

Social Support, Time Use and Travel

Anna Grigolon and Harry Timmermans

Eindhoven University of Technology, Urban Planning Group, PO Box 513, 5600 MB Eindhoven, The Netherlands, h.j.p.timmermans@tue.nl

Abstract. To contribute to the better understanding of the transport generating effects of social support activities, this paper reports the results of some descriptive analyses on the 2006 Dutch national time use survey on the intensity and co-variables of social support activities such as grandparenting and associated travel. Results of descriptive analyses show evidence of task allocation between males and females, with females being more responsible for caring. Car is the dominant transport mode using for conducting social support activities, although slow modes also pick up a substantive share. Use of transport mode varies by time of day, while different social support activities tend to be conducted at different days of the week, and times of day. By extending these analyses and capturing the interdependencies in formal representations, social support activities could be separately identified and embedded in large-scale activity-based models of transportation demand. This would make these models sensitive to assess the activity-travel implications of social-economic policies that affect the intensity and nature of social support activities.

INTRODUCTION

Traditionally, transportation researchers have studied at length travel behavior related to the commuter trip. This focus can be appreciated by realizing that for many decades transportation research has been primarily conducted to support infrastructure investments decisions. In emerging economies this is still the case. The commuter trip is fundamental to understanding the critical relationship between transportation demand and infrastructure capacity, reflected in the number, length and duration of traffic jams.

Since the emergence of the activity-based approach, transportation researchers have increasingly realized that other type of trips, induced by activities other than work, may also play an important role in the intensity, and spatial-temporal distribution of traffic. Thus, travel generated by activities such as shopping and leisure have been examined by several scholars. Examples include Bhat (1996), Bhat et al. (2004), Schlich et al. (2004), and Moktharian et al. (2006).

Recently, most attention has been directed to social activities, which according to Axhausen (2003) constitute the fastest growing segment of travel. Social networks need maintenance and therefore social activities are an important trigger of transportation demand. Various aspects of social networks and their impact on time use and travel behaviour have been examined over the last decade. As part of the "Connected Lives" study, Carrasco and Miller (2005), concentrated on the characteristics of network members and the overall social structure (see also Carrasco et al., 2008, Carrasco, Miller and Wellman, 2008). Carrasco and Habib (2009), found that egos maintain an intense relation with a very close-circle of contacts and tend to keep in touch with those with a wider connection.

Many studies found distance to be a key variable influencing the frequency of social contacts, in addition to other variables. Frei and Axhausen (2007, 2009) found that face to face contact frequency decreases with increasing distance whereas email frequency increases. Using data collected in the Eindhoven region, van den Berg, Arentze and Timmermans (2009, 2010) reached similar conclusions, which however were congruent with the findings of Molin, Arentze and Timmermans (2007), who used data about social networks collected in the 1980s. Silvis et al. (2006) found for Davis, California, that individuals make longer trips for socializing and visiting family. Ettema and Kwan (2010) concluded that contact frequency with social network members is positively correlated with the frequency of social and recreational activities.

Physical travel may however be substituted by other communication means, and consequently several studies have been concerned with the influence of modern ICT on the maintenance of social networks (e.g. Carrasco and Miller, 2006; Larsen et al. 2006; Dijst, 2006; Carrasco et al., 2008; Axhausen, 2008; Van den Berg et al., 2009, Tillema et al., 2010).

In addition to these studies on transport-related aspects of social activities and social networks, there is an abundance of studies that have examined time use-related aspects, especially the duration of social activities. Raux et al. (2009) for example studied travel and time allocation for different activities in eight different cities in Europe, and estimated a Cox proportional hazard model of daily activity duration for different purposes, including social activities. They found that males and older people spend more time on social-recreational activities. Similar results were found by Kemperman et al. (2006). Carrasco and Habib (2009) estimated an ordered probit model for the joint decision of frequency and duration of social activities, which include hosting, visiting, and gatherings at bars or restaurants. They concluded that the frequency and duration of social activities primarily depends on social network composition and structure, and characteristics of the ego-alter relationship, less on the ego's personal and household attributes. Habib et al. (2008) found longer durations for people with more cars and people who work full time, if more people are involved in the social activity, and if travel time is longer. The number of household with children and the number of social activities per week result in a shorter duration.

