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Lauritzen, in 1-Year Review of Performance Measures for the Chicago Transit Authority's Special Services Contracted Service for the Elderly and Handicapped, examines certain performance measures for comparing newly contracted services with in-house services. Performance measures are compared for four private carriers that have contracted with the Chicago Transit Authority for service. A random sample of switching riders is examined to determine if the basic premise, that competition among carriers promotes quality of service, is upheld.

In Evaluation of a Demonstration Small Bus Program for the Elderly and Handicapped, McKelvey et al. evaluate the state of Michigan's small-bus demonstration program that provides essential transportation services to the elderly and handicapped in specific neighborhoods in Detroit. Included is a discussion of the quantitative, qualitative, and institutional factors that were considered in the evaluation.

In Travel Mode Choice Behavior and Physical Barrier Constraints Among the Elderly and Handicapped: An Examination of Travel Mode Preferences, Parolin discusses the formation of travel mode preferences among the elderly and handicapped by using personal construct theory, multidimensional unfolding, and cluster analysis. This analytic tool was developed for and tested on a sample population of the elderly and handicapped in Columbus, Ohio.

Atkinson and Suen, in The Role of Private Enterprise in Elderly and Handicapped Transportation in Canada, discuss the Canadian experience with successful partnerships between public and private carriers for delivery of service to the elderly and handicapped. The policies and initiatives that encouraged these partnership arrangements are described, and examples of new or restructured service organizations are given. Current trends are also discussed.

In Special Transportation Service in Sweden: Involvement of Private Operators, Ståhl reviews Sweden's experience in providing service for the elderly. The usage, growth, and costs of the service are discussed. Because of increased costs of travel by special transportation service, many municipalities are reviewing its organization. New solutions, which have already led to a decline in private-sector involvement in providing this transportation service, are examined.

Rosenbloom, in Role of the Private Sector in the Delivery of Transportation Services to the Elderly and Handicapped in the United States, reviews the state of the art of private provision of service for the elderly and handicapped in the United States. Suggested are answers to the policy question: What is known about the impact of private service delivery on the short- and long-term costs and service characteristics of such service?

In Suburban Activity Center Transportation Demand Management (TDM) Market Research Study, Valdez et al. discuss the background and findings of a study designed to assist in planning and implementing TDM strategies at suburban activity centers. The findings suggest that major opportunities exist to improve mobility through implementation of TDM measures.

McLeod et al., in Commuting Behavior of Hawaii State Workers in Honolulu, suggest that several transportation system management strategies could be implemented to encourage carpools and vanpools. Expansion of existing high-occupancy-vehicle lanes and changes in parking rates are examples.

Bell, in Mobility and Specialized Transportation for Elderly and for Disabled Persons: A View from Four Selected Countries, discusses specialized transportation developments in Canada, Sweden, the United Kingdom, and the United States. The intent of the paper is to contrast and compare various aspects of specialized transportation development in terms of policy and practices in four industrial countries.

Cyra et al., in An Inventory of Twelve Paratransit Service Delivery Experiences, present an informal inventory of transportation disabilities in some of the urban areas of the United States and Canada. Information was collected from 12 cities in an attempt to investigate alternative

forms of service and observe the level of uniformity and equity in the delivery of specialized transportation.

Dueker and Davis examine some of the issues involved in integrating transportation for social service clients with the Portland Transit District's Special Needs Transportation program. The characteristics and problems of the Portland system are described and compared with those of transportation for social service clients in seven other West Coast cities.

A 1-Year Review of Performance Measures for the Chicago Transit Authority's Special Services Contracted Service for the Elderly and Handicapped

TRACEY LAURITZEN

Examined in this paper are certain performance measures for the Chicago Transit Authority's (CTA's) Contracted Service for the Elderly and Handicapped during the first full year of service. The new contracted service is compared to the in-house service, examined for trends during the first year of service, and compared for the same performance measures among the four private carriers that have contracted with the CTA to service these riders. A random sample of switching among riders is examined to determine if the basic premise is upheld that competition among carriers promotes quality of service.

The Chicago Transit Authority (CTA) began an in-house, door-to-door Special Services program in 1981 in response to federal requirements for transportation services for persons whose disabilities prevent them from using the standard bus and rail service. In the fall of 1985, after a review of the existing CTA Special Services operations and an extensive survey of successful privatization efforts in other cities, the CTA began a hybrid "user-side subsidy" program. The main feature of this program is that CTA contracts with four private carriers to allow rider choice and to foster competition among the carriers. The CTA maintains all records of certified users, takes complaints from users, monitors service, and updates and maintains all relevant statistical data for the service.

Certain performance measures of the new service are examined in this paper. The contracted service is compared with the former in-house service and the performance trends accumulated during 1 full year of contracted service are examined. The 1-year period covers February 1986 through January 1987. Using this period takes advantage of software changes that occurred at the CTA in February 1986; therefore, all the data are consistent and can be compared directly. The full contracted service began in November 1985. This paper is not intended to describe the origins of the privatization service. The start-up and decisions for the new contracted service are described elsewhere (*1*).

Performance measures for paratransit have not been exhaustively compiled as they have for standard transit services. Also, each paratransit operation is different and direct comparisons mean little. A qualitative examination and a comparison of the first year of contracted service with the CTA's own performance may have more relevance than comparison with any other paratransit service. Therefore, in the first section of this paper, the new privatization service is compared with the previous CTA in-house operation. A time-trend comparison of the contracted service during the 1-year study period is presented in the second section. In the third and last sections, respectively, the performance measures of the four carriers are compared and carrier switching among users of the service is described.

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LITERATURE REVIEW

A review of the current literature was done to ascertain what similarities could be found among the diverse privatization efforts in other cities in terms of performance measures. Some studies have been done to determine what the user of the specialized service considers important in terms of quality of service. Mittendorf et al. surveyed eligible nonusers of specialized services and found that level-of-service factors such as scheduling, lengthy travel times, and unreliable service were not a concern (*2*). Falcocchio studied users of a paratransit service in New York to determine what service factors were important to the user (*3*). Kikuchi and Rosenbloom have both done separate studies comparing quality of service factors with cost (*4*, *5*). In general, there appears to be a trade-off between better service and lower costs, which can be important if there is a lack of funds to support a service for all who would like to use it. Many cities restrict the purposes of trips because of financial constraints. One way to become more cost-efficient is to separate trips by ambulatory and nonambulatory riders because nonambulatory riders generally require specialized vehicles. Many studies have shown a substantial difference in cost when trips are separated in this manner (*6–9*).

CONTRACTED VERSUS CTA IN-HOUSE SERVICE

Hours of Service

The CTA in-house service operated Monday through Friday from 6:00 a.m. to 9:30 p.m., and on Saturdays, Sundays, and holidays from 9:00 a.m. to 5:00 p.m. The private carrier service operates daily from 5:00 a.m. to 1:00 a.m., with all four carriers

operating between 5:00 a.m. and 9:00 p.m. and one carrier also operating between 9:00 p.m. and 1:00 a.m. The new hours represent a 33 percent increase in available hours of service.

Cost

The in-house service is estimated to have cost $28.00 per trip, not including capital costs. The private service has averaged $12.47 per trip, including capital costs, for the study period. The cost of administration is estimated to be not more than 8 percent of the trip cost. The average cost of the new service is approximately 55 percent less than the cost of the old service, not considering capital costs.

Trips Serviced

A consultant's report done in 1984 (*10*) shows that for 3 days in January and February of that year—January 19, January 27, and February 23—there were 643 trips, 551 trips, and 530 trips, respectively. This represents a rough daily weekday average of 575 trips. In comparison, 1,623 average daily trips were provided by the private carriers during the 1-year study period. This is approximately 180 percent more average daily trips provided by the new contracted service.

The in-house service was frequently booked by 9:00 a.m. the previous day. According to a July 1985 rider survey, only 27 percent of the riders said that they always received a ride when they called to request service. The new service had not refused a trip to any eligible rider as of February 1987.

On-Time Performance Reliability

According to the consultant's 1984 report, an examination of 1 day of the CTA's in-house service showed an on-time performance of 73 percent, "on-time" being considered as 10 min early to 10 min late. The report also indicates that this figure is probably overstated because of trip sheet entry inconsistencies. The July 1985 survey of riders of the in-house service showed that 41.5 percent believed that they were always picked up on time, and 47.6 percent of the riders believed that they were usually picked up on time.

The private carrier service overall averaged an on-time performance for the 1-year study period of 66 percent on-time pickups. This on-time "envelope" is defined by the CTA as any time early to 10 min late.

Trip Time

According to the 1985 rider survey, 5.9 percent of the users believed that their ride time always exceeded 90 min in the vehicle. An additional 12.4 percent of the users believed that their in-vehicle time usually exceeded 90 min.

For the private carriers, there is a penalty for trips exceeding 90 min of in-vehicle time. The carriers are allowed to have 4 percent of their trips exceed 90 min without penalty. For the study period, an overall average of 2.9 percent of the trips exceeded 90 min. Although there are no definite numbers to compare with the in-house service, it appears as though there has been some improvement from the in-house service in that respect.

TIME TREND COMPARISON OF CONTRACTED SERVICE DURING 1-YEAR STUDY PERIOD

Cost

The cost of a trip without attendants decreased from February 1986 to January 1987 by $0.29. The highest monthly average cost per trip was $12.68 in February. The lowest monthly average cost was $12.33 in September (Table 1).

