

PERSONAL MOBILITY AND ACCESS IN TRIPOLI, LIBYA :
THE RESULTS OF AN EMPIRICAL INVESTIGATION

by

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1. INTRODUCTION

In this paper are described the findings of part of a wide ranging study of mobility and accessibility in Tripoli, the capital city of Libya (Shembesh, 1981). The paper reports the results of an empirical investigation of variation in what is here termed personal mobility or, more meaningfully, the 'ability to travel', and its relationship with the concept of access, defined as an 'ability to reach desired destinations'. The authors have examined these concepts in some detail elsewhere (see Proudlove, Shembesh and Brown (forthcoming)). The current paper is directed towards providing empirical verification of the existence or otherwise of various relationships identified in the course of that examination. The first part of the paper briefly outlines the discussion of some of these issues and their relevance to conditions in Tripoli. This is followed by an introduction to important features of the study area and the data employed in the subsequent analyses. A number of preliminary analyses are then presented briefly in order to highlight a number of distinctive characteristics of travel behaviour in Tripoli. Finally, attention is turned to the examination of differences in mobility displayed by certain groups of the population with respect to 'essential' and 'discretionary' travel.

2. MOBILITY, ACCESSIBILITY AND ACCESS

In common with many recent studies of factors influencing travel behaviour, the discussion referred to above stresses the benefits to be gained from the examination of such behaviour at the level of the individual rather than with respect to the more conventionally adopted unit of the household (see for example Jones (1975), Supernak (1979), Dalvi (1978), Banister (1980)). It is in this context of personal travel that alternative definitions and interpretations of the key concepts of mobility, accessibility and access have been explored. It emerges that it is appropriate to view personal mobility as an ability to travel, or more precisely, as a potential to undertake travel to satisfy particular daily needs - a potential which is conditioned in a complex manner by a large number of factors relating to the personal, familial and locational circumstances of the individual. It is argued that this potential is translated into access, or the reaching of desired destinations, when the mobility of the individual provides the means to take advantage of the accessibility afforded by the individual's location, coupled with the availability (within the field of opportunities to satisfy needs) of suitable transport infrastructure.

The investigation reported here was prompted by the belief that certain members of the population of Tripoli, notably car owners, have benefited much more than others from the effects of recent sharp increases in national wealth and the pursuit of almost exclusively car orientated transport and

land use policies by the city authorities. Indeed, it was believed that these policies were likely to have contributed to a widening of disparities in the 'quality of life' and, in particular, in the ability of different groups to satisfy their daily needs. As a result of these effects it was thought likely that it would be possible to identify particular groups of 'less mobile' members of the population who could be described as being deprived by virtue of their limited access to opportunities to satisfy their daily activity needs, such as those associated with employment, education and social activities. Furthermore, the concentration of an increasing proportion of employment, shops, public and private services and other activity in the city's C.B.D., over a period in which the city has undergone considerable outward expansion, suggested that these deprived groups might be found to be located in particular areas of the city, notably in peripheral housing estates remote from the C.B.D.

For the purpose of investigating these issues it is extremely difficult to arrive at a single unambiguous quantitative measure of mobility which adequately reflects the interpretation placed on this concept as a potential to undertake travel which emerged from the earlier discussion. Trip rate and amount of travel have served as convenient quantitative measures which have enabled analysts to examine relationships between 'mobility' and various population and other attributes. However, it is widely recognised that these measures are mere surrogates which fall a long way short of reflecting the complexity of the notion of mobility alluded to above. Indeed, this is made especially clear, for example, with respect to the development of policy objectives, when mobility is viewed as a quantity or quality which one might seek to maximise. Thus, in the absence of a more appropriate surrogate measure, the pursuit of an objective couched in terms of maximising travel is likely to be viewed as pointless, if not reckless, at a time of rising energy costs (Jones, 1975). Notwithstanding these weaknesses, it was thought appropriate to base an empirical investigation of the above inter-relationships on the use of the conventional measures.

The empirical work reported here represents part of an investigation of the effects and an attempt to determine the nature and extent of the deprivation experienced by those with a low level of mobility. To this end, data relating to Tripoli are employed in establishing the extent to which demographic, socio-economic and locational circumstances of individual residents contribute to an explanation of differences in revealed rates of trip making and other aspects of travel behaviour. This exercise serves as a means of exploring how far differences in personal mobility appear to lead to disparities between the amount of travel undertaken by different groups or categories of individuals. An important distinction is made between travel which is judged to be essential to the satisfaction of daily needs and that which is more discretionary or less regular in nature. The study thus seeks to reveal the existence or otherwise of differences in the effect of personal and other characteristics on the ability of the individual to undertake essential journeys and to enjoy the benefits of discretionary travel.

