

## Urban Travel Comparisons— Great Britain-U.S.

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### ABSTRACT

Data is presented to show comparisons of demand for both public and private transportation between the U.S. and the United Kingdom. In both countries the past two decades have witnessed large expenditures and investments in the private auto and highways. However, in the U.K. there is still a great demand for public transportation, and a strong reliance on walking. Further, in Great Britain there is an apparent tie of the place of residence to place of work, especially for lower income workers. This is illustrated through the development of an expected cost of the journey to work for a variety of job types in the U.K. Demand for public transit in London is seen to be comparable to that in New York, where natural restraints hinder use of the private car. The systems that feed London, British Rail, London Transport Bus, and London Underground, are compared with New York's subway system.

### Introduction

At a time when car ownership is increasing at a rate alarming to planners in the United Kingdom, it is still at a level half that of the United States. While one implication of this initial comparison might be that U.S. planners should have been alarmed when levels of car ownership were much lower, another is that comparisons of car ownership in the U.K. and U.S. are really comparisons of dissimilar things. This dissimilarity results from the land use in the nature of the urban areas, the relation of urban space to rural space, personal mobility within the urban area, and the impact and role of the national government acting as a planner. Detailed descriptions of the historical growth

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of urban physical plans and transportation patterns in both countries will not be discussed in this paper. Comparisons shall be made regarding current mobility problems similar to both countries. Approaches to understanding these mobility problems will be illustrated through discussion of the benefits of mass transit and pedestrianism as well as the disbenefits of using the car.

The most identifiable unifying problem is that of the relationship of the car to the environment of urban areas. As oriented as the U.K. has been traditionally towards public transit, the spiral of increasing car ownership and concurrent decline of public transit is evident. The complexities of the problem of relating the car to the environment are underlined by such facts as the hearings into the Greater London Development Plan (GLDP) which have been ongoing for nearly two years and have been finally concluded. The GLDP has implications for the future physical and social structure of London, with regard to housing and employment that are integral with the transportation plan. It will be shown that in Great Britain there is a tendency of many people to live near their work, a tendency not seen so strongly in the U.S.

It is the intent of this paper to illustrate patterns of urban travel in the United Kingdom and compare some of these patterns with many in the United States. The importance of the comparison is to show the relative decline of the use of public transportation in both countries, as the car has become the prime mode. However, experience in the U.K. suggests that the decline can be controlled through planning, and that personal attitudes towards the mode they choose, or a given trip can serve as a mechanism to limit car trips. This will be seen in particular with regard to neighborhood shopping trips. There is a strong reliance on walking in the U.K. that has really not been measured significantly in the U.S. In addition, comparisons are made in the relative costs of travel in both countries.

### **Allocation of Transportation Resources**

In both the U.K. and the U.S. the Government has always acted as a de facto planner through funds allocated for highway construction and maintenance, and for support of public facilities. Over the past 20 years the U.K. road program has increased considerably (Table 1). This has been effected both to keep pace with the increase in car ownership and to modernize a system of historically inadequate roads. Investment in the British Highway Program has trebled per highway mile over the past decade. During the same period the investment in public transportation has declined. The highway expenditure has been made to cover the 100% increase in cars operated in the last decade, and the concurrent demand for road space made by these vehicles. This is clearly shown in Table 2 where in the U.K. the passenger miles per private vehicle has remained essentially constant over the last decade. The total vehicle mileage doubles as the number of private cars is

Table 1. Government Support of Transportation

Year	Total disbursements for highways (U.S. dollars)	U.K. road program (pounds <sup>a,b</sup> )	U.K. public transport (pounds <sup>a</sup> )	U.K. public road expenditure %	Miles of roadway	
					U.K.	£/mile
1960		238,000,000	—	—	197,200	1220
1965	15,698,000,000 <sup>d</sup>	421,200,000	—	—	201,000	2070
1970	20,090,000,000	663,700,000	—	—	207,900	3200
1971	n.a.	752,600,000 <sup>c</sup>	169,700,000 <sup>c</sup>	22.5 <sup>c</sup>		
1972	n.a.	831,200,000 <sup>c</sup>	175,900,000 <sup>c</sup>	21.1 <sup>c</sup>		
1973	n.a.	896,700,000 <sup>c</sup>	173,300,000 <sup>c</sup>	19.3 <sup>c</sup>		

<sup>a</sup> The pound was worth approximately \$2.40 until late 1971. In early 1972 the dollar was revalued and the pound is currently worth approximately \$2.60. In late 1972 the pound was devalued and became worth \$2.35. Presently (1973) devaluation of the dollar makes the pound worth approximately \$2.45. Comparisons are obviously difficult as the currency values in each country are somewhat independent of exchange values.