TABLE 1 AVERAGE TRIP COST

	Average Trip Cost ($)	
Month	Without Attendants	With Attendants
February	12.68	11.34
March	12.56	11.14
April	12.53	11.10
May	12.48	11.01
June	12.47	11.04
July	12.42	11.00
August	12.51	11.07
September	12.33	11.12
October	12.45	11.29
November	12.44	11.24
December	12.42	11.21
January	12.39	11.31
Average	12.47	11.16

The cost of a trip with attendants was the highest also in February at $11.34. The lowest cost of a trip including attendants was $11.00 in July. For the last month of the study, the cost of a trip averaged $11.31, which is $0.03 less than in the first month of the study.

The private carriers are paid more for nonambulatory trips than for ambulatory trips. Therefore, the average cost of a trip is tied to the percentage of ambulatory and nonambulatory trips made that month. The trip cost decrease throughout the study period reflects the greater increase in percentage of ambulatory trips made each month.

Trips Serviced

The total number of trips provided increased from February to January by 94 percent overall. The average daily trips (monthly trips divided by the number of days in the month) increased by 76 percent over the study period.

At the beginning of the study period, ambulatory trips accounted for 48.3 percent of total monthly trips. By January 1987, ambulatory trips constituted 62.8 percent of the total trips, whereas nonambulatory trips accounted for 37.2 percent of the trips (Figure 1).

Average daily ambulatory trips increased from 461 trips in February to 1,051 trips in January the following year. This is a 128 percent increase (Figure 2). Average daily nonambulatory trips increased from 493 average daily trips in February to 623 average daily trips in January, a 26 percent increase (Figure 3).

The average number of daily weekday trips overall increased from 1,130 trips in February 1986 to 2,037 trips in January 1987. This is an 80 percent increase. The largest monthly increase occurred in March with an 11.7 percent increase in average daily weekday trips. August was the only month that

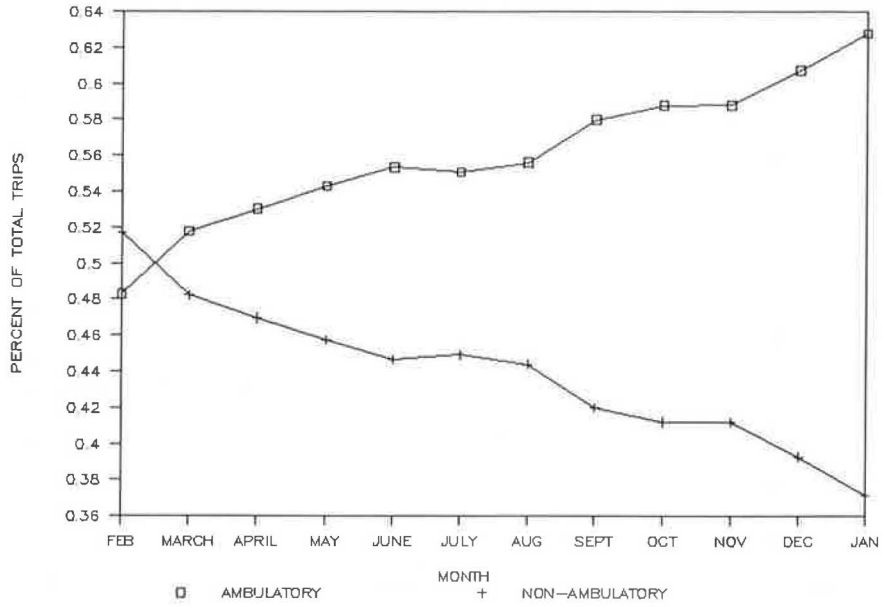

FIGURE 1 Total ambulatory and nonambulatory trips.

had a decline in the average daily weekday trips. December and January both showed smaller increases probably as a result of fewer discretionary trips being made because of inclement weather.

The average number of daily trips made on weekends and holidays increased from 514 in February to 914 in January. This is an increase of 78 percent. The highest average daily weekend trips occurred in November with 984. The largest monthly percent increase occurred in March with 18 percent. December and January showed a decline of –6.4 percent and –1.3 percent, respectively. The ratio of weekday to weekend trips is fairly consistent throughout the study period at 2.0:1.0.

On-Time Performance

The average percent of trips considered picked up on time (any time early to 10 min late) in February was 64.0 percent. In January at the end of the study period, the percent of on-time trips averaged 64.4 percent. The highest value of percent of on-time pickups occurred in both August and October with 68.3 percent of the trips being picked up on time. The lowest value occurred in December with 63.9 percent being picked up on time. The lowest values all occurred during winter months between March and November, when weather could have been a major factor in delayed pick-up times.

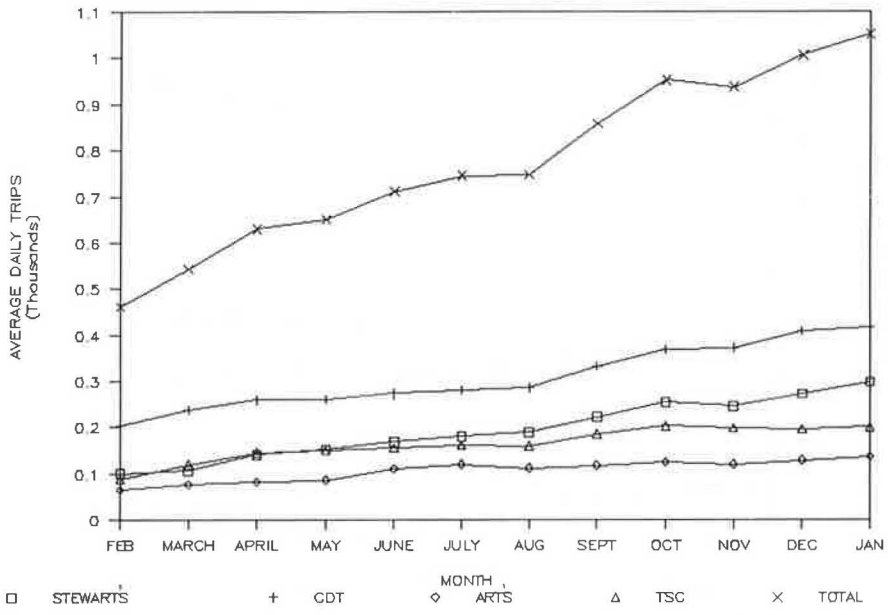

FIGURE 2 Average daily ambulatory trips.

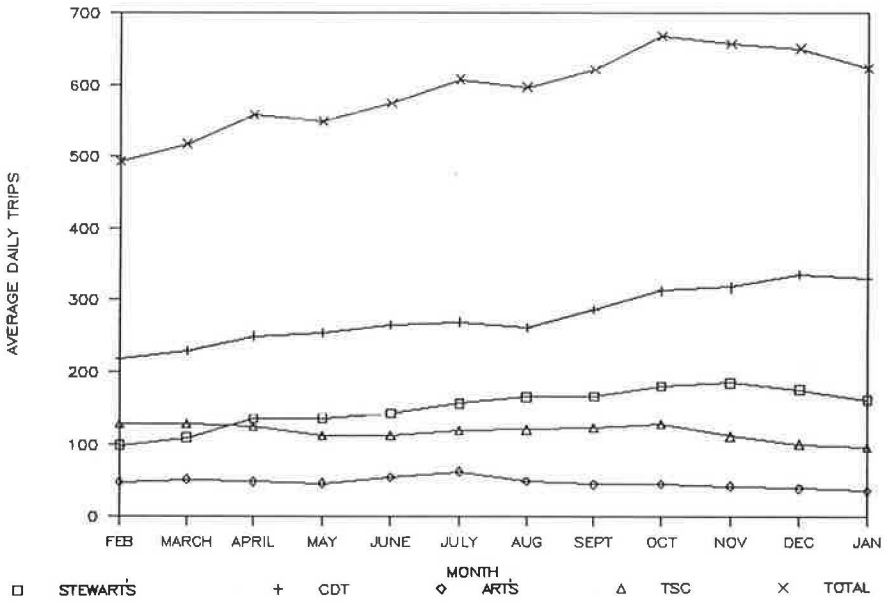

FIGURE 3 Average daily nonambulatory trips.

Length of Trip

The overall percentage of trips exceeding 90 min for the 1-year study period was 2.9 percent, which is within the contract penalty figure of 4.0 percent. There was no month in which the overall average for the month exceeded 4.0 percent. The highest monthly figure was 3.3 percent of the total trips exceeding 90 min, which occurred in October and again in December. The lowest figure occurred in March, April, and July with 2.6 percent of the trips exceeding 90 min. Although the values are all very close, the trend for the overall average has been increasing since August.

COMPARISON OF CONTRACTED SERVICE AMONG CARRIERS

Trips Serviced

At the beginning of the new service in October 1985, all the carriers were assigned riders equally. Looking at the number of monthly trips provided during the study period, one carrier consistently provided over 40 percent of the trips, another carrier approximately 10 percent, and the other two split the remainder (Figure 4).

