Analysis of Travel Behavior in Arab Communities in Israel: A Comparison of Household Surveys

ABSTRACT

This paper analyzes the main characteristics of travel behavior by the Arab minority community in Israel and discusses two issues related to household travel surveys: data collection among minorities and under-reporting of mid-day trips.

Household travel surveys are generally designed and conducted for the majority population and, therefore, lack a proper accounting of minorities and miss many of their less-frequent trips. An alternative approach to conducting household surveys is presented, with the aim of improving data quality for transportation planning. The survey was designed for and conducted in three Arab towns in Israel. The main improvement of the survey involves better interaction between interviewer and interviewee, which should materialize into a relaxed environment that allows for obtaining detailed, reliable results within a reasonable amount of time.

The results of the survey employing the alternative approach were compared to a sub-sample of the same towns taken from a regional survey conducted by the regional planning agency at the same time. The paper presents simple statistics on the main variables for each survey. Significant differences are found in the two data sets, mostly regarding the frequency of less frequent, non-home-based trips. A plausible explanation for these differences relates to the more detailed and improved data collected in the new survey.

1. INTRODUCTION

Transportation-planning and travel-demand models are based on various behavioral data, in particular travel-habit surveys. The accuracy of these models and their forecasts are highly dependent on the quality of the data used to estimate and calibrate them. There are various ways to collect travel information, the most common being household surveys, including travel diaries and collecting information about the travel patterns of household members (Ortuzar and Willumsen, 2001; Stopher and Metcalf, 1996). These surveys typically record the main socio-economic and demographic household variables and information about all trips taken by every individual in the household over a period of at least 24 hours.

The literature indicates several non-response issues associated with household surveys (Grove and Couper, 1998; Ricardson et al., 1996; Richardson and Meyburg, 2001; Tourangeau et al., 2000; Zimowski et al., 1997; Zmud and Arce, 2000). The first issue is related to a refusal to participate. This problem is particularly apparent in localities with a culture and language that differ from the mainstream (Turner, 2000); it is has been suggested that rigorous pilot testing be conducted to ascertain whether language differences have an effect on survey responses (Grieco et al., 1996). In many countries, a proportion of the population has a native language different from the main common language. In the United States, for example, the country's ethnic and racial composition have changed over the past decade, and 8.6 percent of the American population 5 years and over do not speak English fluently (American Community Survey, 2008). In Israel, the Arab population, whose native language is Arabic and whose children attend Arabic-speaking schools for the most part, constitutes about 20% of the population. They hold Israeli citizenship but traditionally relate to the Israeli government with distrust, believing that governmental functions and procedures (such as surveys) are generally performed to its detriment. This community has displayed a reluctance to take part in government-sponsored surveys (Gordoni, 2006). Various social theories, such as the reasoned-action theory, suggest that minority groups are more prone to refusal to answer and response error in surveys (Hox et al., 1995).

The second non-response issue is the hesitancy to reveal various data, such as income and employment details (Turner, 2000). This is particularly true of minorities, who are likely to withhold or conceal certain data for fear of governmental retribution; for example, employment in an unreported position or possessing an unregistered vehicle. More important, and specifically with respect to household travel surveys, is the fact that only some of the respondents' trips or activities may be reported. This incomplete response phenomenon may result from memory problems, but it may simply reflect an unwillingness to describe in detail all of one's daily trips and activities. There is also a tendency to under-report mid-day or secondary trips (Richardson and Meyburg, 2001). People tend to report trips from home to their main activity and back but tend to "forget" other trips conducted during the day, whether it is a stop on the way to/from home and work or, for instance, an evening trip to visit a friend. Bricka and Bhat (2006) claim that for any given regional travel survey, trip under-reporting will occur at some level. Based on the literature, they found that respondents who make many trips a day tend to "forget" short trips and discretionary trips (NuStats, 2004). Forrest and Pearson (2005) compared results from trip diary data using computer-assistance telephone interviews (CATI) with GPS data for the same respondents; they found that whereas almost all home-based work (HBW) trips recorded by the GPS data were also found in the CATI data, less than half of the

home-based non-work trips and non-home-based trips recorded in the GPS data were found in the CATI data.

