# **Transportation Usage Study**

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#### **OBJECTIVES**

● THE MAIN objective of this study was to secure information to aid in the assignment of traffic to arterial streets, expressways, and to mass transportation facilities. This study was designed to probe directly into the attitudes and personal reasons involved in the choice of mode of travel.

People making trips (other than walking) can be divided into three broad categories: (a) those who must use some form of mass transit; (b) those who must use an automobile; and (c) those who have a choice of using either an automobile or some form of mass transit. Knowledge of the characteristics of group (c) is of great value for traffic assignment purposes. When changes are made in available facilities, this group tends to redistribute itself over the various forms of mass transit and auto transportation. This redistribution can best be explained in terms of the personal reasons involved in the choice of mode of travel.

# THE SAMPLE

Usable data was obtained from interviews of nearly 2,000 households in Cook County, Ill. as the general sample for the Transportation Usage Study. Each adult member (16 years of age and older) of every household was personally interviewed. In addition to the general sample, six cluster areas were selected for blanket coverage (minimum of 100 household interviews per cluster). These areas were chosen on the basis of such factors as income level, available mass transit facilities, and distance from the central business district (CBD) of Chicago.

# THE INTERVIEW

The interview consisted of basic household data, and for each person interviewed, data pertaining to work trips, trips to the downtown area of Chicago (other than for work), and trips for the purpose of shopping. This discussion will be limited to that portion of the study dealing with work trips.

### WORK TRIPS

# Mode of Travel

Nearly 4, 200 adults were interviewed, of which over 2, 300 reported making one or more work trips during an average week. Figure 1 shows the modes of travel used to reach work destinations in the Chicago CBD and in outlying areas. The left side represents those trips to the Chicago CBD, and the right side portrays trips to outlying areas. The number of trips made by each of the major modes of travel is shown by a bar graph. The respective percentage associated with each mode of travel is also indicated. The sharp differences in mode of travel to the CBD as opposed to mode of travel to the outlying areas is apparent. Automobile trips account for 29 percent of the work trips to the CBD but account for 64 percent of trips to outlying areas. All forms of mass transit except the Chicago Transit Authority (CTA) bus show large percentage drops in usage for trips outside of the CBD as compared to trips within the CBD. These relationships were also found to hold generally in the five cluster areas. However, cluster No. 2, an above average income area, showed a higher than average percentage of automobile trips both to the CBD and to the outlying areas.

### Reasons for Choice of Mode of Travel

The significant reasons given for choice of mode of travel are shown in Figure 2 for the general sample. As in Figure 1, the left side portrays trips to the Chicago CBD



Figure 1. Mode of Travel for work Trips General Sample.

while the right side shows trips to outlying areas. The number of persons giving each of the indicated reasons is shown by the respective bar graphs. The white bar graphs represent automobile trips, and the black represent trips made by mass transportation facilities. The reason most frequently given was "less time required." This was true of trips made by transit as well as trips made by automobile. The next most important reason seems to be comfort, although when automobile and transit are considered separately it can be seen that comfort plays only a minor role in the selection of transit as a mode of travel. The cost factor ranks high for the transit users, and is important because of its absence for the automobile users.

In about 37 percent of the automobile trips to the CBD either the car is necessary for business purposes or there is no other reasonable means available. The other 63 percent might be induced to switch to some form of mass transit if the time and comfort factors could be altered to make the transit facilities more attractive. This is not an unreasonable approach for trips to the CBD. However, with the advent of the comprehensive expressway system, automobile travel to the CBD will be on a much more competitive basis with transit facilities with respect to both time and comfort factors. This might easily lead to a drop in the percentage of transit trips to the CBD.



Figure 2. Reasons for Choice of Mode of Travel for Work Trips, General Sample.

The transit companies are faced with even more difficult problems for trips with destinations other than to the CBD. Many of these trips involve one or more transfers so that automobile travel has an even greater time advantage than for trips to the CBD. The bulk of those who could shift from automobile to some form of mass transit are made up of the "time" and "comfort" groups so that a satisfactory solution for the transit companies (with respect to trips to the outlying areas) seems remote.