Ambulatory trips can be compared among the carriers based on average daily trips (Figure 5). The largest carrier, CDT,

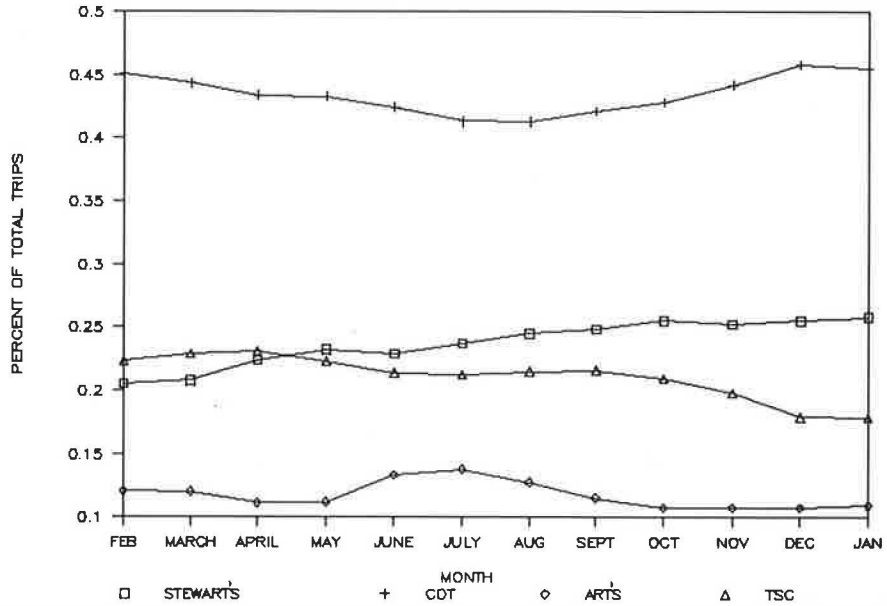

FIGURE 4 Percentage of average monthly trips, by carrier.

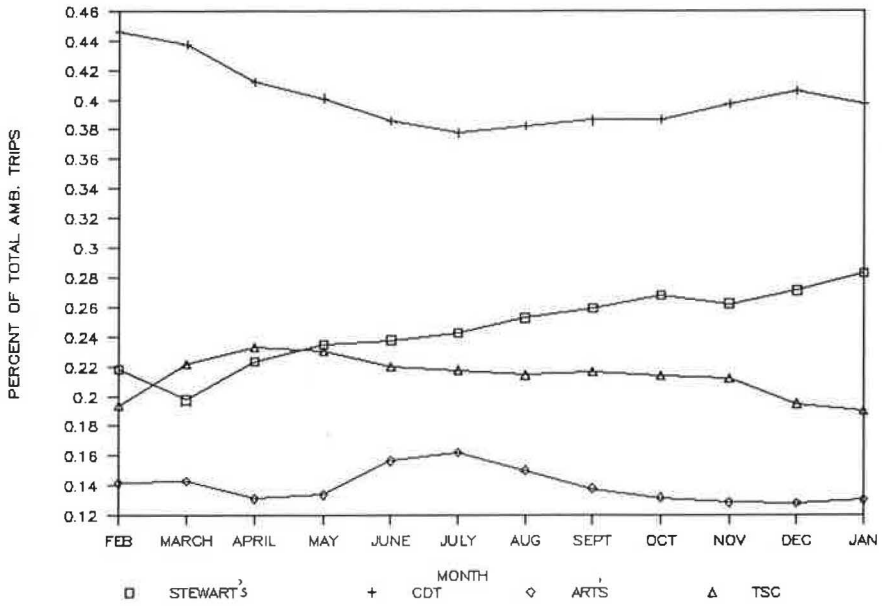

FIGURE 5 Percentage of average daily ambulatory trips, by carrier.

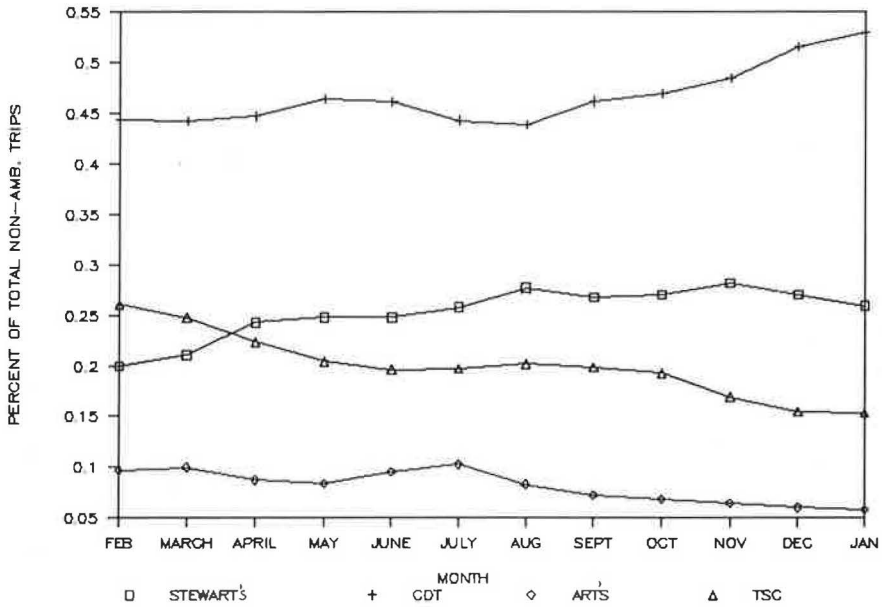

FIGURE 6 Percentage of average daily nonambulatory trips, by carrier.

began the year-long study period with 44 percent of this group. CDT has lost ambulatory ridership percentage through the year and now claims approximately 40 percent of the ambulatory trips. TSC and Art's have remained fairly constant in percentage of ambulatory ridership with approximately 20 percent and 14 percent of the trips, respectively. Stewart's has increased its percentage from 22 percent in February to 28 percent in January. These figures are also consistent with the overall average daily ridership.

The average daily nonambulatory ridership is split differently than the overall daily ridership (Figure 6). CDT has increased its percentage of nonambulatory ridership from 44 percent in February to 53 percent in January. Stewart's also increased its percentage from 20 to 26 percent. TSC lost over 10 percentage points throughout the year, from 26 to 15 percent, while Art's decreased from 10 to 6 percent.

Average daily weekday trips are spread among the carriers in a fashion similar to the overall average daily trips (Figure 7). However, average daily weekend trips are slightly different (Figure 8). CDT carries approximately 40 percent of the weekend trips, whereas Stewart's has increased its percentage from 23 percent in February to 35 percent by January. Art's has decreased its share of the weekend trips from 11 percent to 8 percent; TSC's share has decreased from 26 to 17 percent.

The carriers' percentage of subscription trips was split similarly to other overall daily trips: CDT varied between 42 to 51 percent, Stewart's increased from 17 to 26 percent, Art's decreased from 16 to 7 percent, and TSC averaged approximately 22 percent throughout (Figure 9).

The overall average percent of subscription trips to total trips is 17 percent. The carriers' percentage of subscription trips to their own total trips was as follows: Stewart's averaged 12

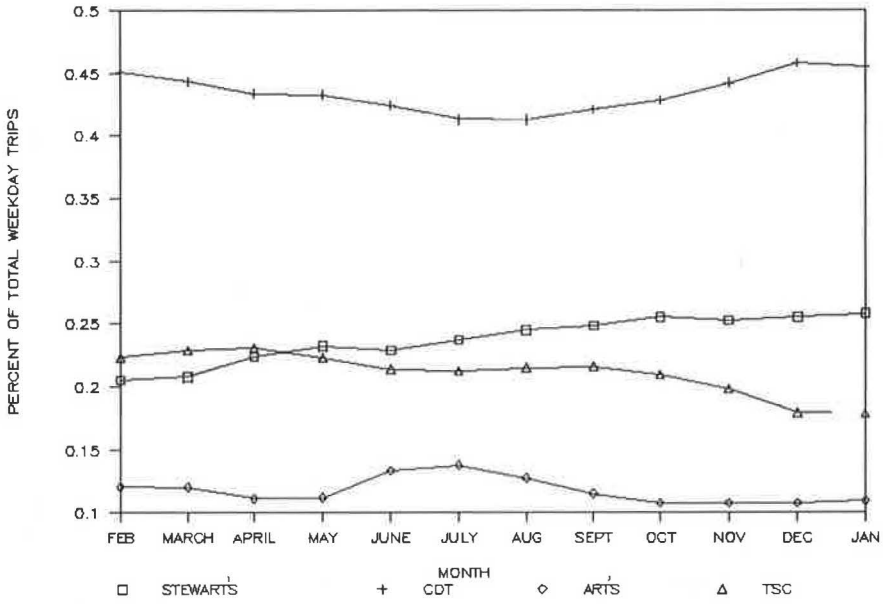

FIGURE 7 Average daily weekday trips.

