

# Gender and Travel Behavior in Two Arab Communities in Israel

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**This research addresses the critical but understudied issue of gender differences in travel behaviors in traditional societies, in general, and in the Arab world, in particular. To avoid known problems of data collection, a careful and labor-intensive survey process was undertaken in two Arab communities in northern Israel. The data gathered through this process were analyzed by a variety of statistical means to reveal that rather stark gender distinctions in travel behavior exist. On the whole, men make more tours, spend more time traveling, make more stops, and spend more time at activities at those stops than women. Men disproportionately travel by private vehicle modes, whereas women disproportionately walk. In the communities surveyed, the amount of transit provided was low and had a correspondingly low mode share. This dearth of transit seems to impair women's travel further. An extensive comparison of adult female and male tour frequencies was undertaken by using bivariate correlations and an ordered logit model. The most striking finding of this analysis was that 1/6th of Arab women do not leave the house to make even a single tour, whereas this proportion is 1/30th for men. The more nuanced statistical analyses revealed that demographic factors affect tour frequency differently for women and men. Effective policy interventions must consider these gender distinctions to address in the best way possible the travel needs of individuals in communities in the Arab world.**

A productive tack of transportation research has been the study of gender distinctions in travel behavior. These efforts have revealed a more complex and nuanced understanding of transportation patterns, which has fostered a more effective and inclusive transportation policy. To date, these research efforts have focused almost exclusively on Western industrialized societies, and little has been written on gender disparities in travel behavior in more traditional societies.

The Arab community of the Middle East and North Africa represents one such society characterized by traditionally prescribed gender distinctions. This community encompasses roughly 325 million people and extends from the Atlantic Ocean in the west to the Persian Gulf in the east. In addition to comprising the majority population in most nations of this region, the Arab community also represents substantial minority populations in the neighboring countries of

Chad, Iran, Mali, and Israel. Although united by the shared use of the Arabic language, there is tremendous regional, ethnic, economic, and religious diversity in the Arab world. Such diversity is likely to affect gender distinctions in travel.

The purpose of this research is to extend the consideration of gender and travel behavior to include more traditional societies, in general, and the Arab world, in particular. This research uses highly detailed demographic and travel survey data to examine gender variations in travel behavior among residents of two Arab towns in northern Israel. The decision to focus on the Arab community in Israel enables this research to highlight specific issues regarding ethnic minority status and travel. Finally, as much of Arab society is organized around religious affiliation, this research expressly considers the influence of Moslem, Christian, or Druze identity in affecting gender variations in transportation behavior.

## BACKGROUND

Israel is a small Middle Eastern country whose land area comprises 22,072 km<sup>2</sup>, roughly the size of New Jersey. The state is populated primarily by Jews and Arabs, both groups of which are nonassimilating (1). As of 2006, 1.4 million people, or 19.8% of the Israeli population, was Arab. This community is primarily Moslem (82.9%) but includes prominent Christian (8.6%) and Druze (8.3%) minorities (2). The Druze are a religious community of between a half a million and a million adherents living in Syria, Lebanon, Israel, and Jordan. They trace the origins of their beliefs to Islam but have been a distinct community for almost a millennium. In Israel, the Druze are unique among Arab communities in that they have a stronger affiliation with the Jewish state, as expressed by their compulsory service in the military.

These three religious communities have distinct socioeconomic characteristics. Christians most resemble Jewish Israelis in their levels of education and household size and are the highest-earning Arab group, although, on average, Arab Christian Israeli wage rates are only 86.3% those of Jewish Israelis. By contrast, Moslems and Druze report lower levels of education and larger household sizes than Christians. Interestingly, despite the similar levels of education between Moslems and Druze, Druze earn far higher salaries than Moslems. The average Druze wage rate is 98.7% that of Arab Christians, whereas the Moslem wage rate is only 81.0% that of Arab Christians. These labor rate distinctions are attributed to Druze participation in army service, which serves to expand Druze access to employment opportunities, particularly in government service (3).

Arab Israelis account for the majority of the population in the Galilee, the region of the country that contains the two towns surveyed, Majd-Elcrum and Rami. Yiftachel notes that the planning policy of

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*Transportation Research Record: Journal of the Transportation Research Board*, No. 2067, Transportation Research Board of the National Academies, Washington, D.C., 2008, pp. 75-83.  
DOI: 10.3141/2067-09

Israel has viewed this area as an “internal frontier” and has sought to constrain the spatial and economic growth of the Arab villages located in that region (1). As a result, these towns do not enjoy the same level of development as Israel as a whole. One example of this is the virtual absence of public transit service in Arab towns (4). This research postulates that the combination of economic disadvantage and residential segregation experienced by Arab towns in the Galilee preserves more traditional societal roles that include gender differences in travel behaviors.