<sup>b</sup> Unless otherwise noted, statistical data on U.K. is obtained from *Annual Abstracts of Statistics*, No. 108, 1971, HMSO and *Passenger Transport in Great Britain*, 1970, HMSO.

<sup>c</sup> Expenditure Committee, Environment and Home Office Subcommittee, Ministry of Evidence, Tuesday, January 25, 1972, HMSO.

<sup>d</sup> 1966

Table 2. Vehicles in Service, Cost of Use, Miles Traveled\*

	Year		
	1960	1965	1970
<i>United Kingdom</i>			
Licensed cars	5,826,000	8,917,000	11,515,000
Licensed cycles	1,867,000	1,711,000	1,176,000
Public road passenger vehicles	95,000	97,000	103,000
New car registration	805,017	1,122,477	1,097,219
Consumer Cost (1963 = 100)			
Railway	81	110	142
Bus	86	117	162
Car—purchase	115	99	109
Car—running cost	93	109	137
Passenger Mileage billions miles (per cent in parenthesis)			
Road—public	44 (28)	39 (19)	37 (13)
Road—private	89 (56)	145 (70)	196 (77)
Rail	25 (16)	22 (19)	22 (9)
Population (U.K.)			
(million)	52.3	57.4	55.7
<i>United States</i>			
	1960		1970
Licensed cars	61,682,304		89,861,000
Licensed buses	272,129		375,000
Passenger miles (billions)			
Car	588.1	706.4	850.0**
Bus	4.4	4.8	5.0**

\* See note *b*, Table 1, for references

\*\* 1969

doubled. This is indicative of a rapidly rising demand for roadspace for a total population that has increased by 6.5% during that period. The demand for roadspace can also be seen in figures relating passenger miles to miles of road. In 1960, for private vehicles there were 460,000 passenger miles per mile of road, and by 1970 this too had more than doubled to 950,000 passenger miles; the miles of roadway had increased only 7% in that time.

In the U.S. in 1969 there were 228,000 passenger miles per mile of road. The higher costs of expenditures were, of course, due to expensive roadway construction, construction in urban areas, and maintenance of more highly used existing systems. Cost figures also help explain the rise in popularity of

the motor car. During the period 1960-70 the cost of railway or bus travel was increasing nearly 75% while the purchase price of a motor car remained essentially stable (Table 2). The operating costs of a car went up at a lesser rate than travel costs on bus or rail. The reason for the decline in car prices during the first five year period of the decade was the government reduction in purchase tax (a fixed percentage of the car retail price), and during the second half of the decade an ease on the restrictions on hire purchase (installment) buying. This is all summed in the percent of passenger miles traveled by mode shown in Table 2. From slightly more than half the total mileage in 1960, car travel was well over three quarters the total mileage in 1970.

### Travel Characteristics of Households

Understanding of total travel habits can be made by an examination of household travel. Table 3 presents the results of a survey<sup>2</sup> recently completed in the U.K. on travel patterns of households in five areas of differing size in Great Britain. The areas ranged in population from a rural town to a zone of London. The national figure for car ownership is much less in the more populated areas surveyed. To have perspective on the use of alternative modes, several factors on life patterns in the U.K. which may differ from the U.S. should be noted. First, second cars are owned by less than 8% of the total households in the U.K. as compared with 25% of the households in the U.S. [1] There is less of an opportunity to have a car available for purposes

Table 3. Comparison of Travel Modes—5 Areas—England\*

Area	Population	% H.H. with cars	Shop Trips % by Mode			Leisure Trips % by Mode		
			Walk	Car	Bus	Walk	Car	Bus
1	2,000	68	63	31	6	44	50	6
2	31,000	71	55	32	13	30	61	9
3	65,000	66	70	19	11	70	52	8
4	350,000	47	64	19	16	77	42	19
5	7,500,000	46	75	9	15	51	27	22

\* Source: Survey undertaken by Political and Economic Planning, London, England.

