TRAVEL TIME IN A BRAZILIAN CITY

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ABSTRACT

The paper studies the patterns of travel time in the metropolitan area of Belo Horizonte, comparing information obtained through time diaries and the information collected by the João Pinheiro Foundation and the municipality agency for transit control. Besides comparing the two data sets, travel time is studied by social class. The data provided by our Time Use Research is based on traditional methodology, using written diaries for one day of the week and one day of the week-end. A second type of diary was presented with the same classification categories for illiterates (with drawings numbered and digital watches granted to interviews). The time use survey is a probability sample of households in the city of Belo Horizonte with 1184 total diaries obtained in the year 2001. This data is compared with the data provided by the João Pinheiro Foundation and the municipality, using a different type of methodology to collect data on the same topic, and, so, we will be able to speak about the dynamics of urban mobility in this important Brazilian city.

INTRODUCTION

We will treat, in this study, the Belo Horizonte population's daily movement that result in access to different urban spaces, by using several means of transportation or by walking.[1]

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[1] Urban mobility is a different concept from "social mobility", this last concept refers to social and economic movements of individuals, groups or social classes; "spatial mobility" refers mainly to migrations – temporary or permanent – of individuals or groups to other neighborhoods, cities or even

Travel movements give people an opportunity to do different things in different places; therefore, it is primarily interpreted as a derived activity, dependent on other activities (Grünfeld, 2006). On the other hand, this mobility is an important dimension to understand the dynamics of a population's daily life and, consequently, the social organization as a whole. Changes in the rhythm of movements are also indicators of changes in the rhythm of social change: higher current urban mobility in big cities is an indicator that contemporary societies have undergone changes in time and space organization that allow people to move frequently, providing a larger access to leisure possibilities, work and other services available in the city.

Grünfeld (2006) points out that geographic mobility is composed of three interrelated dimensions: number of moves, distance and travel time. In this study, we analyze urban mobility as indicated by the number of movement episodes and the duration of these traveling episodes. Together, these dimensions provide amore complete scenery of mobility in the city.[2] Like Urry (2006), we understand that there is a multiplicity of time perspectives involved in the mobility process, and not only the dimension that is measured by the clock. However, for the current study we will just discuss only the time measured by the clock, for understanding that this is sufficient to reach the objectives proposed here: a) to provide a first picture of urban mobility on a weekday in the City of Belo Horizonte; b) to analyze the relationship between mobility and inequality; and c) to discuss the implications of those results in people's daily life.

In order to analyze urban mobility in Belo Horizonte, we will use data from the *Time Use Research*[3] carried in 2001 by the Department of Sociology and Anthropology of UFMG, which comprised diaries obtained from a probability sample of households in that capital. The second data source is the *Origin and Destination Research*, carried out by the João Pinheiro Foundation, which includes the whole Metropolitan Area of Belo Horizonte, also performed in 2001. We will then make an articulation of both research data, which will provide us with much richer details, in two senses: *Time Use Research* allows greater detail related to urban mobility time, while the *Origin and Destination Research* allows us to see the articulation, through urban mobility between the center and the surrounding areas of the city.

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countries. In this paper, we are using mobility related to moves between different spaces that people perform in their daily life.
[2] Grünfeld (2006) treated mobility just as travel time. In our study, urban mobility refers as both travel time and travel episodes – as in Colleoni's (Colleoni 2004) work.
[3] AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of time use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

Thus, in the first place we will discuss the city conception and functions, its spatial planning and its relationships to the metropolitan area, in order to apprehend how urban mobility is conceived in a planned city that expands itself beyond the predicted limits. After that, we will discus the Time Use and the Origin and Destination Investigations that subsidizes the analysis of urban mobility. The next step is to draw a panorama of people's daily trajectories, the hourly population floating and the reasons for the moves. Later on, we will analyze the relationship between demographic structure and mobility, to culminate with the analysis of the relationship between urban mobility and social inequality.

THE CITY

Belo Horizonte was the first – state – capital planned in the country, built to meet the state elite's political longings for modernity, it was built by the end of the XIX century. The city was planned to be the governmental headquarters of the state of Minas Gerais and to centralize political and administrative activities, to have wide and generous spaces, squares, parks, gardens and to shelter cultural, educational and research activities. It was planned to be a center of tertiary activities: trading, banks and financial activities, finally, to host the essential activities of contemporary economic development (BHTRANS, 2007).

As the city spatial conception corresponded to political and social values of the dominant classes there was little room for the working class needs in the city. For Faria (1985), the elite of Minas Gerais who supported and motivated the planning and construction of the capital, projected its social roots into the urban space. So, a physical-spatial segregation of the less well-to-do emerged and became imprinted in the city.