Bricka (2006) reviews several studies that investigated the assignment of interviewers to particular respondents. Webster (1996) reports significant interaction effects of respondent characteristics with interviewer characteristics. Respondent ethnicity interacted strongly with interviewer ethnicity, particularly with respect to response and item-response effort rates. Johnson et al. (1997) note that people living in a more collectivistic culture tend to feel less comfortable to be interviewed by a stranger. Beatty (2003) presents a discussion of standardized versus non-standardized interviewing methods. He argues that the survey interaction remains an interaction between humans, which has certain advantages over increasingly automatic methods.

Typical household travel-habit surveys are both expensive and time consuming, and therefore a comparison between two cross-section surveys in the same region is no trivial undertaking. There is some literature showing efforts to compare survey results, an example being the Scottish Household Survey (SHS) (Hope, 2002), in which results were compared with the UK National Travel Survey.

This paper discusses the problems associated with data collection in specific population sectors. It focuses on household travel surveys that are generally designed and conducted for the majority population but that lack a proper accounting of minorities, who may constitute significant parts of the population. An alternative approach to conducting household surveys is presented, the aim of which is to improve data quality for transportation planning and eliminate non-response issues. The new approach was used to design and conduct a local survey in three Arab towns in Israel. This survey is then compared to a regional (and traditional) travel-habit survey that was conducted by a regional planning agency, Yefe-Nof, the same year that our survey was conducted, 2006, thus enabling a good comparison of the two methods.

The main improvement of the new survey lies in its interaction between interviewer and interviewee, which was seen to materialize into a relaxed environment that allowed obtaining detailed and reliable results within a reasonable amount of time.

The paper presents simple statistics for the main variables of the two surveys and compares the results of our survey to a sub-sample of the regional travel-habit survey of the same towns. The sample sizes were large enough to obtain significant results for the main trip characteristics, such as trip rates, distribution by period, purpose, and mode. The paper focuses on these general variables in order to assure a significant number of observations for each variable tested.

The objective is to check whether significant differences exist between the surveys in an attempt to identify the causes of such differences, to demonstrate the non-home-based under-reporting problem, and to suggest ways to improve such reporting. Analyzing possible sources of differences will help to identify problems and errors in surveying methods and samples and lead to improved travel-habit surveys in the future.

2. SURVEY DESCRIPTION

This survey was conducted in three Arab towns in the Galilee region of northern Israel: Majd El-Kurum, Rami, and Shefar'am (Figure 1). The first two are small towns, whose populations are 12,700 and 7,800 respectively, while the third is, for

Israel, medium-sized, with 33,600 residents in 2006. The three towns share distinct socio-economic characteristics; namely, a low socio-economic status and a complex demographic structure. Of the three, Rami most resembles a Jewish Israeli municipal entity in terms of education level, household size, population growth rate, and standard of living (which is high for an Arab community). By contrast, Majd El-Kurum and Shefar'am suffer from lower levels of education, larger household sizes, and higher population growth rates. The three Arab localities have a large share of young population (over 40% younger than 19), with Majd El-Kurum having the highest share of youngsters. Not surprisingly, the motorization rate in Rami is the highest, while in Majd El-Kurum it is the lowest. Table 1 summarizes the main characteristics of the three towns.

TABLE 1
Socio-Demographic Traits of Majd-Elcrum, Rami, and Shefar'am

Variable		Unit	Majd El-Kurum	Rami	Shefar'am	Israel
Population	Total Population	Persons	12,700	7,800	33,600	7,374,000
	Growth Rate	%	3.25	2.00	3.00	1.8
Households	Total Households	Households	2,320	1800	5000	2,087,000
	Average Household Size	%	5.04	4.13	4.6	3.3
Economic	Monthly Wages (Males)	₪	3,968	5,313	4,915	9,267
	Monthly Wages (Females)	₪	2,066	2,678	2,545	5,949
	Socio-Economic Level*	Scale	2	4	3	
	Motorization Rate	Vehicles per 1000 habitants	134	202	187	254
Religion	Moslem	%	100.0	18.3	58.6	16.8
	Christian	%	0.0	51.5	27.0	2.07
	Druze	%	0.0	30.3	14.4	1.65
Age Structure	0 to 9		26.9	19.3	24.1	19.7
	10 to 19	%	22.2	21.1	20.5	16.7
	20 to 44	%	36.7	35.6	37.2	34.8
	45 to 64	%	10.9	16.5	13.8	19.1
	65 and Above	%	3.3	7.5	4.4	9.7

* On a scale from 1 (lowest) to 10 (highest), according to the Israel Bureau of Statistics 2006.