## LITERATURE REVIEW

Relatively few studies have examined gender differences in travel behavior outside the industrialized West, let alone within the Arab world. Turner and Fouracre cite research in Brazil, which revealed that women make only a third of work trips but half of non-work trips, and research in Kenya, which revealed that women’s travel is mostly local and on foot (5). In the studies from both Brazil and Kenya, women reported a higher transit mode share than men. Srinivasan found that in Chennai (formerly Madras), India, men spend more time and money on travel than women, although women walk more, make more trips, and complete more shopping tours than men (6). Srinivasan advocates improved transit to reduce travel times to improve access to opportunities. Peters reviewed case studies from cities in India, Mali, Bangladesh, Turkmenistan, and Peru and concluded that women have less access than men to individual mechanized modes of transit ranging from bicycles to automobiles and that women who do have access to public transit are more dependent on it than men with similar access (7).

To the best of the authors’ knowledge, the only studies that considered gender differences in travel behavior and that included Arab populations are from Israel. Blumen and Kellerman (8) found that women in Haifa commute shorter distances than men, and Plaut (9) found that women make up a majority of those noncommuters who walk to work or work at home. Both of those studies did include data for Israeli Arabs, but only as a small minority in a much larger sample. Mansfeld and Ya’acoub focused exclusively on the Arab community of northern Israel and found that traditional and cultural affiliations were much more influential than socioeconomic factors in affecting tourism travel; however, their study did not consider either gender or daily travel behaviors (10).

Some researchers have suggested approaches to the study of gender distinctions in travel behavior in more traditional societies. Turner and Fouracre (5) and Peters (7) call for improved surveys that expressly consider the nuances of female travel behavior and the challenges of eliciting those data from individuals in male-dominated households. The authors also called for a more holistic understanding of travel behavior that considers the interplay of activities within the household. Hanson and Hanson have applied such an approach to the study of gender and travel behavior in Sweden (11). Their work emphasized the travel tour, defined as the chained sequence of trip segments that start at home and end at home, as means of better incorporating activity behaviors. Activity and tour-based analyses treat travel as being derived from the demand for personal activities. Travel decisions therefore become part of a broader activity-scheduling process. More recently, Kwan has affirmed the use of this approach to determine gender distinctions in commuting behaviors (12). The current research applies these tools to gender differences in a non-Western society.

## METHODOLOGY

This study used quantitative statistical methods to explore highly detailed surveys of travel behavior among residents of two Arab communities in northern Israel. Descriptive statistics of mode shares, travel tours, travel times, activity stops, and activity durations were first used to identify overarching disparities between the travel habits of women and men. This initial analysis identifies the travel tour as a particularly useful indicator, and the subsequent analysis focuses on this characteristic by using bivariate correlations and an ordered logit model.

## DATA COLLECTION

The data collection element of the research itself represents a significant contribution to the transportation literature. This research forwent reliance on Israel’s national travel habit survey, which, although it is comprehensively designed, has foundered in its application to individuals in the minority Arab community. This community has historically been wary of programs linked to the Israeli government, on the basis of the assumption that such programs are typically performed to the detriment of Israel’s Arabs. As a result, community members have been either generally reluctant to participate in government-sponsored surveys or likely to withhold information, such as ownership of an unregistered vehicle, for fear of government retribution. It is also possible that such resistance to surveys among the members of the Arab community served government objectives to limit participatory planning within the Arab sector (1) and that little effort was made to pursue more accurate data.

This research attempts to circumvent these barriers to data collection as well as to address the surveying concerns noted earlier by Turner and Fouracre (5) and Peters (7). All the surveys were completed by the lead author (W. Elias), who is a member of the Arab community with no ties to the Israeli government. She was explicit in stating that she was presenting the survey instrument as part of her doctoral research and not as part of any governmental program. She approached households randomly sampled from a set spatial distribution of zones within the community. The spatial distribution is critical to ensuring the inclusion of clans, which have specific living standards and reside in specific areas on the basis of historical land ownership. She telephoned the households in advance to set up an interview time and then visited the home to personally record demographic information and complete travel diaries for the preceding day for each member of the household over age 6 years. A typical survey session took an hour and a half per household. Although her personal involvement was labor-intensive, it enabled extremely comprehensive and highly accurate survey results to be obtained. Such information is critical to the analysis of the travel behaviors of individuals in this understudied community.

This extensive survey process was undertaken in two Arab towns in northern Israel: Majd-Elcrum and Rami. These towns were chosen as part of a larger survey effort on the impact of bypass highways on Arab communities in Israel. The demographic data from the decennial census, shown in Table 1, suggest that Majd-Elcrum has a larger, younger, poorer, and faster-growing population than Rami. These socioeconomic differences also reflect the two towns’ religious compositions. Majd-Elcrum is entirely Moslem, while Rami is mixed and has a slight Christian majority, a significant Druze community, and a Moslem minority. Rami also enjoys better public bus service links to neighboring communities.

