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# Use of Taxicabs for Transporting the Handicapped: Dade County Experience

Fred Silverman and Suzanne LaPlant, Dade County Office of Transportation Administration, Miami, Florida

This paper describes the special transportation service program designed to provide transportation services to handicapped residents of Dade County, Florida. Private, for-hire operators of taxis and lift-equipped vans transport approved handicapped users, who are too disabled to use regular public transit, anywhere in the county for \$1.00 for a one-way trip. This report reviews the program's initial concepts, stated goals, and objectives and describes how the program has worked. User application forms, user trip vouchers, vehicle travel records, and a telephone survey of a random sample of program users provided data to assess user characteristics and trip-making patterns during the first 10 months of operation. After 10 months, the program had over 3400 approved users, 45 percent of whom were 65 years old or over. Out of 56 552 trips, 17 percent of the trips were made by wheelchair-bound users, 74 percent by transferable users, and 9 percent by companions. Disabled persons used a cab in 80 percent of the cases, and lift-equipped vans accounted for the remaining 20 percent of the vehicle trips. The average cost per person per trip was comparable with those reported in Atlanta and Denver for special handicapped services (\$9.56/person in Dade County). The special transportation service program has proven to be successful in Miami and has the potential of being successfully implemented in other areas. The trip-making characteristics and operating data found for the 10-month monitoring period could prove useful to other communities planning transportation for handicapped residents.

The lack of adequate transportation services for the elderly and physically disabled is a national problem. The physical disabilities of these two groups limit their access to existing public transit systems. This problem has two components: (a) an inability to get to transit areas, and (b) an inability to use existing transit equipment.

Federal legislation to promote the transportation needs of the elderly and handicapped has been part of national policy since 1970, when the Urban Mass Transportation Act of 1964 was amended to include section 16. The amended act states that elderly and handicapped persons have the same right as others to use mass transportation facilities and services, and special efforts should be made in the plan and design of mass transportation facilities and services.

The Mayor's Advisory Board on the Physically Disabled, a citizens' advisory organization, in Dade County,

Florida, was contacted by the Dade County Office of Transportation Administration in 1973 to establish a separate transportation service for the physically disabled. The advisory board worked with the Office of Transportation Administration to develop the Special Transportation Service (STS) program. The study design developed for the program was premised on the use of paratransit services offered by privately operated for-hire taxicab and lift-equipped van systems and was designed to accommodate persons too physically disabled to use regular line-haul bus services operated by the county's Metropolitan Transit Agency (MTA).

Dade County's stated goal was to provide public transportation facilities for the transit handicapped who is presently unable to achieve a reasonable degree of mobility in meeting his or her personal needs. The STS study design proposed a series of service objectives for a demonstration program based on specific trip purposes. The service objectives emphasized the provision of transportation for purposes not being met by other public or private nonprofit social service agencies. These were based on the assumption that trip priorities of handicapped persons would be much the same as for non-handicapped persons if a suitable paratransit system were available. The result was an emphasis on providing services for work and school trips followed by medically oriented trips and a variety of shopping trips. The fifth objective was to provide nonessential trips that enrich and enhance the quality of life, such as trips to religious centers, recreation facilities, or friend's homes. As will be shown later, initial assumptions of handicapped user trip purposes were not always correct.

Late in 1975, the Office of Transportation Administration established a program manager's office and publicized the program widely. Initially, 20 000 application forms were distributed to as many social service and public information agencies as possible. The forms could be mailed back by potential users, who were certified by a review process as to their eligibility to participate in the program, the type of transit service they were eligible for, and whether they were transferable

or nontransferable. In June 1977, after a year of operation, nearly 6000 applications had been received, which increased to 9000 applications by early 1978.

Determination of eligibility for STS is based on criteria established jointly by the Office of Transportation Administration and the advisory board. Eligibility requirements use the existence and extent of functional mobility impairments as a measurement of transportation handicap. An eligible person is defined as any person who, because of a permanent injury, illness, physical malfunction, or other incapacity or disability, is unable to use line-haul bus services. Those persons certified by a doctor or someone duly recognized by Dade County to diagnose or verify on an official application that the physical disability is severe enough to prevent the use of transit services was considered eligible for STS service. Once an applicant is approved, he or she receives a card and instructions on how to use the STS program.

