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Managing household activities: Gender differences in time-use and activity scheduling behaviour

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MANAGING HOUSEHOLD ACTIVITIES: GENDER DIFFERENCES IN TIME-USE AND ACTIVITY SCHEDULING BEHAVIOUR

by

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Abstract

Over the past few decades, the observation of household activities was based on the participants' observed activity patterns using traditional diary-based methods and/or stated perceptions during face-to-face interviews. This research uses an innovative approach to probe men and women's activity and scheduling behaviours as they occur within a household setting. The approach involves the use of a computerized household activity scheduling process survey (CHASE) capable of tracing how activity-travel decisions are pre-planned, planned, added, modified, deleted, and executed over a one-week period. This approach goes beyond traditional diary-based methods, which tends to focus solely on observed outcomes.

The data utilised 76 couples with children and 32 without children. The objectives of the study are to compare men and women in different household types (couples and couples with children) according to differences in: 1) observed activities; 2) spatial and interpersonal flexibility of activities; and 3) planning time.

The observed activity patterns reveals that certain activities are still gender bias. Where means may hide overall differences, comparison of the distribution of paired differences suggests that some males exceed some females in duration of certain activities and vice versa. However, the relative lack of differences between males and females in terms of scheduling behaviour and flexibility was somewhat unexpected, especially given known differences between males and females' observed activity patterns. In certain activities, men's and women's scheduling behaviour are different from each other.

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CHAPTER 1 INTRODUCTION

1. Introduction

Decision-making is a normal routine process. We all plan and organize our daily decisions throughout the day. We make decisions about what to do and where to go over time and space, leading to observed activity and travel patterns. Activity scheduling is a process that each of us does every day in an attempt to plan, organize and re-organize our day.

Improving our understanding of this process has long been suggested as a means to better forecast travel demands, especially in response to emerging policies that inherently invoke a re-scheduling response (e.g., telecommuting, travel demand management). However, as researchers we know relatively little about the underlying activity scheduling decision process as it occurs on a day-to-day basis. Even more unknown are whether differences exist across demographic, gender, and marital lines.

Men and women constantly plan and re-plan their schedules across time and space throughout the day before they execute their activities. This thesis focuses on men and women's scheduling activity decision behaviours. The study analyses their households' and other activities (e.g., household serving, work/school, shopping) in relation to household types (coupled and family).

1.1 Problem Statement

Scheduling is important to transportation analysis as human's travel is affected by the timing and the order of the participants' schedule activities (Allaman *et al.*, 1982). Travel behaviour researchers recognize that we need to improve our understanding of the

decision processes that underlie observed outcomes in order to provide a basis for new model development. An activity schedule refers to the individual's decisions about which activities to perform first. Underpinning the scheduling process are the questions of where, when, what duration, with whom, combined with a mode and route choice. The underlying activity scheduling process can be defined as the planning and adaptation of activities and travel over time, space and across individuals (Doherty, 2000).

Part of the challenge is that researchers have for decades relied on interviews and questionnaires that focus almost exclusively on observed activity-travel patterns. In particular, travel and activity diaries are the most pervasive data collection method for studying day-to-day behaviour, yet they provide little if any insights into underlying decisions processes. New techniques have emerged recently to better understand the underlying activity scheduling process. One such technique is known as the "Computerized Household Activity Scheduling Elicitor" (CHASE). This survey method is designed to capture both observed activity/travel patterns and underlying household activity scheduling process. It tracks the participant's sequence of steps used to arrive at a final observed schedule, including adding, modifying, and deleting activities during the scheduling process (Doherty and Miller, 2000; Doherty, 2002b).

The first moderate sized random sample CHASE survey was conducted in Toronto in 2003 with 271 households (Doherty *et al.*, 2004). One of the most fundamental questions concerns whether there are any differences between men's and women's scheduling processes in different household types.

1.2 Objectives

This study sets out two objectives in order to explore and understand the flexibility of activities, observed results, and underlying decision processes. It seeks:

1. to understand the constraints of spatial and temporal flexibility of activities by activity type and by household type
2. to provide an empirical and descriptive analysis of the observed activity and scheduling behaviour by activity type and by household type

Note that the differences in gender are investigated throughout this thesis. Household type consists of coupled males, coupled females, family males and family females. Further details will be explained regarding household type and hypotheses in chapter 3.

1.3 Overview of Chapters

This thesis is organized as follows: chapter one gives an overview and the objectives of the study. A review of previous research on gender and travel behaviour is elaborated in chapter two. In addition, activity scheduling processes are discussed. Data collection and analysis techniques are examined in chapter three. The results of this study are presented in chapter four - focussing on the differences between males' and females' observed activity, spatial and temporal flexibility of activities, and activity scheduling processes. The final chapter discusses the results, the implications of these results, and suggests future research into this area.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

It is generally acknowledged that men and women perceive and perform different types of activities and likely manage their schedules differently. These differences affect their travel behaviour. In order to understand their observed activity/travel behaviour, new emerging travel survey methods are trying to capture their underlying activity scheduling process.

This chapter focuses on four themes: 1) factors influencing people's observed activity/travel behaviour; 2) household time management; 3) travel survey methods; and 4) underlying activity scheduling processes.

2.2 Observed Activity/Travel Behaviour by Gender

A number of factors influence people's activity/travel behaviour, such as division of labour and chauffeuring family member. These factors differ depending on one's gender (Rosenbloom, 1978; Rosenbloom, 1993; Rosenbloom, 1994). It has been postulated that one's responsibilities affect the type, level and the rate at which activity/travel decisions are made. Women have many responsibilities that affect their activity/travel behaviours, including domestic responsibilities in addition to their paid employment. This section explores men and women's observed activity/travel behaviour and the division of labour. Observed activity/travel behaviour is defined as activity/travel that is executed over time and space.

2.2.1 Men and Women's Activity/Travel Patterns

Many past researchers (Rosenbloom, 1978; McGoldrick, 1988; Rosenbloom, 1989; Rosenbloom, 1992; Rosenbloom, 1993; Rosenbloom, 1994; McGuckin and Murakami, 1995; Bianco and Lawson, 1996) have focused their attentions on women's activity/travel behaviour and concluded that women's travel was affected by a variety of factors. These factors are related to the specific circumstances faced by women, including household life cycle (McGuckin and Murakami, 1995).

The 1995 Nationwide Personal Transportation Survey (NPTS) data in the United States were used by McGuckin and Murakami (1995) to examine the trip-chaining behaviour of adult men and women who travelled from Monday through Friday. Their analyses indicated that women made more trips for household activities, such as shopping and family errands leading to more trip-chaining, particularly when there were children in the household. For example, 61.2% of women made at least one stop after work and 28.3% made two or more stops. As for men, only 46.4% stopped on the way home from work and 17.7% made two or more stops (McGuckin and Murakami, 1995).

These findings of McGuckin (1995) were similar to other researchers (Helling, 1996; Rosenbloom, 1996). Rosenbloom (1996) found that women covered greater miles, made more trips, and used a vehicle more often than men from a past U.S. study. In particular, women under 64 increased their trips by 8% and men under 64 increased their trips by 2.2% between 1983 and 1990. As for women over 65, they increased their trip making by about 15%, where men over 65 only increased about 1% between 1983 and 1990. In addition, women were shown to use more transit and cars for their trips than did men between 1983 and 1990. Men 16-64 years of age decreased their use of transit

(0.03%) between 1983 and 1990 compared to women of the same age at a difference of (0.1%). Men's use of public transit was marginally lower than women's use of the public transit. Women 16-64 years of age increased their trips by 2.3% between 1983 and 1990. Rosenbloom (1996) noted that women reported more vehicle trips, home-based trips and short stops than men; however, men had more minutes in travel than do women.

It is interesting to note that none of these observed activity/travel behaviours considered the underlying decision-making process.

2.2.2 Division of Labour

Some of the changes in women's driving time, distance and number of trips listed above are likely due to more women being in the workforce. Traditional gender roles saw males working in the public sphere, while women were sidelined to perform domestic tasks at home. However, over the past 30 years, an unprecedented flow of women into the work force has occurred. Women, however, continue to carry the majority of domestic workload and child care tasks (Gerson, 1985; Gerstel and Gross, 1987; Coltrane, 1996; Hanson, 1996).

Household labour is defined differently from study to study. Shelton (1996) defined it as unpaid work done to maintain family members and/or a home. Individuals' roles in the household, gender division of labour in the household, and function of household composition have received significant attention. Many studies have noted that the division of labour in the household is gender-biased (Harvey, 1993; McGuckin and Murakami, 1995; Bernard *et al.*, 1996; Sarmiento, 1996). Furthermore, the interview data that Luxton (1988) collected indicated that men would not take responsibility for

pre-task planning and on-going management tasks. They would only tend to go grocery shopping if their wives make a basic list of things for them to purchase. Their wives know what is needed because they oversee household activities.

Many studies as noted by Coltrane (2000) have indicated that women performed more housework than men when married with children. This, however, has been changing recently as Coltrane (2000) found that women, whether employed or not, are performing less housework while men are undertaking more housework than in the past. Nonetheless, studies of time use have shown that women continue to perform the majority of domestic tasks (Miller and Garrison, 1982; Kwan, 2000b), even though men have slowly increased their help around the house (Miller, 1982; England and Farkas, 1986; Luxton, 1988; Robinson, 1988; Shaw, 1988; Hochschild, 1989; Blau and Ferber, 1992; Marini and Shelton, 1993; Daly, 2001b).

A time-use study conducted in Canada by Harvey (1993) revealed that on average women spent 2.5 hours per day on domestic activities versus 1.0 hour for men. Greenstein (2000) and Zuzanek (2001) also indicated similar findings from Canadian and U.S. studies, showing that women spent about twice the amount of time on housework and/or child care than men.

Both men's and women's household labour affect their travel behaviour. Women who undertake more household work have different and more frequent travel activities than their male partners. Hochschild (1989) used the term "second shift" to describe those women who have a full time job and come home to perform household work after work. Beach (1989) called these women "supermoms", a term used to describe women who take on many chores and responsibilities. Domestic work consists of helping the

children with schoolwork, bathing them, taking them to games/practices, lessons, cooking, and cleaning (Hochschild, 1989). There are however differences between coupled and family households. Harvey (1993) found that both women and men contributed more to housework when there were dependents under 19 years old living at home.

People's views and attitudes towards the division of domestic labour differ. However, two dominant opinions exist. While one school of thought sees domestic tasks as women's domain suggesting that women therefore should perform them alone, the other feels that domestic tasks should be shared (Greenstein, 2000). Greenstein (2000) noted that many researchers have hypothesized the domestic division of household labour as due to certain traditional beliefs or ideologies. Presser (1994) hypothesized that couples with more traditional beliefs about gender and marital roles would view the division of household labour very conventionally, i.e. that household work is women's work. However, couples with less traditional views might consider balancing the domestic division of labour equally. Thus, the slow process of change in division of labour might be due to men's ideologies regarding domestic labour, which in some cases have not changed.

2.2.3 Chauffeuring Family Member

Other factors that influence women's travel and household obligations are the aging population and children. Rosenbloom (1993) found that women's travel patterns depend on the age of their children. Children influence women's travel behaviour in terms of extra curricular activities. She defined 'Twinners or Sandwich Generation" as

women taking care of their elders, while also caring for their own children. In today's society, women could have an 80 year-old parent and a 16 year old child to take care of simultaneously (Rosenbloom, 1996). As a result, their travel behaviour may be more complex due to their role as family chauffeur.

The role of women in domestic work and other familial obligations can make them very time conscious. Overall, men and women have different factors that affect their observed activity patterns. This leads to the next section on scheduling activities.

2.3 Time Management

Time management affects the way households are run. Time management is defined as overseeing your own scheduling. It is clear from the above information that men's and women's activities and travel patterns differ, which likely requires or suggests differences in time management and scheduling styles. Szinovacz (1987) defined household management activities as meeting loved ones' needs. This can be thought of as empowerment for the women, wherein they manage and make the decisions for their family (Szinovacz, 1987). Women in this case might feel that they want to control their households. Scheduling and time management have a direct effect on women's travel behaviour in terms of when and how they execute their activities. It is crucial to understand how they manage their schedule as their travel behaviour patterns are affected.

Traditionally, the developed world, women organize the temporal coordination of family activities (Mederer, 1993) and are responsible for controlling the temporal organization of family life ranging from making decisions about when to give birth to

scheduling all family members' timetables (Hantrais, 1993). For example, women tend to organize the family schedule, as they know their children's schedules i.e., waking them up, taking care of them by getting them dressed, and dropping them off to school (Le Feuvre, 1994). These household management activities reflect the caring nature for their family members, which may be valued more by women.

Fraenkel (2001) speculated that women in families typically find themselves as primary organizers and keepers of the family schedule due to the impact of technology (e.g., alarm clocks, personal digital assistants). These are some signs that women might schedule most of their family activities. In the next section, household scheduling, multi-tasking and flexibility will be the focus as these are some factors that are connected to time management.

2.3.1 Household Scheduling

Women tend to manage the family schedule at home, which results in greater responsibilities for household work and the well-being of family members (Coltrane, 2000). Other researchers (Shelton, 1992; Spain and Bianchi, 1996; Sanchez and Thomson, 1997) have proposed that women tend to schedule their work and home responsibilities to accommodate others before their own schedules. Shelton's (1992) research was based on two separate studies, both of which are based on representative national samples (Time Use Longitudinal Panel Study 1975-1981 and National Survey of Families and Households 1987 (NSFH)). These samples used personal and telephone interviews (open-ended questionnaires) to obtain estimates of time use for housework

tasks. Her findings revealed that women estimated longer time spent scheduling on work and home activities than men.

Similar to Shelton's (1992) methodology, Sanchez & Thomson (1997) used the National Survey of Families and Households from 1987 to 1988 and 1992 to 1994 (NSFH1 and NSFH2). They examined the effect of the transition to parenthood on the division of labour among married couples and hypothesized that parenthood would produce a more differentiated gender division of labour. Their findings illustrated that household management responsibilities and domesticity are still primarily maternal roles. Fatherhood did not bring about a change.

On the other hand, women try to "balance" their work and home schedules to accommodate others (Spain and Bianchi, 1996). The researchers noted that the dirty dishes can sit in the sink, but children need to be taken care of continuously, which means that women tend to take care of their children more than other activities. They observed that women juggled a variety of roles out of preference and necessity (Spain and Bianchi, 1996).

Moreover, Presser (1989) noted that women were the "adapters" who would arrange their work hours to meet their children's need and around their husbands' need, whereas men tended to be the "accepters;" men would take care of their children when women were in the workforce. Presser's study focused on shift work between males and females. The data were from the Current Population Survey (CPS). The CPS data were from the United States Bureau of the Census, which conducts monthly household sample questionnaires survey regarding fixed schedules of employment and unemployment in the United States. They used log-linear analysis to test their conceptual models, where they

found that women seemed to be more responsive to their husbands' labour activity due to children. This means that women are more adaptive to their partners' schedule.

In a recent study in Canada, Daly (2002) conducted fifty interviews with seventeen dual-earner couples (individual and couple interviews) to better understand how the participants talked about time together, how they perceived time differently between genders, as well as how they negotiated and controlled time in a demanding society. His results indicated that scheduling was a priority activity for dual-income earners, and that women usually bore responsibilities for scheduling in the home. Views on who was better at scheduling included the following (Daly, 2002, pg. 16):

- wife keeps family on schedule;
- wife is the keeper of the calendar;
- wife is organized and has the schedule prepared well in advance;
- wife employed as "chief administrator of time"; and
- wife takes cares of other people outside and inside the home.

Daly's research is similar to the underlying activity scheduling behaviour; however, his methods of collecting data were different in terms of the participants' attitude toward household labour and not their actual behaviour. As is well known, peoples "intentions" and "perceptions" are not always the best predictors of actual behaviour. His data were of participants' perceived notion of time and how they negotiated time. It is important to note that the methodology in this thesis differs. It

focuses on capturing the actual daily scheduling activity process that participants are involved on a daily basis, rather than recalled behaviours (generalizations and perceptions).

2.3.2 Multi-tasking

In dual-earner families, women were more likely than men to perform two or more things simultaneously when at home (Hochschild and Machung, 1989a). For example, a woman might be taking care of her child while washing dishes and thinking of what to cook for the night. Men, however, tended to focus more on activities separately. In both interviews, women talked more about being overtired, sick, and "emotionally drained." Women felt more *responsible* for the home and childcare. They juggled housework, job, and children – while men juggled job and children. Women at times spent more time doing housework than spending time with their children (Hochschild and Machung, 1989a). The researchers (Hochschild and Machung, 1989a) spent time with their participants and documented details of how they coped and failed to cope with the demands of work and family. However, these researchers did not capture the scheduling activity process of men and women.

As a result of scheduling pressures for women in a dual income earner role, finding time for all the activities is of the essence. Men on the other hand, are less likely to experience shortage of time (Burley, 1991). Burley's (1991) study found that men not only spend less time in household activities, but that the activities are different compared to women. For example, women seem to have a daily routine of family tasks (meals, cleaning, etc.) because the meals need to be served and can not be postponed, while men

have more flexibility in terms of when to perform their tasks (e.g., mow the lawn) (Hochschild, 1989; Hochschild and Machung, 1989b; Shelton, 1992).

2.3.3 Flexibility in Time and Space

In time-space settings, Hägerstrand (1970) noted that there are three constraint categories that might affect scheduling. First, capability constraints refer to physical constraints, such as the need for a minimal number of hours of sleeping and eating. Second, coupling constraints refer to being with a particular person at the same location at the same time. Third, authority constraints refer to regulations and rules. An example would be the store hours for a particular shopping center (Jones, 1979). These constraints affect people's travel behaviour and their flexibility to schedule their activities, especially towards their spatial, temporal and interpersonal flexibility of activities. These flexibility of activities are mentioned more in-depth in chapter 3.

The notion of flexibility and Hägerstrand's constraints are similar. Capability constraints refer to interpersonal flexibility where some activities need to be conducted with or without other people. Coupling constraints refer to spatial flexibility where some activities are affected in space. Authority constraints and temporal flexibility are similar as the hours of a store affects people's decision to shop.

In order to better understand women's and men's observed activity/travel patterns and their flexibilities; an enhanced travel survey needs to be explored to capture the underlying activity scheduling process.

2.4 Evolution of Travel Surveys

Over the years, travel and activity diary surveys have been used to understand observed activity/travel behaviour of men and women. Currently, there are new emerging travel survey methods that could enhance the collection of not only observed activity/travel behaviour, but also the underlying activity scheduling process to better understand men and women's travel behaviour. This section explores past, current, and emerging travel survey methods.

2.4.1 Diary Survey Methods

The "time diary" was a survey method that typically involved participants describing what they did on a particular day. The information consisted of when they started the new day, their activities throughout the day (including travel), and how they ended their day. The information also included where and who the participants spend the day with, any other activities that they were doing, and other attributes of activities (e.g. their feelings towards the activities). These surveys are used to obtain information on people's daily travel and activities. Households are normally randomly selected and one or more household members are asked to record all their travel or activities. The information is then logged into computer data fields, tabulated and analyzed (Griffiths *et al.*, 2000).

Another survey method used to collect participants' observed activity patterns is through the use of random sampling using an electronic beeper. The electronic beeper is set to beep at random points during the day, wherein respondents then write down what they are doing (Robinson and Godbey, 1999). Other studies used more indirect means to

measure the proportion of activities typically conducted by people, rather than direct observation of time expenditure. For example, Ferree (1991) and Warner (1986) asked whether the wife always, usually, both wife and husband, husband usually or always did a particular household task in a proportional measurement. Juster and Stafford (1991) asked respondents to estimate their usual time spent on household activities.