A final aspect of social network, that has mainly been approached using a modelling perspective, concerns the issue of social influence. The behaviour of a particular individual may be influenced by the behaviour of other members in his/her social network. Hackney and Axhausen (2006, see also Hackney, 2007) for example developed a multi-agent representation, to simulate social influence. Han et al. (2007) incorporated principles of social learning and knowledge transfer in a dynamic model of activity-travel behaviour. Dugundji and Gulyás (2008) demonstrated another multi-agent simulation model taking into account the interdependencies between an individual's choice and the aggregate decision of his/her socio-economic networks in close proximity. Páez, Scott and Volz (2008) formulated a discrete-choice model to account for

social influence on residential location decisions. In an earlier research (Páez and Scott 2007), a similar methodology was applied to telecommuting decisions.

Arentze and Timmermans (2008) developed a more comprehensive theoretical and modelling framework to capture the dynamic interdependencies of social networks, social interactions and activity travel behaviour, based on the concepts of homophily and transitivity, formulated in traditional social network theories. Ronald, Arentze and Timmermans (2009) report a partial extension and implementation of this model. Finally, Illenburger et al. (2010) conducted a similar simulation, albeit using a different approach, which did not account for homophily.

This brief summary of existing work in transportation research on social networks illustrates that the focus has mainly been on social (leisure) visits and joint social activities. Work on social *support* is virtually missing in this research community. This is to be expected in the sense that conventional travel diaries usually lack the detail to differentiate between different motivators of social visits. Little is known about the importance of social support (grandparenting, caring for parents, etc) in inducing travel, differentiated by day of the week and time of day. By not differentiating between social support and other motivators of social interaction and travel, current analyses and models cannot be used to assess the likely impact of socio-economic policies that affect formal and informal social support systems on activity-travel behaviour. Aging societies and current reductions of government budgets will however (dramatically) impact institutionalised care systems and therefore enhance the need for social support.

To investigate transport-related aspects of social support, the aim of this study was to examine the nature of social support activities in terms of timing, gender differences, kind of support and the travel involved. The 2006 Dutch Time Use survey was used for the analysis. Unlike travel surveys, time use surveys in most countries have a detailed classification of activities, including social support activities. In principle, therefore, these time use diaries can be used for analyzing some temporal aspects of social support activities and related travel.

In the next section of this paper, we will start with a description of the available data. This will be followed by a presentation of a series of explorative, descriptive analyses. In principle, the next step might be to estimate more advanced statistical models, but because descriptive results are more informative, this paper only reports these findings. In the final section, we draw conclusions and reflect on the requirements of a more elaborate data collection.

DATA

The analyses described in this paper are based on the 2006 Dutch Time Use Survey. As most time use surveys, the Dutch Time Use Survey (TBO) is conducted to get insight into the type and duration of activities spend on various daily activities such as paid work, commuting, household tasks and socializing. Survey participants are asked to detail their 24-hour activities for a period of one week using a time use diary. This survey is carried out by The Netherlands Institute for Social Research (SCP) and partners once every five years. In 2006, the survey was conducted in accordance with Eurostat guidelines (Harmonized European Time Use Survey) in order to enhance comparability within the EU. One of the major design changes was the fieldwork period; in 2005 the TBO was held in October only while in 2006 across the year.

The recruitment of respondents for the Time Use Survey (TBO) consisted of three stages: First, a random sample was drawn from participants of the 2005 and 2006 National Travel Surveys (MON). For each household, one person was randomly selected using the Kish-selection grid method and asked to participate in a contact TBO interview. Next, a random sample was drawn from these persons and invited to complete the detailed TBO questionnaire. Finally, part of this sample responded to the one-week time use diary. Response rates for the three stages were 71% for MON, 92% for the Contact Interview, and 62% for TBO. The sample size is 1875 respondents.

The classification of activities in the diary is very detailed. A distinction is made between personal care, paid work, education, family care, voluntary work, social activities, entertainment, sports, hobbies and games, mass media and travel. Each of these categories is further subdivided into many subcategories. Respondents were invited to report both the primary and secondary, if any, activity for each 10 minute time interval. A primary activity is defined as the activities which took most of the respondent's time during that interval. Secondary activities are defined as activities which are conducted simultaneously with the primary activities. Respondents are explicitly instructed that two consecutive activities during a time episode do not define a secondary activity (i.e., multitasking).

Social support activities make up a subclass of voluntary work. Respondents can specify the nature of any fixed activity episode as work for another household with subcategories unspecified, preparing meals, household help, gardening and animal care, do-it-yourself (DIY) activities, shopping and running errands, childcare and elderly care. Although some categories are debatable from the perspective of social support, we argue that most are sufficiently defined to allow interpretations as social support. Travel in this time use diary is another category to specify the fixed episodes. A sub-category of travel that was used in the analyses is travel for informal help.