3. BACKGROUND INFORMATION ABOUT THE STUDY AREA

Tripoli is the capital of the Socialist People's Libyan Arab Jamahiria 'Libya', a country which has experienced explosive economic growth since the discovery of oil in the early 1960's. The country's vast area - equivalent to that of the entire E.E.C. - accommodates a very small population of close

to 3 million which is growing at the unusually high annual rate of 4 percent. Nearly half of this population is concentrated in the two metropolitan areas of Tripoli and Benghazi, with populations of 0.75m and 0.5m respectively. Oil revenues have contributed to a dramatic increase in annual per capita income which has risen from the equivalent of £180 in 1962 to £2,800 in 1975, resulting in Libya now having one of the highest Gross National Products per capita in the world. Thus, in 20 years, and particularly since the El Fatah Revolution in 1969, the country has been transformed from being classified as poor to very rich. This increase in national wealth has been reflected in the growth in car ownership - from 40,000 in 1965 to 223,000 in 1976.

A major proportion of national income is concentrated in Tripoli, a city which has experienced considerable physical and population growth in response to the pressures which its role as administrative capital, the country's commercial centre and principal port have placed upon it. From a population of 240,000 in 1954, it grew to 380,000 in 1964 and 709,000 in 1974 and is thought to be rapidly approaching one million. Residents of the capital enjoy a comparatively high standard of living accompanied by a very high level of car ownership. Vehicle registrations in the city grew from less than 15,000 in 1966 to 143,000 in 1976. It is this growth, coupled with the belief that virtually all households in Tripoli have or will shortly have access to a car, that has led to the adoption of the transport policies referred to above which can be characterised by large scale road building and little consideration for the needs of those who remain reliant upon the use of public transport.

4. THE DATA SOURCE

The data employed in the analyses described below were collected in the Tripoli Home Interview Survey 1977. Details of the survey methodology and other features of the data assembled are described elsewhere (see Brown et al, 1978 a,b, Shembesh and Brown, 1979). In summary, the survey took the form of a fairly conventional home interview survey in which approximately 5000 households were interviewed or roughly 5 percent of those resident in the Tripoli study area. Ultimately, this total sample yielded information relating to 3235 households, 13971 individuals and 25432 trips in a form suitable for subsequent analysis.

These data have been the subject of detailed analyses (see Shembesh, 1981) which have revealed a number of features of the population of Tripoli which are of some relevance to the later discussion. Notable among these features is the large size of the typical Tripoli household which, on average, is comprised of 5.8 persons and is thus more than twice the size of the average British household (2.86 persons in 1971). An even distribution of households over the range 3 to 8 persons and as many as 20 percent consisting of more than 8 people are characteristics which reflect the age structure of the population of whom almost 50 percent are under 15 years of age. In common with many other studies, it has been found that information about the holding of driving licences serves as a more direct indicator of likely vehicle use than either vehicle ownership or vehicle availability. As will be revealed more clearly in the analyses below, the distribution of driving licences between the sexes and different age groups reflects very clearly both the immobile and essentially domestic role of the majority of women in arabic/muslim households and the greater propensity to motorised travel displayed by the younger generations of Tripoli residents. The

former point is well illustrated by the fact that 60 percent of household heads but only 7 percent of their wives are found to be driving licence holders.

5. PRELIMINARY ANALYSES OF VARIATION IN TRAVEL BEHAVIOUR

5.1 Introduction

The analyses described below are intended to reveal the extent of variation in different aspects of travel behaviour at the level of the individual. For this purpose a subset of the various characteristics of survey respondents and the households of which they are members was selected from the information gathered in the home interview survey. Appendix 1 contains the specifications of those variables which are not self explanatory.

The approach adopted in the analyses is initially to describe the influence of basic variables such as age, sex, household income and vehicle availability on the level of individual trip-making for different purposes. Selective refinements of these simple analyses then lead, step by step, towards a more detailed examination of the effects of a wider range of variables relating to not only trip rates but also mean distance travelled and travel times.

5.2 Variation by Sex and Age

In this first stage of the analysis the influence of the basic demographic factors of sex and age on the trip rates of individual respondents is examined with respect to different travel purposes and total trips. It can be seen from Table 1 that, overall, the rate of trip making by males (2.41 trips per day) is more than twice that of females (1.16) and that, with the exception of education trips undertaken by persons under 19 years of age, gender is generally more significant than age in accounting for trip rate variation.

