HOW THE PRESENCE OF CHILDREN AFFECTS PARENTS' TRAVEL BEHAVIOR

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ABSTRACT

The impact of having child on the parents and on the rest of the family is already well studied in different domains. The step from two adults towards a family with two adults and one child brings along a lot of consequences. The effects are related to changes in time use, changes in the work situation, differences in composition and size of social networks. Notwithstanding the fact that this key event is quite well studied in the past, the effects on parents' travel behavior are not.

In this paper we found prove for the hypothesis that the arrival of a child affects parents' travel behavior. Evidence for the hypothesis is found using a large travel behavior study, where differences in trip making, number of trips and distance traveled are considered. Not only the presence of children has an effect, it was also found that the age of the (youngest) child influences parents' travel behavior strongly and this up to the age of 16 years. Moreover, the influence on parents' travel is different for mothers and fathers: in particular mothers take care for the transportation of the children.

Secondly, from an exploratory study with couples before and after childbirth, the differences between men and women point out that women become some kind of “taxi driver” of the child, even shortly after birth.

1 INTRODUCTION AND BACKGROUND INFORMATION

For years, the impact of having and raising a child has been studied in different domains. The step from a family of two adults to a family with two adults and a child, brings along a lot of consequences. Within the research domain, having a child is often referred to as a "key event". A key event can be defined as 'a major event in a personal life that will trigger a process of reconsideration of current behavior' (1). Little research has been done on this type of key event while other examples of key events like changes in residential, work or study location are more frequently studied (1).

A child that is welcomed by a family, leads to a change in the routines that have been adopted for years. Moreover, as the new person is totally dependent on his parents, the extra person in the household brings along a lot of additional work: households tasks expand, but also new tasks have to be performed (e.g. child caring and raising) (Van Baelen in (2)). Logically, the arrival of an additional person leads to a change in the parents' time use. Minnen and Glorieux found in the Belgian time use survey significant differences in time use between couples with and couples without children. The division of household tasks between man and woman also changes: while before birth the tasks were equally spread over man and woman, they found a more traditional division of tasks after birth (2) .

However, effects on time use and intra-household task division are not the only effects described. Other research demonstrated that the work situation of the parents changes after birth. In particular women work less after the birth of a child, while for men the situation changes less (see, among others, (2); (3); (4);(5)).

Moreover, the birth of a child in a household has an effect on the social network size of the parents. Bott (6) and Bidart and Lavenu (7) described how the size of the social network of men and women declines after birth. Other researchers showed how, for both sexes, a decline in social network size was observed, but how for men the decrease in size was less drastic than for women (8).

