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Intrapersonal variability in daily urban travel behavior: Some additional evidence

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Abstract. Researchers have used multiday travel data sets recently to examine day-to-day variability in travel behavior. This work has shown that there is considerable day-to-day variation in individuals' urban travel behavior in terms of such indicators of behavior as trip frequency, trip chaining, departure time from home, and route choice. These previous studies have also shown that there are a number of important implications of the observed day-to-day variability in travel behavior. For example, it has been shown that it may be possible to improve model parameter estimation precision, without increasing the cost of data collection, by drawing a multiday sample (rather than a single day sample) of traveler behavior, if there is considerable day-to-day variability in the phenomenon being modeled.

This paper examines day-to-day variability in urban travel using a three-day travel data set collected recently in Seattle, WA. This research replicates and extends previous work dealing with day-to-day variability in trip-making behavior that was conducted with data collected in Reading, England, in the early 1970s. The present research extends the earlier work by examining day-to-day variations in trip chaining and daily travel time in addition to the variation in trip generation rates. Further, the present paper examines day-to-day variations in travel across the members of two-person households.

This paper finds considerable day-to-day variability in the trip frequency, trip chaining and daily travel time of the sample persons and concludes that, in terms of trip frequency, the level of day-to-day variability is very comparable to that observed previously with a data set collected almost 20 years earlier in Reading, England. The paper also finds that day-to-day variability in daily travel time is similar in magnitude to that in daily trip rates. The analysis shows that the level of day-to-day variability is about the same for home-based and non-home-based trips, thus indicating that day-to-day variability in total trip-making is attributable to variation in both home-based and non-home-based trips. Day-to-day variability in the travel behaviors of members of two-person households was also found to be substantial.

1. Introduction

Analysis and modeling of traveler behavior has historically been based on one-day records of the travel and related behavior of a sample of households or persons in spite of the fact that theoretical discussions recognize the

day-to-day variability inherent in travel behavior. The basic assumption in the conventional approach is that if the behavior reported is for a randomly chosen day (out of some longer time period) then an unbiased sample of behavior (over that time period) is obtained. Further, such one-day travel behavior surveys are commonly conducted in such a way that travel behavior information is obtained for the different weekdays. Since the sampling methods employed generally avoid the situation where the characteristics of households or individuals are correlated with the days of the week, this approach leads to unbiased samples of travel behavior on an average weekday and to unbiased estimates of the parameters in the models estimated with such data.

Recently, however, a number of researchers have begun to examine issues relating to variability in the travel behavior of individuals and households over time. Some of this research has been concerned with developing an improved understanding of travel behavior by examining such dynamic phenomena as adaptation, habit, and lack of symmetry in behavioral response through the collection and analysis of longitudinal data (see, for example, Golob & Meurs 1987; Goodwin 1977; Goodwin et al. 1990; Hensher et al. 1992; Kitamura 1990; and Kitamura & Van der Hoorn 1988). Other researchers have focused on variability in behavior over a series of consecutive days (see, for example, Hanson & Huff 1982, 1988; Huff & Hanson 1986, 1990; Pas 1986, 1987; Pas & Koppelman 1987, and Sundar 1992). This latter research has been made possible by the increasing availability of multiday data sets which contain records of behavior for periods ranging from 2 to 35 consecutive days.

In the context of variability in behavior over a series of consecutive days, an important distinction is drawn between intrapersonal and interpersonal variability (Koppelman & Pas 1984). Intrapersonal variability in behavior refers to variation from day-to-day in the behavior of a given person, while interpersonal variability refers to differences in the behavior of different individuals (on the same or different days). Intrapersonal (day-to-day) variability is either systematic or random, where systematic differences are due to the day-of-the-week. Differences in the behavior of different persons are either systematically related to differences in the characteristics of the individuals, and can thus be explained by incorporating these characteristics in a model, or they are unexplained by such characteristics. The former component is generally referred to as the explained variability while the latter is known as the unexplained variability. The relationships among the various components of variability are shown in Fig. 1.