The program started operations in June 1976. The STS program provides curb-to-curb transportation service for all certified handicapped users from 6:00 a.m. to midnight, 7 d a week. Service is provided on a pre-arranged basis, which requires at least 12 h advance notice. Service is provided to both transferable users (those able to walk or move out of their wheelchairs) and nontransferable users (those confined to wheelchairs). Regular taxicabs transport transferable users, and special lift-equipped vans transport nontransferable persons. All trips are arranged through a privately operated central routing and scheduling center with a single countywide telephone number specifically for the STS program. The routing and scheduling center is run by a taxi operator under contract to the county. Subscription service is arranged for trips repeated at least three times a week and is prescheduled when a user joins the program. The routing and scheduling center is notified of the need for subscription trips, usually for work or school journeys. Reservation service requires notice by 4:00 p.m. of the day prior to the trip and is used to accommodate trips made on short notice that are nonrecurring, such as shopping, social-recreation, or medical. System users can be transported to any location within the boundaries of Dade County [5289 km<sup>2</sup> (2042 miles<sup>2</sup>)]. STS users exchange prepaid trip vouchers purchased from the STS project office for \$1.00/trip instead of actual cash. Both the driver of the vehicle and the user must sign the voucher at the conclusion of a trip. Vehicle operators return completed vouchers for reimbursement, and STS riders return their completed copy when new vouchers are purchased as a check on vehicle operator billings and for comments on service.

#### STS SERVICE OPERATIONS

The STS program service operations involved several divisions of the Office of Transportation Administration, the Mayor's Advisory Board on the Physically Disabled, and several private, for-hire paratransit vehicle operators. The advisory board's input included drafting of the eligibility criteria, reviewing denied applications by the board's eligibility committee, and reviewing and modifying administrative procedures and forms. The STS project office in the Office of Transportation Administration administered the public information and marketing, program start-up, user certification, trip voucher issuance, project maintenance, contractor monitoring, and financial reporting. Other divisions of the Office of Transportation Administration handled overall program planning, initial bid specifications, and internal administrative duties.

In May 1976, the county contracted with three local

private firms to provide transportation services from 6:00 a.m. to midnight, 7 d a week. One of the firms was a private lift-equipped van service to transport wheelchair users. The other two firms were conventional taxi companies. In a separate agreement, one taxi firm was responsible for subcontracting with several minority private, for-hire firms to provide transportation services to eligible users. This ensured countywide service coverage by the STS program due to municipal boundary restrictions placed on for-hire vehicles, as well as fulfillment of minority business enterprise requirements, because no minority firms had bid on the contracts. Also, in a separate agreement, the other taxi company was contracted to provide routing and scheduling services for all participating private contractors and subcontractors. The distinct nature of service areas in Dade County for taxi companies and the monitoring of routing and scheduling activities by the project office helps keep trips and reimbursements evenly distributed between contractors and subcontractors and in proportion to contract awards and total funding amounts. The program was put out to bid again in September 1977 under virtually identical conditions.

#### User Profile and Characteristics

The STS program's initial design was hindered by the lack of information about the travel behavior of physically disabled persons. The purposes of their travel, trip lengths, accessibility problems, origins, destinations, and related data vital to normal transit and transportation planning programs were lacking. Therefore, the accumulation of the data became a high priority during the demonstration phase of the program to allow monitoring and future planning efforts to proceed from a solid statistical base. Data from user applications, STS trip vouchers, vehicle travel records, and a telephone survey of a random sample of users supplied information on program users and behavioral patterns.

The STS project office approved 65 percent of the applicants for STS service, and 30 percent were eligible for the MTA off-peak hour, half-fare bus program. Out of Dade County's approximately 1.5 million residents, slightly over 5200 people applied for STS service during the 10-month period monitored for this study. A similar proportion of approvals continued through early 1978.

The main physical or medically related disabilities checked on STS user applications examined and approved were arthritis, 17 percent; legally blind, 15 percent; stroke, 6 percent; para- and quadriplegic, 6 percent; cerebral palsy, 4 percent; and the remainder included a large category called other, where applicants listed various heart and spinal problems, permanently broken bones, amputated limbs, and brain damage. Disabilities by medical name did not describe satisfactorily the level or nature of a person's physical disability; therefore, the service application contained a section for information on mobility impairments and the nature or severity of the disability to ascertain each individual's travel problems. Almost 57 percent of the STS users had difficulty walking, showing an inability to get to a bus line, and more than 45 percent of the users had difficulty standing and entering a bus (Table 1).