Table 1 : All Modes Person Trip Rates by Age and Sex and Journey Purpose

Age Ranges	Sex	Education	Work and Firm's Business	Other Purposes	All Purposes Including Non Home Based	Sample Size
6-18	M	1.70	0.10	0.29	2.16	3497
	F	1.56	0.03	0.17	1.79	3041
19-45	M	0.17	1.64	0.64	2.78	2598
	F	0.06	0.14	0.42	0.66	2620
46-64	M	0.02	1.59	0.58	2.51	1020
	F	0.00	0.16	0.33	0.52	616
65+	M	0.03	0.87	0.53	1.64	427
	F	0.00	0.01	0.05	0.08	187
Means	M	0.86	0.87	0.46	2.41	7355
	F	0.76	0.09	0.28	1.16	6464
Overall Means		0.81	0.51	0.38	1.83	13819

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The differences between male and female behaviour are more marked when looked at with respect to a particular activity. Most interesting is the difference in work and firm's business trips where males are found to make almost ten times as many work trips per head as females (0.87 compared with 0.09). This observation reflects the fact that, in Tripoli, females account for only 10 percent of the labour force and only about 5 percent of females are economically active. In contrast to this marked difference is the similarity in the rates recorded with respect to education trips where males made only 13 percent (0.86 : 0.76) more education trips than females. The difference between the sexes is least in the case of those in the under 19 age group where, per capita, males made only about 8 percent more education trips than females (1.70 : 1.56).

Further interesting patterns emerge with respect to age. The table reveals that male/female differences in the average number of trips undertaken for 'other purposes' (social, recreation etc.) increases with increasing age. Thus, in the 19-45 age group, males made only about 52 percent more trips than females (0.64 : 0.42) while for those 65 and older the difference is much greater, males making over ten times more of those trips than females (0.53 : 0.05). Finally, it can be seen that overall male trip rates remain high throughout the period of economic activity (19-45, 46-64), peaking in the former range, while female trip rates fall substantially after their peak in the years of education.

The above differences in male and female travel propensity can be attributed to a number of factors. These include the familiar restraints on female travel imposed by family or other ties. However, these are frequently reinforced in Tripoli by observance of the social and religious restrictions on female behaviour of the muslim/arab world. These restrictions are likely to be further reflected in differences in driving licence possession by males and females. Before this effect is isolated it is appropriate to examine the underlying influence of household income and vehicle availability on individual rates of trip making.

5.3 Variation by Household Income and Vehicle Availability

In this study the important distinction between the conventional measure of household car ownership and the broader notion of vehicle availability has been recognised. The latter measure is used throughout the analysis as it has been shown to provide a greater explanation of travel variation than car ownership. In this way, availability of a vehicle is taken to include not only the availability of vehicles (cars and light vans) owned by a household, but also those provided by employers for personal and business use. The effect of making this distinction, at the household level, can be seen in the table below.

Table 2 : Comparison Between Household Car Ownership and Availability of Vehicles to Households

Cars Owned	Percentage of Households		Vehicles Available
0	47	39	0
1	50	50	1
2+	3	11	2+
	100	100	

In Table 3 it is possible to identify the combined effect of sex, household income and household vehicle availability on overall individual trip rates. The influence of vehicle availability appears to be stronger in the case of males than females, accounting for differences of 19 percent (2.15 : 2.56) and 10 percent (1.10 : 1.21), respectively. However, this difference is substantially greater in the case of both higher income males (24 percent - 2.15 : 2.66) and females (18 percent - 1.12 : 1.32) than that of low income males (12 percent - 1.99 : 1.24) and females (< 1 percent - 1.04 : 1.05). These differences indicate that the positive effect of vehicle availability on travel propensity is reinforced by the influence of income. The overall influence of income on trip rates is seen to be somewhat stronger with respect to females than males, the female members of high income households making approximately 25 percent more trips than their low income counterparts (1.04 : 1.30) while the corresponding difference for males is only 10 percent (2.20 : 2.42).