There are many problems regarding self-reported methods based on recall (Murakami *et al.*, 1997; Murakami and Wagner, 1999; Wolf *et al.*, 1999; Griffiths *et al.*, 2000; Kwan, 2000a; Wolf *et al.*, 2000; Clifton and Handy, 2001; Wolf and Arce, 2001; Wolf *et al.*, 2001; Stopher *et al.*, 2003). These problems include:

- short trips not adequately reported
- poor data quality such as travel start and end times, total trip times and destination locations
- time consuming and a burden on respondents to fill out survey forms and telephone retrieval methods for each person
- tendency to round travel times to 10, 15, and 30 minute intervals
- under-representation of certain population groups, such as the elderly, minorities, the poor, and people with limited education
- non-participation affects high-quality data

Some of the disadvantages of time use diaries elaborated by Stopher (1995) include: 1) language barriers (e.g. English not well spoken or not spoken at all); 2) personal privacy (personal questions); 3) participants are too busy; and 4) too many telephone marketers contacting households. In addition, limited information is

potentially released to the researchers because of what the participants are able or willing to disclose to the interviewers regarding their travel activities. The participants could intentionally manipulate the information and the researchers would be unable to confidently attest to the integrity of the information (Robinson and Godbey, 1999). Nevertheless, time diaries are still the preferred method used to collect household data despite these disadvantages.

2.4.2 Activity Scheduling Process Surveys

Activity scheduling decision process surveys are an emerging new survey method aimed to understand revealed outcomes from the diary-based methods. Activity scheduling is the mental process preceding the execution of activities. The focus is on the process of how activity-travel decisions are pre-planned, planned, added, modified, deleted, and executed over time and space. The observed outcomes are known as an activity schedule – which activities will be performed, at which locations, in which order, at what times and the travel modes between locations (Simon, 1990; Doherty *et al.*, 2002).

Most data collections do not target the underlying activity scheduling process. Earlier exceptions include works by (Hayes-Roth and Hayes-Roth, 1979; Ettema *et al.*, 1994). Hayes-Roth and Hayes-Roth used a "think aloud protocol" to investigate different behaviours when people have various errands. The findings from their data are more qualitative than quantitative. The participants were asked to undertake a series of errands to perform in a simulated urban environment. Overall, their planning decisions were found to influence other decisions that were made earlier or later in time. Hayes-Roth

and Hayes-Roth's (1979) results produced very complex and detailed verbal record of the activity scheduling process.

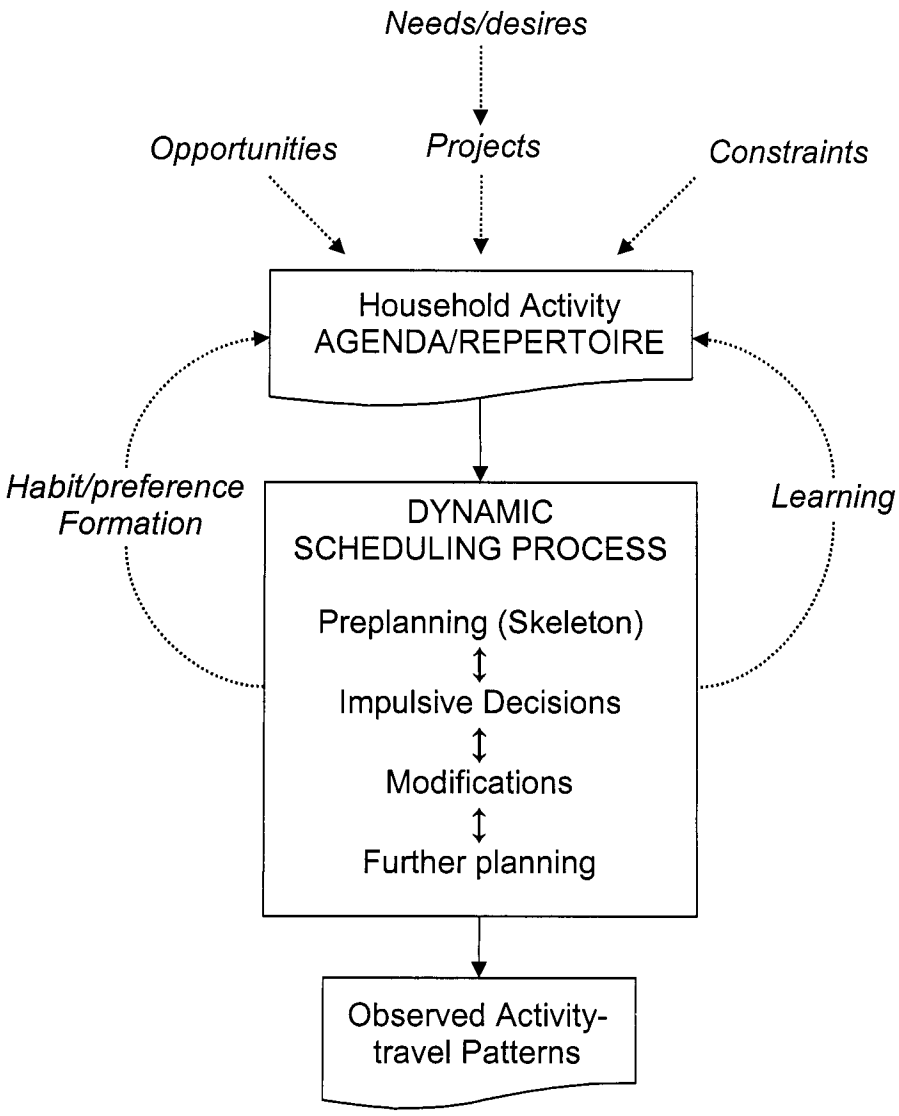
As for Ettema (1994), the participants planning steps were identified by an interactive computer. Participants were given a list of 29 activities and asked to specify the attributes of the activities (i.e. frequency, duration, location choices). Second, the participants used a computer program to schedule for the next day by adding, deleting, and modifying the activities on screen. Ettema (1994) concluded that participants use straightforward planning strategies. Throughout the survey, the individual added, modified, and deleted their activities from the agenda to their schedules. The participants were in a known environment, which maybe the reason for the straightforward planning. However, a more realistic planning of observation in scheduling process will further our understanding of scheduling behaviour.

Building upon these methods is the CHASE (Computerized Household Activity Scheduling Elicitor), survey approach (Doherty and Miller, 2000). The CHASE software program is unique in that it tries to obtain the participants' underlying decision process for a week-long period within the households leading up to the execution of a person's schedule. The program captures the scheduling information as it occurs in reality in the household. Over a multi-day period, the participants keep an on-going record of their scheduling decisions by adding, modifying and deleting activities to their on-screen schedule, as they occur over time. The program tracks each decision entered into the system, along with prompting for additional information on the reasons for the decision, the exact timing of the decision, if people were involved, etc. The computer is significant in this survey in terms of organizing prompts and passively tracking information that

would be much more complex using paper-and-pencil techniques (Doherty and Axhausen, 1999; Doherty and Miller, 2000; Doherty, 2001b; Doherty and Papinski, 2004).

Based on these studies, Doherty (2002b) proposed a conceptual model of the activity scheduling process, shown in figure 2.1. Underlying the household activity agenda are the basic needs, desires, and goals of individuals and households, and these goals embody a wide range of practical and physical constraints. Given activities on the agenda, people then seek to schedule and execute these activities through a continuous process of planning, adaptation, and impulsive decision-making. This includes decisions on activity type, location, duration, start and end times, mode and route choice, sequencing, and involved persons. The activity scheduling process is very dynamic and is a continuous process resulting in observed activity-travel patterns. Habits and learning are two factors that influence scheduling. Habits are defined as a routine decision over time. These activities are fixed over time in the agenda (e.g. work and sleep). However, people are constantly learning new places, meeting new people, or new activities. This might increase the flexibility of participants as they might learn of more locations to conduct an activity (Doherty, 2001a; Doherty, 2002b).

Figure 2. 1 Activity Scheduling Process



Source: Doherty *et al.* (2002); Page 7-3

2.4.3 Conceptual Framework

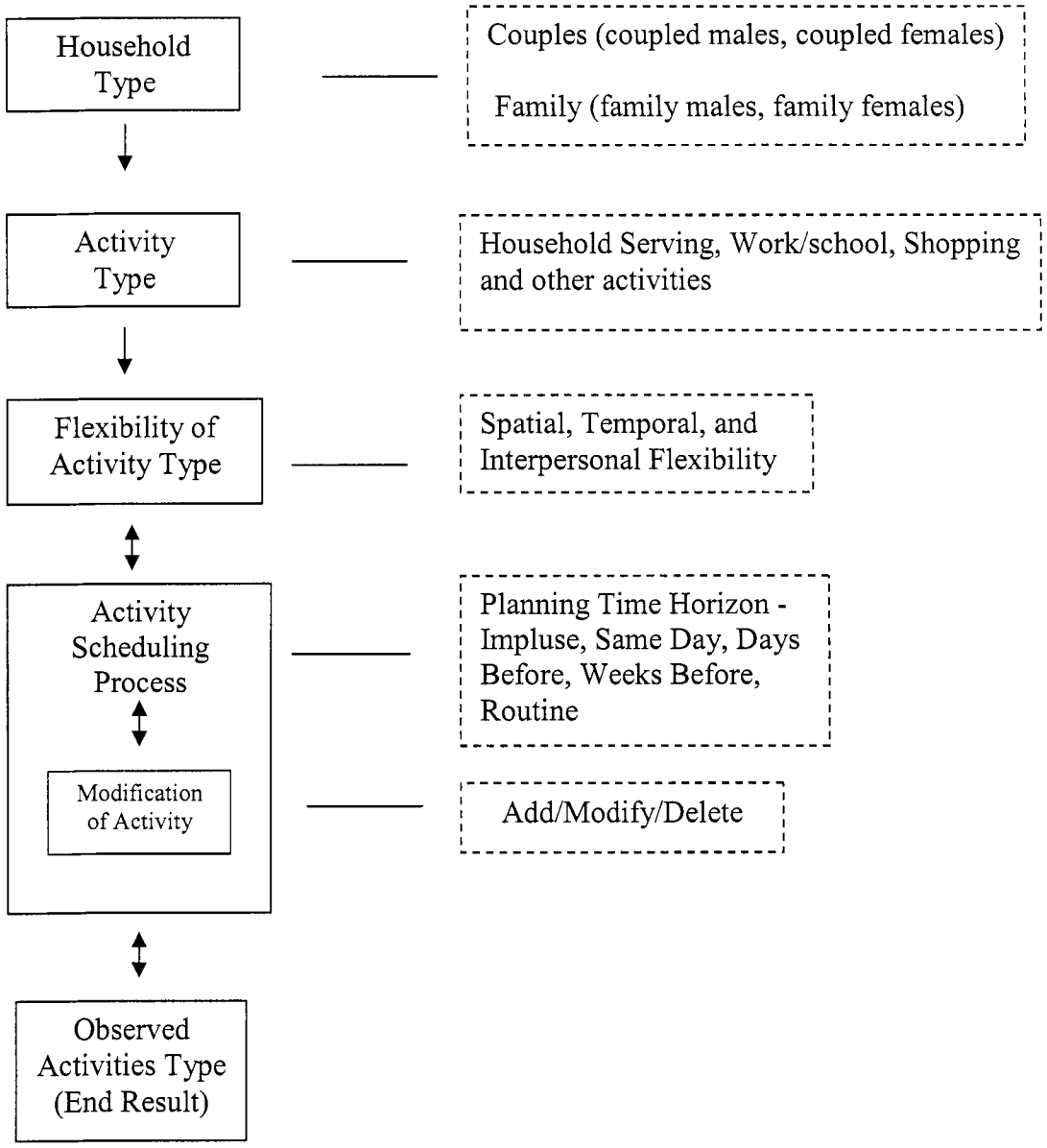
This thesis's main purpose is to further understand the overall observed activity of men and women with respect to observered activities, flexibility of activity and activity scheduling processes. This study focuses on 3 main concepts: observed activities, flexibility of activities, and the activity scheduling process. These focuses were mentioned from the objectives. It is hypothesized that the three concepts will vary by household types. Generally, before people execute an activity they go through many processes. This process of undertaking activities involves identification of activity, examination of flexibility level, and/or scheduling decision, modification and the end-result of an activity. For example, a woman may have a shopping activity that she needs to perform to go through these processes in order to achieve her aim. Between the time that she identifies shopping and actually performs it, other issues may occur for her to either postpone or cancel the shopping activity. As a result, she reschedules the shopping activity for another time instead. This would mean that she did not plan this impulsively, but she planned it days in advance.

The following figure 2.2 is an extension of the original figure 2.1. Figure 2.2 illustrates the conceptual framework of the underlying activity decision process for this thesis. In figure 2.2 below, each household type (coupled males, coupled females, family males, and family females) indicate activities to be undertaken. In the process of performing activities, all the household members examined their spatial (location), temporal (time) and interpersonal (involved person) flexibility of activities to see if they could schedule the activities. Once the flexibility level is satisfied, scheduling process

ensues. The scheduling of an activity can occur at several planning time horizons: impulse, same day, days before, weeks before, and routine. The planning time horizon is the timeframe when the participants schedule their activities. However, before an activity is completed, the process goes through additions, modifications and/or deletions. After the modification of an activity is completed, scheduling needs to be re-examined. Once the activity is completed, we obtained the observed activity. The CHASE program was used to capture and explore these concepts (see chapter 2 and chapter 3).

Note that other activity scheduling survey methods that have evolved from CHASE include REACT! (McNally and Lee, 2002) and EX-ACT (Rindsfüser *et al.*, 2003). These survey methods are currently being used in other projects to capture the travel, activity, and scheduling behaviour of individuals.

Figure 2. 2 Conceptual Framework: Underlying Activity Scheduling Process



Source: Modified after Doherty *et al.* (2002)

CHAPTER 3 DATA COLLECTION AND METHODOLOGY

3.1 Introduction

This chapter explains how the data were collected and what analysis methods were used. The primary method of data collection involved the use of CHASE (Computerized Household Activity Scheduling Elicitor). The CHASE data are considered as secondary data, as they were collected as part of a larger "Toronto Panel Survey" conducted by a collaborative team of geography, urban planning and civil engineering researchers, including the author who participated in data preparation and cleaning. This section describes data collection (section 3.2), research design and sample size (section 3.3), and data analysis (section 3.4).

3.2 Data Collection

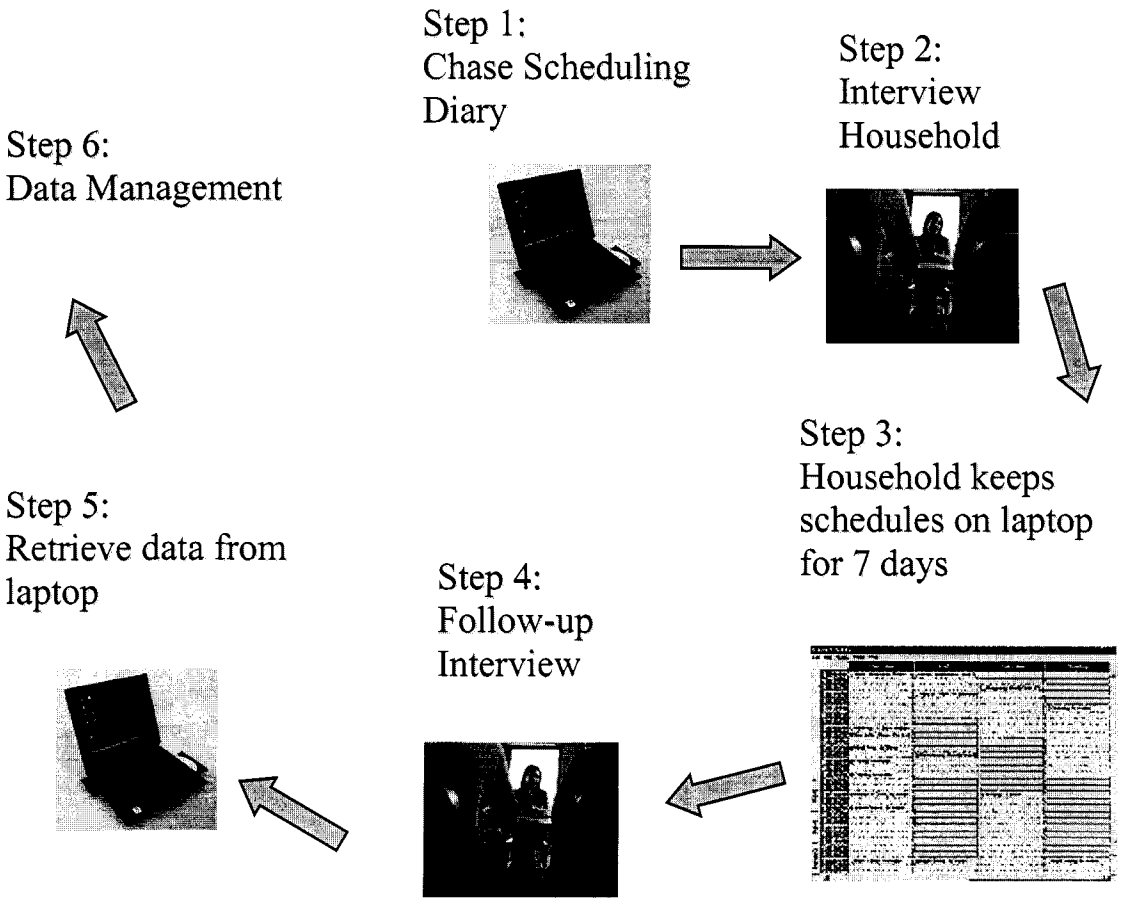
This section will give an overview of the data collection on: 1) interviewing process; 2) field staff; 3) recruiting of households; and 4) wrap up interview and contact survey manager. These key subjects provide a better understanding of how the data were collected.

3.2.1 Interviewing Process

The overall survey process is depicted in figure 3.1. The team performed a detailed interview with the participants and loaned the participants laptop computers to enter the details of the one-week long scheduling survey. After the interview, participants were shown how to use the software before they were left alone for the week to complete the survey. The adults in the households filled out the survey for themselves, as well as any dependents that they might have. After the survey was completed, the

team then performed a follow-up interview with the participants and retrieved the laptops. An honorarium of $20 (CAD) was paid to all adult household members who participated in this survey. After the data were collected from each household, the research assistant reviewed the data manually for any errors and omissions prior to analysis. This method of survey was used to capture not only observed activity patterns, but the underlying scheduling decision process. In addition, the computer programme collected stated spatial, temporal, and interpersonal flexibility of activities.

Figure 3. 1 Overall CHASE Process



Source: Modified after Roorda and Miller (2004)

3.2.2 Field Staff

The data for this thesis were collected as part of an on-going panel survey in the Toronto area. Field staff interviewed and trained the participants on how to use CHASE and advised the participants about the procedure of this data collection. The interviewers were the front line personnel who had close contact with the participants. In addition, collecting accurate data from the participants was also a challenge. A complete manual was produced for interview training purposes, which consisted of in-depth guidelines for the interviewers and the manager of this project. Information from the manual will be briefly mentioned in this section.

There were three trained interviewers for this Toronto Panel survey, as well as one survey manager. The interviewers' responsibilities were as follows:

- Communicate with the survey manager, who was their direct supervisor
- Recruit households by telephone to participate in the study and schedule interviews with the households
- Conduct the start up interview and provide telephone support to the households throughout the week if the household members had any questions
- Conduct a follow up interview and email the data to the survey manager

The interviewers reported to the survey manager at the University of Toronto on an on-going basis to address any issues, concerns, questions, or problems regarding the panel survey. The interviewers at times were requested to attend the University of Toronto's periodic meetings survey to pose any questions, report difficult situations,

discuss data quality, and talk about software issues with the panel. The survey manager did periodic quality checks with the households to ensure that the survey was conducted appropriately and professionally. The survey manager checked for completeness and quality of the survey data on a continuing basis.