ANALYSES AND RESULTS

Activity participation

Frequency analysis showed that the sample during the observation period conducted a total of 429,545 activities. In addition, 58,364 travel episodes were recorded. Only 2,312 (0,54%) of these involved social support activities. From a total of 1,875 respondents, only 614 (33%) performed one or more of the social support activities.

Gender differences

It is interesting to analyze whether participation rates differ between genders. Results of an analysis to that effect are graphed in Figure 1. For each episode of each social support category, the gender was counted, totaled and expressed as a percentage. The figure illustrates in general that female tend to perform social support activities that involve caring, whereas males tend to be relatively more involved in DIY activities. For example, 77 percent of episodes which involve elderly care are conducted by women; for household help and preparing meals it is even closer to 80%. In contrast, only 27% of the episodes involving DIY is conducted by women. Social support activities such as gardening are somewhere in between.

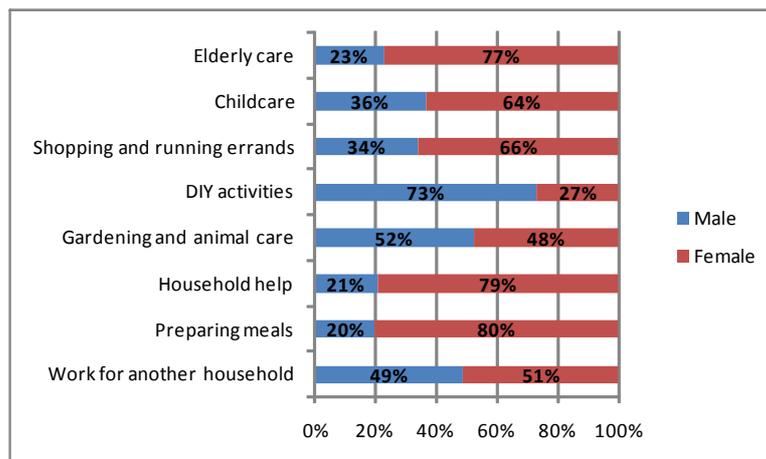


Figure 1: Social support activities - participation by gender

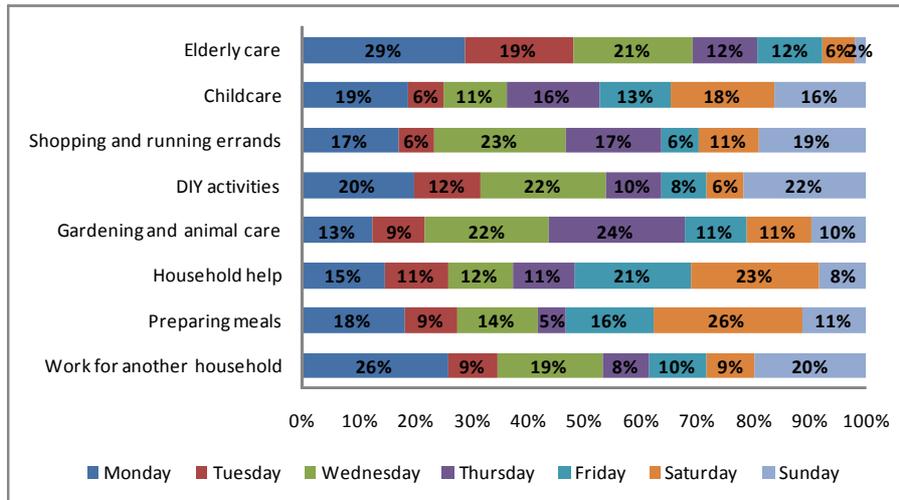


Figure 2: Social support activities - division by days of the week

Day of the week effects

Figure 2 portrays the percentages of episodes involving social support activities by day of the week. Some interesting conclusions may be drawn. First, elderly care seems to be rather evenly distributed across the day of the week, with slightly lower percentages for Saturday and especially Sunday. Mondays and Thursdays are most important for child care. This is understandable in the sense that parents are often not at work during the weekend. On Wednesday afternoon children are free from school and indeed many parents, who work part-time, do not work on Wednesday. Social activities such as preparing meals, DIY activities and doing shopping tend to concentrate on weekends. This seems to suggest that individuals use these days, when they have more time, to conduct these activities, either because they can be combined with their own shopping, or because they take longer or because they are part of a visit, fading the boundaries between social support and social visit.