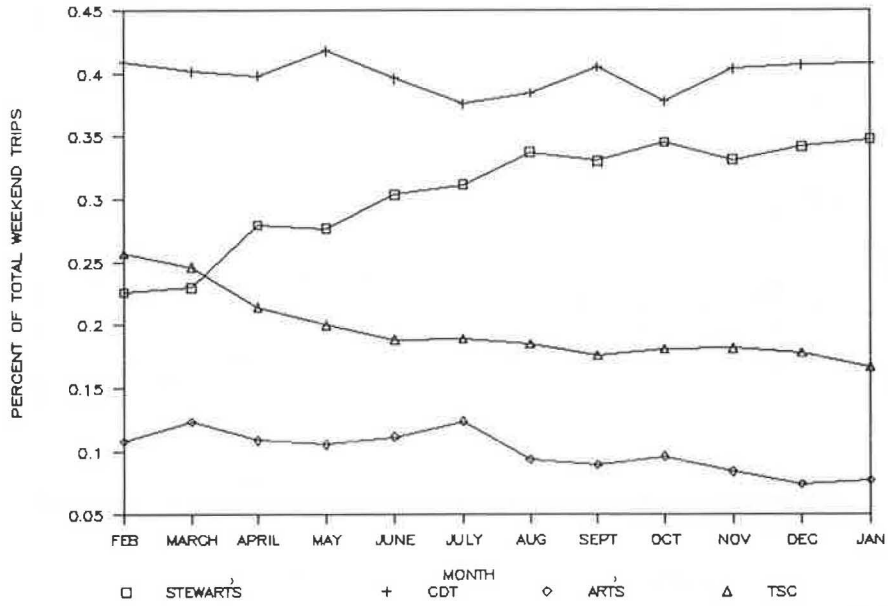

FIGURE 8 Average daily weekend trips.

percent, CDT remained fairly constant with 19 percent, Art's averaged 18 percent but varied from a high of 24 percent in April to a low of 13 percent in December, and TSC increased its percentage of subscription trips from 16 percent in February to 24 percent in January (Figure 10).

On-Time Performance Reliability

The best on-time performance among the carriers has been by TSC with an average of 77 percent of its pickups on time (Figure 11). The values ranged from a low of 71 percent in March to a high of 84 percent in July. CDT had the next best record with an average of 65 percent on-time pickups, ranging from 60 to 71 percent. Stewart's averaged 62 percent of its pickups on time, whereas Art's averaged 59 percent of its pickups on time.

Trip Time

CDT had the best record of percent of trips under 90 min with an average of 1.2 percent of its trips exceeding 90 min of in-vehicle time (Figure 12). TSC had the next best record with 3.3 percent of its trips over 90 min, whereas Art's had 5.1 percent of its trips exceed 90 min. Because CDT carries a majority of the trips with the lowest percentage of long trips, the overall average is lowered and the other carriers benefit.

SWITCHING OF CARRIERS

A primary reason for contracting with four different private carriers is to allow the users to choose their carrier. The user contacts the carrier directly to arrange a trip. The presumption is that the user's option to switch will promote quality of service through competition.

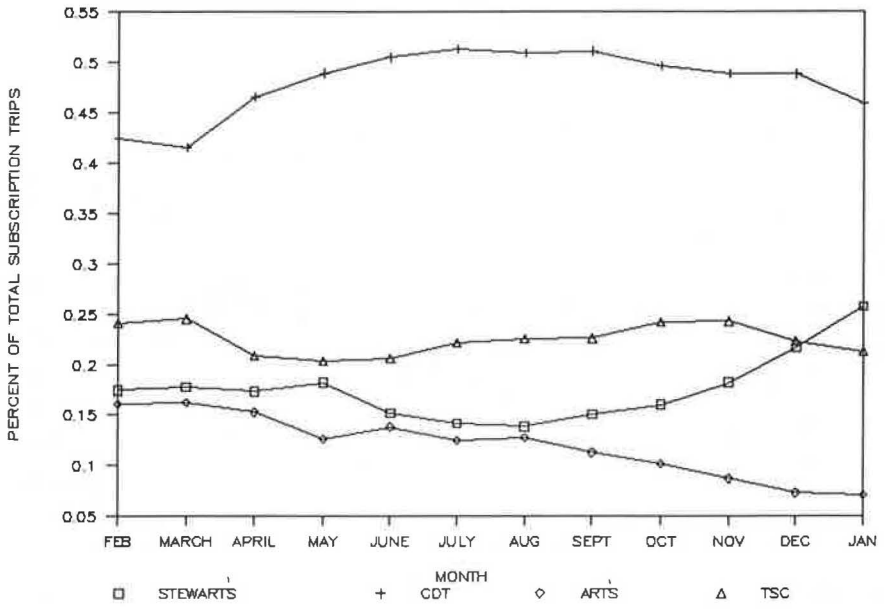

FIGURE 9 Subscription trips.

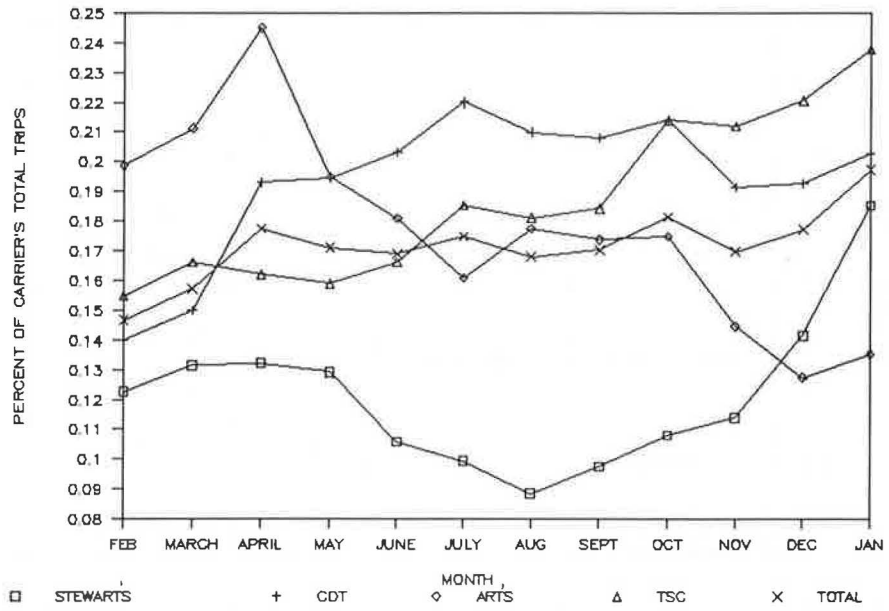

FIGURE 10 Subscription trips, by carrier.

A random sample of users was examined to determine the amount of switching being done by the riders. Nine two-digit numbers were chosen at random to represent the last two digits of the seven-digit user identification number. These user ID numbers were then pulled from the computer with a list of the number of trips made for the month of October on each carrier for each of the chosen ID numbers.

There were 428 users in the sample, who took 6,566 trips during the month of October. Out of the total of 428 users, 78 users rode on at least two carriers and took 1,846 trips during the sample time period. A total of 18 percent of the sampled users switched carriers, and these 18 percent took 28 percent of the trips sampled. In other words, the users who switched tend to make more trips than the users who stuck with one carrier. Another way to analyze this is to look at the trips taken per user. The overall number of trips per user for this sample is 15.3 trips. The number of trips per user taken by users who switch carriers is 23.7 trips. The number of trips per user taken by users who stay with one carrier is 13.5 trips. According to this sample, users who switch carriers tend to take 10 more trips per month than users who do not switch carriers.

Only 1 user out of the 428 sampled (0.2 percent) had ridden on all four carriers during the sample time period. A total of 12 riders (2.8 percent) had tried three of the carriers, and 65 users (15.2 percent) had tried two of the carriers.

Of the 78 users who did switch carriers, 57 (73 percent) switched between the nighttime carrier—Stewart's—and at least one other carrier. Unfortunately, the time of day that the trips took place is not available, so the switching being done between Stewart's and the other carriers could be a result of the nighttime carrier's monopoly on the service between 9:00 p.m. and 1:00 a.m.

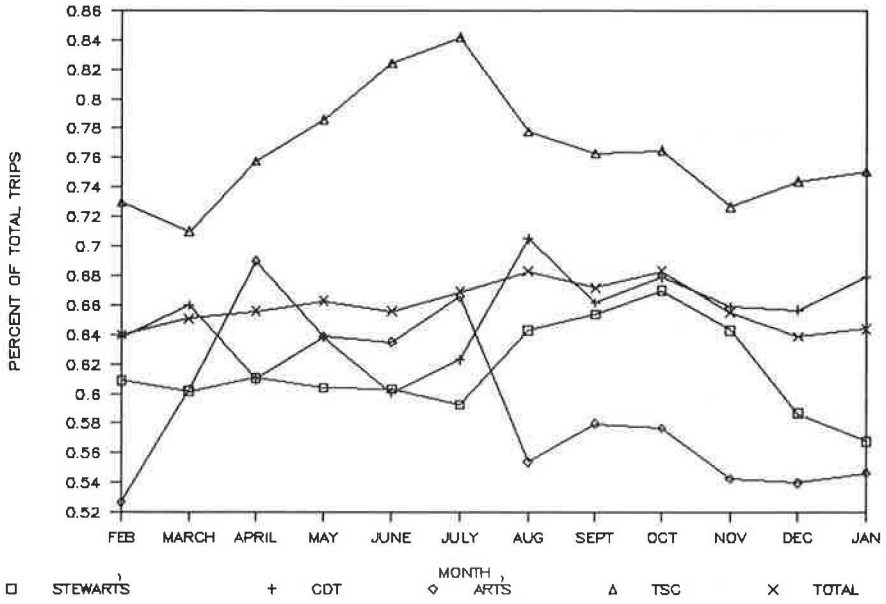

FIGURE 11 Trips picked up on time.

