TRANSPORTATION MOBILITY ANALYSIS OF THE HANDICAPPED

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Handicapped people are one of the neglected minorities of transportation planning. For decades, their needs in transportation have been neglected in favor of the needs of the overwhelming majority. This has meant that, in a society in which mobility is a prerequisite of living, the handicapped are forced to travel very little and either depend on their friends and family for transportation or pay the high cost of special transportation. Handicapped people make up about 11 percent of the population. They are, though, divided by numerous disabilities each of which has its own special limitations. This paper studies the mobility of the handicapped in terms of broad functional classification. In terms of individual personal mobility, a 6-step classification from needing a person's help in moving to no limitations is analyzed. The analysis also includes means of travel, number of trips made, cost of travel, opinions on the adequacy of current conditions, and possible improvements. Handicapped people, especially those with severe handicaps, made fewer trips, depended more on family and friends to drive them, used more expensive travel modes, and were willing to pay more for any new transportation than the average citizen. Furthermore, it was found that improvement in transportation will have to be of at least 3 types: improvements for the ambulatory, improvements for those in wheelchairs who can travel 2 or more blocks (negotiate curbs), and improvements for those in wheelchairs who cannot travel 2 or more blocks. Improvements would range from relatively minor bus modifications, such as lower stairs, to new, special door-to-door services.

•ALTHOUGH many studies have been done on the physical problems that handicapped people have with using public transportation systems, little has been done to determine their travel characteristics and their transportation needs. This study does this in the moderately large (1.2 million people) Denver metropolitan region. An estimated 250,000 people with various handicaps live and work in Denver. The study discussed in this paper covered 4 areas.

1. The chronically handicapped were identified. The handicapped are not a single, well-defined group but are many types of people with many different types of disabilities and combinations of disabilities. Furthermore, handicapped people are represented by a large number of agencies and social organizations that are extremely specialized and, from the transportation point of view, often overlapping.
2. Current travel habits of handicapped people were determined. Most handicapped people are assumed to travel to some extent. Data are needed on how many trips are made for work, school, shopping, and other purposes and what means are used for these trips.
3. The determinants of current transportation usage (that is, mode-determining factors, number of trips, and cost to users) were examined. From this, developing exploratory hypotheses that can be used in planning services may be possible.
4. Opinions of the handicapped (what is thought of the current situation, what improvements are thought to be most helpful, and how an improvement would change

life-styles) were investigated.

SURVEY DESIGN

The survey was designed to bypass one main problem—the lack of centralized information on who handicapped people are, where they live, and how to contact them. The resulting design was to go through agencies and organizations that serve or represent the handicapped. Most of these organizations were contacted through the Denver Regional Transportation District Advisory Committee on the Handicapped. Ten volunteered to distribute the questionnaire to about 250 individuals. Of these, 119 were returned. Each of the agencies was asked to distribute questionnaires to a selected proportion (between 10 and 20 percent) of their clients. They were asked to select a sample that was representative of their clients. This means that the sample was not random and cannot be construed to represent the entire population of handicapped people. In fact, a large but unknown number do not have any contact with these organizations. Also, because the sample from each organization was small, the survey was not biased by a single organization. Therefore, the sample can be considered a reasonable approximation of the people who are represented by the type of organizations that cooperated. These organizations represent mostly people who have disabilities of the limbs or neuromuscular disorders rather than handicaps such as blindness or deafness. This survey, to a large extent, was limited to people older than 15 years.

QUESTIONNAIRE DESIGN

The questionnaire was designed to obtain information in 4 areas: demographics, disabilities, travel habits, and opinions. The demographic questions were included to help identify the person, provide some general information for analysis of determinants, and, most important, serve as a check for comparison with the general population to see whether serious discrepancies occurred. Demographic variables include many of the common indicators: race, sex, age, income, employment, and driver's license.

Two questions were asked and evaluated about the person's disability. The first question was a checklist of descriptive terms common to various handicaps. The respondents were asked to check as many as applied. This question was used to get an idea of the distribution of the disabilities in the sample and to serve as a further demographic check. The second question was designed to get an understanding of the personal mobility of the person and was based on the following classification of handicapped people (1):

1. Must stay in bed all or most of the time;
2. Must stay in the house all or most of the time;
3. Need the help of another person to get around inside and outside the house;
4. Need a special aid, such as a wheelchair, cane, or crutches, to get around inside and outside the house;
5. Do not need any aid or help of any person but have trouble getting around freely; and
6. Not limited in any of the ways mentioned.