3.2.3 Recruiting of Households

The method of recruiting households was by telephone. The interviewers were assigned to a region and provided with a random sample of household phone numbers in the same region (the sampling list was purchased from a separate survey firm). The interviewers tried to contact the participants between the hours of 17:00 to 21:00, as this is the time when most of the potential participants were at home. Once the participants agreed to participate in the survey, a start-up interview was scheduled at the participant's house and the participants were shown how to use the laptop and software. The interviewers collected some background information from the initial interview on: 1) socio-demographic; 2) travel modes; 3) information on potential involved persons; and 4) activities that will most likely occur in the week. The background information would give a better knowledge of each dynamic household.

3.2.4 Wrap up Interview and Inform Survey Manager

The interviewers were required to confirm that the participants' schedules were completed when they returned to the participants' residences for the follow-up interview procedure. Once the wrap up interview was completed, the interviewers then packed up all the equipment from the participants' residence, and proceeded to backup and email the

data to the survey manager. The interviewers advised the households that they might contact the households for the second wave of the panel survey.

3.3 Research Design and Sample Size

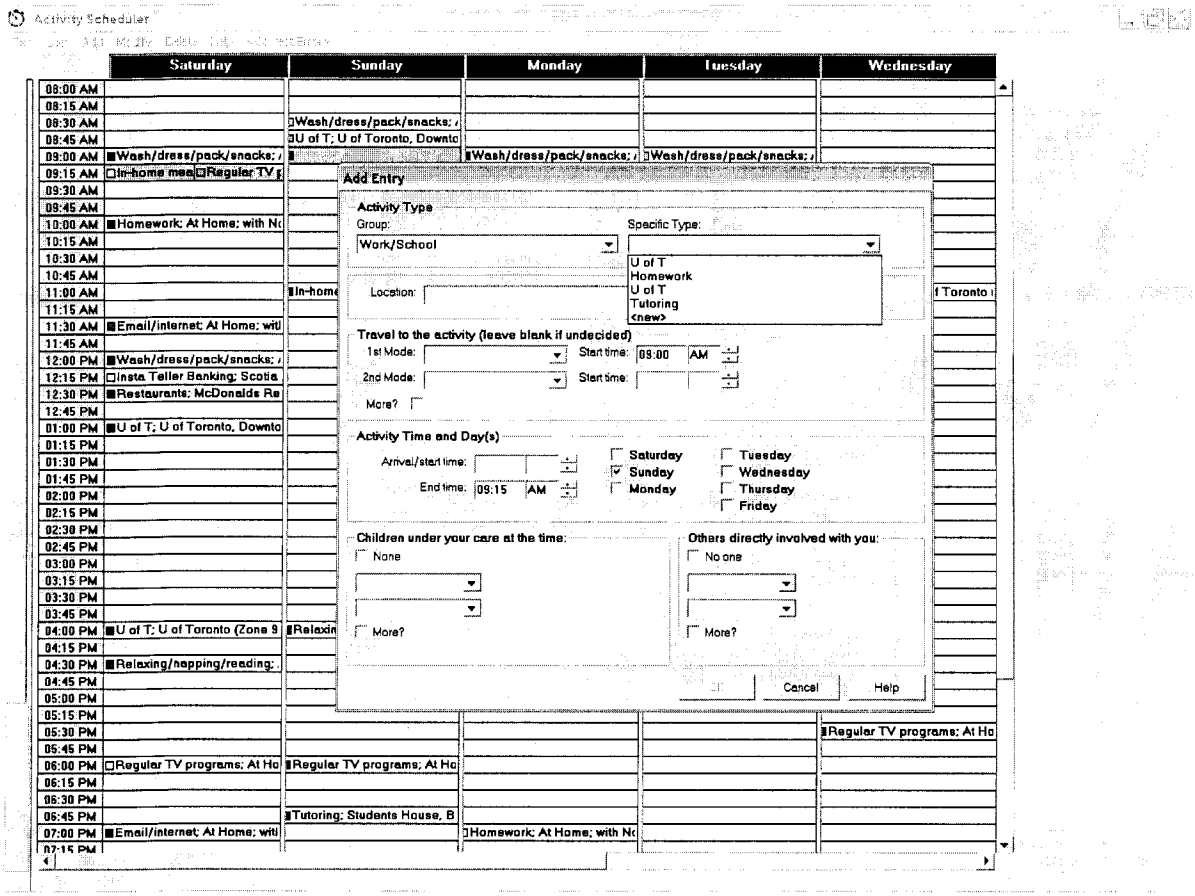
3.3.1 Survey Design: CHASE

CHASE was originally designed by Doherty (2000) and has been further developed and applied in several studies (Doherty and Miller, 2000; Lee and McNally, 2000; Doherty, 2002a; Doherty, 2004; Doherty *et al.*, 2004). CHASE attempts to minimize respondent burden, obtain accurate time for activities start and end time, and capture short trips that are not reported. CHASE captures an individual's add/modify/deletion of activities in sequence as they were made to the final schedule. CHASE also captures an individual's multi-task activities (e.g. eating and watching T.V. at the same time). This survey method also captures the scheduling process as it occurs in reality in a household setting over a multi-day period (Doherty, 2004; Doherty *et al.*, 2004). The CHASE program was written in Visual Basic, runs in a Windows 95 or higher platform, and stores information within a Microsoft Access 2000 database. More details about CHASE can be found in (Doherty and Miller, 2000; Doherty, 2004; Doherty *et al.*, 2004).

Figure 3.2 below shows an example of a household member's weekly schedule displayed from Saturday to Wednesday, and a series of rows with 15 minute time intervals starting at 00:00 and ending at 23:59. At any one time, the user can view five days of their schedule and 11 hours worth of time. The scrollbars allow the user to

manoeuvre to different days and time intervals when they need to view other days. The highlighted areas in CHASE indicated that activities were scheduled. Multiple activities can be in the same block as indicated at 09:15am time block for Saturday. The participant can continuously add, modify, and/or delete activities in their schedule in CHASE. The pop-up dialog box shown in figure 3.2 appears in response to an "add" command - prompting the user for a range of attributes for the activity. The participants will have to pick from a drop down menu to fill out the activity type, specific type, time, travel mode, and people involved in the activity.

Figure 3. 2 Add Entry from the Main Screen of CHASE Program



At any stage of the survey, the participants are prompted with questions of when they add, modify, or delete an activity. The computer prompts, "When did you originally plan this activity?" in a dialog box. The dialog box has five items to pick from (e.g. just before the activity, prior to the activity on the same day, before the day of the activity, I didn't really give it much thought, cannot recall). This dialog box has at least one follow-up questions to capture more detail on the nature of the decision once the participants clicks 'next' from the dialog box. The participants answers many scheduling questions before the activities are recorded into their schedule (Doherty *et al.*, 2004).

3.3.2 Toronto Panel Survey

CHASE was used to capture participants' scheduling process in the Greater Toronto Area. These areas included Toronto, Richmond Hill, Markham, Scarborough, Pickering, North York, East York, Vaughan, Mississauga, and Etobicoke. The survey was conducted from April 2002 to May 2003. The Toronto Panel Survey team sampled 271 mixed households (single, couples with or without children) over a one-week span using CHASE in the first wave (more detail in section 3.3.3 Recruiting Results).

The Toronto Panel Survey is a collaborative project in Canada. Its focus is on behavioural foundations of integrated land-use and transportation models. The Toronto Panel Survey is a long-term panel survey. Its advantages include retaining the core team members of the panel to improve the projects, so that they do not have to retrain the team again for further projects. Toronto Panel Survey has three waves in their project.

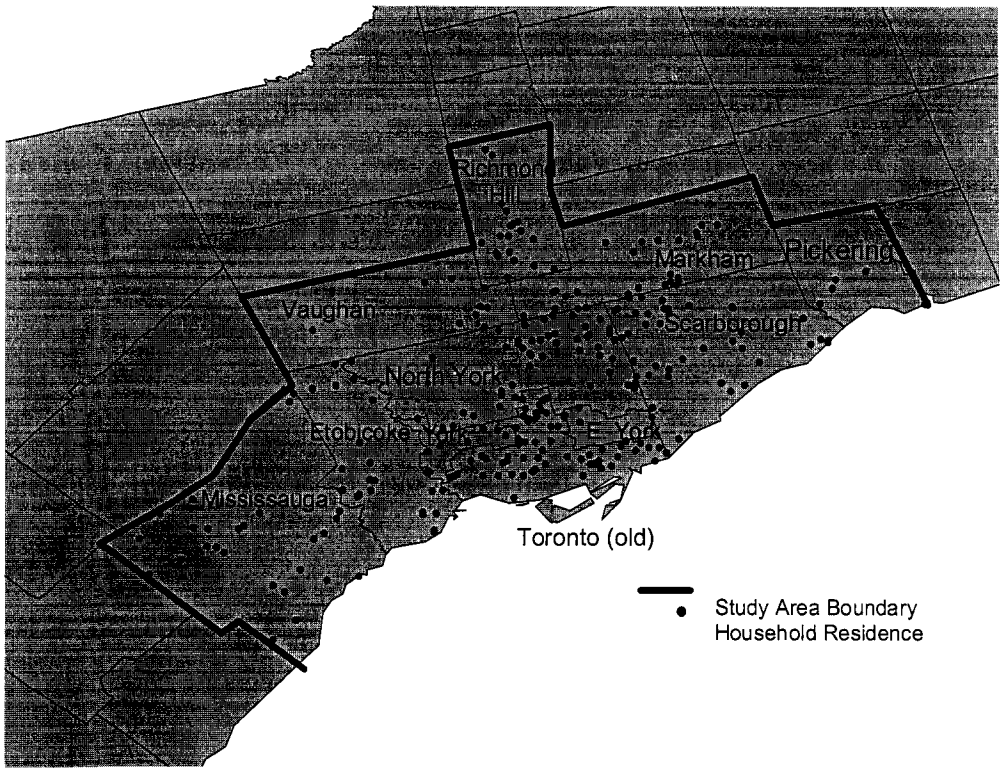
The first wave captures a detail scheduling information for 7 days using CHASE. The second wave is underway (stated preference scheduling conflicts); an interviewer

retrieved the survey through telephone, as the participants used a paper-and-pencil 'memory jogger' diary for two days. The third wave is in the design process (GPS route tracking), a palm-pilot device is used, participants enter their activity schedule into customized software (Roorda and Miller, 2004).

3.3.3 Recruiting Results

Three interviewers were assigned to recruit households from the area indicated in figure 3.3. A grand total of 1,935 households were contacted for this survey. Only 1,637 households were successfully contacted and 298 households were not successfully contacted due to no response and phone services not working. Within the sample of those who were successfully contacts of the households, 271 households completed the survey. The other households did not complete the survey due to language barriers and/or refusal to participate in the survey. The level of commitment from the participants for this survey was 16.6%, which is highly effective for survey percentages (Doherty *et al.*, 2004). Note that these samples are not representative of the population because person of low socioeconomic status were not part of this survey.

Figure 3. 3 Participants' Location from the Panel Survey



Note: The participants' household locations were randomly adjusted to preserve their anonymity by changing the x and y coordinates.

3.4 Data Analysis

Once the survey manager received the data and filed it accordingly, the data were emailed to a research assistant to "clean" and prepare the data according to known procedures set out by the original programmers and designers. Data preparation and cleaning generally involved manually checking for any errors or missing data, imputation of missing data where appropriate, and documentation of errors or other issues. All the

changes made by the research assistant were flagged for future reference. The first preparation step involved examining the description of "new" activities provided by subjects during the week, and the assigning of a "generic" activity type (note that activities defined in the upfront interview are assigned a generic type). For example, the description in the activities table was "playing golf" but the participants did not know which type this activity belongs to. The research assistant needed to manually update the activity into the correct type. Overall, the unknown activities were given a generic type number that matched the description in a given activities table list (refer to section 3.4.4 Activities categories and activities attributes). The next few subsections will show data preparation processes and errors result.

3.4.1 Frequency of Data Cleaning and Imputation

Figure 3.4 indicates the amount of time the respondents did not or did input their schedule. The categorization of missing time consisted of the following: 1) <1 hour missing activity time; 2) 1-21 hours missing activity time; and 3) 21 to >84 hours missing activity time (i.e. 50% missing time). The vast majority of people (93%) fell into the first and second category. The 7% of respondents who were missing 21 to >84 hours of data could be because the participants did not, would not, or forgot to complete the survey. The data were filtered using the first two categories from figure 3.4 for quality control purposes, leaving 422 participants of the original 452 participants from 271 households.

Figure 3.5 shows the total number of cleaning steps for the 422 remaining participants. Each participant's schedule was manually checked to see if there was any error or missing data with respect to his or her schedules. Among the 422 remaining

participants, 248 participants had no errors and 174 participants had some errors and omissions that needed to be fixed. Of the 174 participants, 155 participants had between 1-21 cleaning steps and 19 participants had between 21-50 cleaning steps.

Figure 3. 4 Participants' Total Amount of Missing Time (hours) per Week n=452

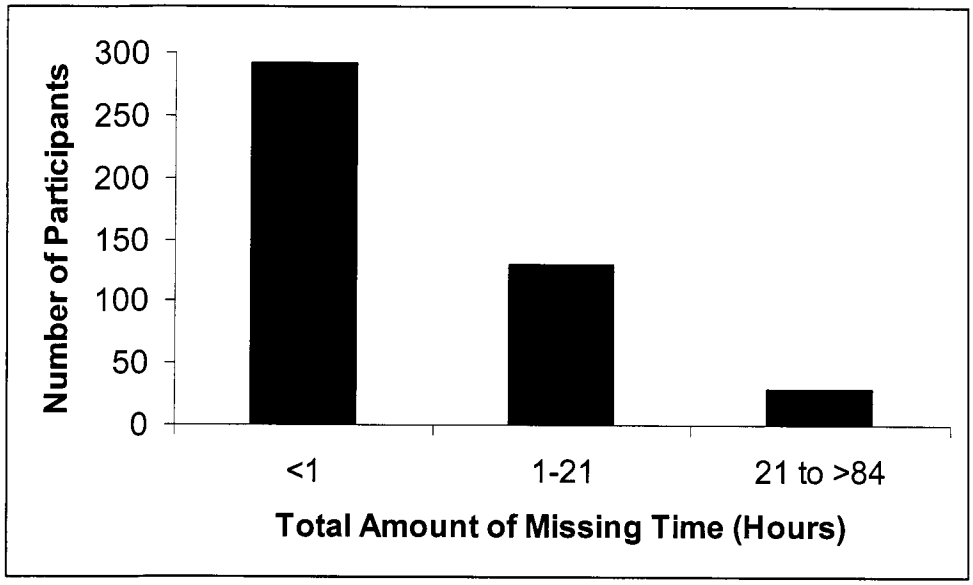
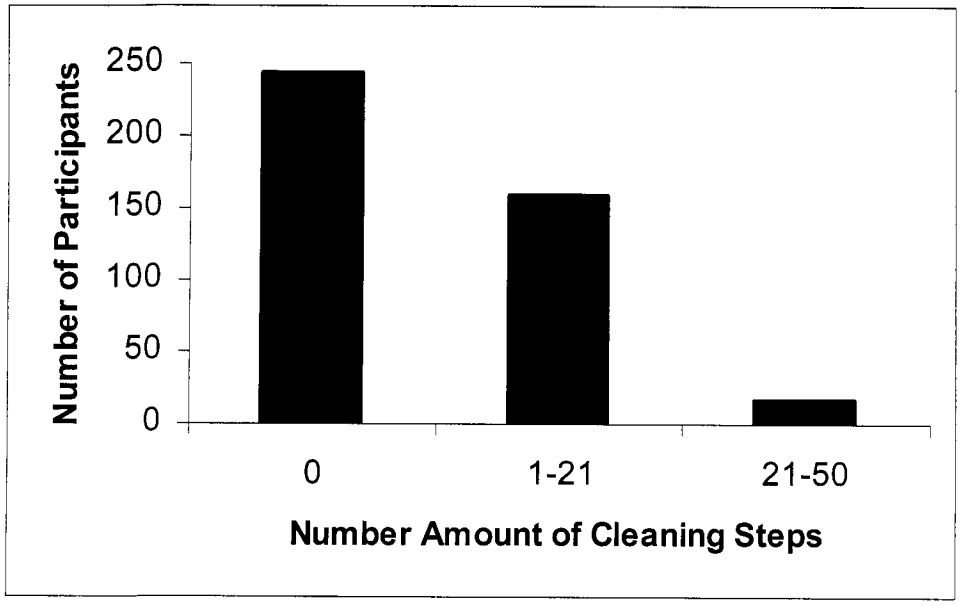


Figure 3. 5 Participants' Total Amount of Cleaning Steps per Week n=422



Moreover, a total of 10,922 unique activity types were scheduled by the 422 participants. Of these 7,387 activities had been executed (marked activities), 3,417 were modified (user defined), and 118 'blank' entries were inputted during the one-week survey. The 'user defined' and 'blanks' entries were updated in the database manually by the research assistant. The 'user defined' activities were the activity types that the participants were unsure of the accurate codes. The participants did not proceed with the activities that were recorded as 'blanks' activities, and were thus ignored in subsequent analysis.

3.4.2 Data Errors

The most rigorous cleaning step resulted from visually inspecting a person's schedule on screen in CHASE. Common errors included:

- participants inputted duplicate activities in their schedules,
- participants inputted wrong activity codes for their activities,
- missing travel mode, and
- incomplete data in CHASE

Some errors are illustrated in this section. For example, the following shows two households that have some errors during the cleaning process. Each households were documented throughout the cleaning process.

- **Household A** – Member 0 – incomplete data in CHASE (50% of data missing)

  Member 1 – Thursday 12am to 7:45am missing time slot

  Member 2 – Monday, Tuesday, Wednesday, and Friday 9am to 9:30am deleted duplicate of work entries.

- **Household B** – Member 0 – deleted duplicate entries on Saturday at 11pm

  Member 1 - Missing travel: Tuesday 7:30am to 1pm

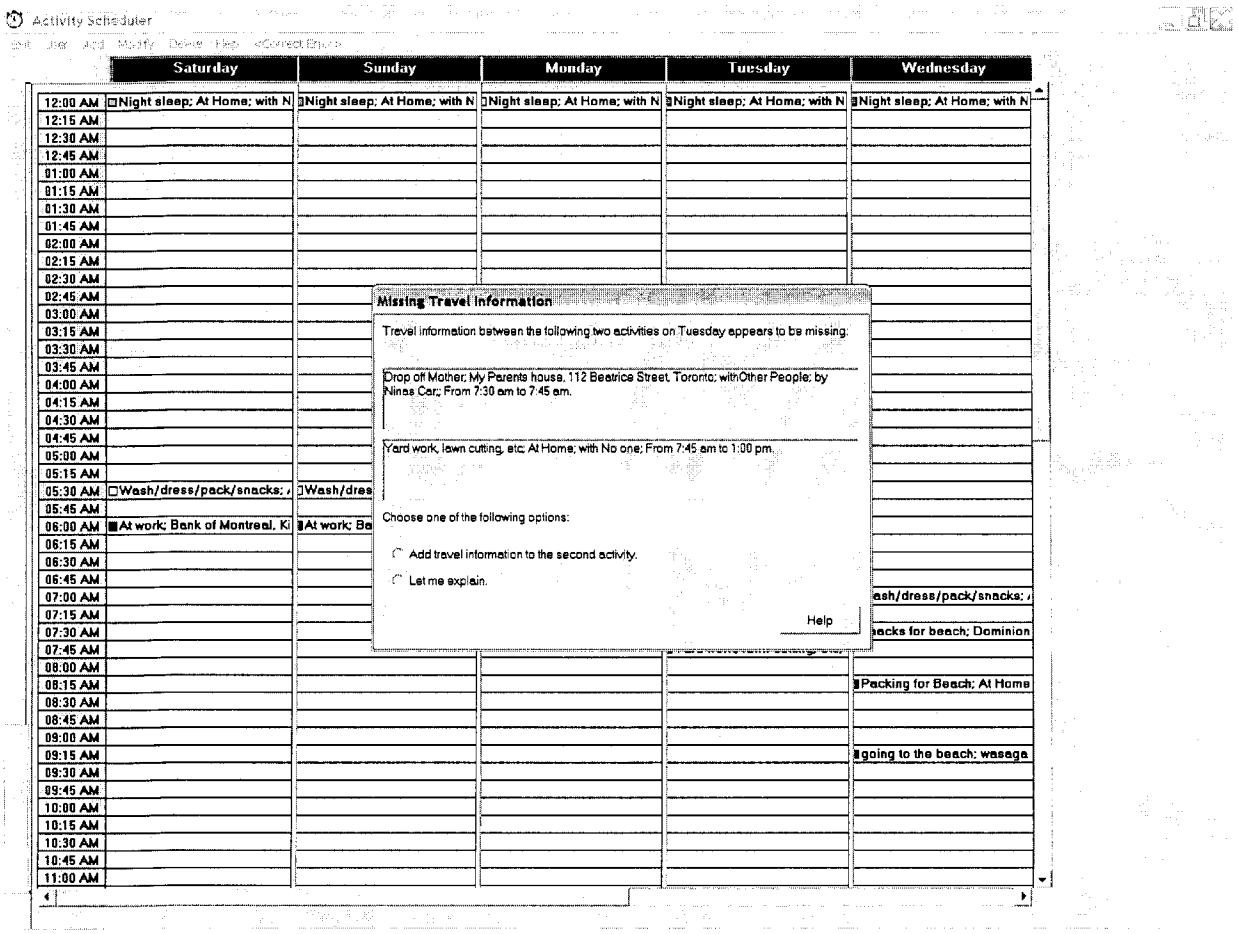
Member 0 in Household A had half of the data unscheduled for the one-week survey. The shaded grey area indicates that the participant did not input any data for that day. The incomplete data in CHASE were not used for the data analysis. Member 0 in Household B had accidentally inputted night sleep twice on Saturday at 11pm. After confirming that it was duplication, one of the night sleep activities were deleted from the schedule.