The city was inaugurated in 1897. It sheltered almost 200 thousand people around a ring (Contorno Avenue). With time the territorial expansion of the city extended far beyond the official limits. The working class that participated in the city construction settled in the periphery, consolidating the segregation of classes in the social space. In 1940 there were already more inhabitants than the officially established limit. At the turn of the century, the population expanded to more than 2 million inhabitants.

Throughout the XX century the urban expansion of the capital was marked by the impossibility of extending the city's rational planning, and thus, the whole city was built far beyond the original ring. This characterized a disordered and heterogeneous

formation. The Metropolitan Area of Belo Horizonte is currently the third largest of Brazil with 4.5 million inhabitants today.

The city hypercenter has remains the main point of population attraction. That space centralizes the main services offered to the population, what implies that the inhabitants' of the metropolitan area converge to the Belo Horizonte's center looking for the existing services in that location. However, municipal organs for urban planning already point out to the need for new service centers in the metropolis, what can help to attenuate the traffic problems in the hypercenter. A polycentric urban net would allow for the decentralization of activities and lighter traffic flow, creating what Grünfeld calls "new centers in the old periphery" (2006). There is now an emptying tendency in the neighborhoods close to downtown and a larger growth of the periphery areas. This growth happens in two different ways as it becomes, on the one hand, occupied by the low income population, and, on the other hand, new neighborhoods emerge destined to the middle and upper-middle-class.

However, BHTRANS's (the municipality transit authority) diagnosis is that the city's transportation system presents connected problems; it is little articulated in perimeter and interregional terms. In other words, the planned city does not articulate well to the non-planned city, forcing low local capacity routes to work as passage ways for an ever growing number of motor vehicles, with a large proportion of private cars. Consequently, traffic jams emerge all along the city and, with that, it is foreseen that the rush period tends to enlarge for the same travel distance.

CHARACTERISTICS OF THE TWO RESEARCH DATA

Time Use Research

The project was developed to study everyday life conditions of the Belo Horizonte population, focusing on time use. The data was obtained from a probability sample of 400 households. Diaries were collected from every household member who was 8 years old or older in 371 households. Diaries were obtained for one day of the week and one day of the week-end randomly selected and collected from all respondents. For the weekdays 1124 diaries were obtained and for the weekends there were a total of 1133 diaries. The research obtained 11 standard post-coded diaries and an additional number of pre-coded diaries (pre-coded with the same broad categories of the post coded diaries applied to the illiterate population). The pre-coded diaries had

drawings describing the activities and numbers and these diaries were minute diaries to match the digital numbers in the watches that were given to each family. For the week-ends there 1118 post-coded diaries and 15 pre-coded. Statistical adjustments corrected the sample to equalize the number of diaries for each day of the week, also statistically correcting the sample to match the population distribution by gender and age, based on Census results for the same year. Codes were applied by a small team of university students using a code book based on the MTUS with some adjustment based on the United Nations Trial Classification Activities Code Book.

Besides the diaries, information about the socioeconomic situation of the respondents was also gathered, questions about the sexual division of the work in the home, and other matters on about the home's characteristics. In that sense, urban mobility plays an important role in the research conception, since it is an activity that connects all other activities, providing links between the domestic environment and the outside world.

Origin and Destination research

The Origin and Destination research had as an objective to measure the volume and characteristics of movements made by the population in the Metropolitan Area of Belo Horizonte in their daily activities, trying to establish quantitative relationships between the moves made and socioeconomic variables like the settlement's physical and urban characteristics, trying to estimate the future transportation demands (Fundação João Pinheiro, 2002).

To fulfill such objectives, the researchers defined homogeneous areas for sampling– grouping 3 to 4 census sectors. They used a questionnaire as their main data collection instrument where they try to grasp the family's socioeconomic characteristics, as well as to find the movements made in a typical day immediately previous to the research date. Besides, they obtained complementary data interviewing the population in strategic population concentration sites. The general research objective was to find the global traffic demand for the whole Metropolitan Region of Belo Horizonte regional routes, trying to document the movement patterns and characteristics of main entrance and exit points of the Metropolitan Region of Belo Horizonte, that is to say, in the confluence of the Contour Line with the great circulation routes[4]. The

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[4]There has also been made interview at the Transportation Station of Belo Horizonte, those ones focus only in the collective transportation.

research presents very broad results, which provides a wide panorama of urban mobility in the whole metropolitan area.

DAILY TRAJECTORIES

In this section we will explore the two researches' complementary results, in order to trace a first panorama of urban mobility in Belo Horizonte. In the first place, it is necessary to justify the reason to analyze the mobility patterns separately from other aspects of everyday life. In spite of the fact that this activity links all the other ones and make possibly for them to be accomplished. The following table, built from the data of the time use diaries, shows the share of participation of travel time in the daily life of Belo Horizonte inhabitants.