As a result of early observations and test questionnaires, item 4 was observed to be more useful if split into the following 3 categories:

1. Need a wheelchair to get around but cannot move out of it;
2. Need a wheelchair to get around but can move out of it; and
3. Need a special aid, such as a cane or walker, to get around inside or outside the house.

Great differences in mobility were observed among these 3 categories. Those who cannot get out of wheelchairs generally have heavy electric wheelchairs that require use of a van with a lift or ramp. Those who can move out of wheelchairs can slide into the seat of a car. This makes taxicab service available to them. Those who can walk may be able to use the bus service and definitely can use automobile and taxi service. A summary of the mobility classes is given in Table 1. After completion of the survey, we found that no one from classes 1 or 2 had responded. Therefore, this variable, mobility, has a range of 3 to 8.

The section on travel habits asked 2 questions. The first requested information about the means used to make trips to work or school, stores, doctors, and elsewhere. The second asked for the number of round trips to these places.

In the section on opinions, 8 questions were asked about the availability of public transportation, how much people were willing to pay, and whether they felt that transportation was a factor in selecting a job or home. Two questions were asked on how transportation might be improved to serve them better, and a final question was asked on how improved transportation might change their life-styles. The purpose of these questions was exploratory, to get new ideas on what might be acceptable. To handicapped people most of these questions were open ended and supplemented with a checklist of common responses to stimulate thinking.

CURRENT TRAVEL CHARACTERISTICS

This section relates the current travel characteristics of handicapped people to their disabilities as indicated by mobility. The characteristics covered are means of travel and number of trips. These are broken into work trips and nonwork trips.

A summary of the means of getting to and from work is given in Table 2. Several things can be seen from these data. First, a large portion of those responding do not have jobs. Second, handicapped people depend a great deal more on public transportation than the general population does. Third, those in the lower mobility classes (classes 3 and 4) depend almost exclusively on ambucab or other people for travel.

Table 1. Mobility classes.

Class	Description
1	Must stay in bed all or most of the time
2	Must stay in the house all or most of the time
3	Need the help of another person to get around inside and outside the house
4	Need a wheelchair to get around but cannot move out of it
5	Need a wheelchair to get around but can move out of it
6	Need a special aid, such as a cane or a walker, to get around inside or outside the house
7	Do not need the help of another person or a special aid but have trouble getting around freely
8	Not limited in any of the ways mentioned

Table 2. Means of getting to and from work.

	Percentage of People							
Mobility	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	All That Work	General Working Population
Drive myself	0	0	30.3	18.2	14.3	0	21	74
Take bus	0	0	0	0	28.6	46.2	14.8	4
Take taxicab	0	0	0	0	0	0	0	2
Use ambucab	22.2	26.9	21.2	4.5	0	0	21.0	—
Walk	0	0	0	0	0	46.2	7.4	6
Others drive me	22.2	15.4	9.1	27.3	0	0	18.5	10
Other means	11.1	19.2	15.2	4.5	7.1	0	16.0	5
Do not work	44.4	34.6	24.2	45.5	50.0	7.7	—	—

Ambucab is a taxi service that uses a van with a ramp for loading and unloading wheelchairs. It is expensive; average fares range from $6.00 to $12.00. The automobile is used mostly by paraplegics (class 5) and the ambulatory (classes 6, 7, and 8). The bus, which is inaccessible by wheelchair, is used exclusively by those who are ambulatory.

The number of work trips is related closely to having a job or going to school. Forty-five percent reported that they made no trips to work or school; 41 percent made 5 trips; and 11.2 percent made from 1 to 4 trips per week, mostly to school. In the area of nonwork trips, the significance of transportation services is more important. The nonwork trips considered were trips to the store, trips to the doctor, and trips to other places for various reasons. Because a person is most likely to use the same means for all nonwork trips, these have been consolidated in the following sample percentages.