Table 3 : All Modes Person Trip Rates for All Purposes by Household Vehicle Availability and Household Income

Household Vehicle Availability	Sex	Household Income			
		Low	Middle	High	Means
No vehicle available	M	1.99	2.17	2.15	2.15
	F	1.04	1.16	1.12	1.10
Vehicle available	M	2.24	2.46	2.66	2.56
	F	1.05	1.25	1.32	1.21
Means	M	2.20	2.30	2.42	2.41
	F	1.04	1.18	1.30	1.16
Overall Means		1.68	1.87	2.04	1.83

5.4 Variation with 'personal vehicular mobility'

The above tables have provided an indication of the extent of trip rate variation with respect to the basic demographic variables of sex and age and the household related variables of income and vehicle availability. Although the availability of vehicle has been shown to have a significant influence on trip rates, it is when this availability is combined with possession of a driving licence, and thus the ability to use the vehicle personally, that a more marked differentiation in rates of trip making can be expected. This combination of vehicle availability and possession of a driving licence has been referred to in terms of equipping the individual with 'personal vehicular mobility', the benefits of which are likely to be reflected in both a greater propensity to travel and greater freedom of movement.

Before the influence of personal vehicular mobility on trip rate variation is discussed, it is appropriate at this point to note from Table 4 the distribution of driving licence possession across different age ranges and the marked differences between the patterns observed among males and females. Thus, it can be seen in the 19-45 and 46-64 age groups that, while approximately 60 percent and 45 percent of males respectively are driving licence holders, the corresponding female proportions are only 6.5 percent and 2.1 percent.

Table 4 : All Modes and All Purpose Trip Rates by Age, Sex, Household Vehicle Availability and Possession of a Driving Licence

Age Range	Sex	No Vehicle Available		Vehicle Available		Means
		No Driving Licence	No Driving Licence	Driving Licence	Driving Licence	
6-18	M	2.13	2.15	2.78		2.16
	F	1.76	1.81	2.09		1.79
19-45	M	2.31	2.08	3.15		2.78
	F	0.52	0.56	2.17		0.66
46-64	M	2.16	2.15	2.98		2.51
	F	0.57	0.38	2.46		0.52
65+	M	1.46	1.54	3.04		1.64
	F	0.10	0.06	0.00		0.08
Means	M	2.15	2.12	3.09		2.41
	F	1.10	1.15	2.19		1.16

The table confirms the very strong influence of the vehicle availability and driving licence combination in the case of both males and females, across all adult age groups. The table also serves to indicate how consideration of the effect on trip rate variation of vehicle availability alone can give a somewhat misleading impression, in that, within each age/sex group, those individual members of households with a vehicle available who have no driving licence are seen to make a very similar number of trips to those with no vehicle available.

In the case of males the overall effect of driving licence possession appears to be that almost 50 percent more trips are made and 100 percent more in the case of those over 64. A still greater proportional increase is observed among the small number of females who are driving licence holders, especially in the case of those in the 46-64 age group who make between 4 and 6 times the number of trips of non-drivers or non-licence holders (2.46 compared with 0.57 and 0.38).

5.5 Conclusions of Preliminary Analyses

The analyses reported above have provided the necessary background against which the aspects of travel behaviour which are the primary focus of this paper can be examined. The systematic examination of the influence of various personal and household characteristics of individual Tripoli residents on rates of trip making has revealed a number of interesting features of travel behaviour in the city. In particular, it has served to demonstrate the considerable differences between the level of trip making undertaken by males and females and has underlined the strong positive influence on trip rates of the combination of vehicle availability and possession of a driving licence. Those who possess this personal vehicular mobility have been shown to make consistently more trips than those who do not. However, what the analyses presented so far have not revealed is whether those without personal vehicular mobility experience any significant form of disadvantage or hardship as a result of making fewer trips.

6. AN EXAMINATION OF 'ESSENTIAL' AND 'DISCRETIONARY' TRAVEL

6.1 Introduction

With the exception of one or two of the earlier analyses, much of the discussion of trip rate variation presented so far has been related to total trips or total home based trips, without making any distinction between the different purposes for which trips are undertaken. In order to further explore the form and extent of any disadvantage experienced by those without personal vehicular mobility, it is appropriate to make such a distinction and to do so in terms of travel which is judged to be 'essential' and that which can be viewed as 'discretionary' or at least not absolutely essential. In this respect, in terms of the categorisation of trip purposes adopted in the earlier sections of this paper, it is suggested that 'education' and 'work and firm's business' trips can be treated as essential, and trips for 'other purposes', including personal business and shopping trips and those trips associated with social, recreational and other activities, may be considered to be discretionary. However, the analysis here will not be concerned with education trips in order to achieve a degree of consistency in terms of the characteristics of the people between whom a comparison of trip rates is carried out.

