowment and the coefficient for each independent variable. This is the portion for which it is not possible to draw a clear conclusion.

Table 4. Results of Oaxaca-Blinder decomposition methods

OB1: Immobile (binary)							
Group A	17.51%	Endowments		Coefficients		Interaction	
Group B	53.77%	*Coefficient*	*p-value*	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Difference	35.26%	26.45%	0.013	20.98%	0.010	-12.17%	0.013
	Intercepts	women	65 and_over	low_income	live_alone	worker	driver_licens
Mean difference	0.00	-6.94%	-39.11%	-20.77%	-22.16%	44.63%	47.89%
Beta difference	22.68%	3.42%	3.03%	-4.63%	-0.13%	-17.79%	-7.80%
OB2: Number of trips per day							
Group A	2.85	Endowments		Coefficients		Interaction	
Group B	2.57	*Coefficient*	*p-value*	*Coefficient*	*p-value*	*Coefficient*	*p-value*
Difference	0.29	0.21	0.052	0.11	0.036	-0.03	0.053
	Intercepts	women	65_and_over	low_income	live_alone	worker	driver_licens
Mean difference	0.00%	-3.49%	-32.01%	-20.07%	-21.81%	42.59%	41.10%
Beta difference	0.093	0.130	0.010	-0.120	-0.034	-0.164	0.038

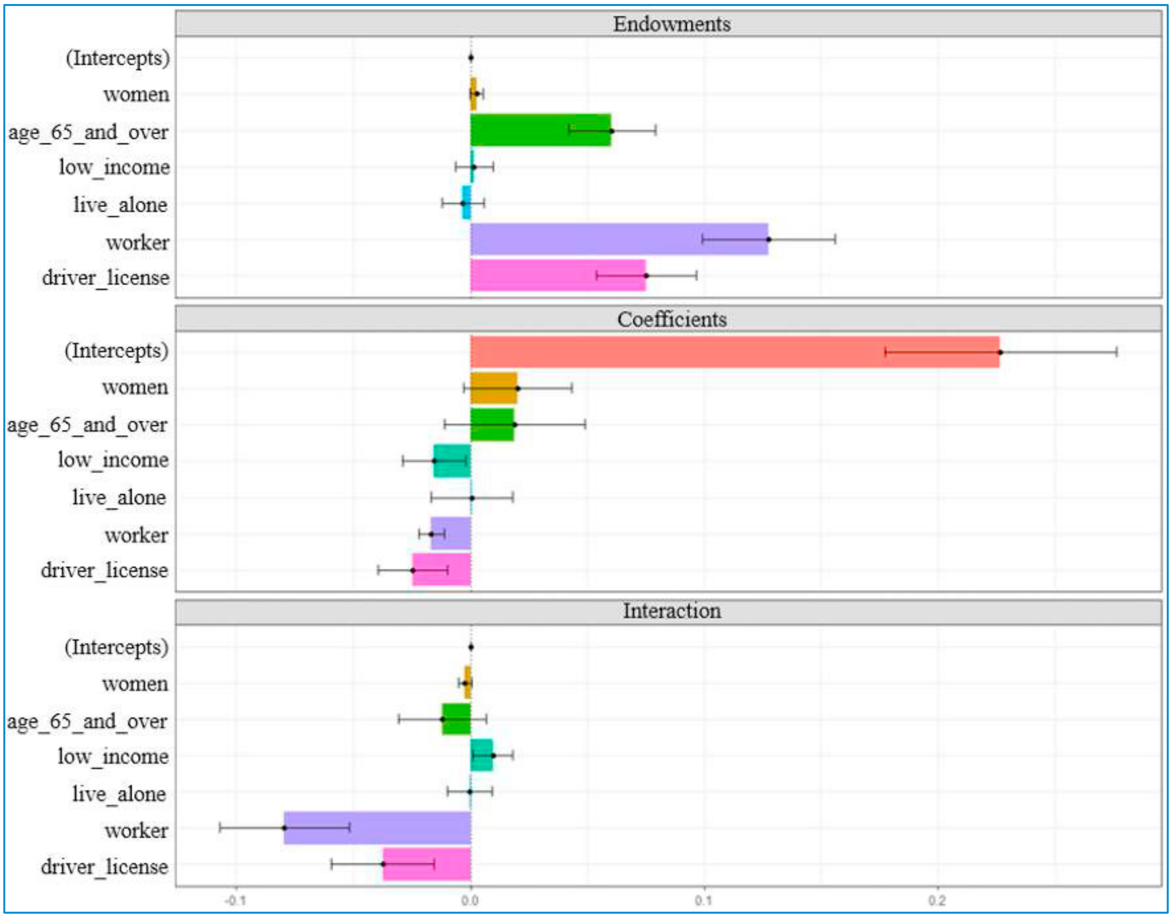

Fig. 4. OB1 - Mobility Status analysis (binary)