Previous research (described in the second section of this paper) has found that intrapersonal variability comprises a substantial portion of the total amount of variability in travel behavior and that such intrapersonal variability may have considerable implications for data collection, model estimation and model interpretation. The purpose of this paper is to validate and extend previous

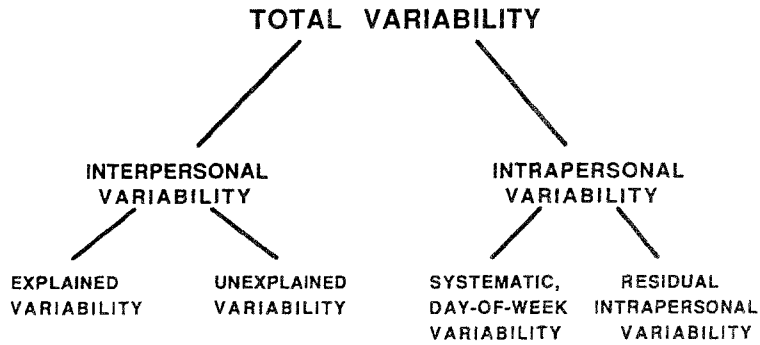

Fig. 1. Components of variability: Basic concepts (After: Pas 1987).

research on intrapersonal variability. The remainder of the paper comprises four sections, organized as follows. The second section provides the reader with background on the subject of intrapersonal variability. We discuss the sources of intrapersonal variability in travel behavior and provide a summary of the previous research on the subject. This discussion also highlights the implications of intrapersonal variability in travel behavior. The third section of the paper describes the purpose and approach of the present study, while the fourth section reports the results of the empirical analysis undertaken using data collected from a sample of residents in Seattle, Washington. Finally, we discuss the empirical results and draw conclusions from our work.

2. Background

It is well recognized that travel is a derived demand that is based on the needs and desires of individuals and households. Differences between people thus lead to differences in their travel behavior, which is the component of variability we referred to above as interpersonal variability. Most travel behavior research in the past has focussed on this component of variability and has tried to explain and model it in terms of the characteristics of individuals and their households. On the other hand, the needs and desires of individuals are not constant from day-to-day. For example, it is generally not necessary to go grocery shopping each day. Thus, we expect that the travel behavior of a given person might vary from day-to-day; this being the component of variability we referred to above as intrapersonal variability.

In an early study dealing with intrapersonal variability, Koppelman & Pas (1984) report on an examination of the issues in estimating linear least-squares regression trip generation models using repeated observations on a set of sampling units. They describe the formulation and estimation of a model that

accounts for the correlations among the observations inherent in such data. The model they describe is a special case of the general class of models that combine cross-sectional and longitudinal data and it can be estimated using generalized least-squares. The authors show that this model yields the same estimation results as one estimated using ordinary least-squares on the average number of trips made by each sample person over the period of interest. The analysis also shows that if one uses the multiday data (repeated observations) without accounting for the crossed-error structure (that is, one estimates the model using ordinary least-squares regression), then one obtains the same parameter estimates as in the above two cases; however, in the latter case one obtains estimates of the standard errors that are downward-biased. That is, by ignoring the fact that the observations are repeated, and hence correlated, one overestimates the precision of the parameter estimates, although the parameter estimates themselves are unbiased.

Koppelman & Pas (1984) also show that if one uses a randomly selected single day for each sample unit, the ordinary least-squares regression parameter estimates are unbiased, but they are less precise than those obtained using generalized least-squares with multiday data. The degree to which the multiday data provide more precise parameter estimates depends on the number of days in the multiday period and the extent to which the repeated observations provide additional information (that is, the degree to which there is intrapersonal variability in the data). The empirical work conducted by Koppelman & Pas, using a one-week data set collected in 1973 in Reading, England, showed that the degree of intrapersonal variability in daily trip generation rates might be considerable.

Pas (1986) has also investigated the potential benefits of intrapersonal variability. In particular, he shows that one can take advantage of intrapersonal variability in daily trip frequency to obtain more precise estimates of the parameters in least-square regression models of trip generation, without increasing the data collection budget, by estimating these models from multiday data sets. Alternatively, one can maintain the same precision in the parameter estimates in such models while decreasing the data collection budget. These benefits accrue because of the additional information that is obtained from each respondent in a multiday survey, at a small marginal increase in cost. Essentially, there is a trade-off between collecting data from fewer respondents for multiple days against collecting data from more respondents for a single day. Of course, if the level of day-to-day variability is low, then little additional information is obtained from the multiday survey. The empirical analysis in this research, using the one-week Reading dataset mentioned earlier, indicated that the optimal number of consecutive days might be approximately two, for a travel behavior survey to be used in estimating models of daily trip generation.