**TABLE 1 Sociodemographic Traits of Majd-Elcrum and Rami from 2001 Census**

Variable	Unit	Majd-Elcrum	Rami
<b>Population</b>			
Total population	Persons	11,600	7,461
Growth rate	%	3.25	2.00
<b>Households</b>			
Total households	Households	2,320	1,800
Average household size	Persons	5.04	4.13
<b>Economic</b>			
Monthly wages (males)	₪ (₪1 = US\$0.24)	3,968	5,313
Monthly wages (females)	₪ (₪1 = US\$0.24)	2,066	2,678
Socioeconomic level <sup>a</sup>	Scale	2	4
Motorization rate	Vehicles per 1,000	169.1	233.0
<b>Religion</b>			
Moslem	%	100.0	18.3
Christian	%	0.0	51.5
Druze	%	0.0	30.3
<b>Age structure</b>			
0 to 19	%	49.7	41.6
20 to 64	%	47.2	51.2
65 and above	%	3.1	7.2

<sup>a</sup>The Israel Central Bureau of Statistics rates socioeconomic levels on a scale from 1 (lowest) to 10 (highest).

## EXPLORATORY ANALYSIS

This research first explores the gender variations in mode shares, travel tours, travel times, and activity durations for the full survey sample, including children.

Table 2 presents the mode shares for all trips segregated by town and religion and grouped into three modal clusters: private vehicles, transit, and nonmotorized modes. Transportation by private vehicle modes includes taking a taxi, driving a car, and being a car passenger. Transit modes include public bus service on established routes and privately contracted vanpool services. Nonmotorized modes include both biking and walking, even though very few bicycle trips were recorded. The gender variation among these mode share clusters is striking, with women reporting lower private vehicle and higher nonmotorized travel shares than men, regardless of religious affiliation or town of residence.

Table 3 presents the mode shares disaggregated by the main tour activity purpose rather than for each unlinked trip, as in Table 2. Four activities are considered: work, education, shopping, and other. The identification of the main tour activity is based on a subjective consideration of activity type and activity duration. By this approach, a tour that includes a short shopping trip on the way home from work would still be coded as a work tour, whereas a tour that contains a several-hour shopping activity, as well as a short stop at one's workplace, would be coded a shopping tour. To maintain somewhat robust samples, this information is not further divided by religious affiliation.

The gender variation within the individual modal clusters is quite pronounced. Among those traveling by private vehicle, women are less often the driver and more often the passenger than men. Religion also affects these shares, as Christian and Druze women drive more often than Moslem women; furthermore, for every private vehicle mode, the differences in modal share between Christian and Druze women and men are less pronounced than those between Moslem women and men. The place of residence also demonstrates

**TABLE 2 Mode Shares of Unlinked Trips for All Survey Respondents**

Mode	Gender	Majd-Elcrum, Moslem	Rami, Moslem	Rami, Christian	Rami, Druze
<b>Private vehicle (%)</b>					
Taxi	Women	0.6	0.0	1.0	0.0
	Men	0.4	0.0	0.2	0.0
Driver	Women	23.6	21.9	39.6	34.0
	Men	48.8	65.4	55.0	53.1
Passenger	Women	22.7	41.1	21.3	26.0
	Men	12.9	23.7	15.2	15.6
Cluster total	Women	<b>47.0</b>	<b>63.0</b>	<b>61.9</b>	<b>60.0</b>
	Men	<b>62.1</b>	<b>89.1</b>	<b>70.4</b>	<b>68.7</b>
<b>Transit (%)</b>					
Public bus	Women	0.3	6.8	4.6	0.0
	Men	1.7	0.0	1.0	0.0
Vanpool	Women	3.4	1.4	1.4	3.0
	Men	2.8	0.0	3.4	8.6
Cluster total	Women	<b>3.7</b>	<b>8.2</b>	<b>6.0</b>	<b>3.0</b>
	Men	<b>4.5</b>	<b>0.0</b>	<b>4.4</b>	<b>8.6</b>
<b>Nonmotorized (%)</b>					
Pedestrian	Women	49.3	27.4	32.1	37.0
	Men	32.7	9.1	25.2	22.7
Bicycle	Women	0.0	1.4	0.0	0.0
	Men	0.7	1.8	0.0	0.0
Cluster total	Women	<b>49.3</b>	<b>28.8</b>	<b>32.1</b>	<b>37.0</b>
	Men	<b>33.4</b>	<b>10.9</b>	<b>25.2</b>	<b>22.7</b>
Total trips (number)	Women	675	73	417	100
	Men	1,063	55	473	128

NOTE: Modal cluster shares are in boldface.