(₪1 = US$ 0.23)

The data relate to two independent household surveys: The first survey was a travel-habit survey conducted by the regional planning agency (Yefe-Nof) in 2006 (the regional survey). The second was a specific survey that the first-named author conducted in selected Arab towns (the local survey). The regional survey was performed partially by means of face-to-face interviews, with the interviewer using a laptop computer, and partially by means of computer-aided telephone interviews. The reason for changing the survey instrument was the high cost associated with the personal interviews and the amount of time required to perform a complete interview. The pre-programmed laptop did not help much to reduce the burden, given the field interviewers' lack of skill. In neither case were households contacted prior to the interviewer's visit. A small incentive (a lottery ticket) was given to participants in the

face-to-face interviews. According to the regional planning agency, the Arab towns surveyed were performed entirely by face-to-face interviews.

The local survey was conducted entirely face to face. The literature suggests that face-to-face interviewing is superior to a telephone interview, particularly on sensitive subjects and with minority group members (Gordoni, 2006). The former method has been used for studying illegal and deviant behavior and attitudes in traditional societies, such as Muslim women in Bangladesh (Newby et al., 1998) and Arabs in Israel (Smooha, 1998). Gordoni (2006), after analyzing the literature, concluded that minorities were more sensitive to data-collection methods than the majority population as they were more prone to response bias because of social desirability and concerns about the possible harm to them and their families from reporting their real attitudes and behavior in sensitive areas.

The main strength of the local survey lay in building good personal contact and trust between the interviewer and the interviewee. Thus, important differences in conducting the local face-to-face interview were introduced compared to the regional face-to-face interview. The local surveys were completed by the lead author, who is a member of the Arab community and has no ties to the Israeli government. She was explicit in presenting the survey instrument as part of her doctoral research, not as part of any governmental program. The literature points out the potential benefits of using interviewers from the localities being surveyed in helping researchers understand local nuances and in ensuring a good response to the survey (Overseas Development Agency, 1994). Gordoni (2006) posited that people living in a more collectivistic culture tended to feel less comfortable in giving an interview on a sensitive subject to a stranger or to someone from another culture as shown also by Johnson et al. (1997) and Johnson and Van de Vijver (2003). Thus, using interviewers living in the localities sampled helps to gain the cooperation and honest responses of communal groups like the Arab villages in Israel.

Specifically for the Arab population, Gordoni (2006) suggested that its hospitality norm made it easier for interviewers to gain cooperation in the face-to-face mode. Ajzen and Fishbein (2004) argued that moral norms can also explain the good response to a local interviewer, as survey participants in the Middle Eastern culture may have a moral obligation that is translated into feeling uncomfortable at refusing to cooperate with a member of the same group (Gordoni, 2006). Social exchange theory emphasizes the concept of trust as the main element in gaining cooperation. It may also explain a respondent's behavior if that person belongs to a group whose trust in the society and its institutions differs from the majority population. Gordoni (2006) concluded that the Arab minority, which feels alienated from the Jewish state and its institutions, would be more willing to cooperate in a face-to-face interview conducted by an Arab interviewer because of feelings of solidarity with such an interviewer.

In the local survey, the interviewer first contacted the household (either in person or by telephone) and set a date and time for the interview at the interviewee's convenience. She then visited the home personally recorded demographic information and travel diaries for the preceding day for each member of the household over the age of seven. A typical household surveying session lasted an hour and a half. Prospective respondents were told upfront of the estimated length of the interview; they were given the option of completing it all at one meeting or of continuing at another time if they became tired or just preferred to split the interview into two meetings.