<sup>2</sup> The survey is part of a major study being carried out by Political and Economic Planning, London, England. The project leader of the mobility study is Mayer Hillman and the group includes Ann Whalley, Irwin Henderson, and for a short period the author. A detailed study by the group is forthcoming. Due to confidentiality the study areas are identified only by total populations of the rural area or cities within which they are contained.

other than work when the car is used predominantly for the work trip. The pattern of necessary shopping (such as for groceries) is affected by hours of opening of shops, location of shops, storage space in the house, and amount of the weekly budget available for shopping. Stores traditionally close in the evening between 5 and 6:00 p.m. and open between 8 and 9:00 a.m. in the morning. Most grocery shopping is done on a day-to-day basis, or to cover a few day period. Milk, and quite often, bread, is delivered so there is no need to make a special trip for these goods. The housewife usually shops during the day. In instances where both husband and wife work, some larger shopping is done during time off (e.g., Saturday morning) with other goods being picked up either in markets near work during lunch hour or after work in markets near the home. These patterns have been stabilized through the existence of markets in or near most residential areas. The survey figures showed that nearly three quarters of the shopping trips were satisfied in less than 15 minutes, indicating the availability of shops within three quarters of a mile to a mile of the place of residence.

Examination of Table 3 shows that for every area, even those with high car ownership, the predominant mode of travel for shopping is by walking. In Area 5, 76% of the survey respondees walked for shopping. This is implicit in a densely populated urban area where there is a high level of opportunity and a great number of shops in or near most residential areas. The trade-off between car and bus trips for the remainder of the population was somewhat dependent upon the availability of public transportation. In Area 1 the public transportation is essentially a rural service with long intervals between buses. The remaining areas all had, by U.S. standards, good levels of service, both with regard to weekday, daytime frequencies and accessibility to residential area. In Area 5 population density is great enough to make car ownership less necessary, this being shown by both car-bus split and car ownership figures. For the remaining areas, households that had cars preferred to use them for shopping rather than put up with the uncertainties and difficulties of using the bus.

Leisure trips are less restricted to time or taken to a wider range of facilities than shopping trips. The mode breakdown for the same areas for leisure trips is somewhat different. Only in Area 5 is walking still clearly the predominant mode of travel. In other areas the car becomes the primary way to satisfy leisure trip requirements. Public transport serves only the small remaining numbers. In Area 5 there is a somewhat even split between public transport and the car indicating that when travel is desired out of the neighborhood, restraints on car use in a densely populated area make public transportation a worthwhile alternative. In Great Britain many leisure trips, by adults, are taken to the neighborhood public house (pub) that serves a social function for which there is no direct analogy in the U.S. These are located in nearly every neighborhood and serve as social meeting places. Thus, many leisure trips are satisfied within the neighborhood.

### Travel, Income, and Expenditure

While the previous section gave basic statistics on mode used for leisure and shopping trips, it is possible to get a better understanding of mode preference by an examination of income-expenditure data. Income effects choice of residence, and quite often distance of residence from workplace. The family budget, given in the 1971 Income-Expenditure Survey in the U.K. is briefly summarized in Table 4. As expected, transportation expenditures can assume a higher proportion of the family budget when less must be spent on food, housing and fuel. At lower income, there is less discretion in choice of living place. As the budget must be carefully watched, by living close to work, the work journey costs are minimized, and with location of adequate shopping

Table 4. Family Expenditures, U.K.\*

<i>Income level</i> £/week	<i>% of Expenditures</i> <i>On</i>		<i>% of Transport</i> <i>Expenditures On</i>	
	<i>Food, housing</i> <i>fuel</i>	<i>Transport</i>	<i>Car</i>	<i>Public</i> <i>transport</i>
Less than 10	75	5	60	32
10-20	58	7	64	30
20-30	49	12	76	19
30-40	44	14	75	15
40-60	41	15	79	15
More than 60	38	17	80	14

\* Social Trends, No. 2, 1971 Government Statistical Service HMSO.

areas, the shopping trips as noted above, can be made by walking. The per cent spent on transportation increases with income. At £1000 per year (approximately \$2500), 22% of the families in the U.K. own one or more cars. At £2000 (\$5000) per year this has increased to 68%. At similar income levels in the U.S. car ownership is higher. At incomes of \$2500 per year 40% of American households are car owning, increasing to 72% at \$5000 per year [1]. The biggest difference in car owning and non-car owning families between the U.K. and U.S. occurs at incomes of less than £1200 (\$3000) where U.S. ownership rates average 8 to 10% higher than U.K. families. An end product of this, of course, is less of a need to locate the residence near the workplace in the U.S. than in the U.K.