TABLE 3 Mode Shares of Trips for Main Tour Activity for All Survey Respondents

Mode	Gender	Work		Education		Shopping		Other	
		Majd-Elcrum	Rami	Majd-Elcrum	Rami	Majd-Elcrum	Rami	Majd-Elcrum	Rami
Private vehicle (%)									
Taxi	Women	0.0	1.5	2.3	2.0	0.0	0.0	0.0	0.0
	Men	1.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Driver	Women	36.7	48.5	2.3	3.9	25.0	0.0	45.8	31.8
	Men	59.8	68.9	2.6	4.2	75.0	16.7	41.7	59.0
Passenger	Women	16.3	22.7	5.7	51.0	50.0	28.6	33.3	45.5
	Men	15.5	13.5	17.1	48.9	25.0	16.7	20.8	13.6
Cluster total	Women	<b>53.0</b>	<b>72.7</b>	<b>10.3</b>	<b>56.9</b>	<b>75.0</b>	<b>28.6</b>	<b>79.1</b>	<b>77.3</b>
	Men	<b>76.3</b>	<b>82.4</b>	<b>21.0</b>	<b>53.1</b>	<b>100.0</b>	<b>33.4</b>	<b>62.5</b>	<b>72.6</b>
Transit (%)									
Public bus	Women	2.0	7.6	0.0	7.8	0.0	0.0	0.0	9.0
	Men	1.0	1.6	1.3	2.1	0.0	0.0	12.5	4.5
Vanpool	Women	16.3	1.5	3.4	5.9	0.0	0.0	0.0	0.0
	Men	6.2	8.0	7.9	10.6	0.0	0.0	0.0	0.0
Cluster total	Women	<b>18.3</b>	<b>9.1</b>	<b>3.4</b>	<b>13.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>9.0</b>
	Men	<b>7.2</b>	<b>9.6</b>	<b>9.2</b>	<b>12.7</b>	<b>0.0</b>	<b>0.0</b>	<b>12.5</b>	<b>4.5</b>
Nonmotorized (%)									
Pedestrian	Women	28.7	18.2	86.3	29.4	25.0	71.4	20.9	13.7
	Men	16.5	8.0	69.8	34.2	0.0	66.6	25.0	22.9
Bicycle	Women	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Men	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cluster total	Women	<b>28.7</b>	<b>18.2</b>	<b>86.3</b>	<b>29.4</b>	<b>25.0</b>	<b>71.4</b>	<b>20.9</b>	<b>13.7</b>
	Men	<b>16.5</b>	<b>8.0</b>	<b>69.8</b>	<b>34.2</b>	<b>0.0</b>	<b>66.6</b>	<b>25.0</b>	<b>22.9</b>
Total trips (number)	Women	49	66	87	51	12	7	24	22
	Men	97	74	76	47	4	6	24	22

NOTE: Modal cluster shares are in boldface.

a large impact on the use of private vehicles, with the wealthier Rami residents reporting much higher automobile mode shares. For example, women in Rami travel by private vehicle roughly the same amount as men in the less affluent Majd-Elcrum. Most strikingly, in Rami, women report a larger share of private vehicle trips to school than men, whereas in Majd-Elcrum, the female share of private vehicle trips to school is only half that of the male share. Finally, for noncommuting, nonshopping trips in both communities, women report larger shares of private vehicle use than men.

Among those few survey respondents who traveled by transit, there are several intriguing gender distinctions. First, regardless of religion or place of residence, men seem to favor vanpool use over public bus use. This reported distinction in modal shares might reflect the directed use of vanpools for commuting trips. Second, the transit mode shares of women demonstrate more variation. For example, although the Moslem women in Majd-Elcrum, like the men generally, reported larger vanpool shares than public bus shares, the Moslem and Christian women in Rami reported the reverse. This finding suggests that, at least for Moslem and Christian women, the better public bus service in Rami results in higher transit mode shares. Third, there are entire groups who do not use segments of the transit market. For example, no Moslem man in Rami reported using transit in any form, and no Druze surveyed reported using public bus services. Although the sample is too small to state definitive cultural preferences for or against transit use, these findings suggest avenues for future inquiry. Gender variation in transit use also emerged in the consideration of trip purposes. In Rami, there was little difference between the female and the male share of transit for either work or school pur-

poses. By contrast, in Majd-Elcrum, the female share of work trips by transit was more than twice that of the men, whereas the male share of school trips by transit was more than twice that of the women.

Of those traveling by the nonmotorized modes, gender distinctions emerged both by religion and by community. On the whole, walking remained a significant mode, particularly in the less affluent Majd-Elcrum, where roughly half of the trips made by women and a third of the trips made by men were made on foot. In Rami, gender distinctions appeared to be strongly tied to religious affiliation. For example, among women, Moslems reported the lowest walking mode share (28.8%) and Druze reported the highest (37.0%). Among men, Moslems again reported the lowest walking mode share (10.9%), but Christians reported the highest (25.2%). Furthermore, the percentage difference between female and male walking mode shares in Rami is much larger for Moslems than for either Christians or Druze. Trip purpose, particularly education, adds to the gender distinctions in walking. In Majd-Elcrum, the vast majority of school trips were made on foot, with women reporting a walking mode share much higher than that of men; by contrast, in Rami, less than a third of school trips were made on foot, and men reported a higher walking mode share than women.