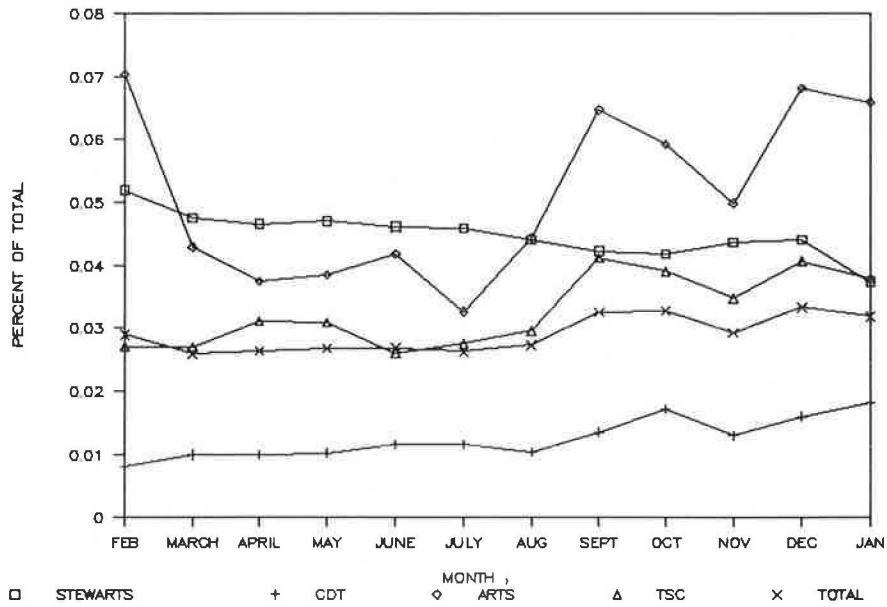

FIGURE 12 Trips exceeding 90 min in length.

The nighttime carrier's trips accounted for 36.5 percent of the sample survey of users who switch trips (673/1,846). Overall, for the month of October, this carrier's market share of the total trips was 27 percent. If overall nighttime trips are subtracted, the market share for Stewart's is 25 percent. The sample survey has a higher proportion of the nighttime carrier's trips, implying that the amount of switching reflected is a result of the forced switching of night trips. Therefore, even the 18 percent of users who do switch may be an overstated figure for users who switch for reasons other than night trips.

CONCLUSIONS

The contracted service has provided an increase in service hours and number of trips, while decreasing the cost of the trips by at least 55 percent. Among the carriers there is a consistent trend for each individual carrier in terms of type of trips carried, overall share of trips, on-time performance reliability, and trip time. The review of data to determine the amount of carrier switching that occurs showed that only 18 percent of the riders sampled had tried more than one carrier. In terms of these performance measures, the contracted service has been successful in reducing the cost of trips over the in-house operation. The rationale for contracting with four different carriers to promote competition among the carriers does not seem to be borne out by the number of riders who actually switch carriers.

Although the cost decrease has made more trips available for the limited budget for CTA Special Services, it cannot be concluded that the private carriers are being more efficient. In fact, the cost decrease could be a result of the private carriers' being able to use nonunion operating labor.

To increase efficiency, which will promote more trip availability for the limited funding, the CTA should consider separating the trips by ambulatory and nonambulatory, when rebidding its contract for Special Services. The new contract would allow two carriers to transport all the nonambulatory trips and two carriers to transport all the ambulatory riders. The CTA will be in a unique position at that time because the users have chosen their favorite carrier of the four. In fact, one carrier already transports over half of the nonambulatory trips and would be an obvious choice for a nonambulatory carrier.

ACKNOWLEDGMENT

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Evaluation of a Demonstration Small Bus Program for the Elderly and Handicapped

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The availability of transportation services to all citizens should be considered essential to maintenance of the quality of life. The best efforts of public and private agencies notwithstanding, it is clear that there are numerous individuals and groups who do not enjoy the same levels of transportation service. The state of Michigan undertook a demonstration program, Local Efforts in Transportation Services, that provides essential transportation services to the elderly and handicapped in specific neighborhoods in the city of Detroit. A discussion of the factors that were considered in a service evaluation performed from quantitative, qualitative, and institutional issue viewpoints is included. Comparisons are made among small bus services provided by public transportation agencies and directed to the elderly and handicapped. These comparisons provide a context within which an assessment of similar types of small bus services to this sector of society can be made.

The existence of a perceived lack of adequate public transportation services to meet the essential transportation needs of the elderly and handicapped in the Detroit metropolitan area resulted in the Michigan Department of Transportation (MDOT), through its Bureau of Urban Public Transportation (UPTRAN), undertaking a unique demonstration project entitled Local Efforts in Transportation Service (LETS GO) during Fiscal Year 1986. This project was designed to effectively and efficiently satisfy the unmet specialized public transportation needs of senior and handicapped citizens in various communities in the city of Detroit. The demonstration program provided state assistance in the form of planning and technical services; the provision of vehicles; and funding for vehicle operating and maintenance, start-up, and coordination costs. The objective of the program was to demonstrate the ability of local communities, through community social service centers, to work with various public agencies to provide specialized transportation services to satisfy the unique transportation needs of these citizens. To assess the degree to which this objective was satisfied, an analysis of the feasibility and viability of these services was undertaken and a determination made of the capability and advisability of the state to extend such services to other communities when such service was warranted. The opportunity to evaluate a functional transit system of this type was appealing in that a similar type of service was studied conceptually by the city of Lansing several years ago (*1*).

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Presented in this paper are the results of a comprehensive review of the first two projects funded under this program (*2*). This review was intended to enable the state to examine possibilities for future expansion of this program to most effectively ensure the maximum benefits for the funds expended. Of general interest to the transportation community at large because many areas are faced with proposals for small bus systems to meet similar needs, this review presented a scope within which such systems could be assessed. The review included

- Documentation of the nature and level of the transportation services provided;
- Examination of the unique transportation needs met by this program;
- Evaluation of the process and procedures under which the program has been planned and operated;
- Assessment of the acceptance of the program by users, community providers, and public agencies;
- Examination of other options for the provision of such specialized transportation services; and
- Development of recommended changes that should occur in the program to more effectively meet the transportation needs of the elderly and handicapped in the most cost-efficient manner.

EXISTING PUBLIC TRANSIT SMALL BUS OPERATIONS

Both the Southeastern Michigan Transportation Authority (SEMTA) and the Detroit Department of Transportation (DDOT) operate extensive networks of line-haul bus transit services in the Detroit metropolitan area. These services are operated on densely populated routes on fixed schedules with frequency based on route demand. These line-haul services are less than optimal, at best, for senior and handicapped citizens who often require more personal and flexible services to specialized destinations. Normally, these types of trips are best suited to small bus systems that operate in a demand-responsive mode.

Conventional small bus operations designed to meet the needs of the elderly and handicapped, as well as others, in the tri-county regions of Wayne, Oakland, and Macomb counties in the Detroit metropolitan area are provided by SEMTA. DDOT does not operate a small bus service although it has a commitment to provide reduced-fare service to the elderly on its line-

haul system. The SEMTA operations are generally based outside the city of Detroit and consist of four types of operations: bus service directly operated by SEMTA (the SEMTA Connector), bus service operated under contract to SEMTA by other public carriers (the SEMTA Community Connector), cab service subsidized under a municipal credit funding arrangement, and van service subsidized by SEMTA (*3*). Although both the SEMTA Connector Service (CS) and the SEMTA Community Connector (CC) service provide effective and efficient conventional demand-responsive small bus transportation to a large number of communities within the tri-county area, no such service presently exists within the boundaries of the city of Detroit. Furthermore, the nature of the service provided by SEMTA in its small bus program does not allow for anything but curb-to-curb service, which may not be the most desirable service for senior and handicapped citizens who often require assistance in getting to and from their residences or trip destinations. Therefore, LETS GO was seen as a way to fill a void in essential transportation service within the city limits of Detroit by establishing demonstration programs for community-based and community-operated assisted-transportation service for senior and handicapped citizens.

LOCAL EFFORTS IN TRANSPORTATION SERVICE

Throughout the urban areas in Michigan, a wide variety of community and social service agencies provide essential support services to senior and handicapped citizens. Available specialized transportation services are critical components affecting the ability of these agencies to provide these support services. LETS GO was funded by the legislature of the state of Michigan for the purpose of funding one or more demonstration projects that might better meet the mobility needs of senior and handicapped citizens and was administered by the Bus Transit Division of UPTRAN.

Capital assistance was provided for vehicles and other support equipment for the operation of the transportation service. The support equipment included such eligible items as wheelchair lifts, radios, vehicle rehabilitation, and heavy vehicle maintenance requirements. Operating assistance provided for includes such items as administration, operator and dispatcher wages, fringe benefits, regular vehicle maintenance, gas and oil, insurance, and rent. A significant level of local support for operating expenses, 20 to 30 percent, was required. Such local support could be a combination of farebox revenues, provider funds, or donations. These could also be in-kind contributions such as volunteer time and equivalent wages.

Detroit Assisted Transportation Coalition

The Detroit Assisted Transportation Coalition (DATC) was funded through the Senior Citizens Department of the city of Detroit for the period from February 3, 1986, through February 3, 1987, at a level of state funding of $203,917. Of this amount, $14,400 was for capital equipment and $189,517 was for operating funds. Seven rehabilitated buses were loaned to DATC by UPTRAN.

DATC consists of small bus transportation services for the elderly and handicapped provided through five community-based social service centers: the Brightmoor Community Center, Latino Outreach and Community Service Center, Community Resource and Assistance Center (CRAC), St. Rose Senior Center, and Delray United Action Council. The St. Rose service is provided by CRAC.