The STS program is designed solely to aid persons with physical disabilities, regardless of age. However, it was of interest, due to federal regulations, to determine the level of overlap between the physically disabled and the elderly. The age profile shows 72 percent of the STS users are over 50 years old and almost 45 percent are at least 65 years old. The older age profile for the STS program seems to correspond with age distributions of other public and private agencies or organizations who

**Table 1. Functional handicap by service type.**

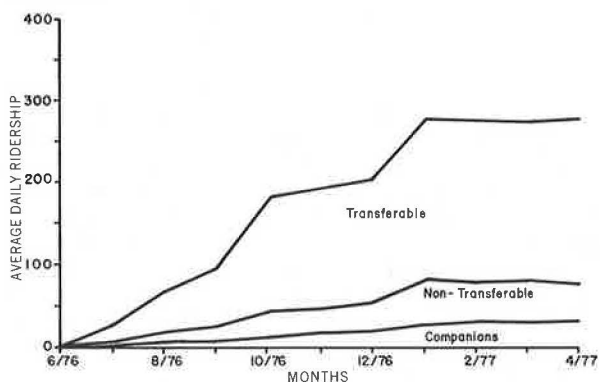
Disability	Level of Difficulty	Total of All Program Users (%)
Walking	Somewhat difficult	5.5
	Difficult	48.3
	Unable	2.1
	Combination answer	1.0
Standing	Somewhat difficult	4.3
	Difficult	39.2
	Unable	1.2
	Combination answer	0.6
Entering a bus	Somewhat difficult	1.7
	Difficult	37.5
	Unable	1.1
	Combination answer	4.9

**Table 2. STS and MTA half fare age profile.**

Age	Combined (%)	STS (%)	MTA Half Fare (%)
Under 21	4.5	2.9	6.5
21 to 35	14.4	13.5	20.1
36 to 49	12.6	11.5	19.5
50 to 64	31.9	28.8	43.2
65 and over	36.6	43.3	10.7

**Table 3. STS and MTA half fare user trip purpose by week.**

Trip Purpose	Percentage of All STS Trips	Percentage of All MTA Half Fare Trips	Combined (%)
Work	12.7	12.3	12.4
School	3.8	10.4	8.8
Medical	24.0	20.4	21.2
Social service	7.6	8.5	8.3
Shopping	19.0	24.2	23.0
Social or recreational	17.7	12.3	13.6
Personal business	8.9	7.3	7.7
Other	6.3	4.6	5.0

**Figure 1. STS average daily ridership by mobility characteristics per month.**

have programs for the physically handicapped. A possible reason that the age group below 21 years old represents slightly less than 3 percent of the STS users is that the parents of potential STS users may choose to transport their own children or that the schools they attend frequently provide transportation services (Table 2).

National travel demand estimation often relies on employment and school enrollment data to estimate the population's overall travel demand. These data were lacking for physically disabled persons and were sought through several methods. An original assumption of the STS program was that travel to work and school on a prearranged basis would be a high-priority service demand. Only 15.4 percent of the STS users were found to be employed and

only 5.8 percent were enrolled in school. This is attributed to the large number of elderly STS users who are out of the work force, as well as to the previously stated small number of school-age children involved in the STS program. No income data were collected on STS users or applicants.

Data on predominant trip purposes indicated that the predominant STS trip purposes were medical, 24 percent; shopping, 19 percent; and social or recreation, 17.7 percent. It is significant that these trip purposes were not among those considered to be the highest priority for STS service (work and school), nor were these trips the most likely to fit into a subscription service concept. It could be inferred from the larger number of medical trips than originally anticipated that existing social service agencies, both public and private, were not meeting the medical transportation needs of many handicapped residents. A closer examination of trip data showed the late mornings and early afternoons to be the predominant travel times. In no case were peak-hour periods dominant (Table 3).