Table 4 presents the daily travel behavior characteristics in an activity-based framework of tours and stops. Women made fewer tours than men in both communities, on average, but this difference was not statistically significant at the 95% confidence level (i.e., when  $\alpha$  is  $\leq 0.05$ ) in Rami. Women also spent less time traveling, made fewer stops, and spent less time at out-of-home activities than men in both communities, on average. Although all of these differ-

**TABLE 4 Comparison of Daily Travel Behaviors by Gender and Community for All Survey Respondents**

Travel Behavior	Majd-Elcrum						Rami					
	Women ( <i>n</i> = 214)		Men ( <i>n</i> = 210)		Comparison		Women ( <i>n</i> = 168)		Men ( <i>n</i> = 158)		Comparison	
	$\mu_w$	$\sigma_w$	$\mu_m$	$\sigma_m$	$\mu_w/\mu_m$	<i>z</i>	$\mu_w$	$\sigma_w$	$\mu_m$	$\sigma_m$	$\mu_w/\mu_m$	<i>z</i>
<b>Daily Travel Behavior</b>												
<b>Tour</b>												
Number of tours	1.40	0.93	2.01	1.01	<i>0.70</i>	<b>6.47</b>	1.49	0.90	1.58	0.92	<i>0.94</i>	<i>0.89</i>
Total travel time (minutes)	46.61	34.43	82.65	70.83	<i>0.56</i>	<b>6.64</b>	52.82	41.90	68.42	62.30	<i>0.77</i>	<b>2.64</b>
<b>Stops</b>												
Number of stops	1.76	1.32	2.97	2.10	<i>0.59</i>	<b>7.09</b>	2.04	1.60	2.53	2.05	<i>0.81</i>	<b>2.40</b>
Total activity duration (hours)	4.90	3.15	7.62	3.16	<i>0.64</i>	<b>8.88</b>	5.68	3.52	6.87	3.56	<i>0.83</i>	<b>3.03</b>
<b>Tour Adjusted Daily Travel Behavior</b>												
Travel time (minutes) per tour	33.29	37.02	41.12	70.13	<i>0.81</i>	<i>1.43</i>	35.45	46.56	43.30	67.72	<i>0.82</i>	<i>1.21</i>
Number of stops per tour	1.26	1.41	1.48	2.08	<i>0.85</i>	<i>1.27</i>	1.37	1.78	1.60	2.23	<i>0.86</i>	<i>1.03</i>
Activity duration (hours) per tour	3.50	3.38	3.79	3.13	<i>0.92</i>	<i>0.92</i>	3.81	3.922	4.35	3.88	<i>0.88</i>	<i>1.25</i>

NOTE: z-scores that are significant at the 95% confidence interval are in boldface. All comparison statistics are in italics.  $\mu_w$  = women’s mean,  $\mu_m$  = men’s mean,  $\sigma_w$  = women’s standard deviation,  $\sigma_m$  = men’s standard deviation.

ences are statistically significant for both Majd-Elcrum and Rami, on a percentage basis, the magnitude of these differences is much less in Rami. This observation confirms the existence of travel disparities between women and men and also demonstrates that the extent of those disparities varies by community.

To understand the factors that are likely to accentuate or mitigate these disparities, this research indexed total travel time, number of stops, and total activity duration by the number of tours. Table 4 shows that, when they are indexed on a per tour basis, the gender differences in total travel time, number of stops, and total activity duration are no longer statistically significant in either community. This finding reflects, in part, the wide confidence interval required by the large variance in tour travel times, number of stops, and activity durations and implies that there are more significant differences in the number of tours than in the other travel behavior variables. It should be noted that in each case, the tour-adjusted average value for women’s travel behaviors remained less than that of men, which suggests that men might travel more than women; interestingly, however, the ratio of the female-to-male average values for each behavior is quite consistent between the two communities.

Although the analysis of differences in activity and travel patterns involves many parameters, these observations of the tour-adjusted data confirm that tour frequency is an effective single measure for approx-

imating broader gender distinctions among activity participation and travel behavior. The following section seeks to examine the differential impact of non-gender-related demographic factors on female and male tour frequency among adults in Majd-Elcrum and Rami.

**TOUR FREQUENCY ANALYSIS**

This section uses descriptive statistics, bivariate correlations, and an ordered logit model to examine the tour frequency behaviors of the adults age 18 years and older who were surveyed. This approach excludes the data on children’s travel behaviors from the tour frequency analysis to focus on the travel behavior characteristics of adult women and men in the Arab world.

**Descriptive Statistics**

Descriptive statistics of adult tour frequency were disaggregated by gender, as shown in Table 5, and revealed statistically significant disparities in both the mean value and the distribution of daily tour making. On average, men made 35% more tours per day than women, and men also comprised the vast majority of people making two or

**TABLE 5 Comparison of Tour Means and Distribution by Gender for Adult Respondents**

	Means Analysis ( <i>t</i> -test)						Distribution Analysis ( $\chi^2$ -test)									
	Tours		Gender Comparison				Tours						Gender Comparison			
	<i>n</i>	$\mu$	$\sigma$	$\mu_w-\mu_m$	<i>t</i>	<i>p</i>	0	1	2	3	4	5	6	$\chi^2$	df	<i>p</i>
Women	262	1.40	0.99				44	110	77	22	8	1	0			
Men	257	1.89	1.08	<i>-0.486</i>	<i>-5.359</i>	<i>0.000</i>	9	99	90	39	12	7	1	<i>35.697</i>	<i>6</i>	<i>0.000</i>
Total	519	1.64	1.06	—	—	—	53	209	167	61	20	8	1	—	—	—

NOTE: All comparison statistics are in italics.  $\mu_w$  = women’s mean,  $\mu_m$  = men’s mean.

more tours per day. Figure 1 presents this distributional information graphically to show that at every level of tour making, a greater percentage of men were making tours than women. This disparity begins with the decision to leave the home at all. Almost 17% of the women did not make a single tour. This percentage is almost five times as large as the comparable share of men who remained in their houses. At the other end of the curve, the percentage of men completing at least three daily tours was almost twice as high as the percentage of women who did so.