Table #1

Time dedicated to typical daily life activities, Belo Horizonte, 2001

Activities	Week*	
	Time (minutes)	% Day
Personal Care	640	44,5
Remmunerated work	243	16,9
Study	76	5,3
Housekeeping and family care	133	9,3
Voluntary work and reunions	24	1,7
Social life and leisure	58	4,0
Sports and outdoor activities	18	1,3
Hobbies and games	17	1,2
Communication	140	9,7
Travel	**88**	**6,1**
Total	1437	100

The time spent filling the diary forms was not included.

Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of time use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

Table 1 shows that Belo Horizonte inhabitants spend a daily average of 88 minutes - almost an hour and a half – traveling. This type of mobility occupies, 6.1% of those people's daily time[5]. The time dedicated to traveling is smaller than the time dedicated to personal care, paid work, housekeeping and family care, and communication; it is greater than time dedicated to leisure and to time spent in studying.

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[5] Colleoni (2004) shows that average time spent in moves in the Milan Metropolitan Region, in 2003, was 87 minutes, one less than Belo Horizonte's. It is also important to notice that we will only treat here the mobility of one weekday for, though we have data for the weekend, the main purposes of this paper refer to the mobility which counts also the moves to workplace.

There are about 6.3 million of daily moves, and the internal moves in Belo Horizonte represents the largest portion of those moves (Fundação João Pinheiro, 2002). Taking into consideration all the transportation means, according to this research, each Belo Horizonte inhabitant makes, approximately, 2 moves a day – 1.67 on the Origin and Destination research, and 2.4 on the Time Use research. When we look at the total of daily activities episodes (23.565), we see that the percentage of episodes related to traveling represents 11.6% of the episodes (2.727). This means that out of each nine daily activity episodes, one represents a trip. This initial panorama indicates how important urban mobility analysis is, since it takes a considerable part of the daily life.

Let us see now how this mobility time is composed according to the motives for the moves.

Graph #1

Travel Time Composition According to Travel Motives,
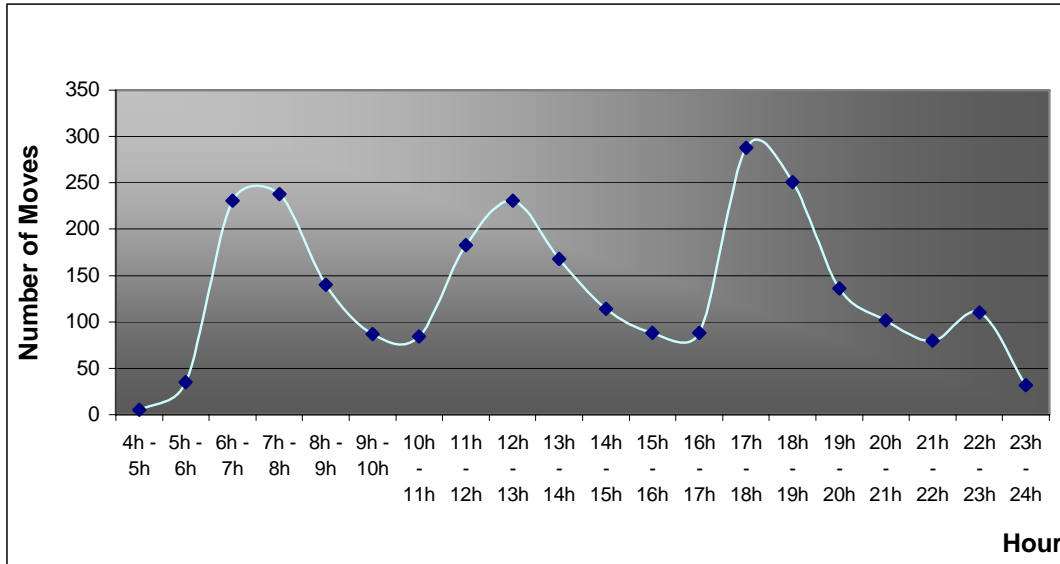
Belo Horizonte, 2001
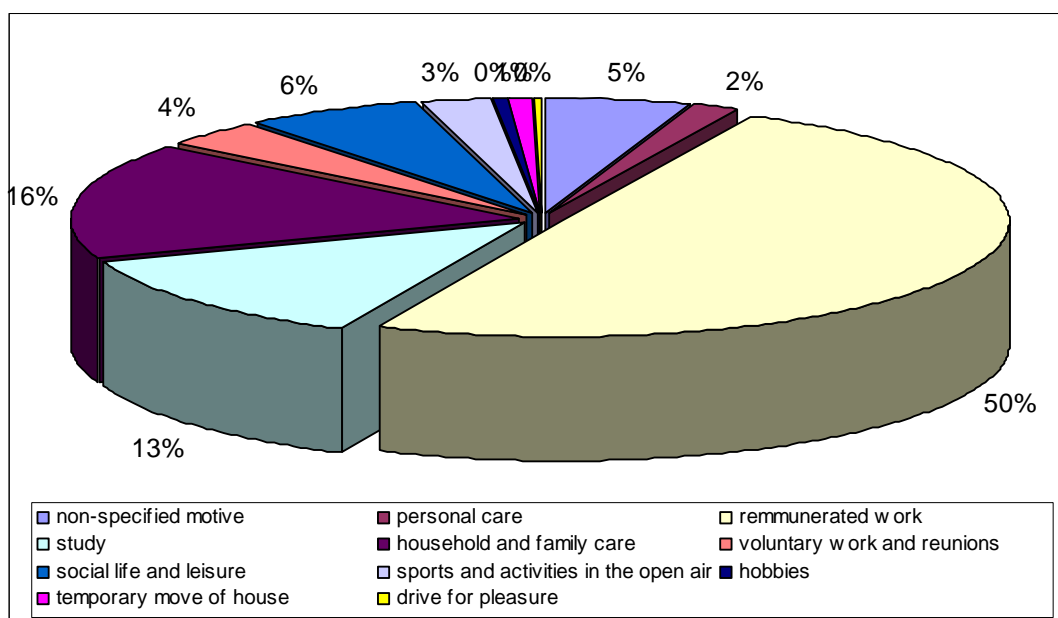
Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of time use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