Time of day effects

Figure 3 captures the time of day when the activities have started and ended. It evidences some distinct differences in the timing of the various social support activities. For example, grandparenting (child care) is mainly concentrated in the afternoon, whereas household help has an early morning peak, a peak around dinner time and a smaller peak around lunch time. Preparing meals on the other hand shows a very high peak around dinner time. Other activities such as gardening have more varied start times. Shopping seems to be primarily an activity around the lunch break. Also interesting is the finding that elderly care seems to have shifted start time after or before the time that usual household activities such as getting children ready to school and preparing dinner take place. End times of social support activities that are flexible often had a peak in the mid to late evening.

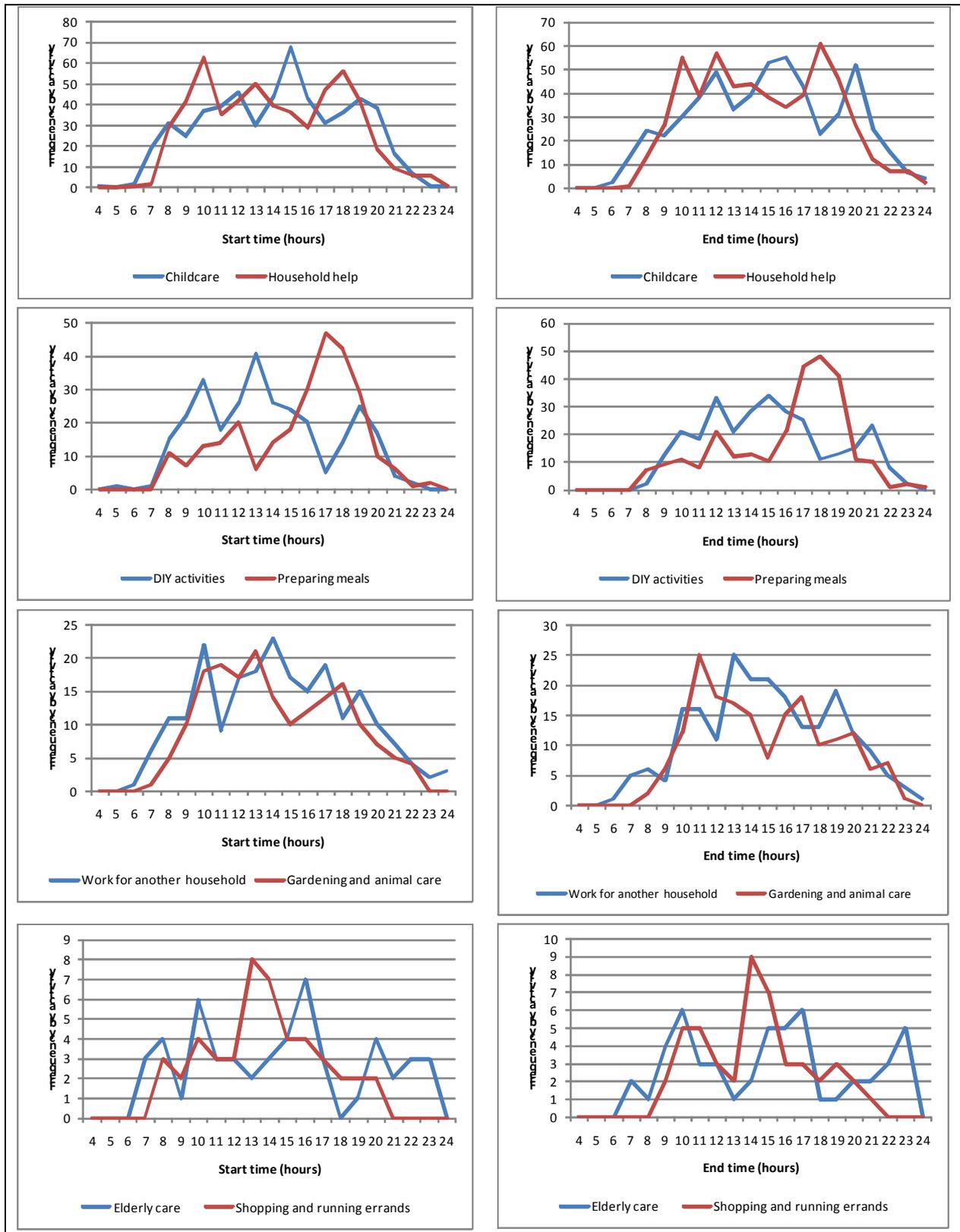


Figure 3: Social support activities- frequency by start and end time

Induced travel

A perfect pattern involving social activities would be a travel episode of some length, the social support activity episode(s) and then a travel episode again. Unfortunately, not uncommon for time use surveys, this pattern was often not observed. This may be due to the definition of primary and secondary activities and the fact that these were reported for fixed time intervals.