Again with consistency in mind, the following analysis is restricted to males, and vehicle availability and possession of a driving licence are the only personal characteristics against which variation in travel behaviour is examined. A further logical limitation is that work and firm's business trips are only analysed with respect to those in employment, while in the case of all other travel, only trips undertaken by those over 19 years of age are considered. For brevity these types of travel will be referred to as 'journey to work' and 'other trips' in the discussion.

A further variable is introduced into the analysis at this stage to reveal an important aspect of travel variation. This is distance of the place of residence (more correctly survey zone) from the centre of Tripoli. Apart from serving as a very crude surrogate variable for quality of public transport service (see Shembesh, 1981), this 'object system' measure also provides an indication of the accessibility of the place of residence to employment opportunities and other facilities, such as shops and public services, roughly 60 percent of which are located within 3 kilometres of the centre of the city. Indeed, the jobs to resident workers ratio was found to be as high as 2.05 in this central area compared with only 0.48 in other parts of the city (Devecon, 1978). As noted in the introduction, it is the separation of those with a low level of mobility from the concentration of activity in and around the C.B.D. that was thought likely to lead this group to suffer some form of deprivation. Finally, in order to obtain a fuller impression of the extent of variation in travel, rather than simply trip making, two further measures are now introduced. The first of these is mean trip length which, when multiplied by number of trips, gives an indication of the total 'amount of travel' undertaken by a particular group of individuals. The second is mean travel time which serves here to represent the 'resources' devoted to travel by particular modal groups, again more explicitly expressed as the product of trips and mean travel time.

For the sake of simplicity in the presentation of the results of this analysis, a distinction is made only between trips undertaken by non-mechanised modes (walk and cycle) and mechanised modes, which include car driver, car passenger, bus, taxi and romis (jitney).

Table 5 : Person Trip Rates for Home Based Trips (All Purposes) undertaken by Males Aged 19+ : by Household Vehicle Availability, Possession of a Driving Licence, Distance from CBD and by Mode

Household Vehicle Availability and Possession of a Driving Licence	Home Zone Distance from CBD (km.)	Car Driver	Car Passenger	Public Transport	Walk or Cycle	Mechanised Modes	All Modes	Sample Size
No Vehicle Available and no Driving Licence	0-3	-	0.27	0.42	1.37	0.69	2.06	411
	3-6	-	0.49	0.82	0.76	1.31	2.07	493
	> 6	-	0.41	0.93	0.50	1.34	1.84	473
	Means	-	0.39	0.74	0.86	1.13	1.99	1377
Vehicle Available and no Driving Licence	0-3	-	0.91	0.26	1.03	1.17	2.20	156
	3-6	-	0.61	0.60	0.56	1.20	1.76	186
	> 6	-	0.74	0.50	0.33	1.24	1.59	153
	Means	-	0.74	0.46	0.64	1.20	1.84	495
Vehicle Available and Driving Licence	0-3	2.23	0.13	0.02	0.36	2.38	2.74	456
	3-6	2.37	0.18	0.05	0.12	2.60	2.72	842
	> 6	2.16	0.20	0.07	0.08	2.42	2.50	688
	Means	2.27	0.18	0.05	0.15	2.49	2.65	1986
Overall Means		1.17	0.33	0.35	0.47	1.84	2.31	3858

To gain an impression of the effect of this simplification and the extent of usage of the different modes which constitute the 'mechanised' category, a breakdown of overall male trip rates with respect to vehicle availability, driving licence possession, 'distance from C.B.D.' and more importantly, travel mode, is presented in Table 5. A number of interesting patterns of variation are revealed in this table which will be reflected in the later analysis, especially with respect to trip rate variation with increasing distance from the C.B.D., and these are only briefly touched on here.

Attention is drawn to the decrease in the number of walk and cycle (non-mechanised) trips with increasing distance of residence from the C.B.D. This pattern is particularly clear in the case of those without a vehicle available who are seen to make more than 65 percent of their trips by the former means when resident close to the C.B.D. and only about 25 percent in the outer areas of the city.

While there is some similarity between the patterns of non-mechanised trip making of the two groups without driving licences, those with a vehicle available tend to make fewer trips by public transport (25 percent compared with 37 percent) and benefit to a greater extent from receiving lifts as car passengers. This mode accounts for 40 percent of the trips made by those with a vehicle available compared with only 20 percent of trips undertaken by those in households with no vehicle available. In contrast, those with personal vehicular mobility are seen to take full advantage of their circumstances and place considerable reliance upon car use as a car driver, with an average of 92 percent of their trips undertaken by this mode.