Project coordination between the community-based social service centers is provided by United Community Services of Metropolitan Detroit (UCS). The Senior Citizens Department of the city of Detroit (SCD) administers the grant funds to the individual social service centers through the coordinator at UCS who works directly with these community-based providers. This coordinator oversees the services offered by these agencies, but all scheduling and dispatching of bus services are done by the providers on a demand-responsive, advance-reservation basis within each of their primary service areas.

The function of the coordinator is to meet with the individual social service centers to resolve operating and maintenance problems, receive monthly operating and financial reports from the individual agencies and transmit them to the UCS, SCD, and UPTRAN, and operate a radio dispatch system on behalf of the individual centers to communicate with buses that are en route during operating periods.

The Brightmoor Community Center is a nonprofit community service provider whose social service activities are funded by contributions made by the United Foundation. The Detroit Area Agency on Aging currently provides funds for a food and friendship program for senior adults, home support services, and a senior center. UCS employment and training funds supplement the senior center staffing. The transportation services offered to seniors provide for transportation to and from the center for the various programs conducted at the center, and for occasionally scheduled short group shopping trips and outings for its clients.

Latino Outreach is primarily a preventive mental health facility serving, in effect, the Hispanic community in southwestern Detroit. There is a variety of services offered at the center itself ranging from a developmental disabilities program to senior and youth programs. The transportation service supports not only center programs but also activity trips and medical-related trips.

CRAC is an association of 20 east-side Detroit neighborhood associations that administers the Senior Citizen Area Transport (SCAT) program providing free door-to-door, assisted transportation to seniors 55 years of age or older. CRAC also provides transport service to the St. Rose Senior Center. One of the largest transportation demands for CRAC is for medical trips. These trips are made for scheduled visits to hospitals to receive treatment for a variety of reasons. For these types of trips, the client is picked up and dropped off at the medical destination, typically a Detroit-area hospital. When treatment is completed, the client telephones and indicates the need for the return trip. For either leg of the trip there maybe some crossover among DATC members; that is, the bus assigned to pick up the passenger may be any of the buses operated by the coalition depending upon operating efficiency and scheduling convenience for the passenger. It should be noted that this procedure is generally used by any of the LETS GO providers dealing with medical trips.

The Delray United Action Council operates out of its senior citizen center on the southwest side of the city of Detroit. Delray operates a daily food and friendship program for seniors and a daily crafts and exercise program. Programming at the center includes a weekly film series, weekly bowling trips, monthly bookmobile, monthly group shopping trips, and a guest speaker series.

Council of Action United for Service Efforts

The Council of Action United for Service Efforts (CAUSE) had $185,246 of state funds for a service period from August 1986 through September 1987. Of this revised funding level, $26,270 was for capital equipment and $158,976 was for operating expenses. Four rehabilitated lift-equipped small buses were provided for this service. CAUSE is a nonprofit, multipurpose senior citizen community organization operating from its own facility located relatively near the center of Detroit. Funding for the CAUSE transportation service is provided by UPTRAN to SCD of the city of Detroit. As costs are incurred by CAUSE, monthly invoices are submitted to the SCD. SCD pays these invoices directly to CAUSE and recovers these funds from UPTRAN.

The transportation service emphasis is on senior citizen clients but handicappers are also accommodated. The service provides for trips to medical facilities, shopping centers, senior citizen centers and service agencies, food and friendship sites, markets, and banks. It also provides for monthly trips for special events and community meetings of interest to seniors.

EVALUATION OF LETS GO PROGRAM

Any review of a program such as LETS GO should include the following dimensions:

- A quantitative evaluation of how much service is being provided and at what cost;
- A qualitative review of the need for, and quality of, the service being delivered; and
- An assessment of the instititional issues, that is, the administrative and organizational delivery system, which includes, for example, the relationship between UPTRAN and the community organizations.

It is only after a reasonably comprehensive evaluation from all of these perspectives that appropriate assessment of service can be made.

Quantitative Assessment

The quantitative review of the program consisted of collecting and analyzing operational data from UPTRAN and the two providers and, in the case of DATC, its member agencies. The data were arranged in traditional ways to arrive at some indication of, for example, the average trip length. The comparative trip purpose data are presented in Table 1 for the DATC providers and CAUSE, and the statistics related to comparative measures of transportation efficiency for the DATC providers, CAUSE, and SEMTA are provided in Table 2.

Services

Latino Outreach The data presented in Table 1 show that the predominant trip purpose for Latino Outreach is for recreation, which includes several activities at the center or elsewhere. Together, recreation and miscellaneous purposes account for approximately 80 percent of the trips. The system appears to have a reasonably good record of availability as shown by the data in Table 2. The average trip length is on the order of 2 mi, which further indicates that many trips were within the service area. For purposes of comparison, the average trip lengths for CRAC and CAUSE, where medical trips predominated, are approximately 50 to 100 percent longer because most of the medical destinations are outside the neighborhoods where the clients reside. The trips per vehicle-hour indicate that approximately six people are riding in any given hour of actual vehicle operation although this counts "dead-heading" when, for example, the vehicle is outbound from the center to the clients to pick them up for center activities. The fact that trips per system-hour are lower than trips per vehicle-hour indicates that there is some time when the vehicle is available but not used, approximately 16 percent of the time. This is also apparent from comparing total system and total vehicle hours.

As indicated earlier, the single biggest destination for this service was found to be the center itself with approximately 38 percent center-oriented. Shopping accounted for just over 20

TABLE 1 COMPARATIVE TRIP PURPOSE DATA FOR DATC PROVIDERS AND CAUSE

	No. of Trips								
Provider	Food and Friendship	Medical	Recreation	Nutrition	Shopping	Special Events	Miscellaneous	Total Trips	Total Miles
Latino Outreach		1,888	5,306	376			1,404	8,974	18,072
Avg monthly trips		172	482	34			128	816	1,642
Delray		702			692	3,398		4,792	5,434
Avg monthly trips		70			70	340		480	543
Brightmoor	5,848				1,152	1,070		8,070	15,243
Avg monthly trips	532				104	98		734	1,385
CRAC		15,006	3,082	6,038				24,126	72,558
Avg monthly trips		1,364	280	548				2,192	6,596
CAUSE		4,457	563	2,095	680		382	8,177	36,378
Avg monthly trips		637	80	299	97		55	1,168	5,196

NOTE: Data cover the period from May 1986 through March 1987.

TABLE 2 COMPARISON OF DATC PROVIDERS, CAUSE, AND SEMTA

Provider	Total Trips	Total Miles	System-Hours	Vehicle-Hours	Trips per System-Hour	Trips per Vehicle-Hour	Trip Length (mi)	Trips per Vehicle-Mile
Latino Outreach	8,974	18,072	1,736	1,453	5.1	6.1	2.2	0.5
Delray	4,792	5,434	1,348	446	3.6	16.4	1.2	0.9
Brightmoor	8,070	15,243	1,832	1,419	4.4	5.7	1.9	0.5
CRAC and SCAT	24,126	72,558	1,832	5,265	13.2	4.7	3.0	0.3
DATC	45,962	111,307	6,748	8,583	6.8	5.4	2.4	0.4
CAUSE	8,177	36,378	1,053	3,224	7.8	2.5	4.4	0.2
SEMTA CS	612,255	2,621,111		120,725		5.1	4.3	0.2
SEMTA CC	260,404	525,257		40,430		6.4	2.0	0.5

NOTE: Data cover the period from May 1986 through March 1987.

percent of the trips, with medical accounting for approximately another 25 percent. According to the trip purpose breakdown provided, medical trips accounted for 21 percent of the total. The service is basically a 24-hr advance reservation service. Radio contact is used to coordinate return trips when necessary. Early in the program there were some vehicle problems but another vehicle was substituted. It should be noted that this sort of problem is potentially troublesome for center or noncenter-oriented services—the need for back-up vehicle capability is critical for all providers. With the arrival of a second vehicle, a new mini-van, one vehicle was dedicated to medical trips and one to all other purposes. Although Latino Outreach had its own vehicle before it participated in LETS GO, the feeling was that most of the trips currently being serviced were made either by taxi or with a friend, or, alternatively, not at all. For special event outings, vehicles had been rented. The SEMTA Connector Service was seen as simply not being adequate. The only person directly funded by LETS GO funds is the driver. Latino Outreach must provide another driver, a supervisor, one person to take calls and schedule trips, and other administrative time.

Delray The Delray service is significantly different from that provided by Latino Outreach. While many trips provided by both are center-oriented, Delray has a much higher proportion of special events trips, many of which are either in or in close proximity to the neighborhood, although this changed during the course of the analysis period. It should be noted that Delray reported no service in May 1986 so the analysis period is less than the others. Also, as indicated earlier, the Delray service area is considerably smaller than the others, which would, for example, affect the typical trip length to a center activity.

Even considering that adjustment, Delray provided significantly fewer but considerably shorter trips than did Latino Outreach. As shown in Table 1, special events accounted for the greatest number of trips. Medical trips accounted for about 14 percent, which is somewhat less than Latino Outreach's 21 percent.

Delray's system-hours were significantly lower than Latino Outreach's, an average of 135 hr/month versus 158, and vehicle-hours were even lower, 45 versus 132, for an average service use of 33 percent for Delray versus 83 percent for Latino Outreach.