In subsequent research, Pas (1987) examined day-to-day variability in daily trip rates using the same dataset. In this work, the variance in an individual's daily trip rate about his/her daily average was used as a measure of intrapersonal variability. Of course, the daily average trip rate for each person is unknown, but the observed average for each individual is used as an estimate of his/her average daily trip-making rate. This approach led Pas to conclude that a substantial proportion of the total variation in daily trip-making rates may be attributable to day-to-day variability in individuals' daily trip-making. This latter component of variability, termed intrapersonal variability, was found to comprise about 50% of the total variability in trip-making rates in the Reading dataset. Pas & Koppelman (1987) also found that, not surprisingly, the relative importance of intrapersonal variability varies (in some cases substantially) across sub-groups of the population. They hypothesized that different levels of constraints (both social and personal), motivations, and resources would be associated with different levels of intrapersonal variability. For example, they hypothesized that females would have higher levels of intrapersonal variability than males, because of the roles traditionally played by females, and a statistical test confirmed this hypothesis.

Pas (1987) also shows that the goodness-of-fit of linear regression models estimated with one-day records of travel behavior is dependent on the level of intrapersonal variability in daily travel patterns, since conventional models can only attempt to account for interpersonal variability. Most importantly, this research shows that the existence of intrapersonal variability leads to lower estimates of the goodness-of-fit of travel demand models. Thus, cross-sectional travel demand models might be doing a better job of explaining the variability in travel behavior than appears to be the case.

While Pas & Koppelman have focused their research on variability on daily trip frequency, other researchers have examined variability in departure time from home and route choice (Mahmassani et al. 1991; Mannering 1989), trip chaining (Mahmassani et al. 1991) and complex travel-activity patterns (Hanson & Huff 1982, 1988; Huff & Hanson 1986, 1990). Much of this other research is complicated by the difficulty of defining and measuring day-to-day variability for the aspects of travel behavior being investigated.

Mahmassani et al. (1991) report the results of a study in which they examine day-to-day variability in trip chaining, departure time from home, and route choice for the morning work commute using data obtained from a sample of commuters in Austin, Texas. In this research, intrapersonal variability is defined and measured in two different ways with respect to departure time from home and route taken. In the one method, termed the "day-to-day" approach, the behavior of each commuter is examined to see if the departure time from home and/or route through the network on a given day are different from that on the previous day (with a switch being defined as a deviation greater than a

criterion level). In the other approach, termed the "deviation from usual," the researchers examine deviations from the median departure time and the most commonly chosen route as measures of intrapersonal variability.

Mahmassani and his colleagues noted that their conclusions, much like those of Hanson & Huff (1982), depend on which measure of variability one chooses and also on the criterion of what constitutes a switch in departure time (i.e. 3, 5, or 10 minutes). However, they do conclude that users engage in a substantial amount of departure time switching. They also find that route switching is not as frequent as departure time switching for the morning commute, a result which is consistent with the findings of laboratory experiments undertaken previously by Mahmassani and his collaborators (see, for example, Mahmassani & Herman 1990).

Mannering (1989) also examines switching behavior with respect to route choice and departure time from home. His work is based on a survey in which he asked travelers how often they switched from their normal departure time and route, with the specific intent of avoiding congestion. Mannering's data reveals a lower rate of departure time switching than that reported by Mahmassani et al. (1991). This is an expected result as it is unlikely that a traveler would view a variation in departure time of 3, 5, or even 10 minutes, as a change made specifically to avoid congestion.

Hanson & Huff have published a series of papers in which they investigate day-to-day variability and repetition in urban travel behavior (see Hanson & Huff 1982, 1988; Huff & Hanson 1986, 1990). The empirical component of their research has been undertaken using a very rich dataset collected in Uppsala, Sweden, in 1971. This dataset is unique in that each of the sampled persons kept a detailed diary for 35 consecutive days. As a result, Hanson & Huff have been able to not only study variability from day-to-day but also to look at the extent to which behavior is repetitive over time even when it varies on consecutive days. As noted earlier, the work undertaken by Hanson & Huff has focused on complex travel-activity patterns and thus their research has had to deal with difficult definitional and measurement issues. Not surprisingly, they have found that the level of day-to-day variability depends to some extent on the definition and measurement employed in describing behavior and variability. However, they find evidence of considerable day-to-day variability in urban travel behavior, although some stops (called core stops) are repeated often over the course of the 35-day period of observation. At the same time, they find that the repetition is not systematic. In fact, they conclude that the distribution of core stops is essentially random over the 35-day record. They do, however, find considerable persistence in the location of the stops, even when they measure location very precisely.