Another error would be the participants' occasional exclusion of travel mode to their activities. Member 1 from Household B showed that the participant dropped off the participant's mother and drove home, but forgot to include the mode of transportation in the next activity (Figure 3.6). As a result, it was manually corrected and the error documented.

The participants in different household types coded traveling home as an activity; however, traveling home should be part of the relaxing/napping/reading activity as the participants needed to travel home in order to relax/nap/read. The research assistant checked to make sure that the following activity had no travel mode and would add the travel home mode into relaxing/napping/reading activity. Once that was done, the traveling home activity was deleted and noted in the word document and was also updated in the Access database.

Other inherent errors could also consist of participants not scheduling certain activities in the survey because they may not want to divulge certain activities, or may deem some activities irrelevant. However, the participants were advised at the interview that the survey process is more interested in how they scheduled their daily lives and not interested in their daily activities. Overall, once these steps were taken, the completed merged files of all households were double checked for duplicate entries, and any missing data or non-cleaned data in the tables.

Figure 3. 6 Missing Travel Input from a Participant's Schedule



After the data preparation process was completed, statistical packages were used to explore the data. The focus in this research is gender and household type in the following areas: 1) observed activities; 2) spatial and temporal flexibility of activities; and 3) scheduling time horizon including deletion and modification. Note that observed results and flexibility of activities results focus on observed (end-results) activities, wherein deletion, modification, and scheduling time horizon focus on activity scheduling process. This subsection illustrates the details for the results chapter.

3.4.3 Comparison Groups

The data consisted of 422 individuals from 271 households in the Greater Toronto area. A set of preliminary descriptive results were generated to gain a better understanding of the Toronto Panel Survey. Only couples, and couples with dependents were selected for analysis. As a result, 216 respondents remained for analysis – including 32 couples and 76 couples with dependents. The distribution by adult age ranged from 23 to 82, with an average age of 46.7 and the average household income of about $48, 000 for the 216 participants. Table 3.1 illustrate the average income and average age of the comparison groups. Their age and income might affect their scheduling behaviour.

Table 3. 1 Average Income and Average Age of Household Type

Household Type	Coupled Males	Coupled Females	Family Males	Family Females
Average Income	$52, 750	$37, 437.50	$62, 110.53	$32, 815.79
Average Age	54	51	46	43

For the purpose of this study, a couple consisted of one hetero-sexual male and one hetero-sexual female. Each coupled and family households has a pair of one male and one female. The group 'couples with dependents' have dependents from toddler to adult age in their households. It is hypothesized that these dependent groups will affect males and females' scheduling decision making processes. In the categorization for this thesis, 'coupled household' means the couples are married and have no dependents. 'Family household' means the couples are married and have dependents. Single households were not used, as insufficient data were not available to compare them within and between groups.

3.4.4 Activities Categories and Activities Attributes

The 216 adults in the sample had common types of activities conducted during the study week. The activities were classified into nine main activity groups, which are further categorized into 3-7 specific types shown in table 3.1. These specific types of activities were used during the up-front interview. The project team wanted to capture most of the general activities that an individual undertakes. There is a group called 'other' that was not used for this research because it was coded as miscellaneous. These activities are considered part of everyday activities that one engages in. The various types were aggregated into activity groups. These activity groups will be used for comparison of scheduling and travel differences between males and females.

Household serving activities are defined as activities that are related to or for the household participants, where the person does not get paid to perform them. Work/school activities are defined as activities that are related to school and work. Work

is defined as paid work. School involves work; however, one is not compensated for labour by means of money. Shopping activities are defined as activities that are not related to household serving activities. Note that these categories are determined by the author and may not be the same categorization as other past researchers. These unique groups of activities are most significant to the thesis, as the majority of the analysis is based on household serving, work/school, shopping, and other activities. These activities were chosen because they are part of the household work, which needed to be further explored. Many past researches have noted some differences between males and female's division of labour, but not their underlying scheduling activity process.

Table 3. 2 List of Activities

Night Sleep and Wash	**Work/school**	**Leisure**
Night sleep	At work	Regular TV
Wash/dress/pack/snacks	Telework	Unspecific TV
	Volunteer work	Watching video
	At school	Relaxing/napping/reading
	Schoolwork	Email/internet
Household Serving	Training/special classes	Video rental
Cleaning/maintenance	Other work/school	Other recreation/entertainment
Meal preparation		
Attending to children		
Attending to pets		
Pick up/drop off people	**Shopping**	**Active Recreation**
Dry Cleaning	Convenience store	Hobbies
Mail	Clothing/personal items	Exercise or active sports
Minor/major groceries	Drug store	Spectator events/theatre
Housewares Shopping	Internet shopping	Playing/parks
Other household obligations	Other shopping	

Meals	**Services**	**Social**
In-home	Medical/professional	Hosting visitors
Bagged lunch	Barber/salon/beauty	Visiting
Restaurants	Banking	Planned social events
Coffee/snack shop	Religious	Bars/special clubs
Meal	Gas	Helping others
Snacks/drinks	Other services	Telephone >10 minutes
Other basic needs	Religious/cultural	Other social

After the participants completed the week long scheduling survey, they were prompted with a series of questions concerning each activity they performed during the week, in the form of an "end-of-week review" (EWR). This included questions concerning the spatial, temporal, and interpersonal flexibility of performed activities, and their "normal" durations and frequencies, as shown in figures 3.7 a-e. More detail about the EWR can be found in Doherty (2003). Given that in the past, spatial, temporal and interpersonal flexibility of activities have not been measured in depth, these data present a unique opportunity to explore differences between males and females.

Responses from the participants from the EWR during the study week were used to calculate a set of activity "flexibility" indicators and some traditional attributes, as described below (definitions are based on Doherty, 2003):

Spatial flexibility indicator is measured by the number of locations considered for an activity. For example, if a male has a value of 10 for an activity, he has a very high level of flexibility in space compared to a male who has a value of 1. If a male has value of 1 for an activity, this activity is highly fixed to just one location. The calculations were taken from the responses' value in figure 3.7a. This indicator will tell us that certain activities have more places known than other activities.

Temporal flexibility indicator value ranges from 0 to 1. Values close to 0 indicate that activities are fixed in time, where values close to 1 indicate flexibility in time. For example, if a female has an indicator of 0.95 for temporal flexibility of an activity, she is most likely to be flexible when certain situations present themselves. The values were calculated from using the average duration time divided by the duration of the time window that the activity could occur in. The calculation in duration of the time window

is measured by the differences between the earliest and latest end-time of the activity as derived from the prompt figure 3.7b where the participants indicate activities as "fix, somewhat variable, very variable, completely variable, and variable but limited". The calculation for temporal flexibility is considered the actual temporal flexibility of activities. This indicator will tell us if certain activities are affected by time.

Interpersonal flexibility indicator is a binary indicator variable (figure 3.7c). If a female has a value of 0, it means that she normally conduct her activity alone. If a female has a value of 1, it means that she must conduct her activity with or for other people. If a female has a value of 2, it means that she can optionally conduct activities with or for other people. This indicator tells us that certain activities are performed with or without other people.

Frequency per week (average) was set to the observed frequency if the observed frequency of the activity was 4 or more during the study week (figure 3.7d).

Average duration (minutes) was based on the average of the durations of the observed instances of the activity if the observed frequency of the activity was 4 or more during the study week (figure 3.7e).

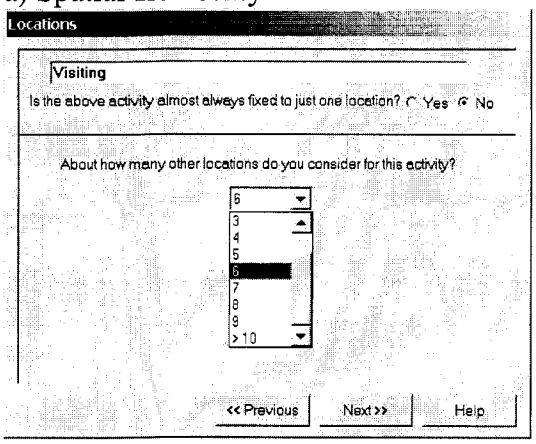
3.4.5 Statistical Test and Histograms

The analysis presented in this thesis focuses on comparing the statistical significance of the differences between activities and scheduling behaviour for the following groups: 1) coupled males versus coupled females; 2) family males versus

family females; 3) coupled males versus family males; and 4) coupled females versus family females. Independent sample T-test, Wilcoxon test, and proportion test were used where appropriate.

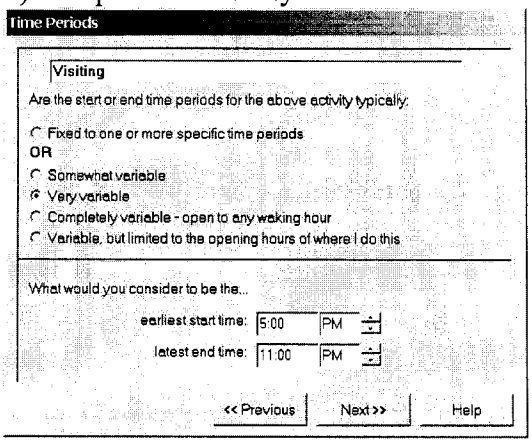
Figure 3. 7 End-of-week Review Prompts for Attributes of each Observed Activity Type

a) Spatial flexibility



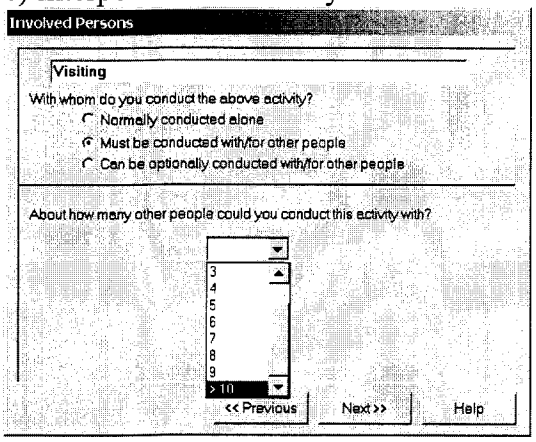
Note: if "No" selected, lower portion does not appear.

b) Temporal flexibility

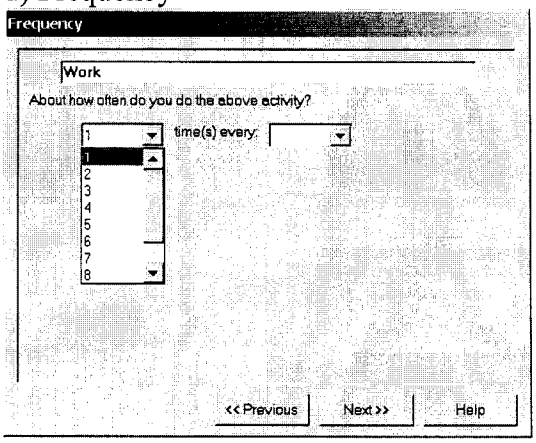


Note: lower portion appears only for first 2 options

c) Interpersonal flexibility

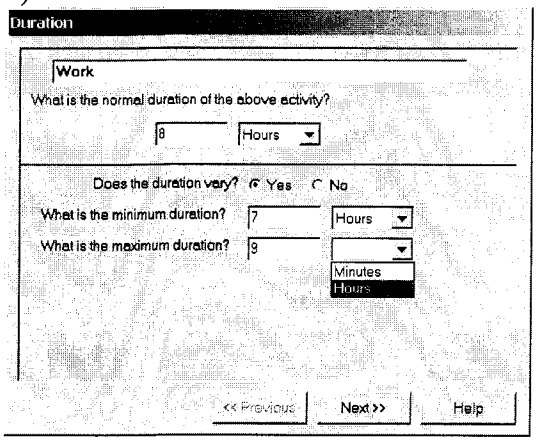


d) Frequency



Note: lower portion appears only for the latter 2 options.

e) Duration



Note: if "No" selected, lower portion does not appear Source: Doherty (2003)

The paired t-test is used to determine whether the means of two groups are statistically different from each other. The paired t-test analysis was favoured over One-way Analysis of Variance (ANOVA) or a form of regression analysis because the results are identical when comparing only two groups. For example, coupled males versus coupled females are two groups and ANOVA gives the same results as a paired t-test would.

The histograms illustrate the distribution of the paired differences between the duration of coupled men's and women's activities from the same household, for a variety of activity types and planning horizons. The difference was calculated as female's minus male's activity duration. Thus, a positive number would indicate that the female performs more of certain activities than her partner does, and vice versa. Whilst overall, a t-test may reveal that collectively females tend to have more/less duration of certain activities compared to males; the histograms reveal whether this holds in all households and if any exceptions exist.

The paired Wilcoxon test was used to test for the statistically significant differences between males and females in their average spatial and temporal flexibility. It is a nonparametric alternative to the two-sample t-test. This test ranks the absolute values of the differences between the paired data in male and female's activities and calculates a statistic on the number of negative and positive differences. The test is based on the order in which the observations from the two samples fall. The Wilcoxon test was used in part due to the range in numbers from spatial and temporal flexibility results. Due to cost and time, interpersonal flexibility of activities was not analyzed. Future projects could focus more in depth towards interpersonal flexibility where necessary.

Proportion tests were used to test if there were any significant differences between males and females in the observed, deleted and modified, and scheduling processes. An example would be the proportion of rolls of a die that have come up 6. Given an assumed probability for the observation, the proportions test examines how far from the expected proportion is from the observed proportion. The proportion test is also known as the binomial distribution test. The binomial results is associated with only two outcomes either zero-one or yes-no. In addition, the binomial distribution examines probabilities from multiple events or trials (McGrew and Monroe, 1993; Long, 2003).

3.4.6 Observed Activity Patterns

The observed activity patterns referred to males and females' activities that have been executed throughout the week, but the observed activity patterns did not illustrate the scheduling behaviours of the participants. These observed activity patterns were illustrated in tables that show the occurrences and durations of activities in a variety of categories. In addition, these observed activity patterns were depicted in figures that show the differences in duration of activities between males and females with or without dependents. The observed activity patterns tables in chapter 4 consist of count and duration percentages. The count percentages are the number of activity frequency percentages that the participants executed. The count percentages are calculated by adding all the activity types and dividing each activity type by the grand total of the activity type. The duration percentages are the percentages of hours that the participants spent on the activities. The duration percentages are calculated in a similar way as count percentages.

3.4.7 Scheduling Processes

The participants added, deleted, and modified their activities throughout the week which lead to observed activity patterns. The percentages of activities later modified or deleted were analyzed by household type. The timing of activity scheduling decisions was also analyzed in depth, in terms of how far in advance they were planned – or in terms of their "planning time horizon". The definition of planning time horizons is as follows:

1) impulse – last minute changes (<5 minutes)

2) same day – within 24 hours of that day

3) days before – from 1 to 13 days ahead

4) weeks/months/year before – more than 1 week

5) routine – planned without much thought

The proportion of activities planned in each of these categories was talked by household type. Note that routine planning is calculated as part of the planning horizons; however, routine planning results will not be examined. This is because the routine planning questions prompted during scheduling are ambiguous. The participants estimate their activities with regard to plan it or they just cannot recall when they planned the activities.

A summary of each of these concepts in terms of indicator, measurement and statistical test is shown in table 3.2.

Table 3. 3 Summary of Conceptual Framework

CONCEPT	INDICATOR/VARIABLE	MEASURE/COUNT	TEST
Household Type	Coupled Males	Author categorizes males and females into household type	Not Applicable
	Coupled Females		
	Family Males		
	Family Females		
Activity Type	Nine Activity Types – Night sleep, Household serving, Meal/snack, Work/school, Shopping, Leisure, Service, Active Recreation, Social	Author categorizes activities into activity type	Not Applicable
Flexibility of Activity Type	Spatial Flexibility	The participants indicate how many places of an activity type that they know at the end of week review.	Wilcoxon Test
	Temporal Flexibility	The participants indicate if they are fixed in time or flexible in time for an activity type.	Wilcoxon Test
Activity Scheduling Process	Nine Activity Types – Night sleep, Household serving, Meal/snack, Work/school, Shopping, Leisure, Service, Active Recreation, Social	Planning Horizon = Impulse, Same Day, Days Before, Weeks Before, Routine Participants are prompted with questions and they select which scheduling decision are performed for each activity	Proportion Test
Modification of Activity	Add	Count	Proportion Test
	Modify	Count	Proportion Test
	Deletion	Count	Proportion Test
Observed Activity (End Result)	Household Serving, work/school, shopping and other activities	Frequency and duration	Proportion Test

3.4.8 Hypotheses

From the objectives, the following specific hypotheses will be tested to see if the speculations are correct.

1) Hypothesis: Women tend to have higher duration and wider variation of household serving activities compared to men.

Women report spending more time in child-related activities than men do in the household with children. The presence of children in the household has greater affects on women's travel activity behaviour than that of men. As a result, the duration of certain activities differ across gender (e.g., women tend to spend more time shopping than men). This indicates that the variability in duration for certain activities is also expected to differ.

2) Hypothesis: Men have higher spatial and temporal flexibility of activities than women regardless of household types.

Men are expected to be more flexible in spatial and temporal flexibility of activities as they may have fewer activities to juggle around compare to women.

3) Hypothesis: a) Women have a higher total number of deletion and modification of activities than men, especially in households with children.

b) Women have lower rate of impulsive decisions when compared to men regardless of household types, as they pre-plan their schedules.

It is suspected that women tend to alter their timetable, and pre-plan their schedule in a given week more so then men, due to their household obligations.

These hypotheses along with the objectives from the introduction will be investigated further in the next chapter. The following chapter focused in the gender differences of the scheduling behaviour.

CHAPTER 4 EMPIRICAL RESULTS

4.1 Introduction

This chapter is divided into three sections and deals with the analysis of the thesis data collected in the field. The first section examines observed activity patterns, followed by the second section which focuses on spatial and temporal flexibility of activities. The last section examines the underlying activity scheduling decision processes. All analyses focus on comparing differences in frequency and/or duration of activities between the following household types: 1) coupled males versus coupled females; 2) family males versus family females; 3) coupled males versus family males; and 4) coupled females versus family females.