A very important aspect, as described above, is the issue of missing non-home-based trips. This typically happens when a person fills out the diary alone, as it

is easy to forget marginal trips. In our survey, the diary was filled out together with the interviewer and never alone by the interviewee. In a pilot comparing our method with an option in which the questionnaire was left for the interviewee at home and the interviewer returned to pick it up, later discussion about the diary revealed that respondents had forgotten some trips that they were able to remember during the discussion. In the present study, accordingly, the interviewer was very active during the interview in trying to make the respondent think of additional trips that might have been made and forgotten. She asked various questions about specific activities that may have involved more trips than initially mentioned, such as "And how did your child get back from school?" or "Was this the only shopping you did that day?" etc. This type of probing has been found to be helpful (Turner, 2000). Finally, it was also found important to conduct the interview while several or even all of the members of the household sat down together so that one member could remind the respondent of a trip that may have been forgotten. In this way, it was possible to capture many of the non-home-based trips that are often omitted.

The first-named author's personal involvement as the sole interviewer, although labor intensive, enabled obtaining comprehensive and highly accurate survey results. This was critical for analyzing travel behavior in a minority population, specifically Israel's under-studied Arab community.

Households were selected randomly from a set spatial distribution of zones within each community. The spatial distribution is critical to ensuring the inclusion of clans, which have specific living standards and reside in specific areas, based on historical land ownership.

To obtain a comparable benchmark, a sub-sample was extracted from the regional surveys for the three Arab towns selected for this comparison: Majd El-Kurum, Rame, and Shefar'am (Figure 1). The local survey included 298 households, representing 1.7% of the population of these three towns; the regional sample size for this area included 133 households.

Figure 1: Localities Included in the Survey

Table 2 describes and compares the main characteristics of the two surveys. It shows that the surveys are similar in most aspects (sampling frame, household definition, etc.) and that the main differences reflect the surveying method as described above.

In both surveys, details about all family members were collected from the questionnaire and from a travel diary covering a period of 24 hours; the regional surveys were completed by those 8 years old and older, and the local surveys by those 7 years old and older.

TABLE 2
Main Survey Characteristics

	Survey 1 – The Regional	**Survey 2 – The Local**
Sampling frame	Municipal property tax files	Random within geographical clusters
Trips / Activities	Only trips were recorded	Trips and activities
Modes	Motorized trips only	Motorized and non-motorized
Household definition	Persons living there on a permanent basis	Persons living there on a permanent basis
Minimum age for diary collection	Age 8+	Age 7+
Geographical distribution	Metropolitan	Local
Response rate	78%	100%
Sample size	2,000 (metro area) 100 (local)	298
Field-survey period	March 2006 to June 2006	March 2006 to June 2006
Questionnaire type	Face-to-face and telephone interviews	Face-to-face interview
Number of days surveyed	1 full day	1 full day
Weekdays investigated	Monday to Thursday	Monday to Thursday
Interviewer's visiting period	Monday–Thursday from 16:00 – 21:00	By appointment (any hour)

3. RESULTS

3. 1 Response Rate

The response rate reported in the regional survey was quite high, 78%, compared to values reported in the literature (Stopher and Greaves, 2007). This is explained by the number of times that the interviewers returned to a household: up to four return visits. The local survey achieved a 100% response rate, as all the households were willing to participate in the survey. This full participation was due to several factors as discussed above in regard to the surveying method: First, households were contacted in advance, and a time and date for the interview were set at their convenience. Second, the contact was made in the same language (Arabic) by an interviewer from the local community, and the potential benefits of participating in the survey were explained to each participant. It is noteworthy that no additional incentives were given to the participants. Using this method, we succeeded in removing obstacles that may have prevented members of a minority group from responding to a survey; that is, we overcame an unwillingness to participate or to provide accurate data by clarifying our

non-governmental affiliation while displaying an obvious affiliation with the Arab community.

3.2 Household Characteristics

This section presents selected results for the main household characteristics. Figure 2 shows the household-size distribution for the two surveys.