3. Study purpose and approach

3.1. *Study purpose*

The purpose of the present study was to validate and extend the earlier research undertaken by Pas (1987). Since the latter research was performed using data collected in 1973 in Reading, England, it is important to establish whether similar results would be obtained with data collected in another country at another point in time. Further, the Reading data was collected using an activity diary survey in which respondents were asked to record each change of activity. Such a survey tends to yield higher trip rates than a conventional travel diary, primarily because the activity diary survey captures information on short and infrequent trips that tend to be underreported in a travel survey. Because it is possible that the high level of intrapersonal variability reported in Pas' earlier research was in part due to the instrument used to collect the data, we undertook this study in the belief that there was value in replicating the earlier research with data collected recently in the USA using a travel diary survey.

The present research extends the earlier work by examining day-to-day, intrapersonal variability in measures of travel behavior in addition to the daily trip frequency measure analyzed previously. Two of the additional measures of travel behavior describe the time devoted to daily trip-making; namely, travel time per day and travel time per trip per day. The present study also examines the components of variability separately for home-based and non-home-based trips, in order to determine whether non-home-based trips are primarily responsible for day-to-day variability in trip-making.

The present study further extends the previous research by decomposing the total variability in two-person households into between-household and within-household components, with the latter being decomposed into its between-person (interpersonal) and within-person (intrapersonal) components.

3.2. *Study approach*

The primary methodological approach used in this study is the decomposition of the total variability in various measures of travel behavior into their different components. We represent different components of variability by appropriate sums of squares, following the approach described by Pas (1987). Thus, the total variability is represented by the total sum of squares (TSS), as follows:

$$\mathrm{TSS} = \sum_{j} \sum_{i \in M_j} \sum_{k} (t_{ijk} - \bar{t})^2 \qquad (1)$$

where

TSS is the total sum of squares,
t_{ijk} is the number of trips made by person i of household j on day k,
$\bar{t}$ is the overall sample mean number of trips made per person per day, and
M_j is the set of all persons in household j.

Note that while the above definition, and the others that follow below, are expressed in terms of trip frequency, we can use the same equations to evaluate the various components of variability for other measures of trip-making (such as travel time). Thus t_{ijk} denotes any measure (on a ratio scale) that describes the behavior of person i of household j on day k.

The two major components into which the total variability may be divided are the interpersonal and intrapersonal components of variability. These components are described by the between-person sum of squares (BPSS) and the within-person sum of squares (WPSS), respectively, defined as follows:

$$\text{BPSS} = K \sum_j \sum_{i \in M_j} (\bar{t}_{ij} - \bar{t})^2 \tag{2}$$

and

$$\text{WPSS} = \sum_j \sum_{i \in M_j} \sum_k (t_{ijk} - \bar{t}_{ij})^2 \tag{3}$$

where

BPSS is the between-person sum of squares,
WPSS is the within-person sum of squares,
$\bar{t}_{ij}$ is the mean number of trips made per day by person i of household j, and
K is the number of days in the observation period.

As noted previously, a portion of the day-to-day variability in an individual's travel behavior is due to systematic day-of-the week effects. However, to estimate the day-of-the-week effect separately for each individual requires data for a number of consecutive weeks for each person. Such data are generally not available, as is the case in the present research. In previous research (Pas 1987), the systematic component of the intrapersonal variability was approximated by the sum of the squared differences between the sample average for each day and the overall average. Of course, because different individuals have different systematic day-of-week effects on their behavior, this measure underestimates the systematic component of intrapersonal variability. Therefore, in this paper we do not report the decomposition of intrapersonal variability into the systematic day-of-week and residual components.