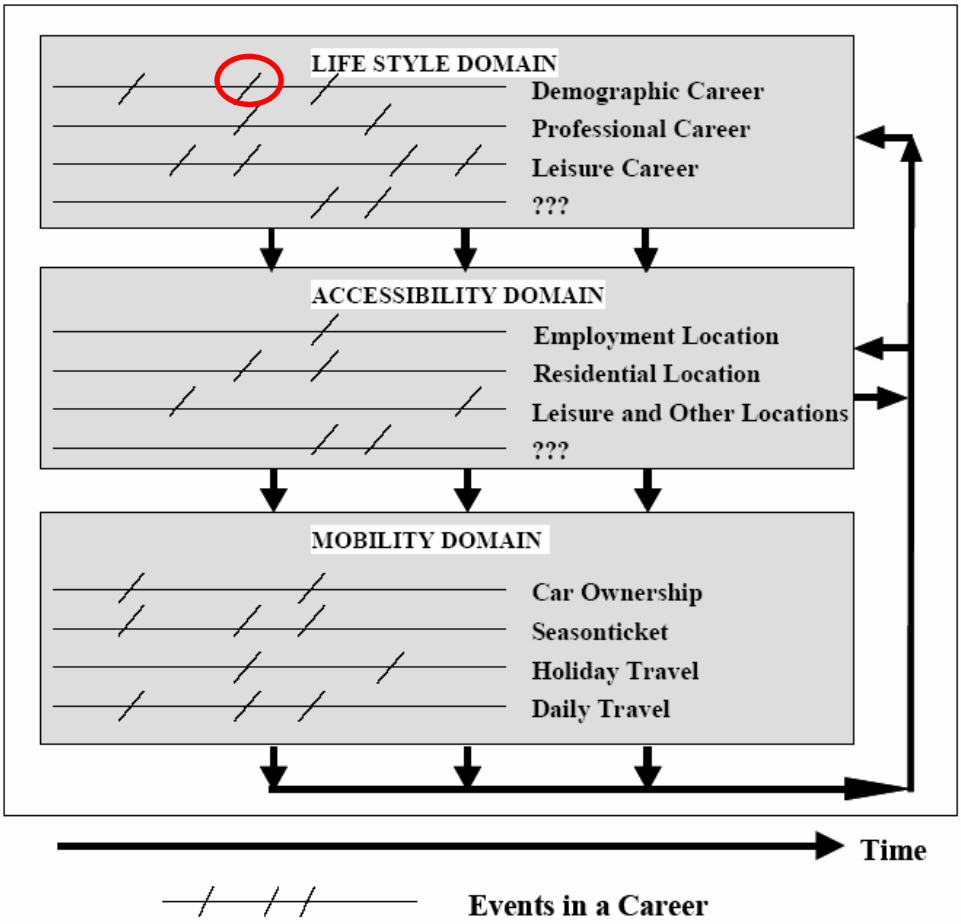
Johansson (9) described how childhood influences adult travel mode, but the focus of this study was on the attitudes of parents and children and the use of travel modes. On the other hand, Pekkarinen (10) modelled traveller's mode choice and the value of travel time while examining the effects of gender and life-cycle. The age of the (youngest) child was taken into account limited (younger or older than 7 years). Jones (11) showed, for different life cylces, how mean trip rates and trip purposes differed for men and women. The age of the youngest child was divided in more categories, but the division remains quite broad. This paper contributes to this line of research by describing the affects of childhood on parents' travel behavior in a more detailed way.

The remainder of this paper is structured as follows. Section 2 discusses the theoretical framework for this study. The third section describes how a child affects the travel behavior of the parents in terms of trip making, the number of trips and the kilometers traveled. The more, in this section, we give a short overview of the planning and the results of an exploratory study before and after childbirth. This paper concludes by defining some topics for future research and by giving a summary of the research findings.

2 TRANSPORTATION AND SOCIAL LIFE

In the field of transportation, the interest in the social aspects of traveling came up just recently. On the other hand, in the field of sociology, the interest in travel and transportation remained absent ((9); (12); (14)). At the beginning of the eighties, Salomon already linked social, cultural and political environment with mobility, activity and trip choices (15). Lanzendorf adopted the scheme of Salomon and constructed the concept of 'mobility biography' (16).

FIGURE 1 Life domains and related events that affect mobility biographies (16)



Mobility biographies refer to the total of longitudinal trajectories in the domain of transportation. Lanzendorf assumes that events in these trajectories exist or that at certain moments in an individual's life, the daily travel patterns, the car ownership or other mobility characteristics change to an important degree. He expects that the life style and the accessibility domains affect the mobility biography, not withstanding the fact that this effect may occur vice versa too (16).

This paper focuses on one of these key events (birth of a child – indicated in figure 1 with a red oval) in the demographic career of an individual. We expect to see (i) an effect of the presence of a child in the household on parents' travel behavior and (ii) an effect of the age of that child. When a household has more than one child, the (age of the) youngest child (the child that needs the most care) will be taken into account to see the effects.