To understand better the factors that are related to the creation of these gender disparities in tour making, this research explored the possible influence of demographic characteristics. Such characteristics were clustered into three groups, which correspond to personal, household, and communal traits. This tripartite division reflects the expansion of social units from the individual to the community and seeks to identify how factors at different demographic levels might affect tour frequency.

Personal factors included respondent age, marital status, number of years of schooling, employment status, and driver's license possession. Age and the number of years of schooling are considered interval variables, whereas the other three personal demographic factors are coded as dummy variables. The marital status dummy variable considers the four respondents who were either divorced or widowed as among the set of married people. This inclusion reflects an assumption that getting married reflects a transition, particularly in more traditional societies, to a distinct life stage; therefore, the few respondents who were divorced or widowed were included in what might be best considered a "has been married" category. The employment status dummy variable considers as employed all workers or students and considers as not employed those nonstudents who do not work, are unemployed, or are retired.

Household factors included the number of children, the income level, and the number of cars. The number of children and the number of cars were recorded as interval data. Children were considered everyone under age 18 years, and cars were considered all four-wheeled, private vehicles, even if they were also used for work purposes, such as a light truck. Income level was coded as an ordinal scale ranging, in order of the least to the most wealthy, from 1 to 5.

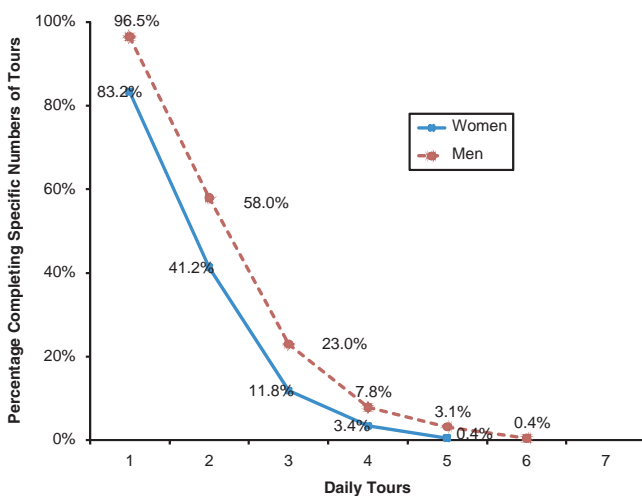


FIGURE 1 Percentage of adult women and men surveyed completing a given number of daily tours.

Community factors included the religious community of the household and the town of residence. These were all coded as dummy variables. The inclusion of religious status among the community factors reflects the reality that religious distinctions in the study region represent not merely personal spiritual beliefs but tightly held social structures.

### Bivariate Correlations

To begin to explore the relationships between these demographic factors and gender disparities in tour frequency, bivariate correlations were calculated. These correlations, shown in Table 6, identify whether a statistically significant linear relationship exists between the given demographic trait and the number of tours made.

Among the personal demographic factors, the number of years of schooling, employment status, and possession of a driver's license were all positively correlated with tour making for women at statistically significant levels. Together, these factors, which are, not surprisingly, also highly correlated with each other, emphasize that access to employment is strongly related to daily tour frequency for women. By contrast, age and marital status, which showed no linear correlation for women, were positively correlated to tour making for men. These two factors, which were also highly correlated with each other, suggest that the tour frequency for men is less tied to access to the workforce and is more linked to life-stage responsibilities.

Among the household demographic factors, no correlation with tour making was found at the 95% confidence interval. Relaxing the level of significance slightly suggests that the number of cars in a household has a weak positive correlation with female tour frequency and that income level has a weak negative correlation with male tour frequency. The former finding linking motor vehicle availability and female tour frequency is not surprising. In the context of the Arab communities in Israel, this finding may have added significance, as the poor provision of public transit services in this sector may unduly limit the tour frequency of women without access to cars. The latter finding that income is negatively related to male tour frequency is surprising, as it seems to challenge the classic assumption that income is positively related to the demand for travel; however, it reveals the utility of the tour as the basis for analysis by suggesting that men of greater wealth are more able to optimize travel by linking trips into a single tour. This interpretation is bolstered by a weakly positive correlation between income and the ratio of stops to tours in data that are available upon request.

Of the community demographic factors, there were no statistically significant correlations with tour frequency for women. Men, however, reported a positive correlation for being Moslem and living in Majd-Elcrum and a negative correlation for being Christian. Because Majd-Elcrum is entirely Moslem, these findings are internally consistent. Furthermore, because being Christian is linked to higher economic status in the region, these findings may confirm the earlier observation that for men income is negatively associated with tour frequency.