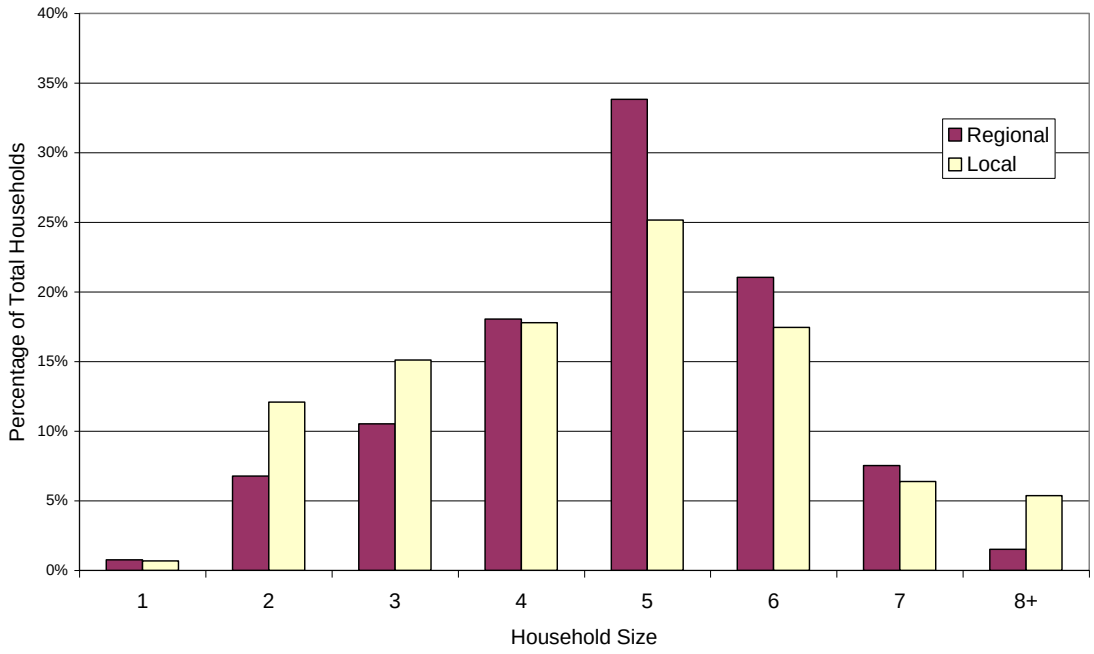

Figure 2: Distribution of Household Size, by % and Survey Type

Overall, the household-size distribution is quite similar in both surveys. The average household size in the regional survey is 4.78, and in the local 4.60. The regional survey shows more households with 5 and 6 members, while the local shows both more small (2 and 3) and more large (8+) households. Inspection of various local data sources, including data from the 2006 Israel Central Bureau of Statistics, the Rame Master Plan of 1996, and the Majd El-Kurum Master Plan of 1996, confirmed this distribution.

Figure 3 shows that the distribution of the number of cars per household is also quite similar in both surveys, except that the local survey shows a slightly higher share of households with 2+ cars compared to those with one car.