3 DATA

Different data were used to gain insight in the effects of the presence of children on the travel behavior of the parents. First, the large travel behavior study of the central Flemish region of Vlaams-Brabant, Belgium, was used (17). 12,522 households with in total 28,736 persons participated in the research. The analyses presented in this paper, were restricted to the head of the household and to his or her partner in two-parent families. Singe-parent families were excluded as their travel behavior is more complex and the comparison with two-parent families will not hold.

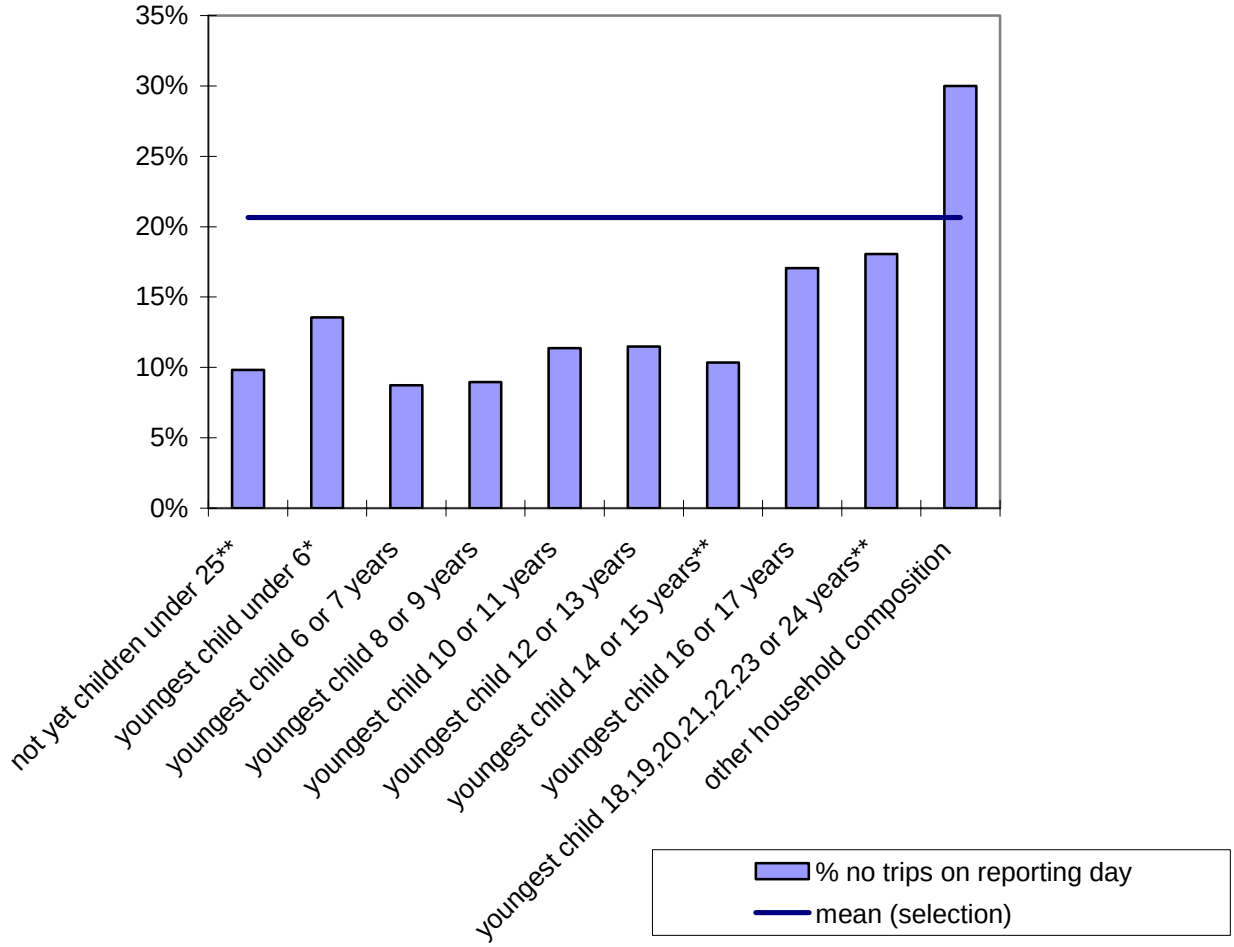
In sum, 13,573 persons were selected for this analysis. 52.7% of these persons did not have children younger than 25 years. The age limit of children being dependent on their parents was set on 25 years. The reasons for this decision are socio-economic insights (at this age a lot of children start working and earning) and statutory regulations (parents receive child allowance until the age of 25, in case the child has no earnings). Second, this data was complemented with qualitative information that was obtained from interviews with 15 couples before and after birth , and with data from a weekly activity diary these couples kept during a week before and after birth.