4.2. Examining Observed Activity Patterns

This section is divided into two parts. The first part examines observed activity patterns followed by the second part which focuses on the distribution of the activity duration. The observed activity frequency and duration data indicate differences by activity type and by household type. In the second part, histograms display paired differences of observed activity duration by household type.

4.2.1 Observed Activity Frequency and Duration

An examination of the frequency and duration of activities for males and females in different household types is shown in tables 4.1 a-d. A few of the observed frequency and duration of activities are similar to past studies. An overview of past studies will be discussed later in this section. Note that there are statistically significant differences

among males and females in time use and activity frequency, as indicated by p-values less than 0.05. Not all activities that have significant differences are explored as the main focus is on household serving, work/school and shopping activities. However, some other activities that show significant differences are mentioned as some of these activities display trends or patterns.

The most significant difference in time use concerns household serving activities, as shown in tables 4.1 a-b. In general, the trend indicates that coupled and family females carry out household serving activities significantly more often (20.8% and 28.6% respectively) and spend more time (11.1%, 15.4%) in household serving activities compared to their male partners. Coupled females have 1.5 times more and spend 1.6 times longer in household serving activities than coupled males. This is also similar to family females compared to family males. In addition, coupled females and family females execute shopping activities more often (2.2% and 1.7% respectively) and spend more time (1.2%, 1.3%) in shopping activities than coupled males and family males. This means that coupled females have 1.6 times more and spend 2 times longer in shopping activities than coupled males. As for family females, they have 1.4 times more and spend 1.9 times longer in shopping than family males. Together, these results indicate that females manage household serving and shopping activities. This pattern is somewhat consistent with findings of previous researchers (e.g., England and Farkas, 1986; Hanson, 1996). The question that remains for future research is whether these results suggest that females enjoy household serving and shopping more than males, or whether they see it as an added burden, stressful and/or as their traditional duty.

In exchange for less household serving and shopping activities, coupled males and family males carry out more often and spend more time in work/school and leisure activities than coupled females and family females (tables 4.1 a-b). Coupled males have 1.2 times in frequency and duration in work/school activities than coupled females. Family females have 1.2 times more and spend 1.1 times longer in leisure than coupled males. Family males have 1.4 times more often and spend 1.6 times longer in work/school than their counterparts. Family males have 1.3 times more and 1.2 times longer in leisure activities than family females. Past researchers have mentioned that males tend to work more hours than females. This is still true even though these results also indicate that males have more school activities as well. These findings are somewhat similar to those of Daly (1996) and Harrington's (2001) research. In the past researchers dealt with a general response of who does more in the family, whereas this data captured the actual reported measures of frequency and duration.

Turning attention to differences in couples versus families, several important differences are evident. In table 4.1c, family males carry out more often and spend significantly more time in household serving and spend more time in work/school activities than coupled males. Family males have 1.4 times more and 1.3 times longer in household serving than coupled males. Also, family males spend 1.2 times longer in work/school than coupled males. This is likely due to family males having more obligations toward the family household and financial situation. Note that there was no significant difference in frequency for work/school activities. There were also no significant differences between coupled males and family males in frequency and duration of shopping activities.

The table 4.1d focuses on females in different household types. Coupled females spend more often and more time in work/school and leisure activities than family females. Coupled females have about 1.2 times more and spend 1.2 times longer in work/school and leisure activities than family females. Possible reasons could be that family females are stay at home parents and cater more to their dependents lives than taking into consideration their own needs. This leads to the question of possible differences between past interviewers' results and the day-to-day basis results of participants' activity duration and frequency.

Table 4. 1 Activity Frequency and Duration by Household Type

a)

Activity Type	Coupled Male (n=32) Count	%	Dur*	%	vs. Coupled Female (n=32) Count	%	Dur*	%	Count Z value	P value	Duration Z value	P value
Night Sleep	684	(27.2)	1940	(38.9)	706	(24.7)	2009	(39.5)	2.13	0.03	-0.69	0.49
Household Serving	351	(14.0)	343	(6.9)	596	(20.8)	562	(11.1)	-6.68	0.00	-7.38	0.00
Meal/Snack	435	(17.3)	356	(7.1)	456	(15.9)	320	(6.3)	1.35	0.18	1.67	0.09
Work/School	242	(9.6)	1046	(21.0)	234	(8.2)	897	(17.7)	1.86	0.06	4.20	0.00
Shopping	35	(1.4)	31	(0.6)	62	(2.2)	59	(1.2)	-2.16	0.03	-2.89	0.00
Service	56	(2.2)	52	(1.1)	74	(2.6)	85	(1.7)	-0.85	0.39	-2.74	0.01
Leisure	505	(20.1)	779	(15.6)	486	(17.0)	708	(13.9)	2.93	0.00	2.37	0.02
Active Recreation	87	(3.5)	162	(3.2)	101	(3.5)	138	(2.7)	-0.13	0.89	1.56	0.12
Social	117	(4.7)	280	(5.6)	146	(5.1)	301	(5.9)	-0.76	0.45	-0.68	0.50
OVERALL	2512	(100)	4989	(100)	2861	(100)	5079	(100)				

b)

Activity Type	Family Male (n=76) Count	%	Dur*	%	vs. Family Female (n=76) Count	%	Dur*	%	Count Z value	P value	Duration Z value	P value
Night Sleep	1618	(28.5)	4617	(38.8)	1770	(26.2)	5019	(41.6)	2.82	0.01	-4.35	0.00
Household Serving	1128	(19.9)	1090	(9.2)	1926	(28.6)	1852	(15.4)	-11.36	0.00	-14.66	0.00
Meal/Snack	803	(14.2)	574	(4.8)	883	(13.1)	679	(5.6)	1.71	0.09	-2.78	0.01
Work/School	536	(9.4)	3025	(25.4)	454	(6.7)	1935	(16.0)	5.50	0.00	18.07	0.00
Shopping	70	(1.2)	77	(0.7)	112	(1.7)	157	(1.3)	-2.00	0.05	-5.16	0.00
Service	120	(2.1)	145	(1.2)	144	(2.1)	185	(1.5)	-0.08	0.94	-2.08	0.04
Leisure	1043	(18.4)	1647	(13.9)	959	(14.2)	1418	(11.8)	6.24	0.00	4.87	0.00
Active Recreation	181	(3.2)	325	(2.7)	206	(3.1)	256	(2.1)	0.43	0.67	3.08	0.00
Social	175	(3.1)	389	(3.3)	290	(4.3)	566	(4.7)	-3.61	0.00	-5.62	0.00
OVERALL	5674	(100)	11888	(100)	6744	(100)	12067	(100)				

Continued from Table 4.1

c)

Activity Type	Coupled Male (n=32) Count	%	Dur*	%	vs. Family Male (n=76) Count	%	Dur*	%	Count Z value	P value	Duration Z value	P value
Night Sleep	684	(27.2)	1940	(38.9)	1618	(28.5)	4617	(38.8)	-1.19	0.23	0.06	0.95
Household Serving	351	(14.0)	343	(6.9)	1128	(19.9)	1090	(9.2)	-6.41	0.00	-4.88	0.00
Meal/Snack	435	(17.3)	356	(7.1)	803	(14.2)	574	(4.8)	3.69	0.00	5.99	0.00
Work/School	242	(9.6)	1046	(21.0)	536	(9.4)	3025	(25.4)	0.27	0.79	-6.21	0.00
Shopping	35	(1.4)	31	(0.6)	70	(1.2)	77	(0.7)	0.59	0.55	-0.20	0.85
Service	56	(2.2)	52	(1.1)	120	(2.1)	145	(1.2)	0.33	0.74	-0.98	0.33
Leisure	505	(20.1)	779	(15.6)	1043	(18.4)	1647	(13.9)	1.83	0.07	2.97	0.00
Active Recreation	87	(3.5)	162	(3.2)	181	(3.2)	325	(2.7)	0.64	0.52	1.82	0.07
Social	117	(4.7)	280	(5.6)	175	(3.1)	389	(3.3)	3.54	0.00	7.11	0.00
OVERALL	2512	(100)	4989	(100)	5674	(100)	11888	(100)				

d)

Activity Type	Coupled Female (n=32) Count	%	Dur*	%	vs. Family Female (n=76) Count	%*	Dur*	%	Count Z value	P value	Duration Z value	P value
Night Sleep	706	(24.7)	2009	(39.5)	1770	(26.2)	5019	(41.6)	-1.62	0.11	-2.49	0.01
Household Serving	596	(20.8)	562	(11.1)	1926	(28.6)	1852	(15.4)	-8.24	0.00	-7.80	0.00
Meal/Snack	456	(15.9)	320	(6.3)	883	(13.1)	679	(5.6)	3.56	0.00	1.68	0.09
Work/School	234	(8.2)	897	(17.7)	454	(6.7)	1935	(16.0)	2.35	0.02	2.27	0.02
Shopping	62	(2.2)	59	(1.2)	112	(1.7)	157	(1.3)	1.61	0.11	-0.76	0.44
Service	74	(2.6)	85	(1.7)	144	(2.1)	185	(1.5)	1.27	0.21	0.58	0.57
Leisure	486	(17.0)	709	(13.9)	959	(14.2)	1418	(11.8)	3.37	0.00	3.89	0.00
Active Recreation	101	(3.5)	138	(2.7)	206	(3.1)	256	(2.1)	1.11	0.27	2.25	0.02
Social	146	(5.1)	301	(5.9)	290	(4.3)	566	(4.7)	1.67	0.09	3.23	0.00
OVERALL	2861	(100)	5079	(100)	6744	(100)	12067	(100)				

Note: *Dur means duration in hours

4.2.2 Exploring Paired Differences in Observed Activity Duration

The histograms in figure 4.1 and figure 4.2 illustrate paired differences in the duration of key activities between coupled males and females with and without dependents, respectively. These graphs are particularly revealing since overall "mean" differences may not reflect the fact that in certain households, such differences may or may not exist. For example, the t-test shows that collectively females are the main contributor toward household serving activities; however, in some households, males do contribute more than their partners as displayed in the histograms.

Given the paired comparisons, this section only focuses on: 1) coupled males versus coupled females; and 2) family males versus family females. The activities that are examined are household serving, work/school, shopping, leisure, and social activities. These activities were chosen because the graphs exhibit interesting differences between males and females which warrant discussion.

The histograms in figures 4.1 a-e illustrate the distribution of differences in activity duration between coupled males versus coupled females for a selection of activity types. For household serving activities, the histogram is skewed to the right indicating that most of the coupled females spend more time compared to coupled males (figure 4.1a). There are a few coupled females who spend extremely longer hours in household serving activities compared to their husbands, and even a few coupled males who spend more time in household serving activities than their wives. Perhaps, these coupled males and coupled females are currently not employed. Furthermore, these coupled females might have the traditional view toward household serving activities, which explains that

coupled females spend longer time in this activity. However, some of these coupled males are contributing more than their wives. This suggests that some coupled males are bridging the gap in household serving activities.

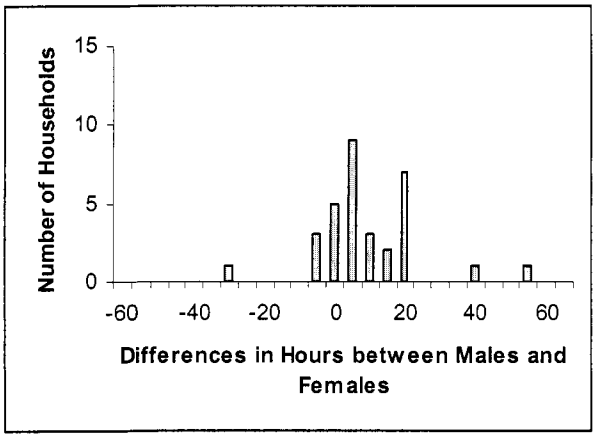
There is a wide variety of differences in duration of work/school activities, as shown in figure 4.1b between coupled males and coupled females. The graph displays a somewhat uniform distribution. Yet, some coupled females spend longer hours in work/school activities just like other coupled males. This shows that work/school activities are performed more equally in some households which are similar to household serving activities. Probable reasons are that both view work as a financial benefit and household serving is slowly being viewed as shared labour.

In table 4.1a, coupled females tended to spend more time in shopping than coupled males. Interestingly, in the histogram (figure 4.1c), it appears that there is a very little difference between coupled males and coupled females in terms of shopping activities. The spread of difference is also very narrow. This means that shopping activities are more evenly split between coupled females and males; however, some coupled females tend to spend longer hours in shopping activities. The graph illustrates that majority of the time shopping activities are share equally.

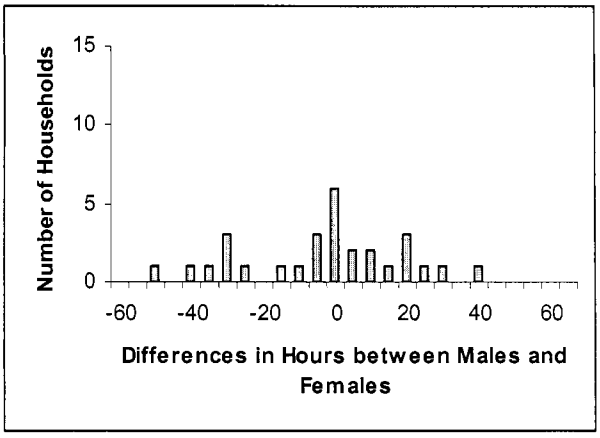
Figure 4.1d illustrates that there are some moderate differences among coupled males and coupled females in leisure activities. In some households, males have more time to spend in leisure activities than their wives and vice versa. This show that leisure time is not evenly distributed in each household, as the median is not high like shopping activities.

Figure 4. 1 Distribution of Differences between Coupled Males and Females in Activities Duration (Hours), by Select Activity Types

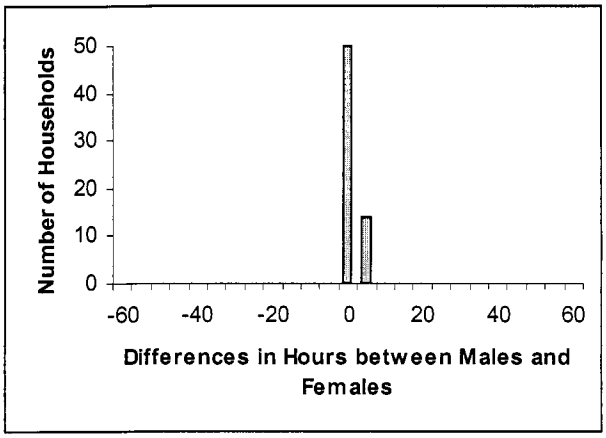
a) Duration in Household Serving Activities



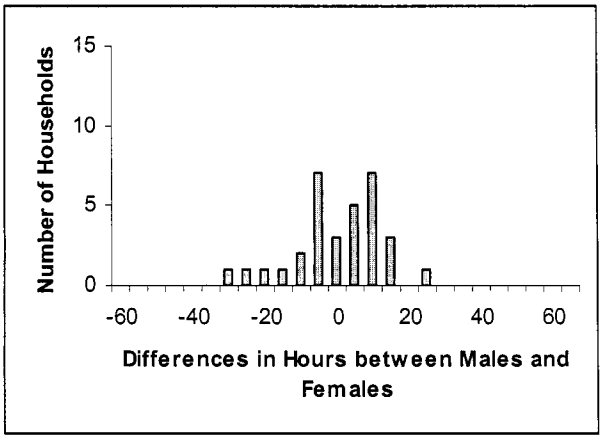
b) Duration in Work/School Activities



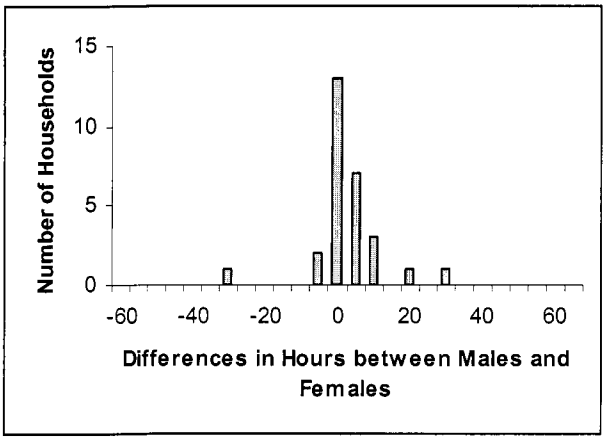
c) Duration in Shopping Activities



d) Duration in Leisure Activities



e) Duration in Social Activities



* Calculation is female minus male duration of activities across the whole week. A positive number would indicate that female performs more hours of certain activity than her partner does and vice versa.

Evidently, by viewing figure 4.1e, the graph seems to be skewed to the right, where some coupled females socialize longer than their husbands. Note that there are a few outliers in coupled males and coupled females. This reveals that each household is unique.

The same examination of the distribution of differences in activity duration was performed between family males versus family females as shown in figures 4.2 a-e. Wide differences in the duration of household serving (figure 4.2a) and work/school activities (figure 4.2b) exist. Figures 4.2 a-b are similar to figures 4.1 a-b, where some males and females spend more time in household serving and work/school activities, respectively. For example, a coupled male exceeded about 25-35 hours of household serving and work/school activities more than his partner (figure 4.1a and figure 4.2a).

The range of differences in household serving activities in figure 4.2a is more prominent than figure 4.1a. The tight distribution shows that family males are starting to pull their weight more around the household when their children are involved than coupled males without children. Family males are contributing more possibly due to their transition from coupled males to family males. The graphs displayed a few females exceeded about 40-60 hours of household serving activities than their partners (figure 4.1a and figure 4.2a). Possible reason could be that there are more dependents in the house, which increase the hours of household serving activities. The other reason could be cultural differences in viewing who is responsible for household serving activities.

In figure 4.2b, some family males and family females increased their time in work/school activities even more than coupled household did (figure 4.1b). Evidently,

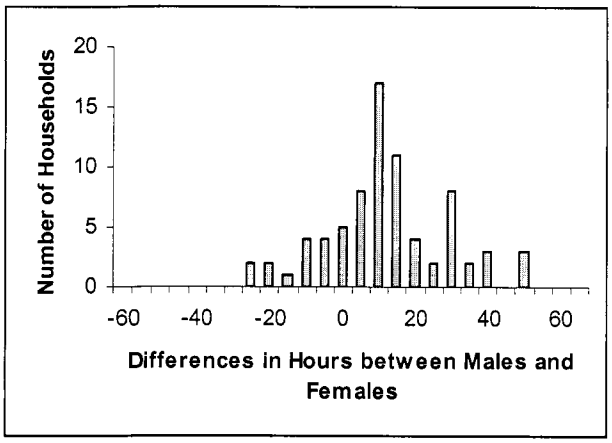
the graph is skewed more to the left because most family males spend significantly more time in work/school activities than family females. This means that even though females are working, males work longer hours than females – in other words, males are still the breadwinner in most households. Not withstanding this general trend, a few family females spend more time in work/school activities than family males. These few family females might be career females in their work field or study long hours at school. These females might spend less hours in household serving activities, but spend more time in work/school activities.

The duration of shopping activities among family household is shown in figure 4.2c and display small differences between family females and family males. This distribution is somewhat similar to figure 4.1c, where females tend to shop for longer periods compared to males. However, there are more family males assisting in shopping activities more than coupled males. This could be because these family males prefer or need to assist their partners more in shopping activities than other family males. These family males might be the "accepters" in the family households due to children involvement; as a result, they help around the house.