The graph allows us to visualize that 50% of the total of mobility time, on the average, is spent in the moves to and from work, while 16% relates to family care and housekeeping, and 13% relates to studying. The main fact to point out, then, is that at least 80% of the time spend in urban mobility refers to professional appointments, to studying and housework and family care, leaving little time for moves related to social life, sports and leisure.

We will draw now a chart which consists in the graphic visualization of the mobility hourly floatation through the capital during a weekday.

Graph #2

Moves Hourly Fluctuation in Belo Horizonte, 2001

Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of Time Use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

Graph 2 shows the urban mobility hourly peaks, according to the travel episodes. The first peak of the day happens between 6 and 8am when people move mainly to work and to school. The second peak happens between 1 and 2am, when a lot of people go back home after school time, and when others leave their houses to access services in several places of the city, mainly in the center. The third and larger peak happens at 6pm when the population goes back home. These are workers, afternoon shift students and people looking for services out of their houses.[6]

It is worth emphasizing that those results are consistent with the analysis performed by the Origin and Destination research, which identifies a demand concentration for collective transport in two peaks: in the morning, from 6 to 8am and in the afternoon, from 5 to 7pm. However, when the peak between 1 and 2pm is concerned, the graph indicates that the low transportation demand identified by the Origin and Destination research on this time is not verified; it is observed, on the contrary, a high mobility level in lunch time.

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[6] Harvey (1997, 1999) compared the hourly fluctuation of work and travel activities in several countries, what we used as reference to draw the hourly fluctuation of mobility in Belo Horizonte.

The next step is to find out how time people spend in moving during the day is structured.

Graph #3

Hourly Floatation of the Individual Time Spent Traveling, Belo Horizonte, 2001
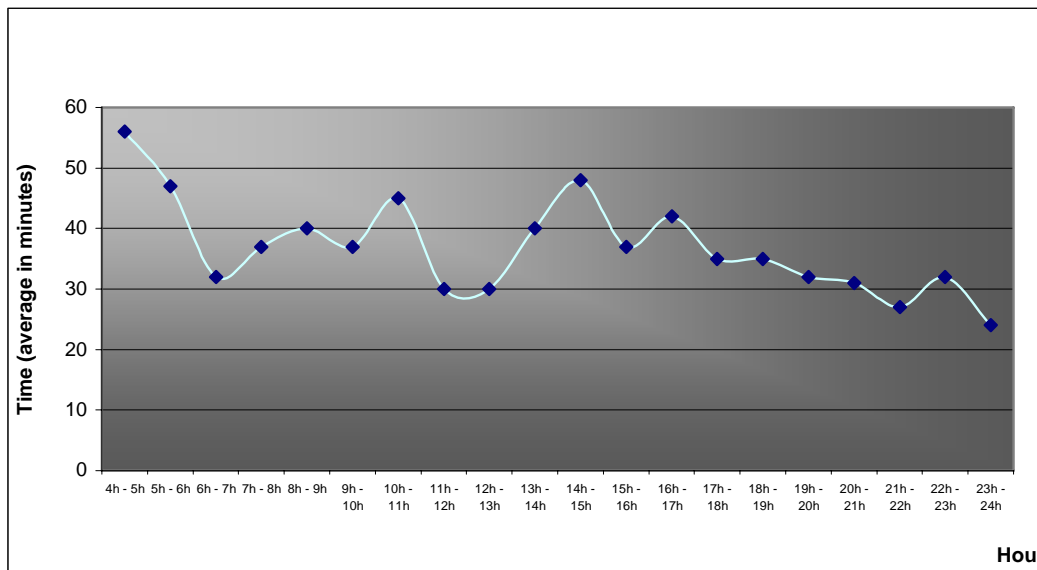
Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of Time Use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