3.1 Indicators from the travel behavior study

Different variables can be used to describe the travel behavior of the parents in our analysis. The first variable that will be used for analysis evaluates whether the person involved makes a trip on the reporting day or not.

Figure 2 shows the percentage of persons with no trips on the reporting day and the mean percentage for the sample of couples. All the couples were divided in classes on the basis of the age of the (youngest) child. When couples had no children, the distinction was made between couples that do not yet have children and those that never had children or where the child(ren) left home. The first category was defined as follows: when the age of the father is lower than or equal to 60, and age of the morther is lower than or equal to 45 (according to the statistics of age of the parents at childbirth (18)), the couples were placed in the first category. Otherwise, in case these conditions were not fulfilled, the couples were put in the last category ('other household composition').The proportions of each category were tested against the proportions of the next category in the life cycle.

FIGURE 2 Percentage of persons with no trips on the reporting day and the mean percentage

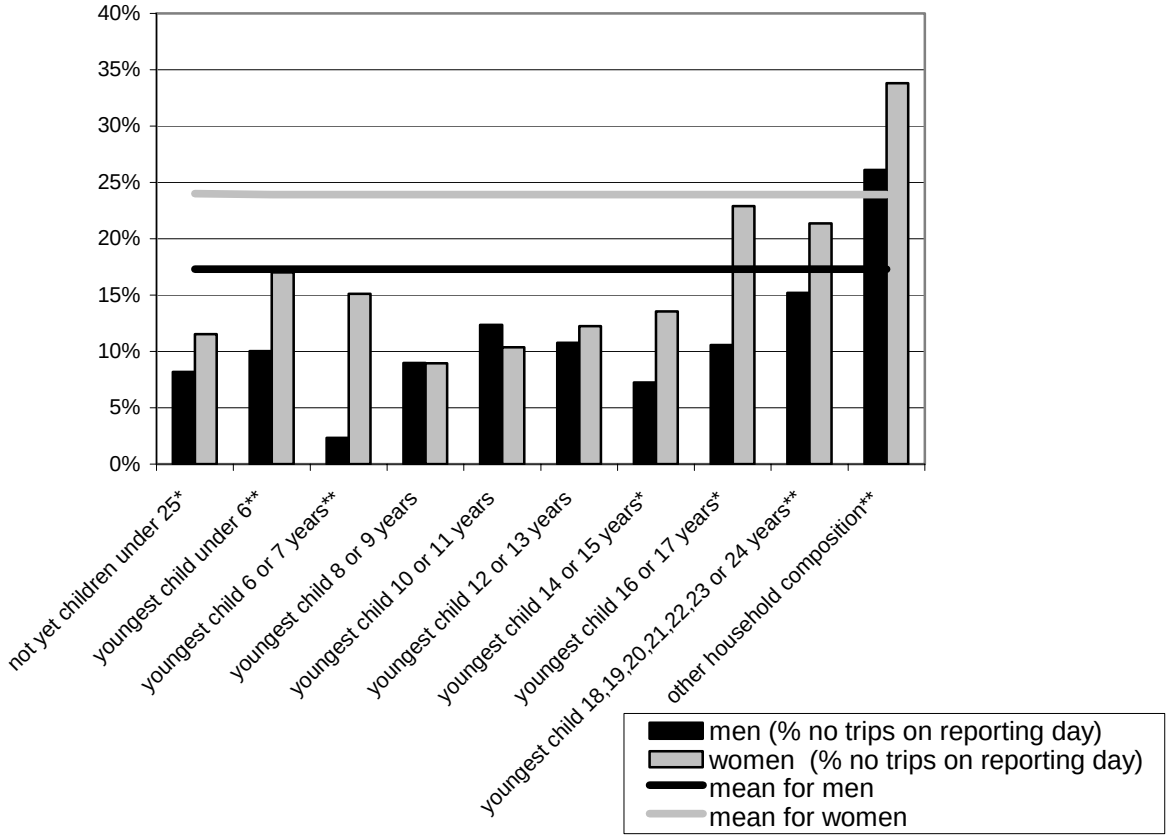


*, ** : difference with the next class * P<0.05; ** P<0.01

The mean percentage of persons in two-parent households that do not make a trip on the reporting day is 20.64% (indicated by the line). When there are not yet children present in the household, the percentage of people that do not make trips is rather low (9.83%). The proportions for each class were tested against the proportions of the next class with the z-test for proportions (19). This percentage differs significantly from the percentage of household with the youngest child being under six (13.55%, P<0.01). Also the difference between the second (youngest child < 6) and the third class (youngest child 6 or 7) is significant (with P<0.05). The next significant difference is the increase between the persons with a youngest child being 14-15 years and those with the youngest child 16 or 17 years old (P<0.01). The category with (a) child(ren) between 18 and 24 differs significantly from the 'other household composition' category.