Means	Percentage	Means	Percentage
Drive	20	Walk	7
Bus	5	Others drive	49
Taxi	4	Other	2
Ambucab	8		

The percentage of those using ambucab is high because many handicapped people use this service to go to the doctor and are reimbursed by vocational-rehabilitation or welfare programs. The most important thing that this tabulation shows is that half of the respondents depended on others to drive them. This generally holds through all of the mobility classes. The generalization that was extended for work trips seems to hold here. That is, those that are less handicapped seem to use less expensive modes except that all classes seem to depend on others to drive them. Handicapped people make relatively fewer trips than the general population does (3.4 trips per week versus 4.6 trips per week) (2). A large portion of handicapped people make less than 1 trip per week (about 45 percent of those in class 3 are in this group).

OPINIONS

Three of the questions in the section on opinions gave meaningful results. The first, which concerned the price that a person is willing to pay for transportation, is an important indicator of dependence. Again the previously mentioned pattern shows. Those who are more severly handicapped feel that transportation is more important and are willing to spend more for it. On the average, handicapped people are willing to pay $1.22 for a trip to the doctor. Handicapped people in class 3 are willing to pay $2.80 for a trip to the doctor.

Answers to the second question indicated that transportation is not an important factor in selecting a home or a job. Other more important reasons may be such things as concerns of parents or other family members and job availability.

The last question dealt with how bus service might be improved to serve handicapped people better. The answers drew a pattern. For those in wheelchairs, lifts and tie downs that make the bus accessible and safe are important. For those who are ambulatory, physical improvements such as lower stairs, wider doors, and larger route signs, driver courtesy, and changes in management policies (eliminating long waits for transfers between routes) are important.

CONCLUSIONS

As a result of this study, handicapped people can be said to be a large but neglected

minority. This is probably because handicapped people are a diverse population. Their income level varies, although usually they are poorer than the average American. Their demographic characteristics also vary. They live in every sector of the city and want to go to all other parts of the city. Handicapped people can be said to have the same desires and needs for travel as everybody else.

Handicapped people now use all modes to a varying degree. The mode that is most often used by handicapped individuals depends greatly on the specialized needs of the individual. Some generalizations can be made, however. All handicapped people are more dependent on their families and friends to drive them on trips than most people in the general population are. Those who are more seriously disabled are dependent on only 2 modes of transportation: friends or family who have a van with ramp or lift and ambucab. Only a few can drive. The remainder, the ambulatory, have the most modes available to them. They can get into and out of cars easily, they can use taxicabs, and many can drive. They also can use buses and other forms of public transportation.

Handicapped people, on the average, make fewer trips than the general population does. There was found to be no great difference in the number of trips made by each handicapped person, but there were large numbers in each class who did not make even 1 trip per week.

About half of each group worked, which means that about half made 5 round trips per week for that purpose. The remainder averaged a mere 3.5 round trips per week.

The price that handicapped people pay for transportation is high if not in dollars then in wear and tear on families and friends. The average price they are willing to pay is $1.22; those in the more disabled categories usually are willing to pay more. This is due to the high cost of trasnportation; fares range up to $12.00 for ambucab and $5.00 for taxicabs.

Transportation improvements for the handicapped will have to be for at least 3 types—those who can walk, those who can get around easily in wheelchairs, and those who cannot get around easily in wheelchairs. The easiest improvements, which have the added advantage of being useful to the general public, are those for the ambulatory. The best thing for them is an expanded bus system (or other means of public transportation) with some relatively minor modifications. Most useful for them would be lower stairs and wider doors for entrance and exit. Also of use would be reserved seats near the front so that they can be seated before the driver gets moving. Improvements for those who can get around easily with a wheelchair would include modifying buses with wheelchair lifts and means of tying down the wheelchair. This could be done with buses on regular or modified routes. The handicapped, in this case, would have to be able to go 2 or more blocks to a stop. Improvements for the person who is not able to negotiate in a wheelchair in two or more blocks will have to be door-to-door transportation in a vehicle with lifts and tie downs. Some of these people also will need attendants.

If these improvements are made, handicapped people will use them. They do not travel as much as most people. Indications are that they would if the cost was lower and the transportation was more accessible.

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