In this graph it was computed the average traveling time during the 24 hours of the day. In each one-hour interval, it is calculated the average time of the travel episodes independently of the transportation means. Initially the graph indicates that the period in which people take more time moving is between 4 and 5am; however, on this period only 5 moving episodes happened, what indicates the need to consider that result more carefully. With more reliable results, it is verified that the periods when more time is spent moving is between 5 and 6am - 47 minutes -, and the one located between 2 and 3pm - 48 minutes. The moves that take less time are concentrated between 11am and 1pm, when the traffic is less intense, in spite of the fact that the number of trips is greater in that period; also from 7pm onwards begins a progressive decrease in travel time. At the rush hours, the average duration of moves is 40 minutes.

According to the data from the Origin and Destination research, in the metropolitan area the bus user spends an average of 46 minutes to complete a move. This includes the whole time spent from the origin to the final destination. The internal moves in Belo Horizonte by bus take about 38 minutes. Concerning the moves between the cities of the metropolitan area using the subway, the average duration is 54 minutes due to the prevalence of inter-cities moves. When we consider the municipal move in

Belo Horizonte by subway, the average duration is 35 minutes. Moving by car in the metropolitan area takes an the average of 21 minutes. The internal moves by car in Belo Horizonte take 20 minutes (Fundação João Pinheiro, 2002).

MOBILITY AND DEMOGRAPHIC STRUCTURE

In 2001, the population of Belo Horizonte was, approximately, 2.240.000 inhabitants. The city has decreased its population growing rhythm in relation to the other cities of the metropolitan area, since there is no more space to grow[7], an event that Lefèbvre (1999) called process of "explosion" of the city. This process is characterized by the expansion of the metropolitan areas all over the world: the explosion of the surrounding space, with the extension of the urban tissue. This comprises socio-spatial process that carry the productive conditions before restricted to the cities, extending them to the immediate regional spaces (Monte-Mór, 2005).

In Brazil in general, the city - and the metropolitan area – undergo a process of demographic transition that leads to the progressive aging of the population. Theoretically, urban mobility is expected to be differentiated according to the age, because, as Colleoni points out (2004), youths tend to move more frequently than older people who, after getting out of the labor market, have their mobility decreased.

Looking at Belo Horizonte, we could build a graph that represents the average distribution of travel time by age:

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[7] According to Teixeira and Souza (2003), between 1980 e 1996, while the metropolitan area had decreased its growing level from 2,6% to 2,04%, Belo Horizonte had a reduction in growing level from 1,2% to 0,7%.

Graph #4

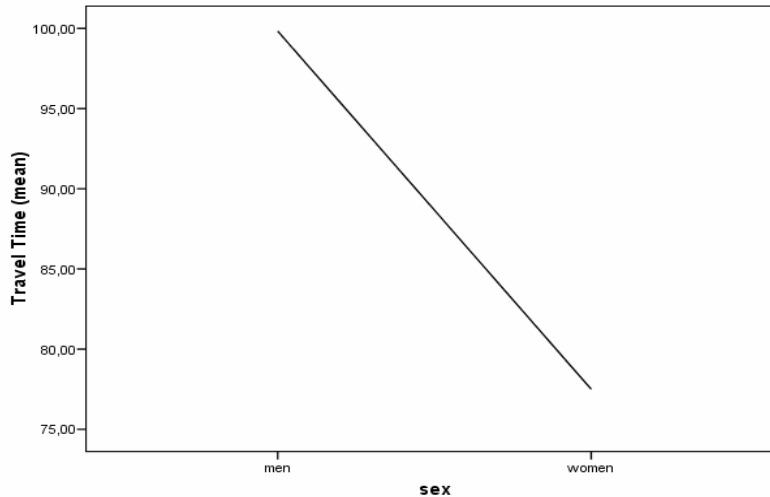Average Travel Time by Age, Belo Horizonte, 2001
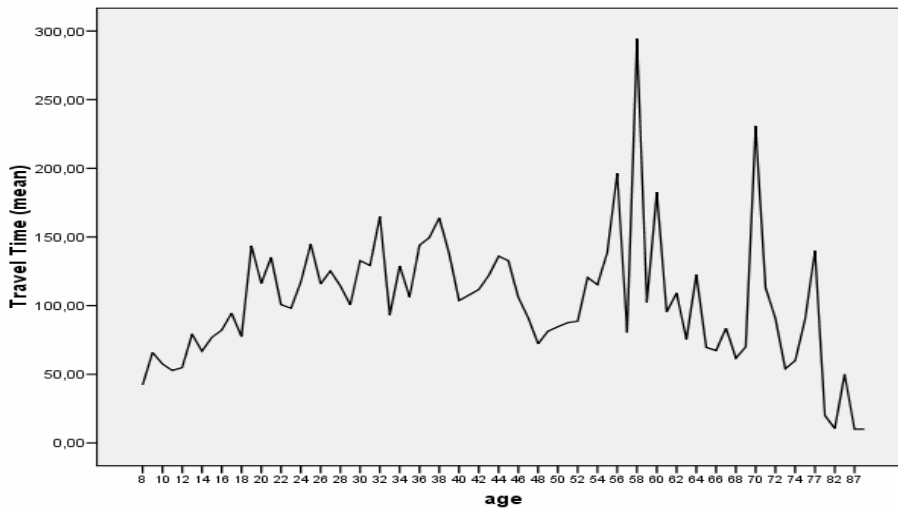
Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of Time Use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