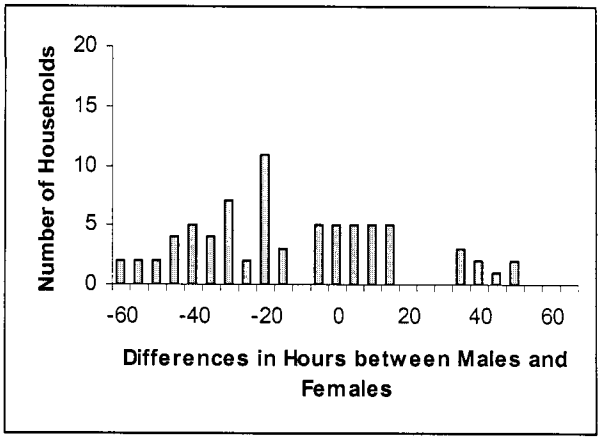
Moderate differences in the duration of leisure and social activities exist in family households (figure 4.2d and figure 4.2e). Both figures display a more even distribution in duration of leisure and social activities. However, there are outliers, as in the case where one male spent significantly more time in leisure activities than his partner. As for figure 4.2e, a moderate difference in social activities is displayed and the distribution is similar to figure 4.1e. However, a few family females are extremely far to the right of the graph indicating that they spend more time in social activities than their partners do.

Figure 4. 2 Distribution of Differences between Family Males and Females in Activities Duration (Hours), by Select Activity Types

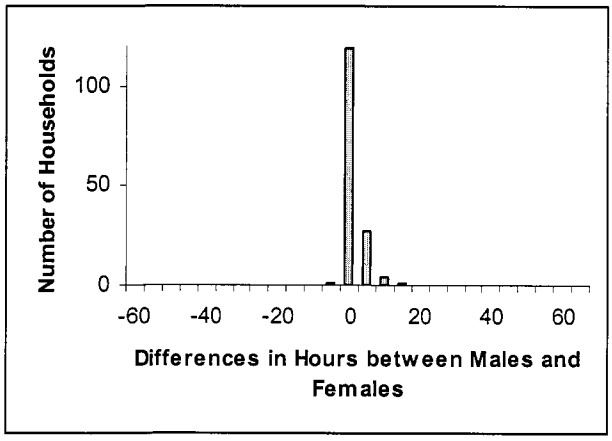
a) Duration in Household Serving Activities



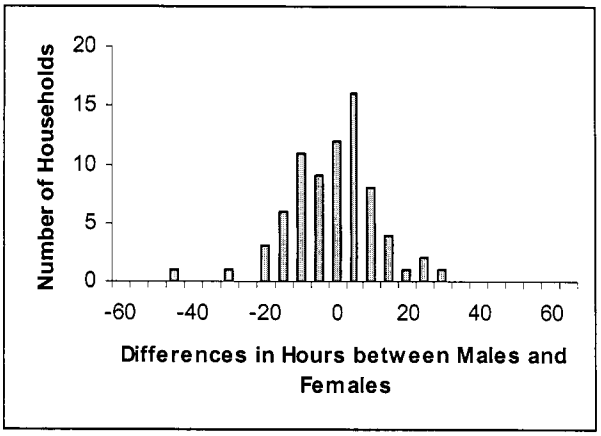
b) Duration in Work/School Activities



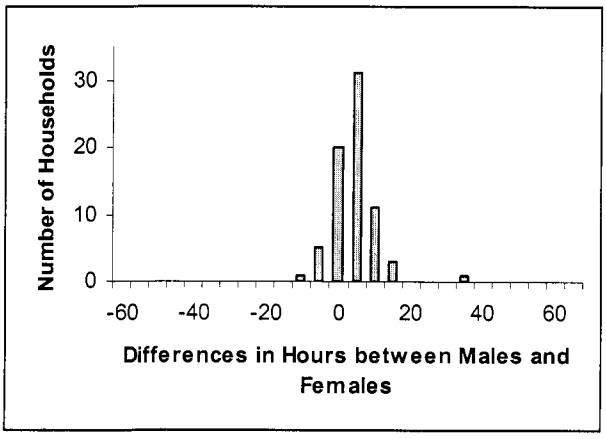
c) Duration in Shopping Activities



d) Duration in Leisure Activities



e) Duration in Social Activities



* Calculation is female minus male duration of activities across the whole week. A positive number would indicate that female performs more hours of certain activity than her partner does and vice versa.

Looking more closely, these histograms show a different view of activity type in certain households. These histograms reveal more in-depth knowledge of each male and female in their own households. In general, past researchers' findings found that females are responsible more for certain activities. Overall, these histograms illustrated that many different arrangements of responsibility exist in different households. This leads to the question of whether males and females are very different in terms of their activity type.

4.2.3 Summary

Generally, females perform more household serving activities relative to males, and males work more relative to females. However, the opposite can be true in that some males assist around the house more and some females work more hours than their partners. Past researchers indicate that there are differences between males and females in certain activity types. On the contrary, the day-to-day data reveals that there are often minimal differences between males and females. Both males and females are working together in their own households.

The distribution graphs have shown results in terms of some males in certain household types carried on longer household serving activities than their wives. In addition, some females in certain household types carried out longer work/school activities than their husbands. Note that shopping activities for the most part, seemed to be evenly distributed among females and males except few females and males in either coupled or family household types.

This section focused on observed activity type. The next few sections focus on flexibility of activities and the underlying scheduling process.

4.3 Analysis of Spatial and Temporal Flexibility of Activities

4.3.1 Spatial and Temporal Flexibility

This section explores the average spatial and temporal flexibility of activities by household type and activity type. Past researchers have speculated about males and females' flexibility of activities; however, quantifiable measures of the level of flexibility in activity was not collected. Males and females' flexibility of activities likely affect how they are planned and executed, and may also help explain differences in observed activity patterns examined in the previous section

Tables 4.2 a-d illustrates the average spatial and temporal flexibility of activities reported by subjects by household type and activity type. The males and females show no significant differences in flexibility, except one – there are significant differences between family females and family males in average temporal flexibility of household serving activities. Family females have more temporal flexible in household serving activities than family males. However, this does suggest that family females either need to be more flexible in their household serving activities or perhaps that the women are easier to juggle around.

Note that the participants input a value for these indicators. The methods of collecting these flexibility of activities is still quite experimental (see Doherty, 2003) and therefore the differences between males and females may be an artefact of this. Future research should investigate further into the instrument's methodology to better enhance the collecting date of the flexibility of activities.

Table 4. 2 Gender Differences in Mean Spatial and Temporal Flexibilities Ratings by Household Type and Activity Type

a)

Flexibility/Activity Type	Coupled Male	Coupled Female	Z*	P value
Average Spatial Flexibility				
Night Sleep	1.07	1.14	-1.60	0.11
Household Serving	1.41	1.43	-0.24	0.81
Meal/Snack	1.78	1.80	-0.19	0.85
Work/School	2.07	1.80	-0.77	0.44
Shopping	2.18	3.29	-0.45	0.66
Service	1.63	1.95	-1.63	0.10
Leisure	1.04	1.06	-0.41	0.69
Active Recreation	2.06	1.83	-0.26	0.79
Social	2.71	3.28	-1.37	0.17
OVERALL FLEXIBILITY	1.49	1.52	-0.31	0.75
Average Temporal Flexibility				
Night Sleep	0.86	0.90	-0.19	0.85
Household Serving	0.77	0.75	-0.06	0.96
Meal/Snack	0.90	0.94	-1.00	0.32
Work/School	0.45	0.62	n/a	n/a
Shopping	0.76	0.88	-1.41	0.16
Service	0.45	0.64	-0.82	0.41
Leisure	0.60	0.60	-0.45	0.65
Active Recreation	0.42	0.37	-0.71	0.48
Social	0.80	0.92	-1.63	0.10
OVERALL FLEXIBILITY	0.73	0.78	-1.72	0.09

b)

Flexibility/Activity Type	Family Male	Family Female	Z*	P value
Average Spatial Flexibility				
Night Sleep	1.09	1.08	-0.68	0.50
Household Serving	1.48	1.46	-0.13	0.90
Meal/Snack	1.55	1.39	-0.75	0.46
Work/School	2.15	1.48	-1.90	0.06
Shopping	2.44	2.69	-1.22	0.22
Service	1.55	1.35	-0.30	0.76
Leisure	1.08	1.11	-0.38	0.70
Active Recreation	2.11	1.98	-0.23	0.82
Social	2.73	2.94	-0.03	0.97
OVERALL FLEXIBILITY	1.45	1.38	-1.30	0.20
Average Temporal Flexibility				
Night Sleep	0.90	0.88	-1.63	0.10
Household Serving	0.64	0.72	-2.26	0.02**
Meal/Snack	0.93	0.97	-1.13	0.26
Work/School	0.48	0.41	-0.38	0.71
Shopping	0.74	0.86	-1.00	0.32
Service	0.40	0.34	n/a	n/a
Leisure	0.56	0.59	-0.80	0.42
Active Recreation	0.38	0.51	-1.27	0.21
Social	0.50	0.80	-1.60	0.11
OVERALL FLEXIBILITY	0.72	0.73	-1.09	0.28

Notes: *Tests for statistical difference between two means

**Difference in statistical significant at the 0.05 level using Wilcoxon Test

Continued from Table 4.2

c)

Flexibility/Activity Type	Coupled Family Male	Family Male	Z*	P value
Average Spatial Flexibility				
Night Sleep	1.07	1.09	-0.68	0.50
Household Serving	1.41	1.48	-0.90	0.37
Meal/Snack	1.78	1.55	-1.45	0.15
Work/School	2.07	2.15	-0.53	0.60
Shopping	2.18	2.44	-1.00	0.32
Service	1.63	1.55	n/a	n/a
Leisure	1.04	1.08	-0.94	0.35
Active Recreation	2.06	2.11	-1.92	0.06
Social	2.71	2.73	-0.21	0.83
OVERALL FLEXIBILITY	1.49	1.45	n/a	n/a
Average Temporal Flexibility				
Night Sleep	0.86	0.90	-0.47	0.64
Household Serving	0.77	0.64	-0.09	0.93
Meal/Snack	0.90	0.93	n/a	n/a
Work/School	0.45	0.48	-1.73	0.08
Shopping	0.76	0.74	-0.58	0.56
Service	0.45	0.40	-0.58	0.56
Leisure	0.60	0.56	-1.16	0.25
Active Recreation	0.42	0.38	-0.45	0.66
Social	0.80	0.50	-0.45	0.66
OVERALL FLEXIBILITY	0.73	0.72	n/a	n/a

d)

Flexibility/Activity Type	Coupled Female	Family Female	Z*	P value
Average Spatial Flexibility				
Night Sleep	1.14	1.08	-0.42	0.68
Household Serving	1.43	1.46	-0.24	0.81
Meal/Snack	1.80	1.39	-1.31	0.19
Work/School	1.80	1.48	-1.19	0.24
Shopping	3.29	2.69	-0.74	0.46
Service	1.95	1.35	-1.63	0.10
Leisure	1.06	1.11	-0.70	0.48
Active Recreation	1.83	1.98	-0.41	0.68
Social	3.28	2.94	-0.20	0.84
OVERALL FLEXIBILITY	1.52	1.38	n/a	n/a
Average Temporal Flexibility				
Night Sleep	0.90	0.88	-1.15	0.25
Household Serving	0.75	0.72	-0.82	0.41
Meal/Snack	0.94	0.97	-1.41	0.16
Work/School	0.62	0.41	-1.34	0.18
Shopping	0.88	0.86	-0.82	0.41
Service	0.64	0.34	-0.58	0.56
Leisure	0.60	0.59	-1.22	0.22
Active Recreation	0.37	0.51	-0.30	0.76
Social	0.92	0.80	-0.82	0.41
OVERALL FLEXIBILITY	0.78	0.73	n/a	n/a

Notes: *Tests for statistical difference between two means

**Difference in statistical significant at the 0.05 level using Wilcoxon Test

4.4 Planning Time Horizon

In general, both males and females (with and without children) pre-planned (same day, days before and weeks before) about 70% of their overall activities, with the remainder planned impulsively. No significant differences by household type existed in these overall proportions. Table 4.3 to table 4.6 provide a more detailed examination of the frequency of activities by planning time horizon and activity type for different household type.

4.4.1 Planning Time Horizons for Coupled Males versus Coupled Females

An examination of the frequency of activities by planning time horizon and activity type, for coupled males versus coupled females is shown in table 4.3. Coupled males and females have high percentages of activities that were planned impulsively. For example in table 4.3a, coupled males impulsively plan 3 times more in shopping (34.3%) and 1.5 times more in social activities (41.0%) compared to coupled females (11.3% and 27.4%, respectively).

There are no significant differences between coupled males and females in table 4.3b (same day planning) and table 4.3c (days before planning) for the three main activities (household serving, work/school, and shopping). More importantly (and surprisingly), notice that there is little significant differences in planning between coupled males and coupled females, even when examined by activity type. In table 4.3d, coupled males plan 1.6 times more of their work/school activities weeks in advance (31.8%) compared to coupled females (20.1%). As for coupled females, they plan their service activities weeks in advance 3.6 times more often than coupled males.

4.4.2 Planning Time Horizons in Family Males versus Family Females

The same analysis of planning time horizon was performed between family males versus family females in table 4.4. Family females impulsively and advance plan household activities more often (1.1 times, 1.2 times respectively) than family males. Another example would be that family males planned work/school activities 1.3 times more in days before than family females. As for the other activities, family females impulsively plan 1.1 times more in leisure activities and advance plan 1.4 times more in active recreation activities than family males. Thus, so far, these findings do not support the notion that females schedule their day-to-day activities significantly differently than males.

4.4.3 Planning Time Horizons in Coupled Males versus Family Males

An analysis of the frequency and duration of activities by planning horizons and activity type, for coupled males versus family males is shown in table 4.5. In table 4.5 a-d, there are many significant differences. Coupled males have 1.2 times and 1.1 times more days before planning in household serving and work/school activities than family males. Yet, family males have 1.55 times and 1.2 times more advance plan in household serving and work/school activities than coupled males. Most of the significant differences are less than 1.5 times, except in service activities (table 4.5d). A possible reason could be that family males need to plan service activities in advance (2.8 times more) as their family schedules are hectic and some service activities need to be booked in advance, however, some females do the same. Both household types seemed to have similar scheduling of activities.

Table 4. 3 Activity Frequency by Activity Type and Planning Time Horizon, Coupled Males and Coupled Females

a)

Impulse Planning Horizon

	Coupled M. vs. Coupled F.				Count		Coupled M. vs. Coupled F.				Count	
Activity Type	**Count**	**%***	**Count**	**%***	**Z value**	**P value**	**Count**	**%***	**Count**	**%***	**Z value**	**P value**
Night Sleep	143	(20.9)	194	(27.5)	-2.87	0.00	83	(12.1)	71	(10.1)	1.23	0.22
Household Serving	129	(36.8)	234	(39.3)	-0.77	0.44	108	(30.8)	162	(27.2)	1.17	0.24
Meal/Snack	130	(29.9)	163	(35.7)	-1.87	0.06	123	(28.3)	101	(22.1)	2.11	0.04
Work/School	36	(14.9)	21	(9.0)	2.00	0.05	52	(21.5)	64	(27.4)	-1.49	0.14
Shopping	12	(34.3)	7	(11.3)	2.56	0.01	17	(48.6)	42	(67.7)	-1.86	0.06
Service	14	(25.0)	9	(12.2)	1.85	0.06	23	(41.1)	23	(31.1)	1.18	0.24
Leisure	237	(46.9)	215	(44.2)	0.85	0.40	122	(24.2)	116	(23.9)	0.11	0.92
Active Recreation	17	(19.5)	28	(27.7)	-1.33	0.18	21	(24.1)	21	(20.8)	0.55	0.58
Social	48	(41.0)	40	(27.4)	2.33	0.02	33	(28.2)	41	(28.1)	0.02	0.98
OVERALL	766	(30.5)	911	(31.8)	-1.07	0.29	582	(23.2)	641	(22.4)	0.67	0.51

b)

Same Day Planning Horizon

c)

Days Before Planning Horizon

	Coupled M. vs. Coupled F.				Count		Coupled M. vs. Coupled F.				Count	
Activity Type	**Count**	**%**	**Count**	**%**	**Z value**	**P value**	**Count**	**%**	**Count**	**%**	**Z value**	**P value**
Night Sleep	84	(12.3)	143	(20.3)	-4.06	0.00	246	(36.0)	186	(26.3)	3.89	0.00
Household Serving	49	(14.0)	90	(15.1)	-0.48	0.63	40	(11.4)	77	(12.9)	-0.70	0.49
Meal/Snack	40	(9.2)	67	(14.7)	-2.54	0.01	86	(19.8)	80	(17.5)	0.85	0.39
Work/School	56	(23.1)	62	(26.5)	-0.85	0.40	77	(31.8)	47	(20.1)	2.95	0.00
Shopping	5	(14.3)	13	(21.0)	-0.85	0.40	1	(2.9)	0	(0.0)	1.01	0.31
Service	13	(23.2)	20	(27.0)	-0.50	0.62	4	(7.1)	19	(25.7)	-3.02	0.00
Leisure	40	(7.0)	33	(6.8)	0.68	0.50	53	(10.5)	75	(15.4)	-2.32	0.02
Active Recreation	26	(29.9)	21	(20.8)	1.43	0.15	22	(25.3)	23	(22.8)	0.40	0.69
Social	21	(17.9)	35	(24.0)	-1.20	0.23	9	(7.7)	22	(15.1)	-1.92	0.06
OVERALL	334	(13.3)	484	(16.9)	-3.71	0.00	538	(21.4)	529	(18.5)	2.68	0.01

d)

Week/Month/Year Planning Horizon

Table 4. 4 Activity Frequency by Activity Type and Planning Time Horizon, Family Males and Family Females

a)

Impulse Planning Horizon

	Family M. vs. Family F.				Count	
Activity Type	**Count**	**%***	**Count**	**%***	**Z value**	**P value**
Night Sleep	345	(21.3)	363	(20.5)	0.58	0.56
Household Serving	392	(34.8)	603	(31.3)	1.95	0.05
Meal/Snack	261	(32.5)	303	(34.3)	-0.79	0.43
Work/School	58	(10.8)	58	(12.8)	-0.95	0.34
Shopping	28	(40.0)	42	(37.5)	0.34	0.74
Service	22	(18.3)	27	(18.8)	-0.09	0.93
Leisure	452	(43.3)	458	(47.8)	-1.99	0.05
Active Recreation	52	(28.7)	52	(25.2)	0.77	0.44
Social	64	(36.6)	109	(37.6)	-0.22	0.83
OVERALL	1674	(29.5)	2015	(29.9)	-0.46	0.65

b)

Same Day Planning Horizon

	Family M. vs. Family F.				Count	
Activity Type	**Count**	**%***	**Count**	**%***	**Z value**	**P value**
Night Sleep	113	(7.0)	136	(7.7)	-0.78	0.44
Household Serving	221	(19.6)	331	(17.2)	1.65	0.10
Meal/Snack	109	(13.6)	140	(15.9)	-1.32	0.19
Work/School	45	(8.4)	55	(12.1)	-1.91	0.06
Shopping	26	(37.1)	39	(34.8)	0.32	0.75
Service	20	(16.7)	26	(18.1)	-0.30	0.77
Leisure	140	(13.4)	135	(14.1)	-0.42	0.67
Active Recreation	37	(20.4)	47	(22.8)	-0.57	0.57
Social	39	(22.3)	64	(22.1)	0.05	0.96
OVERALL	750	(13.2)	973	(14.4)	-1.95	0.05

c)

Days Before Planning Horizon

	Family M. vs. Family F.				Count	
Activity Type	**Count**	**%**	**Count**	**%**	**Z value**	**P value**
Night Sleep	162	(10.0)	185	(10.5)	-0.42	0.67
Household Serving	131	(11.6)	195	(10.1)	1.27	0.21
Meal/Snack	71	(8.8)	67	(7.6)	0.94	0.35
Work/School	109	(20.3)	69	(15.2)	2.12	0.03
Shopping	12	(17.1)	18	(16.1)	0.19	0.85
Service	30	(25.0)	43	(29.9)	-0.89	0.38
Leisure	100	(9.6)	85	(8.9)	0.56	0.58
Active Recreation	29	(16.0)	25	(21.1)	1.09	0.27
Social	37	(21.1)	65	(22.4)	-0.32	0.75
OVERALL	681	(12.0)	752	(11.2)	1.48	0.14

d)