6.2 'Essential' Travel : Journey to Work and Firm's Business

In Table 6 is presented the breakdown of journey to work and firm's business trip rates and corresponding mean trip lengths and mean travel times with respect to the criterion variables introduced above. Discussion will focus initially on trip rate variation.

First of all, there is some variation in the overall number of trips reported with respect to distance from C.B.D. and between those with and without personal vehicular mobility. However, it is notable that the difference between the trip rates of those with personal vehicular mobility and those without a driving licence or vehicle available is of the order of only 10%. Within this overall pattern, those in the latter group are seen to substitute use of mechanised for non-mechanised modes with increasing distance from the C.B.D., making as many as 77 percent of trips by the latter means if resident in the outer areas of the city. A similar but less marked pattern of substitution is observed among those with vehicle available but no driving licence. However, those with personal vehicular mobility are seen to make in excess of 95 percent of their trips by mechanised means, with only a modest decrease to 88 percent recorded by inner areas residents. These figures indicate that those with personal mobility make very few walk and cycle trips in connection with the journey to work.

If attention is turned to the mean trip lengths corresponding to the trip rates recorded in Table 6, it will be seen that there is a fair degree of similarity between the overall mean trip lengths of the three mobility groups in each of the different C.B.D. distance bands. There is the expected increase in mean trip length with increasing distance from the C.B.D., reflecting the considerable concentration of employment

Table 6 : Person Trip Rate, Mean Trip Length and Mean Travel Time for Non-mechanised and Mechanised Home Based **Journey to Work and Firm's Business** Trips Undertaken by Males in Employment : by Household Vehicle Availability, Possession of a Driving Licence and Distance from CBD

Household Vehicle Availability and Possession of a Driving Licence	Home Zone Distance from CBD (km.)	Non-Mechanised Modes			Mechanised Modes			All Modes			Sample Size
		Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	
No Vehicle Available and no Driving Licence	0-3	1.13	1.42	14.4	0.64	3.01	17.8	1.77	1.98	15.6	367
	3-6	0.56	3.47	32.3	1.18	4.97	24.5	1.74	3.37	27.0	457
	> 6	0.37	3.31	29.9	1.27	6.65	34.5	1.64	5.89	33.4	419
	Means	0.67	2.38	22.6	1.05	5.31	27.4	1.72	4.17	25.5	1243
Vehicle Available and no Driving Licence	0-3	0.97	1.69	17.0	0.75	3.52	14.5	1.72	2.49	15.9	108
	3-6	0.37	3.20	25.2	1.05	4.18	16.0	1.42	3.92	18.4	168
	> 6	0.28	2.40	21.0	1.33	5.50	25.7	1.50	4.92	24.8	140
	Means	0.49	2.31	20.5	1.03	4.58	19.5	1.52	3.85	19.8	416
Vehicle Available and Driving Licence	0-3	0.23	1.43	14.3	1.74	3.21	11.9	1.97	3.00	12.1	432
	3-6	0.05	2.52	23.9	1.84	4.67	14.9	1.89	4.61	15.1	811
	> 6	0.03	2.83	23.8	1.82	6.28	18.4	1.85	5.77	18.4	659
	Means	0.08	1.98	18.9	1.81	4.91	15.4	1.89	4.79	15.6	1902
Overall Means		0.33	2.34	22.0	1.46	4.96	18.7	1.79	4.48	19.3	2561

opportunities in the central parts of the city. However, although there is a tendency for those with high personal vehicular mobility to make slightly longer trips, especially within the inner city band, it is notable that those without a vehicle available in general make the longest non-mechanised mode trips while those resident in the outer city areas make the longest mechanised mode trips. It will be recalled that this latter group make 77 percent of their trips by this means, a large proportion of which are made using what has been described as a very poor quality of public transport service in those outer areas (Shembesh, 1981).

What this analysis has demonstrated so far is that, although there are marginal differences between the trip rates and mean lengths of trips associated with work journeys undertaken by those with and without personal vehicular mobility, no evidence has been found to suggest that the latter group is significantly deprived in any way by virtue of not being able to reach employment opportunities. The analysis suggests that those without a vehicle available and living further away from the centre tend to place greater reliance upon mechanised modes of public transport to reach central city employment opportunities. This pattern seems to reflect the ability of individuals to find at least some means of reaching their places of employment.

6.3 Variation in Resource Expenditure

What the above measures of trip rate and length do not reflect, however, is the difference in the effort or resources which the three mobility groups are required to devote to achieving this broadly similar level of access to employment opportunities. Although such a measure of resources expended in travelling to and from work should ideally include a number of components such as time and cost etc., for the purpose of the current analysis only the simple measure of travel time will be employed to give an indication of the above differences.