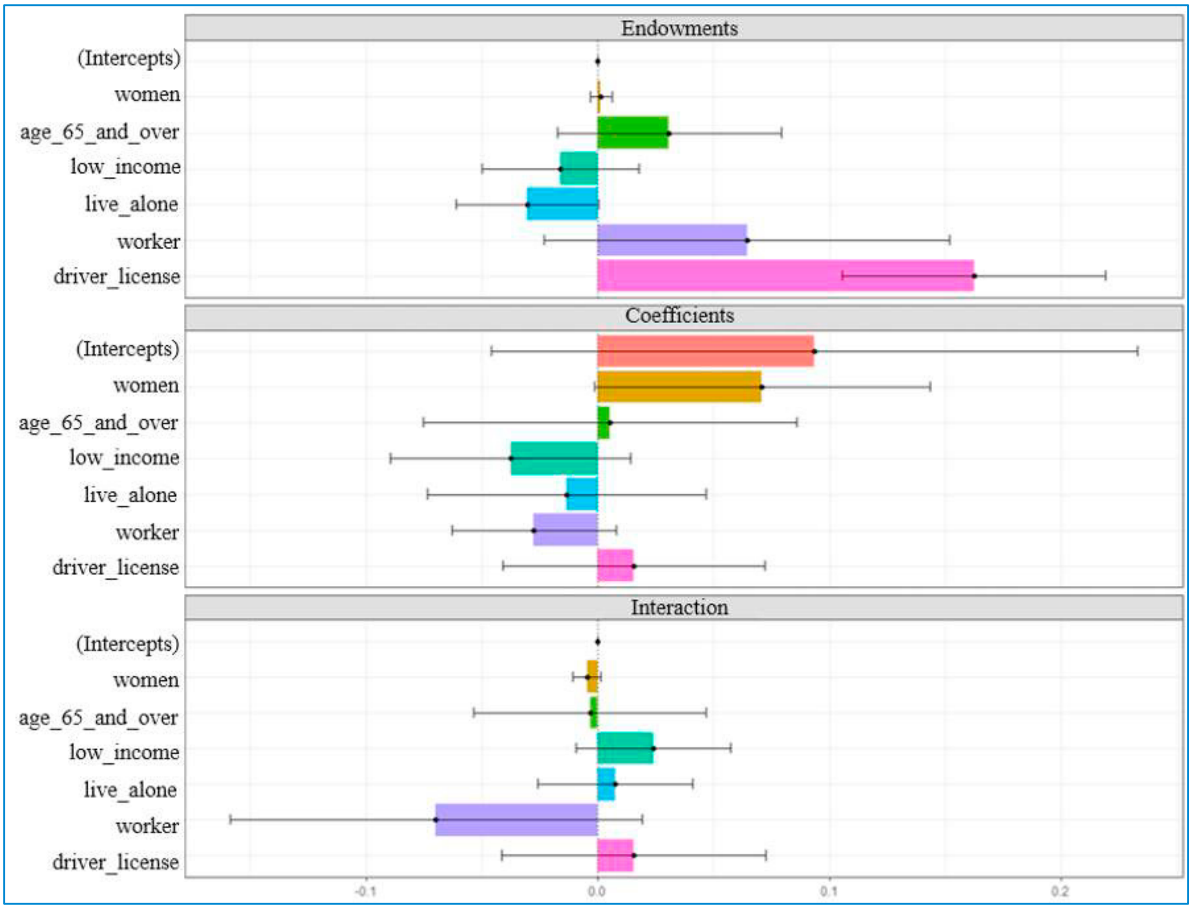

Fig. 5. OB2 - Number of trips per day

With these three Oaxaca-Blinder decompositions (results presented in Table 5, Figure 5 and Figure 6) the following observations can be made.