From these figures it seems that when a child is under six, parents stay more at home. From the moment that the child starts with leisure activities and primary school (6 years), parents need to travel more. At the age of 16, the child is considered to be old enough to travel alone, as parents stay more at home.

FIGURE 3 Percentage of men and women with no trips on the reporting day and the mean percentage



*, ** significant difference between male and female * P<0.05; ** P<0.01

Figure 3 shows the percentages of non trip making persons in two-parent household for men and women separately. The mean values of non trip making differ for men and women (the black and the grey line in figure 3): men make more trips than women do. The presence of children in the household has an effect, both on men and women. In the households where there are not yet children, the number of non trip making persons is low. For both sexes there is an increase when children are under six years old. The decrease that follows is different for men and women. For women we see a slow decrease with the lowest point when the youngest child is 8 or 9 years old. From that point on, the percentage of non trip making women increases, with a strong rise when the youngest child is 16 or 17. Men's percentage of non trip making persons decreases rapidly for those with a youngest child at the age of 6 or 7. In the next two classes the percentages grow, followed by a decrease from the age of 12 or 13 years on. By the age of 16, the proportion of non trip making men sharply rises. Again, it seems that children at this age are considered to be able to travel alone

From these figures we learn that the age of the youngest child has an effect on trip making of parents, and that there is a different effect for men and women. Men and women with no children yet, are very mobile and stay less at home. This changes when a child is present in the family. Until the age of six (for the youngest child), parents make less trips than households

which do not yet have children. These figures give an idea of trip making, but the number of trips is is neglected in this figure.

Another indicator for the 'mobility' of people is the mean number of trips per day per person. This mean also takes the number of non trip making persons into account.