From Table 6 it is evident that those with the benefit of personal vehicular mobility are able to undertake, in much less time, journeys of similar or slightly greater length than those without a vehicle available. The mean journey times for those resident in the outer areas are approximately 16 and 26 minutes, respectively, for those with and without a vehicle available. To compensate for the effect of minor trip length differences, this contrast is perhaps better expressed in terms of mean journey speed i.e. 18.8 kph and 10.6 kph for those with and without personal vehicular mobility.

Although these measures of mean journey time and speed give an impression of the nature of the advantage enjoyed by those with personal vehicular mobility over those without a vehicle available, they do not adequately reflect the extent of the difference in resource or effort expenditure in making those journeys. There can be no doubt that the degree of relative disadvantage suffered by those without personal use of a car would be made more explicit if an adequate means could be found to quantify other aspects of travel which relate to the effects of such factors as reliance on others (e.g. for lifts) and the discomfort, inconvenience and frustration associated with using inadequate public transport services. Nevertheless, the analysis has pointed to what appear to be important similarities and differences between the patterns of variation in travel behaviour in the case of journey to work and firm's business trip making in Tripoli. We shall now turn to a similar examination of travel for less essential purposes.

6.4 'Discretionary' Travel: Travel for 'Other Purposes'

The corresponding analysis to that presented above for journey to work trips is set out in Table 7 for home based trips undertaken for 'other purposes' by males who are aged 19 and over. It will be recalled that, in this context, 'other purposes' is taken to refer to trips associated with shopping, personal business, social and recreational activities. Again the discussion will start with consideration of trip rate variation between the three mobility groups.

The table indicates that there is a very different pattern of variation with respect to 'other purpose' trips from that described earlier for the journey to work. The most striking feature of this pattern is the more marked difference(s) between the numbers of trips reported by those with and without personal vehicular mobility, the latter group overall making almost 1.75 trips for every one made by the former, with corresponding differences observed in each of the three C.B.D. distance bands. In this case also those with a vehicle available but no driving licence make an intermediate number of trips, roughly 25 percent more than those with no vehicle available.

Another interesting feature of this pattern is for those living in the intermediate distance band (3-6 km from C.B.D.) to make the largest number of trips in all three mobility groups. This can be accounted for by the ability of those without a driving licence living in this band to both reach the facilities located in the C.B.D. area and perhaps visit friends and relatives etc. in the outer area by non-mechanised means, as reflected in the relatively high mean trip lengths associated with the non-mechanised trips made by these groups.

It is also notable that there is not the consistent increase in mechanised trip making with increasing distance from the C.B.D. among those without personal vehicular mobility which was observed in the case of journey to work trips, perhaps reflecting the greater deterrent effect of distance and public transport usage from the outer areas when discretionary rather than essential travel is contemplated.

When the mean trip length figures are examined this pattern is clearly borne out in that the comparatively small numbers of mechanised trips, made by those residents outside the inner city area who are more reliant upon public transport, are consistently longer trips than the trips of those with personal vehicular mobility (4.94 km. compared with 4.62 km and 6.17 km compared with 4.97 km). It is also interesting to note with respect to the overall pattern that, while the mean trip length of mechanised trips is only 8 percent less than in the case of journey to work travel (4.57 km: 4.96 km), there is a difference of 30 percent in the overall non-mechanised mean trip length (2.34 km: 1.64 km), again reflecting a greater reluctance to commit physical effort to travel when less importance is attached to the purpose of the journey.

Finally, Table 7 records a significant difference in the time resources devoted to travel between those with and without the benefit of personal vehicular mobility (overall mean of 14.6 minutes compared with 20.7). However, in this case, the difference is somewhat less than recorded for the journey to work (15.6 : 25.5) by virtue of the shorter average length of other purpose journeys undertaken by those without a vehicle available.