Week/Month/Year Planning Horizon

	Family M. vs. Family F.				Count	
Activity Type	**Count**	**%**	**Count**	**%**	**Z value**	**P value**
Night Sleep	517	(32.0)	604	(34.1)	-1.34	0.18
Household Serving	200	(17.7)	402	(20.9)	-2.14	0.03
Meal/Snack	144	(17.9)	180	(20.4)	-1.28	0.20
Work/School	211	(39.4)	185	(40.7)	-0.44	0.66
Shopping	1	(1.4)	5	(4.5)	-1.26	0.21
Service	24	(20.0)	34	(23.6)	-0.71	0.48
Leisure	122	(11.7)	97	(10.1)	1.14	0.26
Active Recreation	37	(20.4)	60	(29.1)	-1.99	0.05
Social	24	(13.7)	32	(11.0)	0.84	0.40
OVERALL	1280	(22.6)	1599	(23.7)	-1.52	0.13

Table 4. 5 Activity Frequency by Activity Type and Planning Time Horizon, Coupled Males and Family Males

a)

Impulse Planning Horizon

Activity Type	Coupled M. vs. Family M. Count	%	Count	%	Z value	P value
Night Sleep	143	(20.9)	345	(21.3)	-0.22	0.82
Household Serving	129	(36.8)	392	(34.8)	0.68	0.50
Meal/Snack	130	(29.9)	261	(32.5)	-0.95	0.34
Work/School	36	(14.9)	58	(10.8)	1.53	0.13
Shopping	12	(34.3)	28	(40.0)	-0.58	0.57
Service	14	(25.0)	22	(18.3)	0.98	0.33
Leisure	237	(46.9)	452	(43.3)	1.33	0.18
Active Recreation	17	(19.5)	52	(28.7)	-1.70	0.09
Social	48	(41.0)	64	(36.6)	0.76	0.44
OVERALL	766	(30.5)	1674	(29.5)	0.90	0.37

b)

Same Day Planning Horizon

Activity Type	Coupled M. vs. Family M. Count	%	Count	%	Z value	P value
Night Sleep	83	(12.1)	113	(7.0)	1.55	0.12
Household Serving	108	(30.8)	221	(19.6)	1.13	0.26
Meal/Snack	123	(28.3)	109	(13.6)	0.21	0.84
Work/School	52	(21.5)	45	(8.4)	0.87	0.38
Shopping	17	(48.6)	26	(37.1)	-0.38	0.70
Service	23	(41.1)	20	(16.7)	-0.26	0.80
Leisure	122	(24.2)	140	(13.4)	-1.11	0.27
Active Recreation	21	(24.1)	37	(20.4)	2.47	0.01
Social	33	(28.2)	39	(22.3)	-0.68	0.50
OVERALL	582	(23.2)	750	(13.2)	10.43	0.00

c)

Days Before Planning Horizon

Activity Type	Coupled M. vs. Family M. Count	%	Count	%	Z value	P value
Night Sleep	84	(12.3)	162	(10.0)	3.68	0.00
Household Serving	49	(14.0)	131	(11.6)	4.09	0.00
Meal/Snack	40	(9.2)	71	(8.8)	5.94	0.00
Work/School	56	(23.1)	109	(20.3)	4.52	0.00
Shopping	5	(14.3)	12	(17.1)	1.12	0.26
Service	13	(23.2)	30	(25.0)	3.30	0.00
Leisure	40	(7.0)	100	(9.6)	4.93	0.00
Active Recreation	26	(29.9)	29	(16.0)	0.67	0.50
Social	21	(17.9)	37	(21.1)	1.13	0.26
OVERALL	334	(13.3)	681	(12.0)	1.61	0.11

d)

Week/Month/Year Planning Horizon

Activity Type	Coupled M. vs. Family M. Count	%	Count	%	Z value	P value
Night Sleep	246	(36.0)	517	(32.0)	1.85	0.07
Household Serving	40	(11.4)	200	(17.7)	-3.10	0.00
Meal/Snack	86	(19.8)	144	(17.9)	0.78	0.43
Work/School	77	(31.8)	211	(39.4)	-2.06	0.04
Shopping	1	(2.9)	1	(1.4)	0.45	0.65
Service	4	(7.1)	24	(20.0)	-2.56	0.01
Leisure	53	(10.5)	122	(11.7)	-0.71	0.48
Active Recreation	22	(25.3)	37	(20.4)	0.87	0.38
Social	9	(7.7)	24	(13.7)	-1.68	0.09
OVERALL	538	(21.4)	1280	(22.6)	-1.15	0.25

4.4.4 Planning Time Horizons in Coupled Females versus Family Females

An examination of the frequency and duration of activities by planning horizons and activity type, for coupled females versus family females is shown in table 4.6. In table 4.6a (impulse planning), family females impulsively plan 3.3 times more shopping activities (37.5%) and 1.3 times more social activities (37.6%) than coupled females (11.3%, 27.4% respectively). Reasons could be that family females might forget or need to buy something at a store that is important to the family needs. Other reasons could be that family females might need to take their children shopping or to the mall. Possible reason for family females to schedule their social activities impulsively is that family females need to be ready for any changes.

It appears that coupled and family females are somewhat different from each other in terms of planning time horizon for work/school activities. In table 4.6 b-c, coupled females appear to plan work/school activities on the same day (2.3 times) or days before (1.7 times) for more often than family females. However, family females plan work/school weeks 2 times more in advance than coupled females (table 4.6d). Perhaps, this means that family females plan weeks in advance because they have dependents and need to schedule their activities accordingly. Interestingly, family females have 4.5 times more advance planning in shopping activities than coupled females. Coupled females did not have any advance planning in shopping activities. Coupled females have 1.3 times days before planning in shopping activities than family females. Note that there are more significant differences between coupled and family females than between males and females.

Table 4. 6 Activity Frequency by Activity Type and Planning Time Horizon, Coupled Females and Family Females

a)

Impulse Planning Horizon

Activity Type	Coupled F. vs. Family F. Count	%	Count	%	Z value	P value
Night Sleep	194	(27.5)	363	(20.5)	3.60	0.00
Household Serving	234	(39.3)	603	(31.3)	3.52	0.00
Meal/Snack	163	(35.7)	303	(34.3)	0.52	0.60
Work/School	21	(9.0)	58	(12.8)	-1.56	0.12
Shopping	7	(11.3)	42	(37.5)	-4.30	0.00
Service	9	(12.2)	27	(18.8)	-1.32	0.19
Leisure	215	(44.2)	458	(47.8)	-1.72	0.20
Active Recreation	28	(27.7)	52	(25.2)	0.46	0.65
Social	40	(27.4)	109	(37.6)	-2.19	0.03
OVERALL	911	(31.8)	2015	(29.9)	1.90	0.06

b)

Same Day Planning Horizon

Activity Type	Coupled F. vs. Family F. Count	%	Count	%	Z value	P value
Night Sleep	71	(10.1)	136	(7.7)	5.84	0.00
Household Serving	162	(27.2)	331	(17.2)	3.07	0.00
Meal/Snack	101	(22.1)	140	(15.9)	3.77	0.00
Work/School	64	(27.4)	55	(12.1)	3.38	0.00
Shopping	42	(67.7)	39	(34.8)	0.79	0.43
Service	23	(31.1)	26	(18.1)	-0.44	0.66
Leisure	116	(23.9)	135	(14.1)	-1.42	0.16
Active Recreation	21	(20.8)	47	(22.8)	1.87	0.06
Social	41	(28.1)	64	(22.1)	0.36	0.72
OVERALL	641	(22.4)	973	(14.4)	8.97	0.00

c)

Days Before Planning Horizon

Activity Type	Coupled F. vs. Family F. Count	%	Count	%	Z value	P value
Night Sleep	143	(20.3)	185	(10.5)	1.83	0.07
Household Serving	90	(15.1)	195	(10.1)	4.96	0.00
Meal/Snack	67	(14.7)	67	(7.6)	2.74	0.01
Work/School	62	(26.5)	69	(15.2)	4.63	0.00
Shopping	13	(21.0)	18	(16.1)	4.93	0.00
Service	20	(27.0)	43	(29.9)	2.47	0.01
Leisure	33	(6.8)	85	(8.9)	5.08	0.00
Active Recreation	21	(20.8)	25	(21.1)	-0.23	0.82
Social	35	(24.0)	65	(22.4)	0.08	0.93
OVERALL	484	(16.9)	752	(11.2)	7.22	0.00

d)

Week/Month/Year Planning Horizon

Activity Type	Coupled F. vs. Family F. Count	%	Count	%	Z value	P value
Night Sleep	186	(26.3)	604	(34.1)	-3.88	0.00
Household Serving	77	(12.9)	402	(20.9)	-4.80	0.00
Meal/Snack	80	(17.5)	180	(20.4)	-1.27	0.20
Work/School	47	(20.1)	185	(40.7)	-5.92	0.00
Shopping	0	(0.0)	5	(4.5)	-2.29	0.02
Service	19	(25.7)	34	(23.6)	0.33	0.74
Leisure	75	(15.4)	97	(10.1)	2.79	0.01
Active Recreation	23	(22.8)	60	(29.1)	-1.21	0.23
Social	22	(15.1)	32	(11.0)	1.16	0.25
OVERALL	529	(18.5)	1599	(23.7)	-5.85	0.00

4.4.5 Exploring Paired Differences in Household Serving Activities

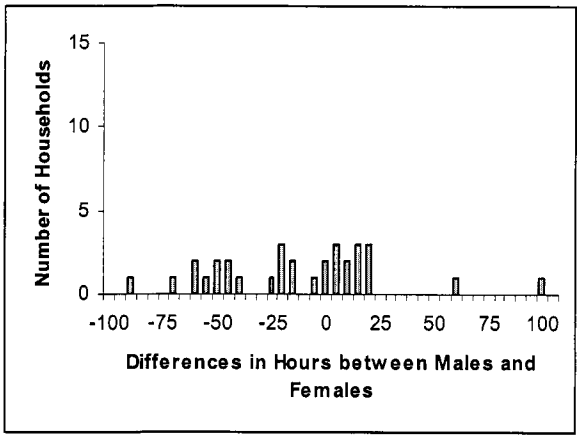
Overviews of the planning time horizons in household serving activities for paired households only (with and without dependents) is depicted in figure 4.3 and figure 4.4. In general, the distribution of planning time horizons graphs are widely, moderately, and narrowly different (figure 4.3 and figure 4.4). All of these histograms were tested using the same procedure from section 4.2.2, except that percentages of duration were used instead of the absolute duration numbers. Household activities were chosen because the graph displayed differences among males and females in different household type. In addition, household serving activities were one of the three activities that were chosen for more in-depth analysis to compare to past researchers. Past researchers have collected many data on stated household serving activities but not the underlying decision process.

An examination of differences in planning time horizon between coupled males versus coupled females for household serving activities is shown in figure 4.3. There is a wide difference in impulse planning between coupled males and coupled females. The graph is skewed to the left towards coupled males including a few outlying coupled females and males who impulsively plan more of their activity time in household serving activities compared to their partners. For household activities planned the same day (figure 4.3b) or weeks/months/years in advance (figure 4.3d), the graph is skewed to the right towards coupled females, with a few outliers. Thus, it appears that in many cases females plan more of their household activities on the same day or very much in advance, whereas males plan them more impulsively, perhaps in reaction to the lead taken by their female spouses. As for activities

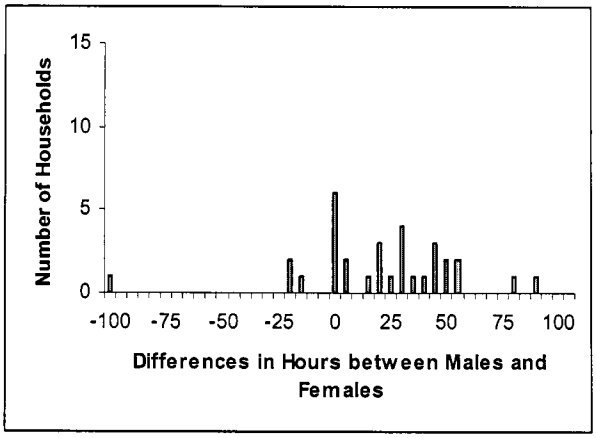
planned in days before the event (figure 4.3c), a more uniform difference is evident with a few outliers. There are, however, some exceptions. For example, some males do take more of a lead on household serving activity planning in their household. Overall it can be seen that a variety of styles exist in the planning of household serving activities.

Figure 4. 3 Distribution of Differences between Coupled Males and Females in Planning Time Horizon, Household Serving Activities

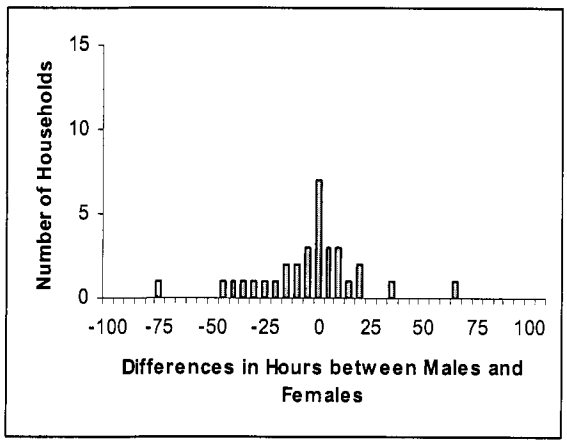
a) Impulse Planning



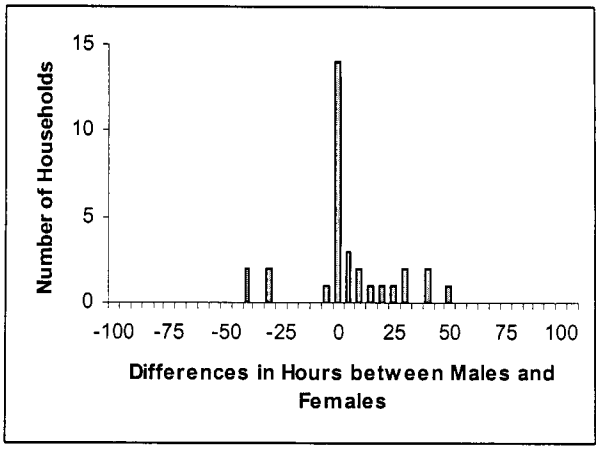
b) Same Day Planning



c) Days Before Planning



d) Weeks/Months Year Planning



* Calculation is female minus male durations in same household types

The same analysis of planning time horizon was performed between family males and family females in household serving activities is shown in figure 4.4. There is a wide difference in impulse, days before, and advance planning between family males and family females (figure 4.4a, figure 4.4c, and figure 4.4d). The graphs display a more uniform difference, where few outliers exist. Some family males impulsively, days before, and advance plan their household serving activities as much as family females.

For household activities planned the same day (figure 4.4b), the graph is skewed to the right towards family females showing that family females planned on the same day more often than their partners, with a few outliers.

Overall, the graphs illustrate that a range of unique differences between a male and a female in the same household exist. Whilst females do tend to take a lead in the amount of and planning of household activities, many males also pull their weight or even take a lead in some of the planning, especially when children are present.

4.4.6 Deletion and Modification of Activities

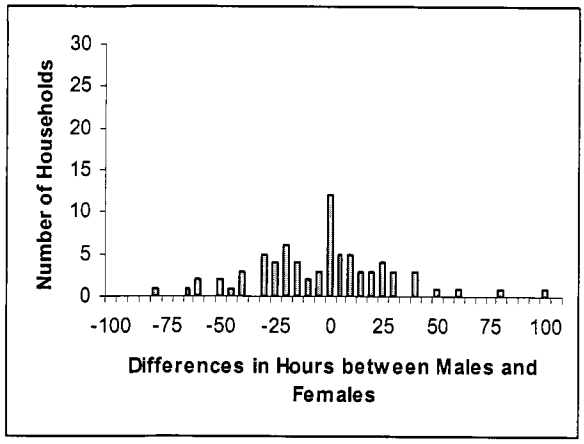
An important component of the activity scheduling process is the modifications and deletions that occur after the planning of activities, due to a range of factors (e.g. traffic jam, weather, family obligations). An analysis of the activity deletion and modification frequency by household and activity type is shown in table 4.7 a-d. Results show that there are some statistically significant differences in the deletion and modification of certain activity types. This suggests that in the aggregate, females and males differ very little in their delete and/or modify frequency of activities. This

represents a departure from previous reports (Mederer, 1993; Le Feuvre, 1994; Daly, 2002) that women re-arrange activities more often to accommodate other activities into their busy schedule.

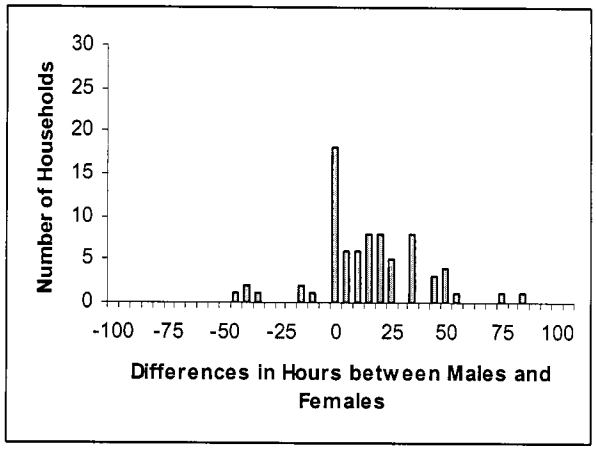
One interesting difference, however, is shown in table 4.7d - coupled females tend to modify work/school more often (31.9%) than family females (19%). In order to obtain the average activities per person from table 4.1d to compare coupled and family females individually – a calculation was performed by dividing the total coupled females into the overall activities and work/school activities (i.e. overall count of activities 2861/32=89.4 counts / coupled female). This methodology is the same for family females, and can be extended to calculate the individual counts for both females (i.e. work/school activities 234/32=7.3 counts / coupled female). The individual average for coupled females overall activities equals 89.4 count compared to 93.7 overall activities count for family females. Note that the average coupled female (7.3) performs work/school activities one more Tim e than the average family female (6.3). The difference is minimal. One might suspect that this is due at least in part to coupled females having more flexibility. However, previous results show that this is not the case. Thus, there is likely some other explanations such as better instrument to capture the flexibility indicators and obtain their reasons as to why they schedule their activities in a certain way.