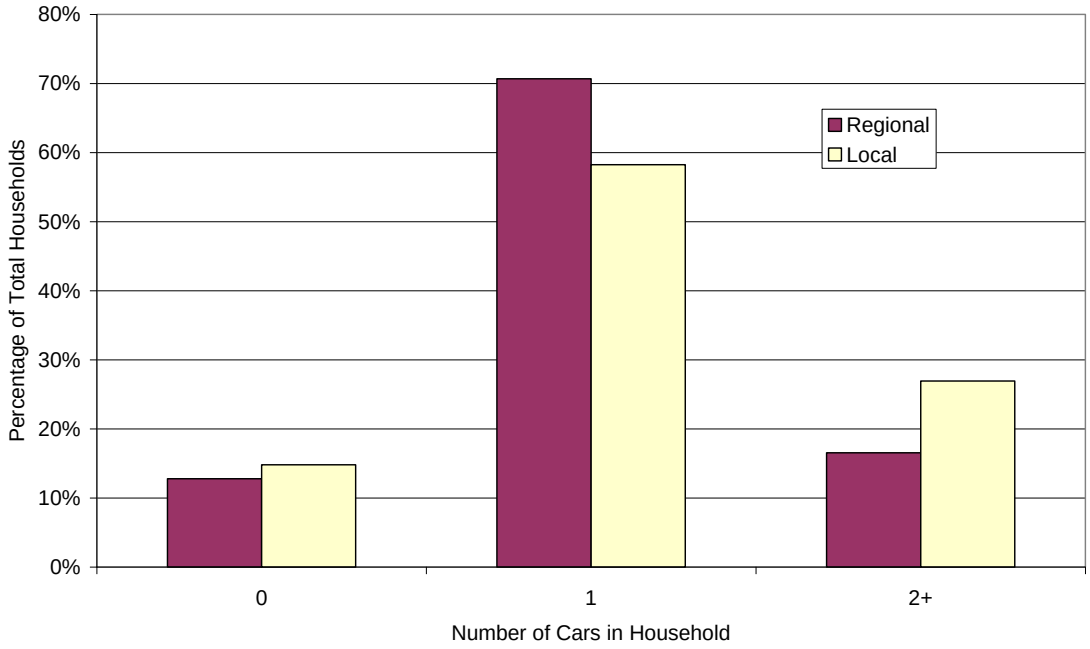

Figure 3: Percentage Distribution of Number of Cars in a Household

3.3 Personal Characteristics

Table 3 shows the percentage in each survey of people working and of people studying. As can be seen, these distributions are very similar for the two surveys, with 3%-5% both studying and working, 41%-46% working, and 18%-20% only studying. Both surveys show that 34% of the population neither work nor study.

TABLE 3
Work / Study Distribution (Persons Age 15 and Older)

	Work					
Study	Regional Survey, 2006			Local Survey, 2006		
	Yes	No	Total	Yes	No	Total
Yes	3%	18%	21%	5%	20%	25%
No	46%	34%	79%	41%	34%	75%
Total	48%	52%	100%	46%	54%	100%

The results in regard to household and personal characteristics show that both surveys included samples with characteristics that were very close to each other: the chi-square value is 0.0021, and the one-tailed chi-square probability with 3 degrees of freedom is 0.999. These findings are consistent with other data for the region. These results have two implications: first, the local survey did not have an advantage with

regard to these data; second, since both samples are similar, it is easy to compare the travel-behavior data obtained from the two surveys.

3.4 Trip Characteristics

3.4.1 Trip Rates

Table 4 presents two types of results: the distribution of trips by purpose and the average number of trips per person for each purpose. The most interesting result is the significant disparity in non-home-based trips between the two surveys. Overall, the table shows a somewhat similar number of trips per person by purpose, with one main exception. The number of non-home-based trips in the local survey is significantly higher than in the regional survey, which in turn causes the total number of trips per person in the local survey to be significantly higher. As described above, the main advantage of the local survey was the elimination of under-reporting of trips. Trips that tend to be forgotten are usually non-home-based trips. People remember that they left home and returned home; however, they tend to forget about some trips they had made in the middle of the day, when in addition to their main destination they stopped somewhere on the way, ran some errands, dropped off a child at some field, or any other activity. This, as has been seen, is a known problem in travel-habit surveys (Ampt and Ortuzar, 2004; Bricka and Bhat, 2006; Forrest and Pearson, 2005; NuStats, 2004), but one that we managed to overcome in this local survey.

TABLE 4
Average Motorized Trip Rates, by Trip Purpose

	Regional Survey		Local Survey	
	Percentage of Total Trips	Average Trips / Person	Percentage of Total Trips	Average Trips / Person
Home-Based Work	31%	0.40	12%	0.32
Home-Based Education	10%	0.13	6%	0.16
Home-Based Shopping	10%	0.13	3%	0.08
Home-Based Other	42%	0.54	18%	0.51
Non-Home-Based	6%	0.07	61%	1.55
TOTAL	**100%**	**1.27**	**100%**	**2.62**

The personal attention of the interviewer led respondents to record trips that tend to be "forgotten" in such surveys. This is probably the most important achievement of the local survey. Other observed differences are fewer home-based-work trips and home-based shopping in the local survey, findings that are related to the issue of eliminating non-home-based trips. If a person forgot a stop she or he made on the way to work or to shopping, and then corrected for it under prompting, we added one non-home-based trip but also eliminated one home-based work or home-based shopping trip.

These differences are also reflected in the percentages of different trip purposes in each survey. Home-based work trips have a significantly lower share in the local survey than in the regional survey. This is explained, as mentioned above,

by the fact that very few non-home-based trips were recorded in the regional survey, and therefore the other purposes were proportionally higher. In other words, almost all travel activity in the regional data comprised trips from home to one destination and back, whereas the local survey showed much more complicated travel patterns, with many chained trips. It is evident from various sources that travel patterns today are characterized by more chained trips than are trips to and from a single destination (Garling, 1998).