Table 7 : Person Trip Rate, Mean Trip Length and Mean Travel Time for Non-Mechanised and Mechanised Home Based 'Other Purpose' Trips Undertaken by Males Aged 19+ : by Household Vehicle Availability, Possession of a Driving Licence and Distance from CBD

Household Vehicle Availability and Possession of a Driving Licence	Home Zone Distance from CBD (km.)	Non-Mechanised Modes			Mechanised Modes			All Modes			Sample Size
		Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	Mean Trip Rate	Mean Trip Length (km.)	Mean Travel Time (mins.)	
No Vehicle Available and no Driving Licence	0-3	0.36	1.18	11.2	0.09	3.19	18.4	0.45	1.58	12.6	311
	3-6	0.22	2.17	20.3	0.26	4.94	24.2	0.48	3.68	22.4	493
	> 6	0.16	2.17	20.7	0.24	6.17	29.5	0.40	4.57	26.0	473
	Means	0.24	1.73	16.4	0.20	5.27	25.9	0.44	3.34	20.7	1377
Vehicle Available and no Driving Licence	0-3	0.31	1.36	13.2	0.25	3.98	14.3	0.56	2.53	13.7	156
	3-6	0.26	2.07	17.1	0.44	4.10	22.3	0.70	3.34	20.4	186
	> 6	0.09	1.96	13.9	0.28	5.63	22.4	0.37	4.74	20.4	153
	Means	0.23	1.70	14.6	0.33	4.48	20.5	0.56	3.34	18.1	495
Vehicle Available and Driving Licence	0-3	0.15	1.27	12.5	0.59	3.36	11.7	0.74	2.94	11.9	456
	3-6	0.07	1.60	16.0	0.80	4.62	14.8	0.87	4.37	14.9	842
	> 6	0.04	2.40	22.7	0.61	4.97	15.6	0.65	4.81	16.0	688
	Means	0.08	1.55	15.3	0.68	4.51	14.6	0.76	4.20	14.6	1986
Overall Means		0.15	1.64	15.4	0.47	4.57	16.6	0.62	3.89	16.6	3858

7. CONCLUSIONS

The analyses reported here have provided some interesting insights into various aspects of travel behaviour in Tripoli. The earlier analyses revealed the marked differences between the levels of trip making of males and females in an arab/muslim society and the effect of age on this variation in travel. The familiar increase in mobility associated with the availability of a vehicle was shown to be present but it was demonstrated that the simple measure of household vehicle availability can give a misleading impression of propensity to an increased level of trip making. The isolation of the effects of vehicle availability and possession of a driving licence revealed that it is only when an individual has the benefit of the latter that a really significant increase in trip making is recorded.

The more detailed analyses of the influence of personal vehicular mobility on travel for 'essential' and 'discretionary' purposes also produced some interesting findings. In the case of the former, journey to work travel, it has been demonstrated that, although those with the benefit of personal vehicular mobility make marginally more trips, there is very little difference in the amount of travel undertaken, and consequently the destinations reached, amongst the three mobility groups considered. In particular, no evidence was found to suggest that those without personal vehicular mobility suffered any great deprivation by virtue of being unable to have access to places of employment. However, this group was shown to rely to a greater extent on what were described as inadequate public transport services when resident further away from the concentrations of employment opportunities close to the central area of the city. Faced with the necessity of making such journeys, the less mobile were also shown to have to devote significantly more time to the work journey than those with greater personal vehicular mobility.

In contrast with the pattern observed with respect to the journey to work, the examination of discretionary travel revealed that those with personal vehicular mobility derive significant benefits in comparison with the less mobile groups in terms of the number of trips undertaken. It would appear that lack of access to a car, coupled with reliance upon poor public transport services and remoteness from the C.B.D. does have a considerable deterrent effect on travel, both in terms of frequency of trip making and length of journeys undertaken. In this respect, in the light of knowledge of the importance placed on social contact and family interaction in Libyan society, this analysis suggests that the less mobile members of the adult male population are not able to engage in these activities to the extent that the more mobile appear to accept as normal. Whether this difference in behaviour or apparent opportunity to meet such commitments can be interpreted as 'deprivation' must remain a political judgement - as must any decision to provide the means to enable the less mobile to achieve the freedom of movement enjoyed by those with personal vehicular mobility.

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APPENDIX 1

For the purpose of carrying out the analyses described in this paper it proved necessary to adopt the following specifications of variables, drawn from the information gathered in the Tripoli Home Interview Survey 1977:

1. Age: 6-18, 19-45, 46-64, 65+ i.e. children under 6 are excluded.
2. Household vehicle availability: defined in terms of the availability of one or more vehicles (cars or light vans) owned by a member of the household or provided by an employer for both business and private use.
3. Household monthly income: Low - < 150 Libyan Dinars (1 Dinar=£2)
Medium - 150-200
High - > 200.
4. Trip lengths were derived from simplified representations of the Tripoli road and public transport networks based on network distances between 60 study area survey zones. Travel times were based upon estimates of travel times via these networks.
5. Trips for 'other purposes' included trips undertaken on personal business, shopping and for social and recreational purposes.