Delray provided on the average much shorter trips, somewhat over 1 mi to Latino Outreach's 2 mi. The monthly and overall trips per vehicle-hour averages support the idea that many of the trips involved taking groups to special events, especially during the earlier months of operation of the service. In the last 5 months of operation during the analysis period, there was a significant change in the service with the number of trips somewhat reduced and the number of trips per vehicle-hour decreasing as well. The above notwithstanding, Delray appears to have provided reasonably efficient service when it was available.

Brightmoor Brightmoor's transportation service has largely been a patchwork program in the past. At various times there have been a vehicle funded for day-care transportation, a van under another social service program, and a driver from yet another program. Transportation is, nonetheless, a vital part of the service that the center offers. The client group—mainly the elderly of the area numbering from 4,000 to 6,000—has no convenient transportation other than that provided by the center to access the center's programs and other special events such as shopping trips. The prevailing view is that SEMTA cannot provide the appropriate level of service to support the center, but could provide supplementary service for the area. Brightmoor's service was presumed to be the most center-oriented as no trip destination data were available, although the average trip length is comparable to that of Latino Outreach. The trips-per-vehicle-hour data indicate that the passenger loading is somewhat lower than for the other centers, which seems reasonable for a center orientation.

Indeed, the food and friendship purpose is a center-oriented trip, which accounts for almost 75 percent of the trips provided, the rest being shopping and special event trips. The shopping trips account for 14 percent of the total, which is the same as Delray and somewhat less than the 20 to 25 percent indicated in the breakdown of the sample of Latino Outreach trips. No medical trips were reported.

Although the reported vehicle-to-system-hours use is between the other two services, Brightmoor's 78 percent is significantly higher than Delray's 33 percent.

CRAC The CRAC service is considerably more well-established and had the benefit of more than one vehicle in operation at all times as may be noted in Table 2, which shows that the average vehicle-to-system-hours ratio is approximately 2.8 versus less than 1 for each of the other systems. Similarly, the trips per system-hour are also quite high since the system has multiple vehicles. CRAC has been in operation for some

time and the organization clearly had the benefit of this experience in running its program. It should also be noted that CRAC's service area is quite large, which in itself would account for longer trips.

The sample of reported trip purposes is dominated, by a significant margin, by medical trips as can be seen in Table 1. Approximately 62 percent of CRAC's trips are medical versus the next highest, Latino Outreach at 21 percent. The smallest share for CRAC is represented by recreational trips at 12 percent, a significantly different orientation than the other three services in the DATC.

As might be expected given the orientation to medical trips, CRAC has the highest average trip length and lowest trips-per-vehicle-mile figures.

CAUSE The service provided by CAUSE is separate from the DATC. However, the service provided appears to be most similar to that of CRAC since the dominant trip purpose is medical, these representing 55 percent of the trips. Likewise, the average trip length of 4.5 mi is the longest of any of the providers and very consistent month to month; the standard deviation was found to be quite low relative to the others.

Again, it is seen that the high proportion of medical trips, which are typically destined out of the neighborhood, lead to low values of trips per vehicle-mile. Also, like CRAC, CAUSE had multiple vehicles available.

Service Comparison

CAUSE can be compared directly with the other providers individually and with DATC in general with the data in Table 2. In should be kept in mind that CAUSE operated for only the last 7 months of the common analysis period although the last four statistics tabulated are ratio forms that implicitly account for some differences in total operations.

A complete economic evaluation is quite difficult since it is virtually impossible to arrive at the real costs of providing the services by any of the groups. Furthermore, the services are different, and the number of vehicles available is different in terms of both reliability and the actual number of vehicles. Therefore, perhaps a better indicator of service efficiency is the trips-per-vehicle-mile statistic. This number essentially normalizes for vehicle availability and provides a limited base for comparing different services. A brief comparison of the DATC providers, CAUSE, and the SEMTA connector services on the basis of the summary statistics is given in Table 2. The fact that the Delray service was available for a shorter time is important, therefore, when the totals are concerned but is implicitly considered in the ratios. This point notwithstanding, the results are somewhat surprising.

In terms of efficiency, measured by the largest number of trips per vehicle-mile, Delray is providing the best service. This is a result of the larger number of trips that are provided to special events when the vehicle is most likely to be filled and there is very little dead-heading. CRAC and CAUSE are least efficient given that they are carrying a fairly large number of people to diverse destinations such as hospitals, clinics, and so forth. This sort of trip presumably requires a lot of dead-heading. This efficiency measure should be interpreted with caution. For example, an uncritical acceptance of it implies that recreational trips, for example, a special event, are as important as medical trips. The difference in the relative sizes of the service areas of the providers will also affect trip length. Delray's trip length is small, which would typically result in shorter trips, while CRAC's is large, resulting in longer trips.

The trips-per-vehicle-hour value is also normalized for the number of vehicles and the time they are on the road. Again, Delray comes out most favorably, presumably for the same reasons. Brightmoor and Latino Outreach offer services that are most similar to one another and their operating statistics are similar as well.

Also shown in Table 2 are summary statistics for the SEMTA-sponsored Community Connectors (SEMTA CC) and general Connector Services (SEMTA CS). While the time periods for the SEMTA services are significantly different, which indicates that the totals should not be compared, the efficiency statistics are essentially normalized. In each instance the SEMTA figures fall within the overall range established by CAUSE and the DATC providers; that is, the services are largely comparable. It would appear that SEMTA is meeting, or attempting to meet, a very similar need in the communities in which it operates.

Cost Comparison

A comprehensive cost analysis is very difficult to do. The reasons for this include the fact that the capital costs are not known; in addition, neither the complete extent of provider contributions to the program nor the associated assignable costs are known. However, based on costs reported to UPTRAN some cost-effectiveness measures have been developed. These are shown in Table 3 for DATC and Table 4 for CAUSE. No comparable figures were obtained from SEMTA. The data reported contain neither complete start-up costs nor any considerations as noted above. Therefore the cost-related statistics reported are all on the conservative side; that is, the actual costs would be significantly higher.

The overall costs per vehicle-hour of operation are approximately $22.50 for CAUSE and $20.00 for DATC. Costs per trip are higher for CAUSE, $8.71, than for DATC, $4.77, which is probably because of the difference in the type of trip being provided. A breakdown of DATC by provider would show a differential with CRAC probably being the highest and comparable to CAUSE. The cost per mile of operation is just under $2.00 for both DATC and CAUSE, which indicates that the costs to have the vehicles on the street are about the same. This statistic tends to be independent of trip purpose and length because most of the travel, regardless of trip purpose and length, is on city streets. Neither system covers an appreciable amount of the costs associated with the service.

From the foregoing data, it seems reasonably clear that fares will never cover costs and that the service must have large-scale subsidies from somewhere. Currently, the best opportunity appears to be a formal linkage with health-care providers where significant costs can be recovered. It is possible, given the above cost figures, that some cross-subsidization within the providers' services could occur if the health-care-related trips could be paid for by the health agency. That is, a "profit" could be realized from medical trips which would then cover at least some of the costs of providing other kinds of trips within DATC and CAUSE service areas.

TABLE 3 COST SUMMARY FOR DATC

Month	No. of Trips	Total Costs ($)	No. of Fares	Avg. Fare ($)	Vehicle-Hours	Total Miles	No. of Trips per Vehicle-Hour	Cost per Vehicle-Hour ($)	Cost per Trip ($)	Cost per Mile ($)	Fare to Cost Ratio	Avg. Trip Length (mi)
1986												
Jan.	862	3,742	90	0.10	360	2,797	2.4	10.39	4.34	1.34	0.02	3.2
Feb.	1,313	4,841	118	0.09	480	3,799	2.7	10.09	3.69	1.27	0.02	2.9
March	2,682	6,225	1,010	0.38	571	5,757	4.7	10.90	2.32	1.08	0.16	2.2
April	2,946	22,442	1,146	0.39	705	5,540	4.2	31.83	7.62	4.05	0.05	1.9
May	2,798	15,312	1,002	0.36	767	7,463	3.6	19.96	5.47	2.05	0.06	2.7
June	2,581	14,254	264	0.10	750	7,172	3.4	19.00	5.52	1.99	0.02	2.8
July	3,655	18,208	1,578	0.43	823	9,280	4.4	22.12	4.98	1.96	0.09	2.5
Aug.	3,206	11,875	1,255	0.39	783	9,659	4.1	15.17	3.70	1.23	0.11	3.0
Sept.	3,802	18,677	182	0.05	837	10,912	4.5	22.31	4.91	1.71	0.01	2.9
Oct.	4,569	11,891	879	0.19	879	4,269	5.2	13.53	2.60	2.79	0.07	0.9
Nov.	3,796	17,379	128	0.03	765	9,633	5.0	22.72	4.58	1.80	0.01	2.5
Dec.	3,926	29,136	2,035	0.52	773	8,715	5.1	37.69	7.42	3.34	0.07	2.2
1987												
Jan.	3,854	12,623	980	0.25	807	13,011	4.8	15.64	3.28	0.97	0.08	3.4
Total	39,128	186,605	10,667	0.27	9,300	98,007	4.2	20.06	4.77	1.90	0.06	2.5