The results in Table 4 clearly indicate the problem of using conventional travel-habit surveys for developing travel-demand models and for forecasting trips. Estimating such models and making forecasts based on the regional data will result in an underestimation of non-home-based trips. Consequently, the corresponding forecast of the number of trips will be significantly lower than forecasts based on the local survey.

In order to provide an independent validation of the local survey, a GPS data logger was distributed to a random selection of respondents. The data-logger memory and battery are sufficient for 24 hours of recording data every 5 seconds. The data received was further processed to determine the number of trips for each respondent. The overall result is a very good match between reported trips and trips calculated from the GPS: only one person forgot a single trip. However, there were some cases with more reported trips than the GPS trips. These cases correspond to persons who indicated that they had forgotten to take the GPS with them for some of the trips.

3.4.2 Distribution by Time Period

Figure 4 shows the distribution of motorized trips by time of day. Overall, the distribution of motorized trips by time of day is similar in both surveys. The only noticeable difference is the higher share of trips between noon and 3 PM in the regional survey; in contrast, the local survey shows higher percentages of trips in the late morning and early evening. However, these differences are not significant, thus indicating that the problem of under-reporting of non-home-based trips characterizes any time of day.

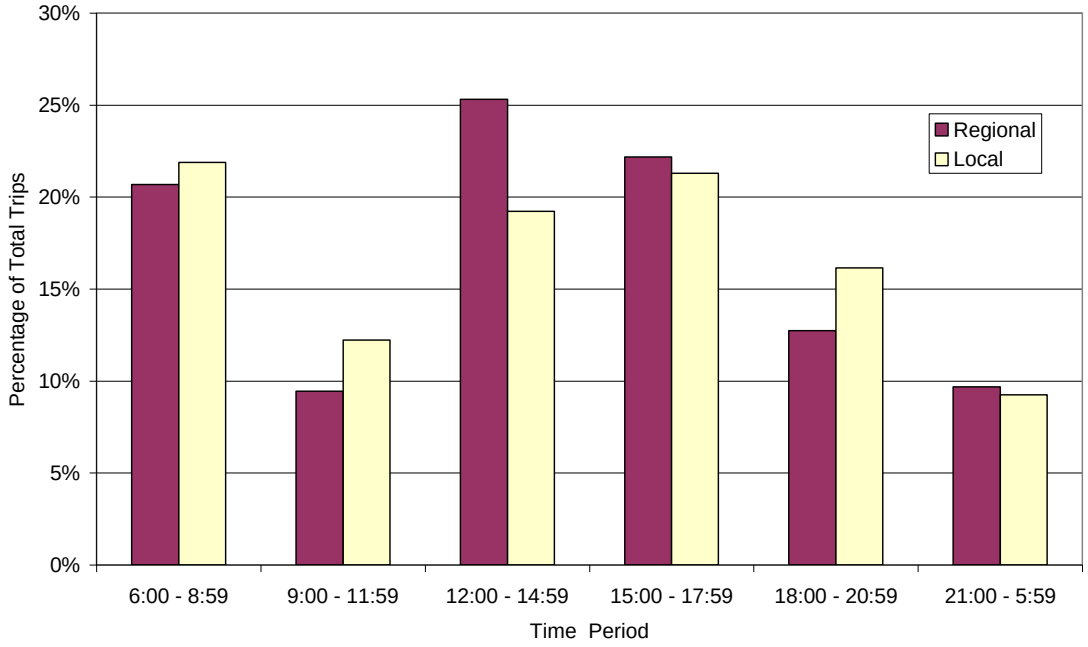

Figure 4: Distribution of Trips, by Time of Day

3.4.3 Modal Split

Table 5 presents the distribution of motorized trips by mode for each trip purpose. Five main motorized modes are considered: car (as driver), car (as passenger), bus, shared taxi, and employer-provided transportation (EPT). As presented in Table 2, the regional survey comprised only motorized trips, and therefore non-motorized trips were not included to allow for a comparison of the surveys.