The parable shaped graph indicates that daily mobility is associated to age, in the sense that it increases among the age groups inserted in the labor market, that is to say, the participation in economic activity by the population implies an increase in spatial mobility, as measured by time devoted to daily trips. As age increases and with the exit of the labor market, the travel time decreases. The apices of mobility take place at 58-year-old age – about 300 minutes, or 5 hours per day – and, from there begins a progressive decrease of the time dedicated to traveling.

When the distribution by gender is concerned, Belo Horizonte is characterized by having, in general, the female population is larger than the male population. In general, in Brazil, in spite of 104 men born out of each 100 women, this setting is inverted by demographic factors - exposition to external factors as accidents, violence alcohol and male migration to other centers –, culminating either the fact that women live longer than men.. The data from the time use research shows that there is a significant difference between men's and women's urban mobility time, the difference is represented in the graph below:

Graph #5

Average Travel Time by Sex, Belo Horizonte, 2001

Source: Time Use Research: AGUIAR, N. (2001). Multiple temporalities of reference: domestic and paid work: analysis of Time Use in Belo Horizonte, Minas Gerais: a pilot project for the Brazilian metropolitan zones.

We observe that the difference is very significant: men spend daily about 22 minutes more in travels than women, what corroborates Colleoni's statement (2004) In spite of women's progressive insertion in the labor market, men continue to have a greater travel time. The age groups where women are the majority are also the groups where urban mobility tends to be smaller.

On the other hand, women have a more fragmented mobility– 3.03 in contrast at 2.90 to men -, what means that they make a greater number of moves with purposes related the family and house care, even though these have a shorter duration time. Analyzed by the person's position in the family, the previous result is confirmed: husbands, sons and nephews move much more than wives, daughters and nieces. The domestic world constraints are still strong for women in Belo Horizonte, and in Brazil in general, more bound to the house.

URBAN MOBILITY AND INEQUALITY

We see that lifestyles are important to understand the difference between urban mobility patterns (Mokhtarian and Saloman, 2001; Colleoni, 2004; Grünfeld, 2006) [8]. The increase of work opportunities and the elevation of a population's educational level produce an increase of social mobility, since they allow the population greater access to goods and services. Besides, urban politics of services decentralization enlarge the possibilities of places in the city where these services can be available.

The two used researches highlight, in a differentiated way, the inequality in the mobility patterns that reflected as much on the space occupation as on the time. According to BHTRANS (2007), a part of Belo Horizonte population has a reduced mobility for they cannot afford the ticket prices, remaining unable to use the essential services, as access to work, leisure and social participation offered by the city. The following table presents a panorama of that situation:

Table #2

Income x Number of Moves,

Metropolitan Region of Belo Horizonte, 2001-2002

Range of Family Income	(%) Population	(%) Moves	Mobility
Up till 1 minimal wage	5.52	0.69	0.12 moves/inhabitant/day
1-2 minimal wage	11.39	5.75	0.49 moves/inhabitant/day
2-3 minimal wages	13.18	9.21	0.67 moves/inhabitant/day
Average - up til 3 minimal	**30.1**	**16**	**0.50 moves/inhabitant/day**
3-5 minimal wages	22.11	17.72	0.77 moves/inhabitant/day
5-10 minimal wages	25.43	28.66	1.08 moves/inhabitant/day
Average -3-10 minimal	**47.5**	**46**	**0.94 moves/inhabitant/day**
10-15 minimal wages	9.65	13.91	1.38 moves/inhabitant/day
15-20 minimal wage	4.37	7.22	1.59 moves/inhabitant/day
over 20 minimal wages	8.35	16.84	1.94 moves/inhabitant/day
Average - over 10 minimal	**22.4**	**28**	**1.63 moves/inhabitant/day**
Total - RMBH Average	**100**	**100**	**0.96 moves/inhabitant/day**

Source: Origin and Destination Research, 2001-2002.