Ninety-five percent of all trips originated from the home. Trip origins generally coincided with the concentrations of elderly persons identified for the county in the 1970 census. The observed trip destinations indicated most trips were made to the Miami central business district (CBD) or hospital district near downtown Miami. The average trip length was 15.4 km (9.7 miles), which was longer than the average trip length for all trip purposes in the county, although the median trip length of 12.2 km (7.6 miles) was close to the average computed for the county's taxi industry.

### Operations Analysis

STS ridership has increased steadily since its inception in June 1976; by April 1977 operators had carried over 56 500 STS person trips. Of this 10-month cumulative total, 74 percent were trips by transferable persons who were able to ride in taxis, 17 percent were trips by non-transferable wheelchair users, and 9 percent were trips made by companion riders. (Seeing-eye dogs were also carried.) These percentages are all within 3 percentage points of the detailed data gathered after 5 months of STS operation (Figure 1).

STS vehicle trip data closely reflect the person-trip percentages of transferable and nontransferable users. The distribution of vehicle trips has remained constant within 3 percentage points during the entire 10-month period monitored—80 percent of the trips were in taxis or limousines and 20 percent were in the private lift-equipped vans.

Average daily ridership reached 225 trips by the end of December 1976, and was up to approximately 375 average daily trips (including weekends in the average) by April, the tenth month of operation. The first 5 months showed approximately a 20 percent increase in trip-making each month; this trend slowed down in early 1977 (Figure 2).

The private for-hire operators made a cumulative total of 56 552 person trips during the 10-month study period. Reservation trips accounted for 60 percent of all trips, and subscription trips accounted for the remaining 40 percent. These percentage breakdowns have remained stable since the second month of STS operation. Subscription service was originally anticipated to be the predominant service, which would have coincided with the presumed dominance of recurring work and school trips. The three prevalent STS trip purposes of medical, shopping, and recreation, constituted 60.7 percent of the trips and did not easily fit a subscription service. The reservation service, therefore, was used more fre-

Figure 2. STS average weekly vehicle trips by month.

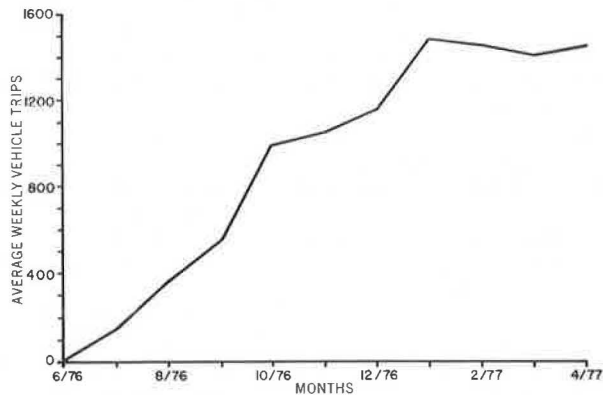


Table 4. Costs per rider for special elderly and handicapped services.

Location	User Restrictions	Cost for One-Way Trip (\$)
Denver, Colorado	Elderly	4.06
	Handicapped	15.00
Atlanta, Georgia	Elderly	2.96 (transferable)
	Handicapped	12.32 (nontransferable)
Columbia, Missouri	Handicapped	15.07 (nontransferable)
Syracuse, New York	Elderly or handicapped	2.50
Seattle, Washington	Elderly or handicapped	6.15
Dade County, Florida	Medicaid recipients	13.67 taxi; 38.93 lift van service
Dade County, STS	Handicapped	8.54 taxi <sup>a</sup> ; 17.31 lift van <sup>a</sup>

<sup>a</sup>Cost includes costs for routing and scheduling.

quently. STS users also reported that 75 percent of their trips were scheduled no more than 1 d in advance. This information does not indicate a need for demand-responsive service, but it does indicate that assumptions regarding the potentially higher use of subscription over reservation service were not borne out.

At the end of 10 months, STS operators had traveled 680 285 km (422 800 miles). Approximately 80 percent of the total distance was in taxis and limousines for transferable users, and 20 percent was for wheelchair users in lift-equipped vans. During the 10 months monitored, the average trip length for taxis each month was 13.7 to 16.6 km (8.5 to 10.3 miles). Average trip length for the lift vans was 12.4 to 16.6 km (7.7 to 10.3 miles).