There are strong links between income, job type, and age in the U.K. The average family income in the U.K. is £33.86 per week (\$4400/year); highest in the London area is £39.48 per week (\$5200/year). For families whose head is less than 30 years old, median income is £33.95/week. Peak earnings occur in the 40-50 age group with earnings of £46.44 per week, declining rapidly with age after 50. Old age pensioners with incomes of £20 per week or less are

severely limited in their transportation expenditure, often allocating 2-3% for this purpose. Walk trips become extremely important for this group. There is a differential between median incomes by job class. A salaried male worker earns £35.80 per week, whereas a manual worker, male, earns £28.05 per week.

The U.S. income distribution is also linked to job type and region of the country. Median family income (1969) is \$9,590 [2]. Median income of professional males was \$10,965, while that of laborers was \$4,647. Median income was highest in the Northeast (\$10,545) and lowest in the South (\$8,079). The stark difference in incomes between the U.S. and U.K. is reflected in discretionary purchases, and is one reason why car ownership in the U.K. has remained at about 60% of U.S. figures. As noted in Table 3 walking is also an important travel mode, reducing the need for any out-of-pocket direct travel expenses for many necessary trips. While the American might hop in his car for a pack of cigarettes, the Englishman will walk to the pub or corner store. The price of gasoline (approximately 75¢ per U.S. gallon) also acts as a restraint on casual trip making by car.

Because of the high population density of the U.K. and because the trends in increasing car ownership are recent, there is a well-developed public transportation system throughout the whole of the country. The system includes buses run by local authorities or by national conglomerations, British Rail (BR, the national railways), and in the case of London, the underground (LT rail). Because each mode has an associated fare structure, workers in lower income classes tend to take the modes that minimize their costs. Conversely as income increases, workers are willing to pay more for a greater freedom of mode choice. A more detailed study of income spent on public transportation shows that families with incomes greater than £40/week spend more on public transportation than families with lesser incomes. While this can be due to more members of the family working, it is also due to longer journeys (public transport charges by distance, fixed fares are uncommon), and increasing use of British Rail by more affluent commuters. In 1970 the average journey length on British Rail was 22.9 miles (at an average receipt of 27.4 new pence<sup>3</sup>) while the average distance traveled on London Transport rail was 4.8 miles with an average receipt per journey of 8.0 new pence. While the former figure does represent some inclusion of intercity travel, the very high proportion of commuters in and around the major metropolitan areas and especially the Greater London Area does reflect a true proportion between British Rail travel and urban public transportation.

The 1966 Sample Census for the U.K. provided much insight into travel patterns with regard to other household variables. From the data it is possible to construct a relationship between occupation of the head of the household

<sup>3</sup> new pence—2.6 cents U.S., April 1972



and preferred mode of travel. This information, coupled with average travel distances and costs for travel by mode (based on distance) is used to establish an expected cost of travel for the journey to work for each profession.

The expected costs were calculated in the following way:

1. For a selected area (i.e., specific census tracts), the population is broken down into job categories and with each category modes for the journey to work are listed.
2. An average distance of travel is associated with each mode.
3. A cost of travel is associated with each distance.
4. The expected cost is then the sum of the proportional components of mode-cost for each mode making up the category.

For an area of central London, the expected costs of travel were developed and are presented in Table 5. There is a distinct structuring of costs between professions reflected in the choice of mode and distance that a person is willing to travel. White collar workers are willing to spend more than twice that of less skilled blue collar workers. Someone classified as professional will spend 20.3 new pence on trips that are made predominantly by car or train. An unskilled worker, more affected by fluctuations in the labor market and perhaps more transient in his dwelling, will spend 8.3 pence on travel to work, predominantly by bus and walking. It is seen that a quarter of work journeys are by walking for service workers and unskilled laborers, and in every category but professional more than 10% of the work journeys are by walk. For four of the seven categories the predominant mode of travel is by bus, and as 80% of the bus trips are less than 2 miles (46% less than 1 mile), it is clearly seen that there is a strong desire to locate the home near work. Studies by Voorhees (Table 6) in the major metropolitan areas of England show that more than 15% of the working population walk to the place of employment in each area.