We noted earlier that one of the extensions in this paper over the earlier research reported by Pas is the decomposition of the total household sum of squares for two-person households. The inter-household and intra-household components of variability are represented by the between-household (BHSS) and within-household (WHSS) sums of squares, respectively, which are defined as follows:

$$\text{BHSS} = K \sum_j I_j(\bar{t}_j - \bar{t})^2 \tag{4}$$

and

$$\text{WHSS} = \sum_j \sum_{i \in M_j} \sum_k (t_{ijk} - \bar{t}_j)^2 \tag{5}$$

where

BHSS	is the between-household sum of squares,
WHSS	is the within-household sum of squares, and
$\bar{t}_j$	is the mean number of trips per person per day made in household j, and
I_j	is the number of persons in household j.

The within-household sum of squares (WHSS) may be further decomposed into that portion which is attributable to within-person variability (WPSS) and the portion that represents the between-person, within-household variability. We define the between-person, within-household sum of squares (BPWHSS) as follows:

$$\begin{aligned} \text{BPWHSS} &= \text{WHSS} - \text{WPSS} = \text{BPSS} - \text{BHSS} \\ &= K \sum_j \sum_{i \in M_j} (\bar{t}_{ij} - \bar{t}_j)^2 \end{aligned} \tag{6}$$

where

BPWHSS is the between-person, within-household sum of squares.

In the following section we describe the dataset used in this research and the empirical results we obtained using the above procedures with this dataset.

4. Empirical results

This section presents and interprets the empirical results following a description of the structure and content of the dataset.

4.1. *Description of the dataset*

The data used in this research were provided by the Municipality of Metropolitan Seattle. The data were collected in North King County, Washington, between May 23 and July 20, 1989, as part of a major King County/Snohomish County transportation planning effort. Of the 489 households which were asked to participate in the travel diary survey, 290 agreed to fill out a diary and were sent the daily recording forms with instructions. A total of 186 households returned diaries of which 150 were deemed usable household responses.

The information available in this North King Country dataset is contained in two files: trip, and household/person files. The trip file contains a three-day record of travel information for each person 16 and over and a one-day record for persons of age 5 to 15. Three-day travel diaries were obtained from 282 persons of age 16 or older in the 150 households in the sample. The household/person file contains information about the socio-demographic characteristics of the respondents and their households.

Before proceeding to the empirical results, it should be noted that the three-day travel sequences were tested for biases in trip recording over time, i.e. we examined whether respondents tend to report fewer trips as the recording period progresses. An analysis of variance was conducted which showed that the day of recording (i.e. whether the day of a diary recording was the first, second, or the third day) had no significant effect on the number of trips reported, once the day of the week was accounted for (Sundar 1992). Thus, no statistically significant biases were found. A reason for this result might be that the number of recording days was limited to three. If the observation period were longer, say seven days, there might have been a definite and significant decrease in the number of trips reported each day over the observation period.

4.2. *Day-to-day variability in trip frequency*

This part of the analysis presents the results of the decomposition of the total variability in trip frequency (trips per person per day) into various components using the methodology described in the previous section. The results presented in this section pertain to the subsample of weekday sequences, i.e. three-day travel diary sequences in which every day is a weekday (Monday-Tuesday-Wednesday, Tuesday-Wednesday-Thursday, and Wednesday-Thursday-Friday). Equations 1 through 3 were used to compute each of the components of variability.

The components of variability in daily trip rate at the person level are reported in Fig. 2(a), which shows that about 38 percent of the total vari-

ability in the daily trip rate is due to the intrapersonal or day-to-day variation in the respondents' travel behavior. This result is comparable to, although somewhat lower than, that reported by Pas (1987) for analyses using the Reading dataset. Pas reports that almost 50 percent of the variability in daily trip frequency is due to within-person, day-to-day variation. The higher proportion reported by Pas is probably due in part to the greater number of days (five weekdays) in the recording period for the Reading data.

4.3. *Day-to-day variability in daily travel time*

The measure of travel behavior considered here is daily travel time, which can be expressed in two ways: the travel time per trip per person per day, and the travel time per person per day. The first measure normalizes the second, daily per capita travel time, with respect to the number of trips. The results of the analysis of variability for both of these measures are presented below.

Figure 2(b) presents the components of variability for travel time per trip per person per day. The proportion of the total variability in daily travel time per trip that is intrapersonal is quite high at 36 percent for the subsample of weekday diary sequences. This figure is very similar to the proportion of intrapersonal variability in daily trip rate (38 percent) as presented in the previous subsection.