The table indicates that higher the income, the greater is the number of moves a person makes in his daily life, taking into consideration the whole RMBH, what is evident in this graphical representation:

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[8] In this work, lifestyle will be measure by indirect measurements: by the family income, in the Origin and Destination research, and by the socioeconomic status index, in the Time Use research.

Graph #4

Income x Number of Travel Moves

Metropolitan Region of Belo Horizonte, 2001-2002
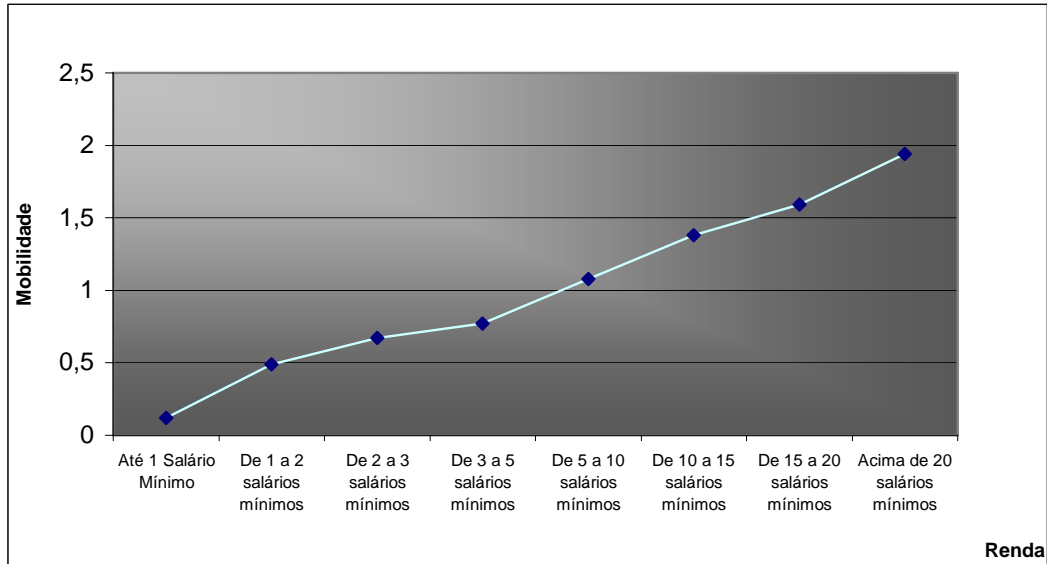
Source: Origin and Destination, 2001-2002.

Since most of the population concentrates on the up to 10 minimum wages range, its weight for travel mobility calculation pulls down the average number of moves, which is less than one move/per day (0,96) in RMBH.

Concerning only the city of Belo Horizonte, the average number of moves is 1.67 for inhabitant per day. The city centralizes all the travel mobility in the metropolitan area presenting, therefore, a greater average number of moves, 74% greater than the general average. The Origin and Destination research allows us to see that the internal differences in the city are also significant, because inhabitants of the richest neighborhoods of the city – center-south area, for example - present an average number of travel moves of 2.20, while inhabitants of poorer areas - like the eastern zone - present average of 0.66 moves a day.

Now, considering the space occupied in the transportation system by buses (32,5 m^2) and automobiles (4.5 m^2), and the amount of passengers transported by bus (60-70 passengers) and by car (1.5 passengers), we find a very unbalanced situation: a bus passenger occupies 0.46 m^2 of the space while the car passenger occupies a space more than 6 times greater, 3 m^2 (BHTRANS, 2007). In general, cars occupy 90% of the transportation urban space of Belo Horizonte to transport only 30% of the people.

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The time use research allows us to observe the relationship between urban mobility and inequality from the time dimension. Taking into account only the moves people make to and from work we estimated a simple linear regression model having as independent variable the socioeconomic status index, originally elaborated by Pastore & Valle Silva (2000). The index refers to the main occupation the individual holds; it was built aiming to measure the individuals' real position in the labor market, indicated by the resources that the individuals command in his respective positions (op. cit.). The empiric referents used in the elaboration of the scale are: educational and income levels within each professional category. This grouping follows approaches of social distance and carries, besides the initial measure of the socioeconomic position, other referring approaches, mainly, to the distinction between manual and non-manuals occupations (op. cit: 20). The range scale is from 0 to 100, considering 2 decimal. The estimated model embraces, then, only people occupied in the labor market, during the period of the research, for whom it was possible to attribute a position in the range. The model equation is:

$$Y = \alpha + \beta_1 X_1 + \varepsilon$$

Where:

Y = travel time to work

α = constant of travel time to work, for an individual of minimum socioeconomic status

β_1 = intercept

X_1 = socioeconomic status index

The regression model is the following:

Table #3

Impact of the Socioeconomic Status on Travel Time to Work,

Belo Horizonte, 2001

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8,585	3,093		2,776	,006
	isse	,376	,061	,249	6,150	,000

a. Dependent Variable: travel time to work

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Thus, the equation with regression results is:

Travel time to work = 8,585 + 0,376 (socioeconomic status index)

The results shown are quite significant, with 99% of confidence. In the first place, they indicate that an individual with minimum socioeconomic status – 20,78, as a washerwoman - spends about 9 minutes in moves related to work per day. In the second place, and more important, it shows that the higher individual's socioeconomic status, the greater is the time he spends in moves related to the work, what, in a certain way, reinforces the results presented in table #2, where the higher the income the greater is the number of moves.