Table 5. Expected Cost of Travel

<i>Job type</i>	<i>Expected cost-pence*</i> <i>(all modes)</i>	<i>Journey to Work Mode (%)</i>			
		<i>Train</i>	<i>Bus</i>	<i>Car</i>	<i>Walk</i>
Profes.	20.3	23	24	37	6
Empl. manuf.	18.2	16	19	33	13
Self. empl.	14.1	6	11	20	14
Skilled	14.9	14	35	24	16
Non-man lab.	8.7	21	43	2	17
Service	9.6	13	44	9	25
Unskilled	8.3	11	50	5	24

\* Developed from data in 1966 sample census for Borough of Southwark, London—see text for method of developing cost.

Table 6. Work Survey by Walking, Selected Areas, U.K.\*

<i>Conurbation</i>	<i>Study population millions</i>	<i>Cars/H.H.</i>	<i>Journeys to work walk: % all modes</i>
London	8.83	0.43	15
W. Midlands	2.53	0.49	19
SELNEC	2.60	0.42	19
Merseyside	1.45	0.39	15
Tyneside	1.43	0.33	19
Clydeside	1.93	0.31	17
W. Yorkshire	2.10	0.41	21

\* *Reference:* A Voorhees & Assoc. Traffic in the Conurbations, A Report for the British Road Federation, 1971.

Expected costs of travel are much more difficult to obtain for U.S. residents in urban areas. Because of the great dispersion of places of employment throughout major urban areas, and the rapid suburbanization of industry, relatively greater distances are travelled to work by people in all job categories. Trip lengths by occupation have not been recorded, but data available shows the general predisposition to automobile, and the trade-off between car and public transit for the highest income workers (Table 7) [1].

In low income areas in the U.S. [3] income and mode choice is also strongly linked. With incomes of less than \$100/week more than 10% of the surveyed workers walk to work, and at less than \$50/week over 20% walk to work. Over 40% of the workers in income categories under \$120/week use public transit. For over 80% of these workers using public transportation the cost of the journey to work was predictably fixed (in the range of a fixed fare plus one transfer). This reflects general U.S. urban transportation policy of having fixed fares for rides within the urban areas as opposed to the distance schedule in English urban areas. In a typical U.S. urban area [4] only 36% of those living in designated low income areas also worked within the area. Over 21% worked outside the city limits, indicating substantial journeys to work.

Table 7. Means of Transportation to Work in U.S. by Occupation [1].

<i>Occupation</i>	<i>Mode by %</i>			
	<i>Public transit</i>	<i>Walk</i>	<i>Drive</i>	<i>Ride</i>
Prof. & Manag.	9	2	68	21
Clerical, Sales	22	3	52	23
Crafts, Oper. Lab.	10	4	55	31
Service, Priv. Work	24	12	42	22

With the exception of clerical workers, who are predominantly female, this distribution was somewhat uniform across all income classes. The argument to use staggered fares in U.S. urban areas is not as strong as it is in England. In the U.S., as noted, there is no strong relationship between job type and distance of journey to work. Staggered fares would tend to have an inhibiting effect on those lower income workers who travel great distances to work.

In the U.S. there is no apparent link of journey to work and car ownership, as areas such as the West Midlands, which have high levels of car ownership, also have high numbers of walk trips. In most areas congestion in the central area serves as a restraint to the auto journey, and other modes of travel are sought. In fact, based upon predictions of future demands, from studies in major English metropolitan areas, it is shown that maximum car use for the central area work journey in the 1980's and 1990's will be limited to 30% of the total trips. This will tend to keep strong ties between place of residence and place of work, and many will still choose to minimize work trip costs.

This can be contrasted with the U.S. [5] where in central areas of the major metropolitan urbanized areas 67% of the work trips are by car, 20% by public transport, and only 4% by walking. As in the U.K. there is a structure of mode choice linked to profession. The highest use of the auto is made by those in professions or managerial occupations (89%); the lowest by service and private workers (64%). The latter category has the highest amount of walk trips (12%) contrasted to the 2% of professionals who walk to work. Even in central areas of the U.S. SMSA's there is less of a tie of residence to work place, for 69% of all work trips in those areas are more than 3 miles. This increases to 73% living more than 3 miles from work for those living outside the central area in the SMSA, even though recent census have shown that places of employment are also shifting to the suburbs.