The results of the analysis in terms of total minutes of travel time per day for each person are shown in Fig. 2(c). Here the proportion of intrapersonal variability is seen to be about 42 percent, which is higher than the figure

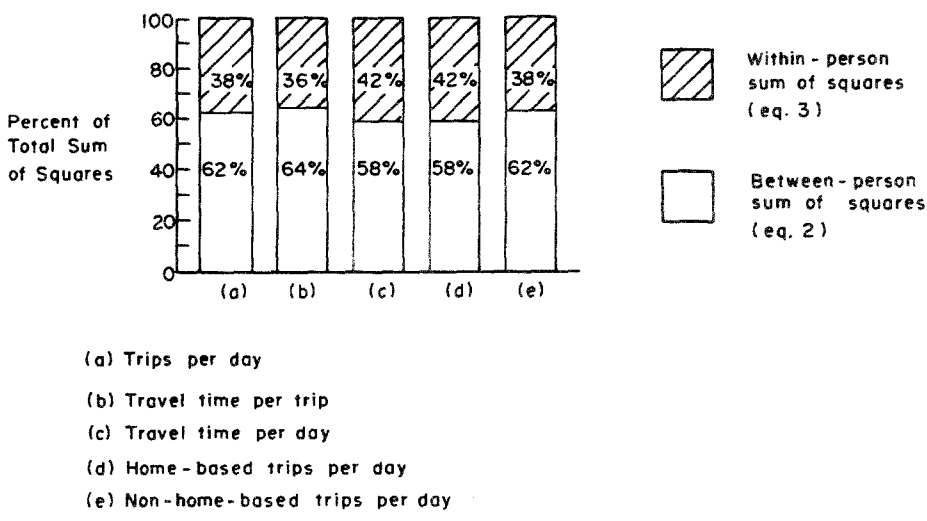

Fig. 2. Components of variability: Empirical results for various measures of personal travel.

reported above for the case where the travel times are normalized by the number of trips. This indicates that people are slightly more regular from day-to-day in average travel time per trip than in total travel time. Thus, some of the day-to-day variation in daily travel time appears to be due to day-to-day variation in trip rate.

4.4. *Day-to-day variability in home-based and non-home-based trips*

The components of variability in home-based and non-home-based trips were analyzed separately to examine the hypothesis that day-to-day variability in total trip frequency is mainly due to day-to-day differences in the number of non-home-based stops (on home-based tours), rather than day-to-day differences in the number of home-based tours. The proportion of variability that is intrapersonal in home-based trips is 42 percent (Fig. 2(d)) while the comparable figure for non-home-based trips is 38 percent (Fig. 2(e)). Thus, day-to-day variability in overall trip-making is attributed to variation in both home-based and non-home-based trips. That is, these results appear to indicate that day-to-day variability in trip frequency is due both to variation in the number of home-based tours as well as to variation in the number of non-home-based trips on those tours.

4.5. *Examination of day-to-day variability within the household*

The purpose of this subsection is to analyze the variability components in daily trip rate at the person level in two-person households. A subset of the overall sample, which consists of the trips made by persons in the 69 two-person households, is used for the components of variability analysis reported here. Figure 3 shows the components of variability in daily trip rate per person in two-person households.

The variability in daily trip rate per person in two person households can be divided into the following two components: between-household and within-household variability in trips per person per day (Equations 4 and 5). The within-household component of variability (WHSS in Fig. 3) comprises 62 percent of the total variability and consists of two subcomponents, namely, within-person-(within-household) and between-person-within-household variabilities, as explained by equations 3 and 6, respectively. Of these two subcomponents, within-person-(within-household) variability comprises a substantial portion of the total variability (about 45 percent) and the between-person-within-household variability components comprises about 17 percent of the total variability. This means that only about 27 percent of the within-household variability in two-person households is due to differences in travel behavior between the two persons living in the household, while the remaining