### Ordered Logit Model

The ordered logit is an appropriate test for use with ordered discrete alternatives, such as the number of automobiles owned by a household or, as in this case, for the number of tours that a person makes in a given

TABLE 6 Demographic Factors and Daily Tour Frequency by Gender for Adult Respondents

Variable	Gender	Bivariate Correlations			Mean Values for Each Tour Level			
		<i>n</i>	$\rho$	<i>p</i>	0 Tours	1 Tour	2 Tours	3+ Tours
<b>Personal</b>								
Age	Women	262	-0.052	0.402	45.93	37.21	36.95	42.55
	Men	257	<b>0.153</b>	<b>0.014</b>	39.33	41.07	39.17	47.17
Married (1)	Women	262	-0.037	0.553	0.84	0.73	0.69	0.81
	Men	257	<b>0.142</b>	<b>0.022</b>	0.67	0.68	0.67	0.86
Years of schooling	Women	261	<b>0.326</b>	<b>0.000</b>	7.98	11.94	12.61	13.19
	Men	256	-0.055	0.378	9.44	12.18	12.84	11.41
Employed or student (1)	Women	261	<b>0.384</b>	<b>0.000</b>	0.00	0.58	0.69	0.71
	Men	257	-0.001	0.987	0.00	0.70	0.88	0.63
Has driver's license (1)	Women	262	<b>0.304</b>	<b>0.000</b>	0.27	0.53	0.73	0.77
	Men	257	0.016	0.798	0.78	0.91	0.91	0.92
<b>Household</b>								
Children under 18	Women	262	-0.065	0.297	1.55	1.08	1.21	1.13
	Men	257	0.074	0.238	0.89	1.11	1.63	1.44
Income level	Women	258	0.041	0.511	3.20	3.60	3.48	3.52
	Men	255	-0.114	0.068	4.44	3.52	3.59	3.12
Number of cars in household	Women	257	0.113	0.070	1.09	1.07	1.20	1.29
	Men	254	-0.012	0.853	0.88	1.18	1.32	1.17
<b>Community</b>								
Moslem (1)	Women	262	-0.105	0.091	0.73	0.56	0.56	0.52
	Men	257	<b>0.213</b>	<b>0.001</b>	0.56	0.41	0.69	0.73
Christian (1)	Women	262	0.067	0.279	0.25	0.40	0.34	0.42
	Men	257	<b>-0.191</b>	<b>0.002</b>	0.33	0.49	0.27	0.20
Druze (1)	Women	262	0.083	0.180	0.02	0.04	0.10	0.06
	Men	257	-0.056	0.369	0.11	0.09	0.04	0.07
Resident of Majd-Elcrum (1)	Women	262	-0.097	0.118	0.66	0.49	0.52	0.42
	Men	257	<b>0.237</b>	<b>0.000</b>	0.33	0.36	0.67	0.68

NOTE: All variables followed by (1) are dummy variables, with the condition coded as 1 and the alternative coded as 0. Correlations that are significant at the 95% confidence interval are in boldface.

day (13). Daly and Van Zwam have similarly applied ordered logit models to predict the number of tours per day in the Netherlands (14). This model represents the choice as the outcome of a sequence of binary decisions, with each one consisting of the decision of whether to accept the current value or proceed to the next level. An ordered logit model is estimated for the four levels of tour frequency presented earlier in Table 6 for both women and men. This grouping clusters all respondents making three or more trips into a single category.

The ordered logit model, presented in Table 7, is a series of three sequential binary choice models. The model is segmented by gender to identify differences between women and men. At each stage, the likelihood that an individual woman or man will make an additional tour is estimated. Therefore, the first model includes the observations for all women (or men) and estimates the probability that they will choose to make at least one tour. The second model includes all adult women (or men) who have chosen to make at least one tour and then estimates whether they choose to make a second tour. The third model includes all adult women (or men) who have chosen to make at least two tours and then estimates whether they choose to make a third tour. All three models are significant for both women and men. For both women and men, working status had to be dropped from the first model because of its collinearity with the choice of making a tour. In other words, people who work or study always make at least one tour; therefore, this variable applies to them only from the second model onward.

Of the personal variables, age is a positive predictor of tour frequency for men making one or two tours and for women making more than two tours. This finding suggests that age is a predictor of men making tours in the first place, whereas age is a predictor of women making multiple tours. As women age and child-rearing responsibilities decline (and grown children can provide chauffeuring services), women make several daily tours. By contrast, with age, men gain economic responsibilities, which, as will be shown later, seem to limit tours to roughly two a day. Marital status is not a predictor of female tour making but is a significant predictor of multiple tour making for men. This finding suggests a gender disparity in activity behavior, with married men engaging in more out-of-home responsibilities, while marital status does not affect female tour making. The number of years of schooling is a significant predictor that both women and men will make at least one tour and that women will make multiple tours. Although education is linked to employment prospects for both genders, it appears that educated women also take on additional activities, possibly tied to household maintenance, that require additional tours. Interestingly, for men, employment status is a predictor of making two tours, but not more. This finding suggests that men who work or study do not make more than two tours, perhaps because of time constraints. Finally, the last personal variable, possession of a driver's license, is a strong positive predictor that a woman will leave the house and likely make two tours. Typically, only women who are likely to