TABLE 1 Mean number of trips per person per day (total, men and women)

		PARENTS	
	PARENTS	**MEN**	**WOMEN**
not yet children under 25	3.21	3.31	3.11
youngest child under 6	3.40	3.45	3.36
youngest child 6 or 7 years	3.66	3.65	3.66
youngest child 8 or 9 years	3.36	3.18	3.54
youngest child 10 or 11 years	3.66	3.58	3.73
youngest child 12 or 13 years	3.26	3.17	3.36
youngest child 14 or 15 years	3.10	3.16	2.43
youngest child 16 or 17 years	2.10	2.37	1.85
youngest child 18,19,20,21,22,23 or 24 years	3.35	3.54	3.18
other household composition	2.18	2.38	1.97

Couples with young children under the age of 14, make on average more trips per day than other couples. Remarkable is the decrease in number of trips for the age groups of 14 to 17: again it seems that children become dependent travellers at this age. Even more remarkable is the difference between men and women with children over the different age groups. Normally spoken, men make more trips than women do. When the youngest child is between 8 and 13 years old, the relation changes into the reverse: women make more trips than men. From these results, it seems that the mobility of the children is guaranteed by the presence of the mother.

TABLE 2 Mean distance traveled per person per day (total, men and women)

		PARENTS	
	PARENTS	MEN	WOMEN
not yet children under 25	57.70	68.79	46.54
youngest child under 6	42.28	51.47	33.23
youngest child 6 or 7 years	42.57	45.81	39.42
youngest child 8 or 9 years	41.91	47.61	36.50
youngest child 10 or 11 years	49.22	51.49	46.88
youngest child 12 or 13 years	55.42	67.38	43.25
youngest child 14 or 15 years	46.83	57.35	28.82
youngest child 16 or 17 years	26.97	35.07	18.85
youngest child 18,19,20,21,22,23 or 24 years	43.50	54.10	32.48
other household composition	24.66	28.23	21.24

The distance traveled per person per day does not confirm the image of the mother being a taxi driver for the children that was found in table 1. Couples which do not yet have children, travel on average the longest distance. The distance traveled per day decreases significantly when there is a child under six in the family. When the youngest child becomes older, the distance increases for the mothers, until the child is 11 years old. After that age the distance decreases again, with the lowest distance traveled for women when the child is 16 or 17 years old. For men the greatest distance traveled is found when the youngest child is 12 or 13. Also here, we see the sharp decline at the age of 16 or 17. At first sight, the distance traveled gives no further evidence for the taxi-driver behavior of the mothers. Another reason may be that the “taxi trips” are rather short trips: school is nearby, leisure activities are close to home.

In order to found this hypothesis we take a closer look at the trip purpose. More specific, the trip purpose 'to bring or get someone' is interesting to see if the age of the youngest child affects this part of trip making, and if there is any difference between mothers and fathers.

TABLE 3 Percentage of 'to bring or get someone' in the mean number of trips per person per day (row percentages)

		PARENTS		
	PARENTS	**MEN**	**WOMEN**	
not yet children under 25 (°°	6,9%	6,9%	6,9%	
youngest child under 6	23,9%	16,0%	31,9%	**
youngest child 6 or 7 years	25,1%	19,4%	30,5%	*
youngest child 8 or 9 years	27,6%	19,9%	34,1%	**
youngest child 10 or 11 years (°°	24,6%	19,8%	29,4%	*
youngest child 12 or 13 years	16,7%	12,6%	20,5%	**
youngest child 14 or 15 years	12,6%	8,4%	16,9%	**
youngest child 16 or 17 years (°	15,3%	13,7%	17,4%	
youngest child 18,19,20,21,22,23 or 24 years	11,3%	11,7%	10,9%	
other household composition	9,7%	10,8%	8,5%	**

(°, (°° : difference with the next class ° $P<0.05$; °° $P<0.01$
*, **: significant difference between male and female * $P<0.05$; ** $P<0.01$

Compared to the couples without children (the first and the last category), the percentage of the trip purpose 'to bring and get someone' is extremely huge for couples with children. When the youngest child is 8 or 9 this trip purpose counts for more than one fourth of all the trips. But at the same time there is a difference between men and women. Until the youngest child is 15 years old, the differences found between mothers and fathers are significant. For mothers with a youngest child in the age of 8 or 9 this percentage mounts up to one third of all her trips! This confirms our previous results that children are mobile, thanks to the mother.