The STS program does not give the user exclusive use of taxis or lift-equipped vans. Group loading by the contractors is encouraged and the routing and scheduling service attempts to arrange multiperson trips whenever possible. Average vehicle occupancy for STS taxis and limousines stabilized at 1.3 persons/vehicle from December 1976 to April 1977, and lift-equipped vans carried an average of 1.4 persons/vehicle by April. This reflects a lower than average occupancy rate compared to taxis in Dade County as a whole (1.94 persons/occupied taxi). The concept of group loading was originally intended to be used extensively in the routing and scheduling of subscription trips. The large size of the county, contractors guarantees of up to a 15-min wait time for each trip, and problems of users wanting transportation to similar destinations but at different times and from different general origins created a difficult task for the routing and scheduling center. During the demonstration program a financial incentive for group loading was not offered to contractors; this will be modified as the program progresses.

Data collected from system users showed that prior

to the STS transportation service most had depended on bus service, a friend, or taxi to obtain transportation service. Previous mode used varied by travel purpose. Social service trips were made previously by bus, 33.3 percent; friend's automobile, 22.2 percent; taxi, 22.2 percent; and social service vehicles, 22.2 percent. For shopping trips the predominant modal breakdown was friend's automobile, 43.8 percent; bus, 18.8 percent; and taxi, 14.6 percent respectively. Variations by mode were considerable for each trip purpose. For example, 40 percent of all work trips had been made on the bus, and 20 percent by a friend's automobile, but for medical trips the previous modal breakdown was 37 percent by a friend's automobile, 28 percent by taxi, 12 percent by social service vehicle, and 9 percent by bus.

Contractor service compensation includes the cost of transportation services, routing and scheduling services, the maintenance of a central reservation telephone number, a fixed profit margin over services cost, and a fee paid to one of the taxi companies to monitor minority subcontractual agreements.

Compensatory expenses for the private contractors totaled slightly over \$540 660 for 10 months of service delivery. Costs for taxi services were based on the meter reading (\$0.80/first quarter mile; \$0.20/quarter thereafter). Costs for van services were based on a contractual cost of \$8.00/pickup, plus a distance surcharge. The average vehicle-trip cost for taxis and limousines ran \$9.31 over the total 10-month monitoring period shown from an average of \$9.02 during the first five months monitored. The average vehicle-trip cost for the lift-equipped vans was \$17.74 for the total 10 months; the last 5 months averaged just over \$17.00. When costs for routing and scheduling and other relatively fixed costs were added on, taxi and limousine costs per vehicle trip were \$10.35 and lift-equipped van costs per vehicle trip were \$18.78.

Item	Vehicle Trip Cost (\$)	Person Trip Cost (\$)
Taxi	9.31	7.74
Van	17.74	16.51
Routing and scheduling	1.04	0.80

The average person-trip costs overall were approximately \$8.50, the average transferable user trip cost was \$7.74, and nontransferable user trip costs averaged \$16.51. Average person-trip costs for transferable riders stabilized between \$7.74 and \$7.79 after November 1976 until the end of the study period. The more expensive nontransferable average person-trip cost increased about 1.5 percent/month over the 10 months. These operating costs seemed to be in line with the cost of handicapped services provided by the transit agencies in Denver and Atlanta after they purchased or modified special vehicles (Table 4).

During FY 1978, the program will have a budget of nearly \$1.2 million and carry 500 to 600 trips daily. Individual use will be limited to 16 reservation vouchers or 40 subscription vouchers/month. Users can purchase up to 10 additional vouchers at \$3.00 each. Use of the system to carry some social service agency trips under contract is anticipated.

## CONCLUSIONS

Numerous programs are currently under way to transport physically disabled persons. The STS program is unique among these systems in its long service hours, its exclusive use of private contractors, its multipurpose trip acceptance, and its geographic and population coverage.

The STS system has been universally accepted by the

handicapped community. The project has had to limit the total number of individual trips an individual can make due to budgetary limits, but trip costs are favorable to other programs where public transit agency vehicles are used and trip lengths are shorter and service less frequent (see Table 4). A paper on social service agency transportation by Rosenbloom and Cox in this Record shows real costs for client services studied to be \$6.83 to 10.90/trip. We confirmed that private taxi operations could be cost-effective alternatives to independently operated special transportation systems.