Now, analyzing the relationship between the position in the status range and the move in general - for all the reasons: leisure, participation, study, shopping etc. - we estimated the following of simple linear regression model. The equation is:

$$Y = \alpha + \beta_1 X_1 + \varepsilon$$

Where:

Y = travel time

α = constant of travel time, for an individual of minimum socioeconomic status

β_1 = intercept

X_1 = socioeconomic status index

Table #4

Impact of the Socioeconomic Status on Travel Time, Belo Horizonte, 2001

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	64,807	14,673		4,417	,000
	isse	,871	,290	,125	3,007	,003

[a.] Dependent Variable: travel time

The equation with regression results is:

$$\text{Travel time} = 64{,}807 + 0{,}871 \ (\text{socioeconomic status index})$$

The results are also quite significant, at 99% of confidence, indicating that an individual of minimum socioeconomic status spends on the average 65 minutes of his day moving. Besides, it shows that the higher the individual's socioeconomic status, the greater is the time he often dedicated to move. To each position in the range, there is an increase of about 1 minute in the move time. In general, what we can verify is that individuals that occupy positions in the market related to activities of non-manual characteristic have mobility possibilities and access to the city's services much superior than those that accomplish work of manual characteristic. These results are compatible with Colleoni's propositions (2004), for whom mobility is more and more individualized according to lifestyles and social categories, the society becomes more mobile to the individual level.

Complementing that data, with the Time Use Research we can join all data in order to obtain a daily panorama for the mobility according to transportation means. The first and curious data is that the move by private car and by collective transport takes an identical average amount of time a day and per person, reaching 96 minutes. However, while for the dependents of the public transportation this time represents a lower number of moves – 2.9 on the average –, even though of greater duration, for those who use their own vehicles, it represents the possibility to make a broader range of moves – 3.4 on the average - and to have access to the most varied goods and services of the city. When the transportation means is the subway, the time reaches 107 minutes. Those that only move on foot spend a daily average of 63 minutes. And people that make moves combining two or more transportation means accomplish a daily average mobility of 88 minutes.

Another important data is the racial inequality concerning mobility. Aguiar (2000), making special tabulation of National Household Survey (PNAD), and comparing it to Amaury de Souza (n/d) data, showed us that black people, independent of the gender, made much higher use of the public transportation system than the white ones. Besides, they presented a time of move to work greater than the white's. Our data

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corroborate partly those discoveries, indicating that 76% of black people are dependent on the public transportation system, while 48% of the white are only dependent on bus and/or subway. Though, when to time of move to work is concerned, the order is inverted and white begins to spend more time - 28 minutes on the average, per day -, in moves related to work, than black - who spend about 20 minutes. The average number of move episodes also indicates that white make a greater number of move per day – 3.1, on the average, the same value of brown's – than the black's – 2.5. That result is coherent with the previous ones, because white people occupy higher positions in the range of socioeconomic status, and black the lower – thus, do not have equal access to transport and services around the city, than whites.

DISCUSSION

We attempted here to provide a first panorama of mobility in Belo Horizonte, beginning with the articulation of two different researches, with differentiated methodologies. In that sense, we believe that it was a successful attempt, allowing us to highlight the relationship between time and space through the moves along the city, and to point out how social inequalities are reflected in the access to the city, through the transportation system.

According to BHTRANS (2007), participation in collective transportation is decreasing, not only as a consequence of the increase in the number of automobiles, but also of a larger distribution of activities in the whole urban net. We even verify a decrease in the quality in the services of the public system due to the increase in operational costs and in the level of traffic jams in the road system.

In spite of the attempts to decentralization of activities in the metropolitan area, the transportation system has not provided people and social classes an equal access to the services the city has offer The city initially conceived to centralize everything is incapable of offering access to services, especially for the poorer classes who already occupy the peripheries of the metropolitan area in cities that were not planned.

Thus, it can be observed that socio-spatial segregation is a dynamic phenomenon (Netto and Krafta, 1999), through the action of individuals and social classes on the urban space. Such segregation is noticed in the movements, in time and space. That means that urban segregation does not happen only when we look at the dwelling distribution in terms of spatial allocation, represented by the expansion of great condominiums for upper-middle classes in the boundaries of the metropolitan area.

Segregation may be mostly observed also in the daily trajectories within the metropolitan space.

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