### **Travel and Public Transport in Central London**

London is as unique a phenomenon in the U.K. as New York City is in the U.S. High populations and high population densities coupled with a history of urban form that can be traced to Roman times make transportation services and problems somewhat unique. The tie of place of residence to work is strong in London, which acts somewhat more as an interconnected group of distinct boroughs, each with its own characteristics, rather than the U.S. form of city—strong central core and active suburban ring. As noted earlier, the most recently proposed transportation studies for London were made in association with the GLDP [6]. These studies provided information on vehicle travel patterns for the residents of the Greater London Area. These are constantly updated by traffic counts made by various agencies of the London governing bodies and by London Transport and British rail. Movement in

London is extremely dependent upon the adequate functioning of its public transportation service.<sup>4</sup> Of the more than 1,100,000 [7] trips into central London during the morning peak hours, only 12% are by private car, with the remaining 88% divided: 40% by British rail, 34% by underground, and 14% by bus. London is split by the River Thames. The underground is extremely well developed north of the Thames, but has much sparser development south of the river, although the population distributions are not dissimilar. Approximately 11% of the stations (there are 238 stations) are south of the river. However, this is compensated for by an extensive British Rail commuter service south of the river (Southern Rail) which provides rapid transit to the Central London Railway Stations and also many interchanges with the London Transport stations. In 1970 British Rail carried 369 million passengers in the London Transport Area, while London Transport carried 672 million passengers. Because the underground is established more as local public transport, with close proximity of stations, it serves more of the non-work journeys and more casual trips than does British Rail.

The third basic means of public transport in London, London Transport buses, had 1,502 million passenger journeys during 1970. The bus network is quite extensive, with more than 200 separate routes throughout the area. The bus is the cheapest mode of public transport in London, with a fare structure somewhat less than the underground. A two mile trip by bus is 7½ new pence; by train 10 new pence. Minimum fares are 3 pence on the bus (up to 3/4 miles), and 5 pence on the train (up to 2 miles). In a study of modal choice [8] of residents within the London area, it was shown that work location had an extremely significant influence on choice of mode to work even in car-owning households. For work in two central areas, less than 25% of households with cars chose the car for the trip. In non-central areas the percentage rose to 90%. The choice of mode utilized, once the car was left home, was primarily British Rail (BR), then the underground. The least utilized mode was the bus.

Those who do use British Rail live the greatest distance from work, hence pay the most for the work trip. The value of time to the traveler is shown clearly by the fact that for those with access to bus, the bus journey is relatively short. If the journey is more than 3.5 miles the car is preferred. However, for long journeys the train is preferred (either U.G. or BR), train journeys being 25-80% longer (distance) than car journeys for those who have that option. The Modal Choice study also showed that BR users travel further than underground users who, in turn, travel more than twice the distance of bus riders. This can be compared to the U.S. where the average travel distance

<sup>4</sup> In 1962 the survey area for London was 941 sq.m. but the inner core only 10 sq.m. 30% of working population worked in inner core. While the population of total area was 9000 pers/sq.m., it rises in the core to 27,000 persons/sq.m.

to work by car, the predominant mode for work trip, is 9.4 miles. The average trip length in New York City on the subway is 5.8 miles, and takes 43 minutes.

For comparison, mass transit plays an extremely important role in travel in New York City [9]. On a typical weekday, of the 4,100,000 trips into Mahattan (one-way trips) 54% are by subway, by far the biggest component; 19% are by bus; 13% car (as driver or rider); 10% by commuter rail; and 8% by taxi. Total daily use of mass transit of all forms in New York is made by 9.9 million people.

The car driver is usually in the minority. The private auto represents only 25% of vehicular trips into Manhattan with trucks and taxis taking the remainder. It seems in this case that cost as well as time acts as a travel restraint. The average income of the car user in Manhattan is 1.5 times the area median. He can well afford the trip cost and Manhattan's high parking costs. The expected cost data for London also suggests that the car is used for the work trip by those of higher incomes. The public transit fare in New York (bus, subway) is still 35c (equivalent to 10p in England) and at the cost, represents a lower percentage of the user's median income.