- Observation 1: There are more older adults in group B (people with disabilities), and this has an impact on the proportion of immobile people and on the number of trips per day.
- Observation 2: There are more workers and people with a driving license in group A (people without disability) and this has an impact on the proportion of immobile people and on the number of trips per day.
- Observation 3: Women and older adults of group B are more immobile and make fewer trips per day compared to people with the same characteristics in the other group. Therefore, PWDs with these characteristics are disadvantaged in comparison with those from group A.
- Observation 4: People with low income, people that are living alone, and workers from group A are less mobile and make fewer trips per day than people with the same characteristics in group B.
- Observation 6: PWDs with a driving license tend to be more mobile than people without disability, but they make fewer trips per day.

5.3. Analysis of User Satisfaction with Regular Public Transit

The use of the Oaxaca-Blinder decomposition method made it possible to identify that woman and the older adults with disabilities face disparity. However, it remains difficult to explain these results with only the information collected through the OD survey. User satisfaction and perceptions of mobility services may impact the use of these modes of transport (De Oña, 2020; Delbosc & Currie, 2012; Minelgaitė, Dagiliūtė, & Liobikienė, 2020). Fortunately, ARTM has carried out a survey on the perceptions and mobility habits of paratransit users in 2020 (ARTM, 2020). This survey was conducted during the pandemic, but the respondent was asked to ignore the change caused by the COVID-19 pandemic. This survey was conducted among 1,500 paratransit users in the metropolitan area of Montreal through an online and telephone questionnaire. The questionnaires are mainly composed of qualitative questions related to transportation habits, satisfaction with different modes of transport and the sociodemographic characteristics of users. All results have been weighted according to the region, gender, age, and main limitation to represent all paratransit users. The advantage of this survey is that it targets paratransit users but questions them about the use of all modes of transport. All these datasets allow to better explain the results of this research.

The survey on the perception and mobility habits of paratransit users realize by the ARTM allows studying women and older adults' satisfaction with the different mode of transport used. Table 6 presents the overall satisfaction based on a scale between 1 (lowest) and 10 (highest)for each mode. Also, respondents had to evaluate 14 criteria on a scale of 1 to 10 for each mode of transport. The satisfaction criteria are listed below.

1. **Physical effort**: Not at all physically demanding
2. **Punctuality**: Travel time is predictable
3. **Flexibility**: Allows me to move where I want when I want
4. **Planification**: Easy to plan
5. **Usability**: Easy to use
6. **Reliability**: Reliable
7. **Efficacity**: Offers the fastest route
8. **Safety**: Make me feel safe
9. **Courtesy**: Employees are courteous
10. **Peacefulness**: Not stressful
11. **Autonomy**: Allows me to be independent and in control
12. **Value**: Affordable
13. **Comfort**: Provide a comfortable environment
14. **Assistance**: Offer all the assistance I need

Table 5. ARTM survey results for women and older adults using paratransit for each mode

Mode	Women	Older adults
STM Paratransit minibus	8,5	8,8
STM Paratransit taxi	8,5	8,7
STM Subway	5,3	5,2
STM Regular buses	5,9	6,2
Car	8,4	8,5
Walk/roll	6,6	6,6

Table 5 shows that women and older adults have generally similar levels of satisfaction for each mode. Also, both groups are very satisfied with paratransit services and cars. However, the level of satisfaction for the subway and the regular buses is low and this may be an explanation for the lower mobility level of women and older adults with disability. Therefore, it would be interesting to compare their regular public transit service satisfaction with the satisfaction of women and older adults without disabilities.

Precisely, the STM frequently assesses user satisfaction with the bus and subway network. In 2019, 13,816 survey responses were collected, including 8,193 by women and 1,454 by people aged 65 and over. Unfortunately, the STM does not use the same survey as the ARTM, however, several elements can be compared and are listed below.

1. **Punctuality**: Overall, in the last 7 days, how satisfied were you with the punctuality of the bus
2. **Reliability**: Overall, in the last 7 days, how satisfied were you with the reliability of the subway
3. **Safety**: How satisfied are you with the feeling of safety on the bus and subway
4. **Courtesy:** How satisfied are you with the attitude of the bus drivers and subway changers
5. **Comfort:** How satisfied are you with the crowding in the bus and subway
6. **Cleanliness**: How satisfied are you with the cleanliness of the bus and subway
7. **Frequency**: How satisfied are you with the waiting time before taking the bus and the subway

For each satisfaction criteria, respondent had to give a score from 1 to 10. Some criteria have been evaluated only for the bus or the metro while others have been evaluated for both modes in this case the average of the two ratings is used for the comparison. As the ARTM carried out its survey in 2020 but users had to ignore the impacts of the pandemic, these data are compared with the STM's satisfaction data for 2019. Table 6 presents the results of the comparison for women and older adults with and without disabilities.