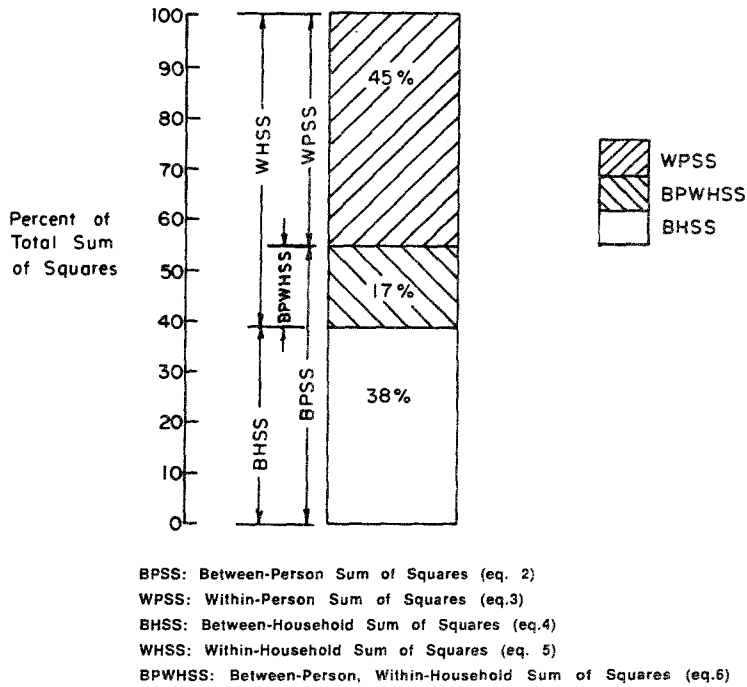

Fig. 3. Components of variability: Trips per day in two-person households.

73 percent of the within-household variability is due to day-to-day differences in the behavior of each of the two people in the household.

5. Discussion and conclusions

This paper examines, and thereby confirms the importance of, intrapersonal variability in person travel behavior using a multiday dataset obtained in 1989 from a sample of residents in Seattle, Washington. The results reported in this paper (and in the larger study from which they are drawn) indicate that intrapersonal variability accounts for a considerable fraction of the total variability in those aspects of daily urban travel behavior examined in the research. Further, the results reported in this paper generally confirm those reported earlier by Pas (1987) using data collected with an activity diary survey conducted in 1973 in Reading, England.

The results reported in the present paper indicate that intrapersonal variability accounts for a smaller fraction of the total variability in trip frequency than was found to be the case for the Reading data, yet intrapersonal variability still comprises a considerable fraction of the variability in trip frequency, travel

time, and trip chaining. Since there are four differences between the two datasets (geographic location, point in time, data collection technique, and length of recording period), it is not possible to attribute the difference to any one factor. The present study also shows that the proportion of the total variability in individual trip-making behavior that is attributable to intrapersonal variability does not vary much across the measures of trip-making behavior examined here. In fact, this proportion varies only from a low of 0.36 for minutes of travel time per trip to a high of 0.45 for daily trip rate in two-person households.

In two-person households, intrapersonal variability was found to comprise approximately 45 percent of the total variability in daily trip frequency. This figure is slightly higher than the comparable one for all households in the sample. Further, intrapersonal variability accounts for more than 70 percent of the within-household variability in two-person households. These results indicate that while the individuals in two-person households vary their travel behavior from day-to-day there is a reasonable level of similarity between the two persons in terms of daily trip frequency. This conclusion is supported by further analyses reported by Sundar (1992) in terms of the correlations between daily trip rates across people and days in two-person households.

The results of this study appear to indicate that travel behavior, at the individual level, is not repetitive from day-to-day. One might be tempted to interpret this as indicating that daily urban travel is not habitual or "mindless," and that it represents the outcome of an active decision-making process. However, one should be cautious in drawing such conclusions from the results reported in this paper. Note that the day-to-day variability in travel behavior reported in this paper pertains only to certain aspects of travel behavior (daily trip frequency, daily travel time, and trip chaining), while mode choice, for example, might be found to be much more stable from day-to-day at the individual level than is trip frequency. Also, notice that day-to-day variation in certain aspects of travel (e.g. trip frequency) might in fact contribute to repetitive behavior in other aspects (e.g. mode choice). That is, one might use an automobile regularly for trips to work in order that one can make stops on the way to or from work on some days. Such behavior would result in low intrapersonal variability in mode choice, due to higher intrapersonal variability in trip frequency. Such issues require further exploration.

In summary, the results reported in this paper concerning intrapersonal variability generally confirm and also extend those reported earlier (Pas 1987). The bottom line is that, as far as certain aspects of daily travel are concerned, there is considerable variation from day-to-day in the travel behavior of individuals. As discussed in the second section of this paper, the considerable level of intrapersonal variability has important implications for data collection, model estimation and model interpretation.

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