Figure 4. 4 Distribution of Differences between Family Males and Family Females in Planning Time Horizon, Household Serving Activities

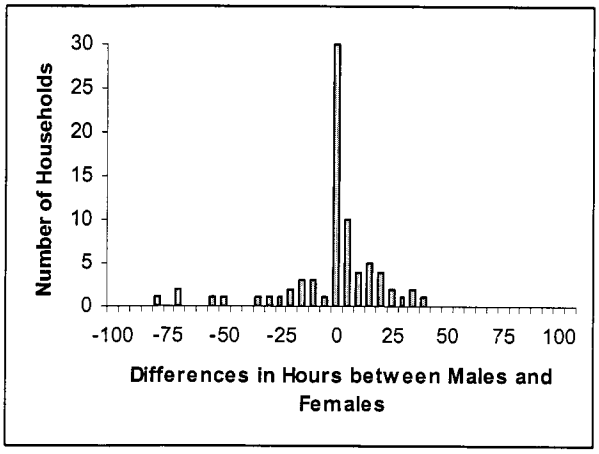
a) Impulse Planning



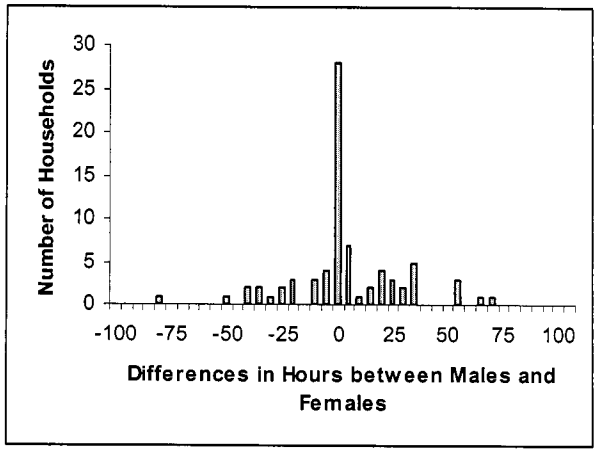
b) Same Day Planning



c) Days Before Planning



d) Weeks/Month/Year Planning



* Calculation is female minus male durations in same household types

Table 4. 7 Activity Deletions and Modification Frequency by Household Type and Activity Type

a) Coupled males versus coupled females

	Deletion				Modification			
	Coupled M. vs. Coupled F.		Count		Coupled M. vs. Coupled F.		Count	
Activity Type	Count %	Count %	Z value	P value	Count %	Count %	Z value	P value
Night Sleep	10 (1.4)	15 (2.1)	-0.91	0.36	62 (8.9)	84 (11.6)	-1.67	0.10
Household Serving	22 (5.8)	19 (3.1)	1.99	0.05	42 (11.1)	80 (12.9)	-0.84	0.40
Meal/Snack	14 (3.1)	18 (3.8)	-0.59	0.56	52 (11.6)	55 (11.7)	-0.06	0.95
Work/School	8 (3.2)	1 (0.4)	2.34	0.04	55 (22.3)	75 (31.9)	-2.39	0.02
Shopping	1 (2.9)	1 (1.6)	0.39	1.00	7 (20.0)	8 (12.7)	0.92	0.36
Service	0 (0.0)	2 (2.6)	-1.43	0.51	8 (14.5)	10 (13.2)	0.23	0.82
Leisure	16 (3.1)	17 (3.4)	-0.29	0.78	59 (11.3)	77 (15.3)	-1.89	0.06
Active Recreation	8 (8.3)	6 (5.6)	0.76	0.45	13 (13.5)	25 (23.4)	-1.83	0.07
Social	2 (1.7)	5 (3.4)	-0.89	0.47	10 (8.5)	25 (16.9)	-2.10	0.04
OVERALL	81 (3.1)	84 (2.9)	0.59	0.55	308 (11.9)	439 (14.9)	-3.31	0.00

b) Family males versus family females

	Deletion				Modification			
	Family M. vs. Family F.		Count		Family M. vs. Family F.		Count	
Activity Type	Count %	Count %	Z value	P value	Count %	Count %	Z value	P value
Night Sleep	17 (1.0)	24 (1.3)	-0.81	0.42	137 (8.4)	145 (8.1)	0.30	0.77
Household Serving	11 (1.0)	72 (3.6)	-5.19	0.00	120 (10.6)	187 (9.4)	1.07	0.29
Meal/Snack	14 (1.7)	16 (1.8)	-0.10	0.92	85 (10.4)	78 (8.7)	1.22	0.22
Work/School	7 (1.3)	8 (1.7)	-0.53	0.60	92 (17.0)	89 (19.0)	-0.80	0.42
Shopping	1 (1.4)	0 (0.0)	1.01	0.39	8 (11.3)	10 (9.0)	0.49	0.63
Service	1 (0.9)	1 (0.7)	0.14	1.00	18 (15.4)	14 (9.8)	1.34	0.18
Leisure	15 (1.4)	17 (1.7)	-0.62	0.54	88 (8.2)	111 (11.4)	-2.39	0.02
Active Recreation	7 (3.8)	4 (1.9)	1.11	0.36	30 (16.4)	43 (20.7)	-1.09	0.28
Social	4 (2.2)	2 (0.7)	1.28	0.21	21 (11.8)	43 (14.9)	-0.98	0.33
OVERALL	77 (1.3)	144 (2.1)	-3.28	0.00	599 (10.4)	720 (10.5)	-0.08	0.94

Continued from Table 4.7

c) Coupled males versus family males

	Deletion				Modification			
	Coupled M. vs. Family M.		Count		Coupled M. vs. Family M.		Count	
Activity Type	Count %*	Count %*	Z value	P value	Count %*	Count %*	Z value	P value
Night Sleep	10 (1.4)	17 (1.0)	0.78	0.43	62 (8.9)	137 (8.4)	0.46	0.65
Household Serving	22 (5.8)	11 (1.0)	3.92	0.00	42 (11.1)	120 (10.6)	0.30	0.77
Meal/Snack	14 (3.1)	14 (1.7)	1.50	0.13	52 (11.6)	85 (10.4)	0.64	0.52
Work/School	8 (3.2)	7 (1.3)	1.58	0.11	55 (22.3)	92 (17.0)	1.69	0.09
Shopping	1 (2.9)	1 (1.4)	0.46	1.00	7 (20.0)	8 (11.3)	1.13	0.26
Service	0 (0.0)	1 (0.9)	-1.00	1.00	8 (14.5)	18 (15.4)	-0.14	0.89
Leisure	16 (3.1)	15 (1.4)	1.99	0.05	59 (11.3)	88 (8.2)	1.89	0.06
Active Recreation	8 (8.3)	7 (3.8)	1.43	0.15	13 (13.5)	30 (16.4)	0.49	0.63
Social	2 (1.7)	4 (2.2)	-0.34	1.00	10 (8.5)	21 (11.8)	-0.94	0.35
OVERALL	81 (3.1)	77 (1.3)	4.77	0.00	308 (11.9)	599 (10.4)	1.94	0.05

d) Coupled females versus family females

	Deletion				Modification			
	Coupled F. vs. Family F.		Count		Coupled F. vs. Family F.		Count	
Activity Type	Count %*	Count %*	Z value	P value	Count %*	Count %*	Z value	P value
Night Sleep	15 (2.1)	24 (1.3)	1.24	0.21	84 (11.6)	145 (8.1)	2.62	0.01
Household Serving	19 (3.1)	72 (3.6)	-0.68	0.50	80 (12.9)	187 (9.4)	2.35	0.02
Meal/Snack	18 (3.8)	16 (1.8)	2.08	0.04	55 (11.7)	78 (8.7)	1.73	0.08
Work/School	1 (0.4)	8 (1.7)	-1.75	0.29	75 (31.9)	89 (19.0)	3.66	0.00
Shopping	1 (1.6)	0 (0.0)	1.01	0.36	8 (12.7)	10 (9.0)	0.74	0.46
Service	2 (2.6)	1 (0.7)	0.98	0.28	10 (13.2)	14 (9.8)	0.73	0.47
Leisure	17 (3.4)	17 (1.7)	1.80	0.07	77 (15.3)	111 (11.4)	2.06	0.04
Active Recreation	6 (5.6)	4 (1.9)	1.52	0.09	25 (23.4)	43 (20.7)	0.54	0.59
Social	5 (3.4)	2 (0.7)	1.72	0.05	25 (16.9)	43 (14.9)	0.53	0.60
OVERALL	84 (2.9)	144 (2.1)	2.16	0.00	439 (14.9)	720 (10.5)	5.90	0.00

4.4.7 Summary

Overall, males and females tend to spread the planning of activities between a variety of time horizons (impulse, same day, days before and weeks before planning) including deletion and modification steps. It is interesting to highlight here that some activity types are pre-planned more often than others in different household types. These findings are important as people assume that females plan more often; however, the results indicate that both males and females pre-plan similarly. This means males and females schedule their activities in a similar way, except for a few males and females in certain households. Generally, males and females, regardless of household types, modify their activities more often than deleting them. This challenges past researchers results indicating that women are the main scheduler in the family.

Table 4.8 illustrate the number of significant differences from table 4.1 to table 4.7 by activity type and household type. Overall, family males and family females tend to have more significant differences between them in the observed results. Note that only family males and family females have a significant difference in average temporal flexibility. As for coupled females and family females, they have the most significant differences in planning horizon.

Table 4. 8 Number of Significant Differences by Household Type from Table 4.1 to Table 4.7

	Observed Results		Flexibility		Planning Horizon					
Household Type	**Count**	**Duration**	**Avg. Spatial**	**Avg. Temporal**	**Impulse**	**Same Days**	**Days Before**	**Advance Planning**	**Del**	**Mod**
Coupled Male vs. Coupled Female	4	5	0	0	4	1	2	4	2	2
Family Male vs. Family Female	6	9	0	1	2	0	1	1	1	1
Coupled Male vs. Family Male	3	5	0	0	0	1	6	3	2	0
Coupled Female vs. Family Female	4	6	0	0	4	4	6	5	2	4

CHAPTER 5 DISCUSSION AND CONCLUSIONS

5.1 Introduction

This thesis examined male and female differences in: 1) observed activity patterns; 2) spatial and temporal flexibility of activities; and 3) the underlying activity decision process in gender and different household types. In order to explore the above differences, data from an activity scheduling survey in the Greater Toronto Area was used, utilizing a new computerized survey method called CHASE. The CHASE software is unique in that it attempts to capture participants' decision process over a one-week period. Some of the results confirmed past researchers' observed results and speculations, whereas some new results surfaced from the activity scheduling process and flexibility of activities. This section discusses hypotheses, main themes, and outlines potential future research needs and opportunities.

5.2 Hypotheses

Three main hypotheses were mentioned in the methodology chapter and were examined throughout the results chapter. All the hypotheses focused on whether there were differences between males and females.

The first hypothesis that women tend to have higher duration of household serving activities compared to men is similar from past studies. Past researchers (Gerson, 1985; Gerstel and Gross, 1987; Coltrane, 1996; Hanson, 1996) indicated that women still continue to carry the majority of domestic workload and child care tasks. The thesis data revealed that women, regardless of household type, engaged in longer duration of household serving activities. Nevertheless, there were few exceptions in certain

households. In some households, one spouse (male or female) can sometimes spend substantially more time in household serving activities, regardless of household type. In other households, the differences were small. The reasons could be that some men and women might still have the traditional view of a housewife or some women might be unemployed, so they stay at home and do most of the household chores. In addition, some men and women might have the egalitarian view where by household chores are shared.

The second hypothesis that males have higher spatial and temporal flexibility of activities than women regardless of household types was found not to hold except in one specific case. There were no significant differences between males and females in average spatial and average temporal flexibility of activities, except temporal flexibility of activities for family males and females in household serving activities. In general, males and females have similar spatial and temporal flexibility of activities.

The third hypothesis that women delete and modify their activities more often than men, regardless of household types. In addition, women pre-plan their schedules. Overall, males and females delete and modify the same. Furthermore, Luxton (1988) indicated that men would not take responsibility for pre-task planning and on-going management tasks. With regards to activity scheduling, this thesis illustrated that on the whole, men and women in different households do not differ all that much in how many activities are planned ahead of time or impulsively. However, when paired differences were examined, a wide variety of scheduling styles were evident, especially with regard to household serving activities. In particular, it appears that more men and women are

sharing the scheduling responsibilities, although in many cases the task of managing the household rests with the women. Whether this task is considered a "burden" or "empowering" is open to interpretation.

5.3 Themes

5.3.1 Gender Differences

Are there any gender differences in observed activities, flexibility of activities, and activity scheduling process? In the past, the primary role of women was the domestic work at home, while men were the 'breadwinners' outside the home and maintained more of the durable maintenance duties around the home. Past researchers (Harvey, 1993; McGuckin and Murakami, 1995; Bernard *et al.*, 1996; Sarmiento, 1996) have noted that the division of labour in the household is gender-biased. The thesis results revealed that household serving, work/school, and shopping activities are *still* gender biased, but not necessarily in *all* households. Females tend to perform more household serving and shopping activities than males. Males tend to perform more work/school activities than females. This is not always the case as the opposite occurs in some households. Note that household serving activities are unpaid work and work/school activities are paid work.

The study found that gender division of labour in household activities is changing from the more feminine task to shared tasks. Males are helping more around the house, but this still appears to be an exception, rather than the norm. While researchers (Harvey, 1993; Hanson, 1996; Coltrane, 2000) found that males assist with the household activities, Hochschild (1989) found otherwise. Hochschild (1989) argues that males'

contribution is insignificant and does not even show any sign of improvement. The results seem to challenge Hochschild's claim that improvement in the balance of housework is not occurring, especially in household with children. The histograms reveal that some males spend a higher percentage of time in housework and other activities than some females.

Surprisingly, there were no significant differences in terms of average spatial and average temporal flexibility of activities among gender in different household types. Perhaps married adults tend to have similar activities where they do things together. This leads to minimal differences in average spatial and average temporal flexibility of activities. One exception was that family females tend to be more temporally flexible in household serving activities than family males, perhaps reflecting the need to juggle the increased number of household serving activities that they do to fit into their busy lives. There might be other factors that we do not know about.

There is the notion that men see their wives as the organizer, controller and/or scheduler of their households agenda (Daly, 2001a), leading women to carry out most of household scheduling. However, Daly captured only overall perceptions of qualitative data, such phenomena via interviews. One might say that it is a burden for women to oversee scheduling, work, and household chores. However, others might say that it is 'empowerment' as this gives the women a sense of control over what is happening in their household, especially with their children. They might not mind being in control of scheduling, since it might be natural for them to take care and oversee everything. On the contrary, women might have to take up the scheduling role as some men do not

like to oversee household chores. The past researchers' results are general information on people's everyday behaviours. This thesis data captured the day-to-day basis of the whole scheduling week.

The data in this thesis illustrated that not only women are the organizer of their households' agenda, but also men. There are some men who would like to organize their households' agenda or share the scheduling responsibilities together with their wives. The results indicated that women and men have similar patterns in scheduling, but that there are some exceptions. It is not exclusively women who perform the management and rescheduling of their family activities. More men and women are sharing the scheduling responsibilities, and some men even spend more time in scheduling their family activities than their partners.

In comparison to previous studies, it needs to be made clear that these results are based on quantitative data on day-to-day activities and scheduling behaviour, rather than generalized attitudes and perceptions garnished from interviews. Taken together, these results suggest that whilst men and women may hold strong differing opinions on who manages the household; this does not necessarily translate into significant differences in day-to-day scheduling behaviour, at least as measured using the current methodology.

5.3.2 Life Cycle

Are there any changes in scheduling from being married with no children to being married with children? The general notion is that married people with children are affected more by how and when scheduling is done than married people without children. However, the data reveals that there are moderate differences.

Of course, family males and females naturally spend more time in household serving activities than coupled males and females. As for work/school, coupled females and males were found to work/study longer hours than family females and males. This suggests that coupled households are more flexible in working/studying longer hours because they have no dependents to take care of on top of their busy schedules.

In addition, there are no significant differences in average spatial flexibility and average temporal flexibility of activities. Perhaps, this is the case because some married couples with or without children might do things with each other; therefore, they have similar average spatial and average temporal flexibility.

Despite these differences, coupled and family households exhibited very similar proportions of impulsive and pre-planned activities. There were also no major differences in the amount of deleting and modifying in their schedules.

5.3.3 Shifts in Our Lives

The notion that females have a "second shift" is still very much evident - working outside the home on the "first shift" and then coming home to a second shift of household activities. However, some males also have "first and second shift" contrary to the supposed normal practice of resting after work. The results indicated that some males work outside the home and assist in the house when they return from work. The "third shift" refers to males and females trying to understand and cope with emotional outcomes from the compressed second shift (Hochschild, 2001).

Hochschild suggested that due to longer workday, males and females feel pressured at home to hyperorganize, to delegate, and to hurry their family time. On the

contrary, this study found that family households do not really do a whole lot more or less scheduling than coupled households. In general, family households might feel that they schedule more of their activities, but on a day-to-day basis, they schedule the same as coupled households. The scheduling results indicated that family and coupled households have similar percentages of frequency in each planning horizon for overall activities. On a day-to-day basis, we all appear to schedule our activities on the similar time horizons. Stress may not affect this trend.

We are all cognitively aware of the activities we would like to get done and things that need to be modified and re-scheduled into our hectic lives. The 'third shift' embodies males' and females' attempt to understand and cope with the emotional outcomes of the second shift – including the scheduling, rescheduling and management of work and home life. Perhaps the second shift is stressful enough that coupled and family households adjust their busy lives. With family households, it could be that parents react to increased household responsibilities and planning by scheduling less of other activities and/or retreating from a busy lifestyle outside the home. Alternatively, for those who do not have busy home lives and children, they may seek out opportunities to schedule and busy themselves. This might explain why scheduling behaviour – as measured in this thesis – does not appear to differ that much between those with and without children. Perhaps at a cognitive level, it is possible that we all seek a similar intensity or perhaps maximum capacity for scheduling in our lives, leading to the similarities found in this study.

5.4 Limitations of the Study

It is important to recognize the limitations of this thesis. Instrument bias might have affected the respondents' input. Scheduling behaviours by respondents might have been biased as the participants realized that they would view their own schedule on screen. This might have lead the participants to change their schedule behaviour. The CHASE program only records what the participants input into the computer. This would have lead to under-reporting, incomplete and/or not accurate data of the participants' daily activities, since some participants do not know how to operate a computer or feel comfortable using one. Some activities might be underreported for reasons such as forgetfulness, private issues and lack of commitment. Consequently, data for a few coupled and family households were not used for analysis because the data were incomplete.

Seasonality would have also affected the data collected. This survey only captured a one-week period of the respondents' daily activities. The spread of the survey period from April 2002 to May 2003 might have influenced activities performed in summer, fall, and winter. Some respondents could have a unique week during the survey, which might affect the results.

In addition, the activity category might be ambiguous as each person categorized the activity differently. This obviously had an effect on the outcome of the results in observed activities, spatial and temporal flexibility of activities and activity scheduling process. Standardization of activity category should be implemented for future use.

As well, the statistical tests used were deemed appropriate; however, other statistical tests could be implemented if needed for further in-depth analysis. For example, use a regression model to predict certain aspects of scheduling behaviour (e.g. planning time horizon) based on a multivariate set of factors including gender.

Furthermore, the uses of secondary data have limitations. The author was not present from the start to engage in interviewing the participants. The author could have asked participants certain questions during the interview and/or have some questions prompted by CHASE. For example, one question could be how they feel about certain activities that are performed. However, depending how the questions were asked, it may lead the participants to answer it differently. This could affect the results.

Due to language barriers and low income, some of the participants were not involved in this study. These barriers made the study biased towards a certain group of people. The involvement of other ethnic groups would perhaps have revealed differences in how activities are scheduled. Perhaps, in the future, multi-lingual interviewers should be hired to attract some minorities into future studies.

5.5 Future Research

In terms of methodology, Personal Digital Assistant (PDA) or cell phone and a Global Positioning System (GPS) could enhance this study. If the participants have a PDA or cell phone with a GPS on the unit, this will reduce the participant's burden of having to recall with accuracy the participants' multi-activities as the GPS enables us to view what the participants have done over the past few days with nodes and routes. In

the future, this will also allow us to analyze the participant's route choice patterns in space using a smaller device than a laptop.

In addition, to capture the participants' initial decision schedule process, a voice recorder would be useful. This gives the programmer confirmation of the route nodes and their actual activities in space during that time, so that the programmer does not have to second-guess the activities that are being performed. The participants' voice recorded information could then be transferred into a word document when they need to reschedule their activities and need to think aloud. Alternatively, the participants could also write down their initial thought process on a note pad and transfer the notes into word document, so that the researcher can analyze the decision process along with the CHASE data to enhance the in-depth analysis decision process further.

Participants' income, age and their origins (ethnicity and race) were not discussed in this thesis. It would be interesting to investigate if there are any differences in scheduling patterns based on these differences. Possibly, these factors might also affect one's scheduling behaviour.

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