This table also shows that the age of the youngest child affects the travel behavior of the parents. We can distinguish three stages over the ages. Until the age of 11, children are extremely dependent on their parents, and especially on their mother, for transportation purposes. From 12 years on, children become less dependent, but they still need some support for their transportation (distance can play a role in this). This result was also found in a large survey of 11- to 13- year- old children (20) . In the last stage children are fully independent from their parents. They own a driver's license and most of the time a family car is available when they need it.

TABLE 4 Percentage of 'to bring or get someone' in the mean distance traveled per person per day (row percentages)

		PARENTS		
	PARENTS	**MEN**	**WOMEN**	
not yet children under 25 (°°	5,56%	6,43%	4,32%	
youngest child under 6	11,14%	7,02%	17,44%	**
youngest child 6 or 7 years	12,96%	10,97%	15,23%	
youngest child 8 or 9 years	15,26%	10,25%	21,35%	**
youngest child 10 or 11 years (°°	14,15%	12,4%	16,13%	
youngest child 12 or 13 years	6,72%	5,61%	8,49%	
youngest child 14 or 15 years (°°	3,96%	3,18%	5,16%	
youngest child 16 or 17 years	10,5%	9,97%	11,56%	
youngest child 18,19,20,21,22,23 or 24 years	8,69%	8,98%	8,4%	
other household composition	7,83%	7,7%	7,94%	

(°, (°° : difference with the next class ° $P<0.05$; °° $P<0.01$
*, **: significant difference between male and female * $P<0.05$; ** $P<0.01$

The percentages of the trip purpose 'to bring or get someone' in the total amount of distance traveled are rather small. Together with the information of table 3, we can conclude that the trip purpose 'to bring or get someone' consists of a lot of trips, but within a short distance. Once more, the difference between men and women is striking. In particular, this is the case when the youngest child is under 6 or between 8 and 9 years. For this last category, 'to bring or get someone' counts for one fifth of all the kilometers women travel.

The results from the analysis confirm to a large extent the results from different other studies (Time Use Surveys – (2)) and continue the conclusions drawn in those studies into the domain of transportation. Mothers not only perform a great part of the household tasks, they also take responsibility for the mobility and the activities of the children. The fact that 'to bring or get someone' counts for more than one third of all trips mothers make, leads to the assumption that the time use rhythm of the children determines in the first place the time use rhythm of the mother, and to a smaller extent time use of the fathers.

3.2 Weekly diaries before and after birth

In order to better understand the impact of the birth of a child, 15 couples pregnant of their first child, participated in a second study. This study included two qualitative interviews (one before and one after birth) and both partners kept a diary during one week (again, one week before and one after birth). The second part of the study was carried out after childbirth. However, the period after birth was not the same for all couples. This period ranges from 4 until 8 months after birth. From five couples the data of the second wave are not yet available.

In this part of the paper we focus on the analysis of these diaries and compare the differences between the data before and after birth, and between men and women. These results are based on a small sample (N1=30; N2=20), and for that reason we do not aim at representativeness.

The diary kept by the parents consisted of different episodes (activities or trips). Every time the respondent started a new activity or a trip, a new item had to be completed and this for the 7 days of the week. The percentages in the next paragraphs indicate the frequency of incidence in the diaries, and they do not give any idea of the duration of the trips or the activities.

Before birth, future fathers reported on average 10.2 activities a day, while future mothers performed on average 12.6 activities. After birth the mean number of activities for fathers climbs to 12.8 activities a day, while for mothers there is an increase to 16.3 activities per day.