#### Assignment Curves

Assignment curves have been constructed which relate the percentage of transit trips to several pertinent variables. These are (a) the time ratio, (b) the cost ratio, (c) the time required for the trip, and (d) the annual household income.

Figure 3 shows the relationship between the percentage of transit trips and the time ratio (defined to be the time required to make a trip by transit divided by the time to make the same trip by automobile). The time referred to is the time for the entire trip, from point of origin to point of destination. This curve is based on data from over 1,200 trips to the Chicago CBD and to outlying areas, for which each person had a choice between making the trip by transit and making it by automobile.

When the time by transit is one-half that of the time by automobile (time ratio = 0.5) almost all trips are made by transit facilities; when the time by transit is equal to the time by automobile (T.R. = 1.0) about 40 percent of the trips are made by transit; and when the time by transit is twice that of the time by automobile (T.R. = 2.0) only about 10 percent of the trips are made by transit.

Figure 4 relates the percentage of transit trips to the cost ratio (defined to be the cost of making a trip by transit divided by the cost of making the same trip by automobile). For automobile travel, this cost includes operation and parking costs. The curve indicates that when the cost by transit is one-tenth that of the cost by automobile about 60 percent of the trips are made by transit; when the cost by transit is one-half that of the cost by automobile, 15 percent of the trips are by transit; and when the cost by transit is equal to the cost by automobile only about 5 percent of the trips are by transit. This curve is based on the same data as that for Figure 3.

Figure 5 indicates the relationship between the time required for trips and the percentage of trips made by transit facilities. It is limited to those trips to the Chicago CBD.







Figure 4. Transit Assignment, Chicago CED and Outlying Areas.

Of all trips requiring 15 minutes about 60 percent are made by transit; of those trips requiring 45 minutes, 75 percent are by transit; and of those taking 75 minutes, 90 percent are by transit. The transit facilities seem to increase in relative attractiveness as the time required for the trips increases.

The curve in Figure 6 relates transit usage to household income. It is limited to trips with destinations other than to the CBD. Transit usage is very high for the extremely low income groups; it drops very sharply until the income level is about \$4,500 per year, and then transit usage tapers to a gradual decrease with increase in income.

All of the assignment curves shown were determined by regression analysis, and all four variables were highly correlated with the percentage of trips made by mass transit (correlation coefficients greater than 0.90).

#### Comfort

Several factors closely related to comfort were isolated and tested for statistical significance. These factors were (a) possession of a seat for the transit riders,



Figure 5. Transit Assignment, Chicago CBD Only.



Figure 6. Transit Assignment, Outlying Areas Only.

(b) necessity of making a transfer, and (c) the amount of walking required. The significance tests were done on two groups of transit users: (a) those who could have made their trips by automobile, and (b) those who could not have made their trips by automobile. For each of these two groups, the percentage not having seats was determined. These two percentages were tested and the difference found to be statistically significant. The group that could have used an automobile had a substantially lower percentage of persons without seats. For each of the same two groups, the percentage making transfers was determined. The group who could have used an automobile had a significantly lower percentage of persons making transfers. The total number of blocks walked (origin end of trip plus destination end of trip) was tested in the same manner, but found not to differ between the two groups.

#### SUMMARY

#### Mode of Travel

Over two-thirds of the trips to the Chicago CBD were made by mass transportation facilities. For trips to areas other than the CBD, about two-thirds were made by automobile.

#### Reasons for Choice of Mode of Travel

<u>Time</u>. Both the absolute time required for making a trip, and the relative time between transit and automobile travel for the trip were shown to have a substantial influence on the choice of mode of travel.

<u>Cost</u>. The relative cost between transit and automobile travel was shown to be an influencing factor in selection of mode of travel. For trips to outlying areas household income was shown to be inversely related to transit usage.

<u>Comfort</u>. Not having a seat and the necessity of making a transfer were both shown to have a statistically significant influence on the group who have a choice between making a trip by automobile and making it by mass transportation facilities. The number of blocks walked had no apparant influence on this group.