This underlines an important point in the comparison. Future investment on public mass transportation is essential because there are no real alternative systems. Data on the number of cars in both London and Manhattan show that the private car is not the major source of traffic congestion, but only adds to inefficient use of complex street systems shared by taxis, buses and, most importantly, trucks. Income data also suggest that pricing will not tend to restrict the private cars that use the streets. The only real restraints are total prohibition or elimination of parking.

On the other hand, factors which tend to increase car use only add to the severity of movement problems. Thus, in New York City, poor service on commuter railroads, or improper maintenance of the subway, or lack of personal safety on the subway, will force many to seek the car. In London, approval of the inner motorways and allowing cars to get to Central London more quickly, will also attract many away from the public transit system. The efficiency of public transit is dependent upon a high demand for its use and is counterproductive to actively planning to reduce this demand.

### Utilization of Public Transport

Over the past decade there has been a decline in utilization of public transport in the U.K. similar to that in the U.S. [10] (Table 8). The biggest decline was in bus use. In the London area the total number of passengers on the underground remained somewhat stable, due in large amount, to the opening of a new line. There were 228 stations on the underground in 1960.

Table 8. Utilization of Public Transportation, U.K.

Year	<i>Passenger Journeys (millions)</i>			
	<i>All buses</i>	<i>L. T. Buses*</i>	<i>B. R.</i>	<i>L. T. R.*</i>
1960	12,534	2,281	1,037	674
1965	11,352	2,132	865	657
(1968)				654
(1969)				676**
1970	9,076	1,502	824	671

\* During the period 1961-1971 the population of the Greater London Area declined from 7.99 million. The population of Great Britain increased from 52.4 million to 55.7 million.

\*\* A new underground line, the Victoria line, was opened during the year.

And even with some closures, the number (with the new Victoria line) increased to 238 in 1970. The high demand for use on the underground can be seen in that the busiest station in the West End of London accommodates over 800,000 passengers per week, 20 stations accommodate more than 250,000 passengers per week, and 61 more than 100,000 per week. The New York Subway system, in comparison, accommodates approximately a total of 25,000,000 persons per week in its 482 stations.

Transportation studies often relate trip generation to household income, with the conclusion that as income increases vehicle trips increase. While true, this can be misleading in terms of estimating the impact of public transit or the volume of trips made at lower income levels. However, the 1962 London Traffic Survey (L.T.S.) showed in income trip plots that income was a greater factor in trip making than car ownership. There was less of a gap in trip making between car driving and non-car driving households at a fixed means level than there was between successive income levels for both types of household.

Table 9, based on L.T.S. data, and populations within income levels,

Table 9. Trip Income Distribution, U.K.

<i>Income range (£)</i>	<i>Cumulative % of trips to given income</i>	<i>% of Trips at Income Level</i>	
		<i>COHH</i>	<i>NCOHH</i>
0-50	5	6	94
500-1000	35	35	65
1000-1500	68	60	40
1500-2000	85	73	27
2000-3000	95	82	18
3000 or more	100	90	10

indicates the total trip making by various income level. The majority of trips are taken at lower income levels simply because there are more low income families. On the usual trip income curve, there is a differential in vehicle trips between income levels. In the U.K., as data reported in earlier sections suggest, much of this gap can be accounted for by walk trips to satisfy specific needs such as shopping, many leisure trips, and in many cases, especially at the low income level, the work trip. The omission of walk trips from transportation surveys in areas where such trips are important to the trip maker and represent a substantial contribution to the total travel pattern, can be seriously misleading. While this seems to be truer of the U.K. than the U.S., overplanning for other modes, especially the car, can only be a disbenefit to planning for a highly efficient mode of movement in dense areas.

### Conclusions

With the exception of New York and London, travel patterns in the U.K. are significantly different from those in the U.S., primarily because of the history of growth of urban areas and the continued reliance on strong public transport levels and walk trips. Increasing car ownership is causing changes in these patterns, but current planning methods and inquiry in the U.K. are insuring that a sense of this historical commitment will remain in future urban form. In the U.S., with less feel for historical commitment and more for our technological commitment, there is new pressure to solve urban transportation problems by way of new large capital investment in specific hardware such as rail rapid systems and Personal Rapid Transit (PRT).

In New York and London, high use of mass transit will in effect level to keep private car use yet, but levels of service of public transit must be kept high so that the user will remain in these cities.

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