The STS program also overcomes the accessibility problem that disabled persons have in even getting to a bus. While the Urban Mass Transportation Administration thinks that accessible buses are necessary to comply with the 504 regulations of the U.S. Department of Health, Education, and Welfare, basic mobility ailments plague STS users in Dade County. Thus, accessible buses may not be a solution to a problem when mobility to a bus stop is impaired. This is confirmed by the 83 percent of the STS users who can use regular nonlift-equipped vehicles that pick them up at the curb.

The STS program has been judged successful in meeting transportation needs of the county's handicapped residents based on random user surveys and public support for the program. The potential for using the same type of program in other transportation service areas ap-

pears to be excellent. The continuity of so many aspects of the program over the 10-month period and since then may be useful to other communities in setting up transportation for the handicapped.

In summary, a number of key observations about the handicapped were evident. The disabled could use a taxi in 80 percent of the cases, and lift-equipped vehicles accounted for 20 percent of the vehicle trips. The ridership composition was 17 percent wheelchair-bound users, 74 percent transferable users, and 9 percent companions. Out of 1.5 million residents, approximately 5200 people applied for STS during the first 10 months. The applicants alone represent less than 0.4 percent of the population. The age profile indicated 72 percent of the users were over 50 years old and slightly less than 45 percent were 65 years old or over. Costs per person-trip correspond well with costs estimated and reported in Atlanta and Denver, where the transit authorities operated their own services in more limited programs.

The STS program has increased the mobility of handicapped people served in Dade County to the extent that they are able to plan and make trips without having to depend on friends, neighbors, and relatives. Reduction of the number of vouchers allowed was necessary due to financial limitations, but this has not negated the benefits or the original program goal of providing an accessible mode of transportation to the handicapped.

## Factors Affecting the Use of Taxicabs by Lower Income Groups

Jeff Allred and Arthur Saltzman, Transportation Institute, North Carolina A&T State University, Greensboro  
Sandra Rosenbloom, University of Texas at Austin

This study investigates the propensity of poor persons to use taxicabs. An evaluation of existing data on the use of taxicabs by different income groups shows that in larger urban areas lower income groups display a relatively high rate of taxi use. A critical analysis of previous work suggests, however, that the data analysis contained therein actually underestimated the reliance of the poor on the taxi. An analysis of the limited work on taxi use in small- and medium-sized urban areas reveals an even greater dependence of the poor on the taxicab. This work is supported by a survey of taxi drivers and an analysis of the origins of taxi trips. The factors that create this pattern of use are also examined. Previous studies and our data suggest that the poor often choose taxis because they are the principal option when an automobile is not available. Taxis appear to be chosen over conventional transit (when it exists) because they offer greater service flexibility, convenience, and duration of service, as well as better meeting the security demands of the poor. Increased availability of taxi service by reduced market entry restrictions and reduced cost of taxi service by permitting group riding and providing subsidies would increase the mobility of the poor.

Although it has been largely overlooked in the past, the taxicab plays an important role in urban public transportation. A survey conducted by the International Taxicab Association in 1970 revealed that 7200 fleets operated 120 000 fully licensed taxicabs, three times the number of vehicles operated by the remainder of the public transit systems in the United States (1). To this figure must be added the many nonfleet, owner-driven taxicabs, livery vehicles, and illegal (or gypsy) operations; al-

though the number of vehicles in these three categories is unknown, the number is probably substantial (2). In thousands of communities the taxicab provides the only form of public transportation. A 1973 survey by the International Taxicab Association demonstrated that more than three times as many communities were served by taxicabs as were served by bus and other forms of transit combined (3).

The Transportation Institute of the North Carolina A&T State University undertook a 2-year study of taxicab use among low-income groups as part of its ongoing paratransit project. The low-income population was chosen because several studies indicate that the poor are among the most severely transportation disadvantaged (4) and, as such, should be a focus of concern for transportation planners. In addition, available data tend to indicate a high rate of taxicab use by low-income individuals. This paper will focus primarily on the relative frequency of taxicab use by low-income groups and the reasons underlying that behavior.

### RELATIVE FREQUENCY OF TAXICAB USE AMONG LOWER INCOME GROUPS

Since serious investigation of the taxicab and other paratransit alternatives has surfaced only recently among urban public transportation planners, a limited quantity