TABLE 5 Frequency of incidence af activities and trips, for men and women

	MEN		**WOMEN**	
	Before	**After**	**Before**	**After**
Sleep	7.00%	6.30%	8.32%	6.73%
Social activities	4.09%	3.44%	5.55%	5.41%
Leisure	12.28%	10.47%	12.49%	8.25%
Work	6.27%	6.79%	4.28%	4.16%
Eating and personal care	21.98%	18.25%	20.29%	17.27%
Care for others	0.92%	14.24%	0.98%	19.90%
Household tasks	8.91%	9.17%	12.43%	12.41%
Education	0.13%	0.00%	0.17%	0.76%
Daily shopping	2.51%	2.21%	3.47%	1.32%
Shopping	2.38%	1.72%	2.95%	1.25%
Services	2.38%	0.74%	2.25%	1.80%
Trip as a means	26.47%	20.87%	23.76%	15.81%
Trip bring or get	2.11%	4.66%	1.04%	4.30%
Trip leisure (biking, walking, …)	1.45%	0.57%	1.39%	0.62%
Trip for work	1.12%	0.57%	0.64%	0.00%

Table 5 shows the frequency of activities and trips. The type of the activities performed, were compared before and after the child birth. Our interest goes especially to the categories 'care for others', 'social activities', 'free time' and 'household tasks'. As expected, 'care for others' counted for a low percentage in the data before birth (0.92% for men, 0.98% for women), but in the second part the percentages increases to 14.24% for fathers and 19.90% for the mothers. The

percentages for 'social activities' remain more or less the same (but here also the remark that duration is not taken into account). Leisure activities decrease after childbirth both for men and for women, but the decrease is stronger for women than for men. The frequency of household tasks increased for men and women after the arrival of the baby.

Before the birth of the child, men report on average 4.6 trips per day, women 4.5 trips. The differences with the tripmaking after childbirth are small: fathers and mothers make 4.6 versus 4.3 trips respectively. The trips were divided in four types: a trip as a means (to go shopping, to go to work, …), a trip to bring or get someone, a trip for leisure (walking, biking, …) and a trip for work (not the home-work trip). The category 'to bring or get someone' increases for mothers and fathers before and after birth, but the increase is stronger for mothers. Remarkable is the decrease for 'trips as a means', and this in particular for women. From that perspective, the relative interest of 'to bring or get someone' becomes more important: even in the case of a newborn child, we found in our small sample evidence for mother becoming taxi driver.

The travel mode used for trip making is another point of interest. From the travel behavior study (17(17) (in globo, not in our selection) we learned that men travel more by car (as driver), women more as car passenger and by public transport Although our sample is too small to give sound results, they partly confirm the information of the Travel Behavior Study. The more, we also see a difference before and after childbirth in the use of transport means: the use of the car as driver decreases for men and increases for women (probably because women need the car to bring or get the child).

4 FUTURE RESEARCH

The results of the small exploratory study are based on the processing of the diaries of the respondents. The qualitative analysis of the interviews should add more information (on car use, on changes in life, …) and offer a more in depth insight in the results already described. Furthermore, the interviews served as a basis for the design of a quantitative survey that will be held in the autumn of this year. The respondents for this survey will be parents with a first child between 4 and 8 months. The survey results will be used to quantify parents' opinions on changes in travel behavior after childbirth. Finally, the results from these different studies will be used for the refinement of micro- and macro- simulation models.

5 CONCLUSION

In this paper we examined how the key-event of the arrival of a child in the household affects parents' travel behavior. Although many disciplines already studied the impact, the transportation domain seem to neglect this key event.

The theory of mobility biographies set a good framework for analysing this key event. With the data of a large travel behavior study, we found that not only the child has an effect on parents' travel, but that also the age of the (youngest) child is important to be taken in account. Furthermore, the effect of a child is not equally spread over mothers and fathers. The effect is much stronger and radical for women than for men. As the trip purpose 'to bring or get someone' counts up for more than one third of the trips women make in certain categories, we can assume here that the time use rhythm of the children determines in the first place the time use rhythm of the mother. The same indications were also found in a smaller, second study, before and after childbirth. Even shortly after childbirth, mother is becoming the taxi-driver.

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