However, in addition, the Dutch time use survey does ask respondent to indicate the purpose of travel episodes, one of which can be interpreted as for social support. Only 3.47% of these travel episodes were observed in the data, which further evidences the mismatch between activity and travel episodes.

Choice of transport mode

Figure 4 shows that the majority of trips induced by social support activities are conducted by car. However, it also illustrates, which is consistent with the incoherent patterns observed, that a substantial proportion is made walking or by bike. These trips likely involve less time and distance. In line with the results of general transport studies, women use the slow modes more often and also travel more often as car passenger. Travel by other modes of transport, including public transport, makes up only 2 percent.

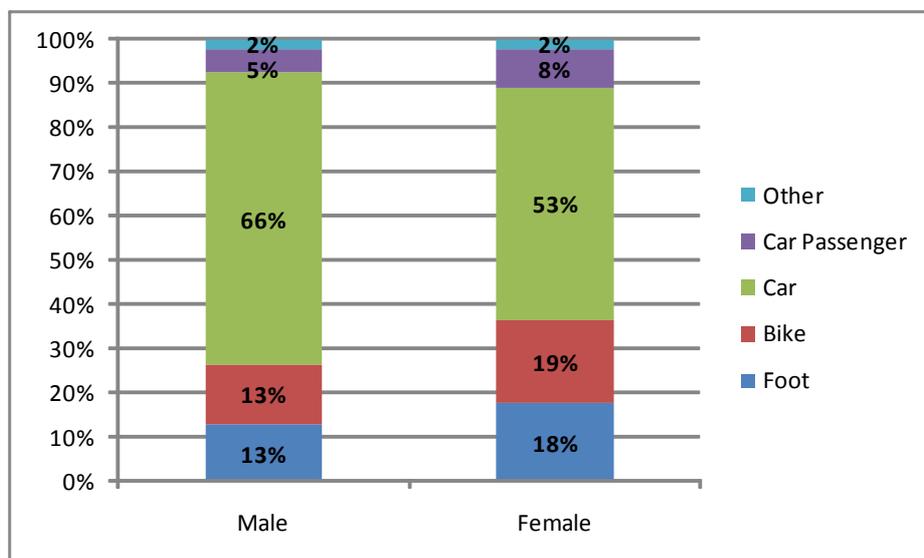


Figure 4: Social support activities - choice of transport mode

Start and end times by transport mode

Finally, we examined the distribution of start and end times by transport mode. Results are shown in Figures 5 and 6. It has some interesting results. In addition to the morning and evening peak, the slow modes of walking and biking show an additional peak around lunch time. In addition, interestingly the afternoon peak for walking (on foot) is shifted to an earlier point in time. In the

graphs of the end time, a peak for walking can be detected later in the evening. There are also peaks around 3 pm. These findings thus suggest that a share of these social support activities take place to the alter's place of residence, as suggested by these slow modes, with activities scattered around dinner time and/or lunch time.