TABLE 7 Ordered Logit Models of Tour Frequency for Adult Respondents

	Model 1, All Respondents				Model 2, Tour Makers				Model 3, Multiple Tour Makers			
	1+ Tours <sup>a</sup> , 0 Tours <sup>b</sup>				2+ Tours <sup>a</sup> , 1 Tour <sup>b</sup>				3+ Tours <sup>a</sup> , 2 Tours <sup>b</sup>			
	Women		Men		Women		Men		Women		Men	
	B	Wald	B	Wald	B	Wald	B	Wald	B	Wald	B	Wald
Constant	0.343	0.3	-0.615	0.0	0.322	3.5	0.415	1.0	-4.325	1.5	0.401	0.6
Personal												
Age	—	—	0.074	4.7	—	—	0.021	4.1	0.046	6.0	—	—
Married (1)	—	—	—	—	—	—	—	—	—	—	1.042	5.0
Years of schooling	0.247	22.4	0.529	5.7	—	—	—	—	0.123	3.1	—	—
Employed or student (1)	—	—	—	—	—	—	0.844	5.2	—	—	-1.478	11.3
Has driver's license (1)	0.585	1.9	—	—	0.941	10.5	—	—	—	—	—	—
Household												
Children under 18	-0.228	4.7	—	—	—	—	—	—	—	—	—	—
Income level	—	—	-0.923	3.8	—	—	—	—	—	—	-0.282	3.9
Cars	—	—	—	—	—	—	—	—	—	—	—	—
Community												
Moslem (1)	—	—	—	—	—	—	—	—	—	—	—	—
Christian (1)	—	—	—	—	—	—	—	—	—	—	—	—
Druze (1)	—	—	—	—	—	—	—	—	—	—	—	—
Majd-Elcrum (1)	—	—	1.687	4.6	—	—	1.349	23.3	—	—	—	—
Model Summary												
<i>n</i>	262		257		218		248		108		148	
$\chi^2$	48.399		20.540		10.816		29.287		7.077		23.484	
<i>p</i>	0.000		0.000		0.001		0.000		0.029		0.000	
Log likelihood	-96.158		-28.702		-145.689		-152.182		-61.205		-87.357	
Prediction accuracy	83.3%		96.9%		60.6%		68.5%		73.1%		66.9%	

NOTE: Because of its collinearity with making at least one tour, employment status was dropped from Model 1. All variables followed by (1) are dummy variables, with the condition coded as 1 and the alternative coded as 0. *B* = logit coefficient.

<sup>a</sup>logit (*x*) = 1.

<sup>b</sup>logit (*x*) = 0.

make tours regularly obtain a driver's license. Possession of a driver's license is a less significant predictor for men, because most men have a driver's license, and those who do not readily share rides with another person.

Of the household variables, the number of children is a negative predictor of making at least one tour for women and is never a significant predictor for men. This finding suggests that women have a primary responsibility for child rearing and are less likely to leave the home while it is full of children, whereas men are unaffected by such responsibilities. Household income is a negative predictor for men making at least a single tour as well as making more than two tours. This finding suggests that women's tour making is unaffected by household income. For men, household income seems to have a dual effect. A high income discourages participation in tour making at all, either through a lack of participation in the workforce or through the maintenance of a home office, which is common among professionals in the communities surveyed, or limits tour making to two daily tours, as there is not time for more tour making. The latter interpretation is in accord with the earlier finding regarding male employment status and multiple tour making.

Finally, of the community variables, living in Majd-Elcrum proved to be a positive predictor for men making one or two tours. This finding may suggest that cultural factors do affect tour making for men.

In this case, men in the less economically strong and more religiously homogeneous community were more likely to make tours.

## CONCLUSIONS

This research addresses the critical but understudied issue of gender differences in travel behaviors in traditional societies, in general, and in the Arab world, in particular. To avoid known problems of data collection, a careful and labor-intensive survey process was undertaken in two Arab communities in northern Israel.

The data gathered through this process were analyzed by a variety of statistical means to reveal that rather stark gender distinctions in travel behavior exist. On the whole, men make more tours, spend more time traveling, make more stops, and spend more time at activities at those stops than women. Men disproportionately travel by private vehicle modes, whereas women disproportionately walk. Among the communities surveyed, the level of transit provision is very low and so it had a correspondingly low mode share. This dearth of transit seems to further impair women's travel.

An extensive comparison of adult female and male tour frequencies was undertaken by using bivariate correlations and an ordered logit model. The most striking finding of this analysis was that 1/6th



of Arab women do not leave the house to make even a single tour, whereas only 1/30th of men do not leave the house to make a single tour. The more nuanced statistical analyses revealed that demographic factors affect tour frequency differently for women and men.

Effective policy interventions must consider these gender distinctions to best address the travel needs of individuals in communities in the Arab world.

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*The Women's Issues in Transportation Committee sponsored publication of this paper.*