Table 6. Comparison of the level of satisfaction of women and elderly people with regular public transit services

	With disabilities		Without disabilities	
	Women	Older adults	Women	Older adults
Physical effort	5,6	5,3	na	na
Punctuality	6,9	6,5	6,8	7,7
Flexibility	6,1	6,1	na	na
Planification	6,6	6,6	na	na
Usability	5,9	6,3	na	na
Reliability	6,9	6,6	8,0	8,5
Efficacity	6,5	6,4		
Safety	6,2	6,3	8,6	9,0
Courtesy	7,7	7,4	8,5	8,9
Peacefulness	5,7	5,7	na	na
Autonomy	5,2	5,6	na	na
Value	6,9	7,2	na	na
Comfort	5,8	5,8	7,1	7,9
Assistance	5,3	5,4	na	na
Cleanliness	na	na	7,6	8,0
Frequency	na	na	7,6	8,1
TOTAL	6,2	6,2	7,7	8,3

Table 6 reveals that the satisfaction of women and older adults with disabilities is lower than that of people without disabilities for all the criteria evaluated by the two surveys. The largest gap is observed for the criterion related to safety. Also, women and older adults have a low level of satisfaction for the criteria related to physical effort, autonomy, and assistance. However, these criteria are not evaluated by the satisfaction survey of users without disabilities. Thus, it seems that women and older adults with disabilities are less satisfied with the regular transit network supply. The fact of not being satisfied by regular public transit services may slow down the mobility of PWDs and this may partly explain the mobility gap between people with and without disability. Furthermore, some users with disabilities may use other modes of transport that are less flexible, more expensive, requiring the help of others, etc. Nevertheless, the difference in mobility behaviour is also the consequence of the disparity present in society.

6. Discussion

Two important considerations stem from the results obtained following the analysis of the differences in the level of mobility behaviour between people with and without disabilities. First, there are disparities in the mobility supply which can lead to disparities on a larger scale. For example, does the fact that public transport is not 100% universally accessible reduce access to employment opportunities for people with disabilities? Grisé et al. (2019) conducted a study to compare access to jobs using the regular public transport for people using a wheelchair and for the general population. They conclude that in Montreal, wheelchair users have access to 46% of the jobs that are accessible for the general population.

The literature review presented in this article shows that there are various categories of mobility disparities that affect mobility behaviour of users. However, is this the only reason to explain the gaps found in this research? It is likely that other disparities in our society affect the mobility needs of people. For example, if a person does not have a job and has a limited social network, it is possible that this person has lower trip frequency. Several studies and surveys have shown that PWDs have a lower employment rate than the general population (Heera & Devi, 2016; Schur, 2002; Stapleton, 2003; Statcan, 2018). Disparities in employment can lead to further disparities in income, socialization and more (Schur, 2002). Another source of disparity that can explain the gap in mobility is destination accessibility. When a place does not respect the principle of universal accessibility, it is unlikely that a person with special needs will travel to this place. Fortunately, many researchers are interested in this subject and develop tools to evaluate accessibility and improve it (Bodaghi & Zainab, 2013; Calder et al., 2018; Chan et al., 2009). Nevertheless, there is still work to be done to achieve universal accessibility.

This research has identified mobility gaps between people with and without disabilities. Unfortunately, the sources and consequences of these gaps are multiple and difficult to identify. However, it is clear that they may reflect disparities that go well beyond mobility.

7. Conclusion

This research allows us to identify and measure the mobility gaps between people with and without disability and people with disability in Quebec have less frequent and less diversified mobility. Furthermore, the Oaxaca-Blinder decomposition method allows us to conclude that women and older adults face mobility disparity. However, the opposite trend is observed for people with disabilities when they have low income, when they live alone or when they have a job. One of the hypotheses to explain the mobility disparity experienced by women and older adults is their satisfaction with the transport supply. Thus, two satisfaction surveys regarding regular public transit in Montreal were compared and the conclusion is that women and older adults with disabilities are less satisfied with the regular transit service than women and older adults without disabilities. Thus, it is important to make public transport more attractive for people with disabilities, by focusing on the physical effort required, the stress generated and the independence for users with disabilities. Nevertheless, other disparities in the society may influence mobility behaviour of PWDs (employment, income, inclusivity, etc.). Thus, this study initiates a reflection that goes well beyond mobility and the transport offer.

8. Disclosure

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