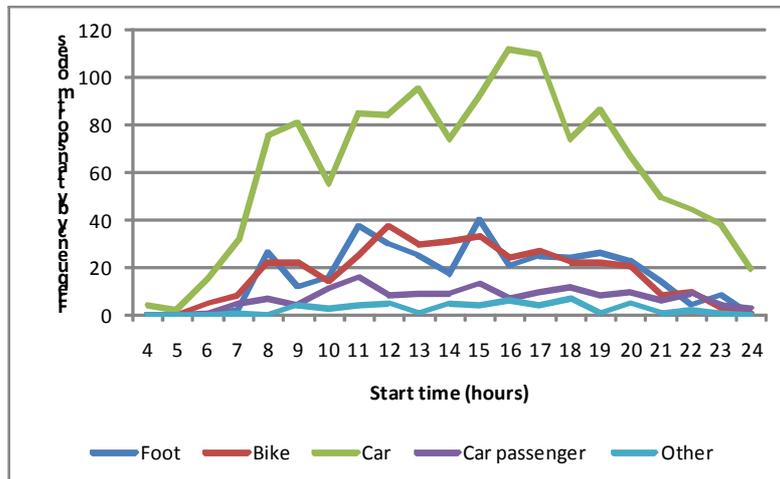


Figure 5: Distribution of start times by transport mode

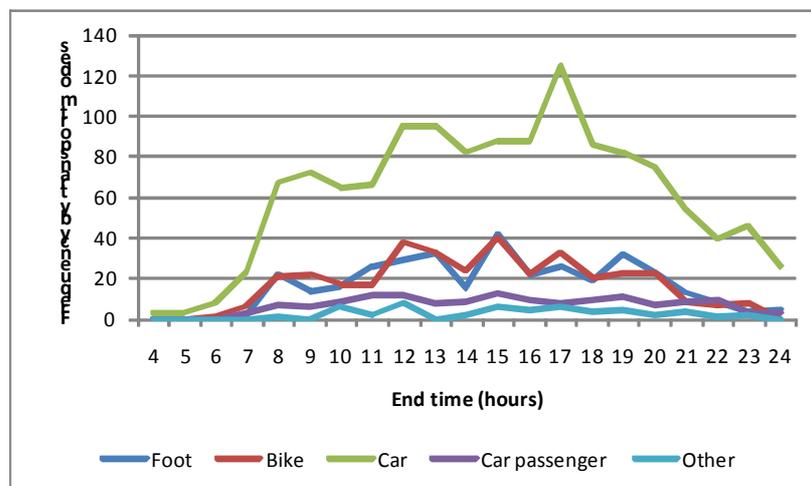


Figure 6: Distribution of end times by transport mode

CONCLUSIONS AND DISCUSSION

Aging societies likely have a dramatic impact on the sustainability of institutionalized social support systems as these have been developed in many countries. Current budget cuts of governmental agencies have amplified and/or moved forward this process. Informal social support networks are expected to alleviate some of these anticipated effects, in part stimulated by

governments and political parties. Any such change will affect activity-travel patterns of individuals, their time use, social exclusion and, jointly with other factors, ultimately quality of life.

Travel surveys typically do not contain the information needed to develop models that allow one to simulate the effects of such socio-economic policies on social support and associated travel. Time use surveys have more to offer in that sense because they tend to have a more detailed classification of activities/time use which often includes categories that can be taken to represent social support activities. On the other hand, the common approach of asking respondents to indicate the primary activity conducted during fixed time intervals and the lack of spatial information means that the ideal pattern of subsequences of travel and activity episodes is often not maintained. If one is willing to assume that the lack of a travel episode is caused by the fact that travel made up the lesser part of the episode, the missing travel episodes and their characteristics might be realistically imputed. However, in the context of the present study, such imputation was not done.

The paper reported the findings of some descriptive analyses of social support activities and related travel, using the 2006 Dutch Time Use Surveys. Keeping the limitations of this survey as discussed above in mind, nevertheless some interesting conclusions can be drawn. First, social support activities make up a distinctive share of social activities and differ in terms of their temporal and spatial profiles. It means that an explicit identification of such activities is potentially valuable not only because it would derive models more sensitive to policies affecting social support activities, but also because it would make the highly heterogeneous class of social activities more homogeneous. Second, we found evidence of gender differences in the degree and nature of participation in social support activities. Overall, females are more heavily involved in social support activities. However, there is also evidence of differential interest and role patterns. Females are more involved in caring activities, while males are disproportionately more responsible for DIY activities. Third, participation in social support activities varies by time of day and day of the week, reflecting time-dependent needs on the demand side and opportunities and constraints on the supply side.

Although this study has resulted in some interesting findings, it is doubtful whether these suffice for an elaborate model, simulating the effects of social support activities on travel and related indicators. An ideal data set and modeling approach would include

- (i) data on the composition and strengths of ties of social networks. In this context, it should be emphasized that commonly used ego-centric networks are insufficient as one would need such data at least for each demand-supply dyad;
- (ii) data on the amount and nature of need for social support;

- (iii) data for each member of the social network or at least the relevant social support subnetwork on commitments and time spent on other activities;
- (iv) a model of time allocation, including social support as a function of willingness and interest (probably associated with the strength of ties in the network), time pressure of the current activity schedule, various spatial-temporal constraints such as working hours, school hours, constraints induced by other fixed commitments, time-dependent availability of transports, etc. The allocation model should also consider the relative position of each member of the network in these regards and allow for phenomena such as turn-taking, and task, gender, and network position-specific time allocation patterns.

Although the modeling task is quite challenging, elaborations and extensions of the latest models of joint time use allocations in households and social networks should be able in principle to successfully address this challenge.

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