TABLE 5
Distribution of Trips, by Purpose and Mode

Regional Survey						
Purpose	Car Driver	Car Passenger	Bus	Shared Taxi	EPT	Total
HBW	65%	28%	1%	1%	5%	100%
HBE	9%	36%	4%	0%	51%	100%
HBS	51%	49%	0%	0%	0%	100%
HBO	62%	35%	1%	1%	0%	100%
NHB	75%	22%	2%	0%	1%	100%
All Purposes	**57%**	**34%**	**1%**	**1%**	**7%**	**100%**
Local Survey						
Purpose	Car Driver	Car Passenger	Bus	Shared Taxi	EPT	Total
HBW	68%	18%	3%	1%	10%	100%
HBE	8%	64%	8%	17%	3%	100%
HBS	54%	43%	3%	0%	0%	100%
HBO	66%	31%	1%	2%	0%	100%
NHB	68%	26%	2%	3%	1%	100%
All Purposes	**64%**	**28%**	**3%**	**3%**	**2%**	**100%**

The results show some differences in modal split for HBW, most notably a higher car-passenger share in the regional survey; however, the main difference appears in the HBE trips. The car-driver share is similar for both surveys, but other modes present significant differences. The regional survey shows that the EPT mode share for education trips is 51%. This is clearly a misunderstanding of this mode among the respondents. In the local survey, the EPT mode share is only 3%, whereas shared taxi and car-passenger percentages are significantly higher than in the regional survey. We believe that respondents in the regional survey confused the EPT mode with any mode in which somebody picked you up either for payment, as in the shared taxi, or for free, as a private-car passenger. All other trip purposes have a similar modal split in the two surveys.

4. SUMMARY AND CONCLUSIONS

This paper shows that a carefully design questionnaire and improved survey techniques can significantly improve response rates and reduced item non-responses in surveys of travel behavior. The main feature of the local survey described in this paper is the improved interaction between interviewer and interviewee, which materializes into a relaxed environment that facilitates obtaining detailed results within a reasonable amount of time. This was partially achieved by a highly qualified interviewer who is a member of the local community and by setting the time for the

interview at the interviewee's convenience. As a result, the researchers were able to achieve a very high response rate; more important, the results showed a significant elimination of under-reporting of trips and activities.

Respondents tended to under-report non-home-based trips in the regional survey. It is not possible to indentify in this study if the problem is simply related to memory problem rather than an unwillingness to report some of the activities and trips. This problem, which is common to travel-habit surveys, limits the ability of such surveys to provide a good and accurate description of travel patterns. On the contrary, it can introduce a bias in models based on such surveys. Personal contact by a local interviewer probing for details was found to be very helpful in avoiding the problem of forgetting some of the non-home-based trips. We also found that cultural and language issues can result in misunderstanding some of the survey questions; this was shown, for example, in the over-reporting in the regional survey of the use of the employer-provided transportation mode for education trips.

The improvements observed in the local survey bear, however, a high cost; in the present case, the personal labor-intensiveness of the first-named author of this paper. This level of effort is not practical for a large-scale survey encompassing thousands of interviews. However, given the positive results obtained in the local survey, it is strongly recommended that such a level of effort be invested in a sample that is limited in size but that is large enough (up to a thousand interviews) to statistically correct for this problem in large surveys.

A key issue related to the success of the tailored interview is related to willingness to participate in the survey as compared to those who had the opportunity to participate in the government-sponsored survey. It raises the need to perform a structured test to determine if the recommended changes alone in a government-sponsored survey would yield the same results. This is left for further research.

There are other techniques that may be suggested for trying to surmount some of these problems; specifically, one of these is the use of GPS to overcome the under-reporting of trips (Forrest and Pearson, 2005; Wolf, 2003). Although they are without question an important addition, such techniques cannot replace personal contact, such as that described in this work, in order to obtain full and reliable information about all aspects of a person's travel behavior, activities, and trips. As argued in this paper, people may also forget to take the GPS with them on some of the trips.

Future research is needed to find a balance between labor-intensive, expansive surveys and collecting mass travel-behavior data. Research should focus on how to use different methods, some focusing on quality and some on quantity, and on being able to use the quality to correct the quantity methods so that overall good-quality data can be obtained for a large sample.

This study shows that it is possible to extract a larger number of non-home-based trips in a personal interview setting for Arab communities. It does not provide evidence that the personal interview technique results in a greater improvement for Arab communities than it would for Jewish or other communities. Further research will test the methodology applied in this study for other communities in Israel.

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