TABLE 4 COST SUMMARY FOR CAUSE

Month	No. of Trips	Total Costs ($)	No. of Fares	Avg. Fare ($)	Vehicle-Hours	Total Miles	No. of Trips per Vehicle-Hour	Cost per Vehicle-Hour ($)	Cost per Trip ($)	Cost per Mile ($)	Fare to Cost Ratio	Avg. Trip Length (mi)
1986												
Aug.	122	5,427	68	0.56	82	822	1.5	66.18	44.48	6.60	0.01	6.7
Sept.	901	7,002	280	0.31	411	4,067	2.2	17.04	7.77	1.72	0.04	4.5
Oct.	1,220	11,194	425	0.35	520	5,556	2.3	21.53	9.17	2.01	0.04	4.6
Nov.	1,032	11,058	448	0.43	448	4,981	2.3	24.68	10.72	2.22	0.04	4.8
Dec.	1,014	9,806	286	0.28	435	4,354	2.3	22.54	9.67	2.25	0.03	4.3
1987												
Jan.	1,221	9,668	488	0.40	486	5,183	2.5	19.89	7.92	1.87	0.05	4.2
Feb.	1,395	9,314	508	0.36	474	6,200	2.9	19.65	6.68	1.50	0.05	4.4
March	1,397	9,356	478	0.34	449	6,037	3.1	20.84	6.70	1.55	0.05	4.3
April	1,477	12,334	479	0.32	475	6,347	3.1	25.97	8.35	1.94	0.04	4.3
Total	9,779	85,159	3,460	0.35	3,780	43,547	2.6	22.53	8.71	1.96	0.04	4.4

Some cost figures from other programs were recently published (*4*) showing that in Austin, Texas, similar public services cost about $10.80 per trip versus $5.00 by taxi. In San Antonio, Texas, the public-provided service costs $9.75 per trip versus $4.10 for a private provider of handicapped services. In Ann Arbor, Michigan, a special publicly and privately sponsored lift-equipped bus provided trips at about $10.90 per trip versus about $4.75 for taxi. It should be noted that the Ann Arbor costs apparently did not include any consideration of capital investment. It is not known whether the Texas figures included them or not. The Ann Arbor costs can be compared with an estimated $50 per trip for one passenger per trip service ($25 for two persons per trip) provided by the public transit agency, Ann Arbor Transit Authority (AATA). Again, it is not known whether the AATA included consideration of capital costs.

There was also a review of SCAT operations (*5*) wherein it was stated that SCAT is self-sufficient and an example of privatization of service, although virtually all of the reported funding was from public sources including MDOT, SEMTA, and the Michigan Department of Labor, among others. However, very little cost information was reported. It is nonetheless clear that CRAC (and SCAT) is a principal provider of services in the area and has taken substantive steps to obtain funding from a variety of sources.

Although direct comparison of the costs in Tables 3 and 4 with those reported in the foregoing paragraphs is problematic, it would appear that the costs being incurred by DATC and CAUSE are similar to those reported elsewhere. Whereas the capital costs of vehicles appear to be consistently overlooked by many providers, the DATC and CAUSE data are presumably artificially low compared to some of the others because of, for example, some driver salaries not being covered by the providers themselves and many administrative costs not being reported. Nonetheless, the conclusion must be that at the current time the costs being reported are similar to or lower than comparable services elsewhere.

Qualitative Assessment

The quantitative statistics concerning DATC and CAUSE services represent only one view of what is needed by and offered to the neighborhoods. The services are unique in that they are the only option for many of the clients. Indeed, one of the most important aspects of the services provided is the personalized,

door-to-door nature of the pickup and delivery of the clients. This is also a major difference between the service that is offered under the auspices of the LETS GO program and that which might be considered as a substitute, for example, SEMTA Connector Service or subsidized taxis. As currently structured, the substitutes would almost assuredly not provide the level of service that is now being delivered. Numerous riders were interviewed during the course of the project; some were actually riding on the buses and others were interviewed at the various centers. In general, it was noted that the drivers and passengers typically had a very good relationship; that is, the drivers knew their passengers and vice versa. One of the real problems in considering large-scale enhancements of elderly and handicapped services is the loss of this sort of bonding that typically is achieved only with local control of the service.

Several points need to be made regarding comments that were gathered from users of the systems. First, the services being offered are clearly important to the clients who are taking advantage of them. Second, comments received regarding SEMTA services were not particularly positive in that the clients felt that the LETS GO services offered were superior to those offered by SEMTA'S demand-responsive system. Whether these comments pertain to the SEMTA service before or after the recent budgetary problems is probably important since significant service reductions occurred in response to fund limitations. Lastly, there was a clear indication of the need for a variety of services, although some priority-response may be necessary for the providers.

Assessment of Relevant Institutional Issues

The last major area of concern in the analysis, and perhaps the most difficult to accurately represent, is the general organizational and political climate in which the LETS GO program exists. During the course of the review, numerous meetings were held with representatives of UPTRAN, SEMTA, the providers themselves, UCS, and the Detroit Senior Citizens Department. While most had a similar opinion on the need for elderly and handicapped services in Detroit, there were varying views on which agencies were best suited to provide them. It seems reasonably clear that not every group had the same agenda when the provision of transportation services was considered.

Ultimately, the important questions concern the philosophy of the program. For example,

- If the existing service is expanded, what group or agency should administer the program?
- Does UPTRAN, or MDOT in general, wish to be in the position of subsidizing and dealing directly with a large number of loosely organized, community-based providers?
- Can the current providers expand service or would other groups be included in the program?

UPTRAN was approached with the idea of funding a special-purpose, pilot transportation program in Detroit with the goal of satisfying the unmet need for assisted transportation services. UPTRAN was contacted because of a lack of money in other social-service-oriented programs. Further, there was the feeling that SEMTA was unable to meet this need for any one of a variety of reasons but presumably primarily because of funding problems. The door-to-door assistance issue was also of primary concern given the nature of the client groups.

Because of problems with UPTRAN not being able to contract directly with the actual providers of the service, a rather imaginative administrative structure evolved which saw, for example, all monies flowing through the city of Detroit's Senior Citizen Department to, in one case, a central clearinghouse agency and then to the providers, and, in the other case, from the city to the provider.

For some of the actual providers, the idea of a central coordinator is seen as a blessing of sorts that relieves the neighborhood-based agency of considerable bureaucratic "hassle." However, others saw the delays in getting the needed monies through the pipeline as the hassle. This is not so much an indictment of the structure as it is a real difference in the needs of different providers.

All of the DATC participants saw real advantages in the coalition idea in terms of "strength in numbers" when UPTRAN or other groups needed to be approached. At the same time, there was some disagreement as to whether or not the coalition should be more formalized or expanded. One view perceived this as more numbers, more strength. Another saw a relatively small number of resources being divided into smaller and smaller portions.

Although most providers had a relatively pessimistic view of SEMTA's present, past, and future responsiveness to the transportation problems being considered, SEMTA's view was, understandably, much more positive. SEMTA viewed their limited successes in providing such service as primarily a funding problem. DDOT, on the other hand, was never really mentioned as being an active participant, either currently or in terms of any future role, in providing this sort of demand-responsive service to special client groups. One of the original goals of the analysis was to evaluate whether the providers could become self-sufficient in terms of the provision of service. It would seem that much, if not most, of the service being provided under the auspices of the LETS GO program would simply not be offered if the funding were to be withdrawn. Indeed, these providers had turned to UPTRAN because there were no other funding sources for the needed transportation services. As indicated earlier, the question then becomes one of whether UPTRAN should, or can, become involved with long-term support of such programs.

It seems reasonably clear that there is an unmet need for elderly and handicapped services in Detroit and much of the metropolitan area, and other urban areas as well. There are several dimensions to this demand. The client group is typically poor and often lives in relatively unsafe areas. The needed trips are for several purposes ranging from special events to shopping and from food and friendship to medical. While a priority could be placed on different types of trips, medical trips would seem most important. Some sort of dependable public transportation is clearly a vital aspect of life for the client groups if their life-styles are going to approach the richer, safer, and healthier life-styles of their counterparts in more fortunate circumstances. This need exists in a context of typically diminishing funding from transportation and social service agencies alike.

The need unquestionably exists and therefore service expansion is warranted. Assuming that increased funding were available from UPTRAN or some other agency, the question becomes how those funds could best be parceled out among competing agencies.

While it appears clear that local delivery of services has the advantage of a personalized service that is important for the client group, it is not at all clear that the individual social service agencies either are providing all of the needed services or could accommodate the needed expansion. Further, it is not at all clear that simple expansion of the current coalition of agencies (or combining, for example, DATC and CAUSE) would necessarily lead to more efficient or more comprehensive services.

This situation logically requires a reconsideration of SEMTA's role in the provision of such services. Although SEMTA's operating costs were not obtained, it seems clear that delivery of services by SEMTA would, at least in the short term, increase per-trip costs. However, there are several very positive aspects to a scenario where SEMTA has the lead role in delivering elderly and handicapped services. These include the facts that SEMTA already has similar established programs in place; it is one of the prime line-haul service providers in the area; it has (or would have) the resources to shuffle between agencies in the event of short-term heavy demand, equipment problems, and so forth; and it has the management and control mechanisms required for a large-scale program. SEMTA could also fulfill the role of local arbiter when resources are to be divided among communities. The most significant negative aspect of SEMTA's taking on this role is the loss of the personalized and assisted services currently being offered.

It is clear that SEMTA should receive an opportunity to take this lead role in the context of coordinating the services. That is, SEMTA should have the primary administrative and managerial role for provision of elderly and handicapped services. The actual delivery of services could be left to the local agencies. Several actual operating scenarios are possible. For example, drivers could be hired by the local delivery agency but paid directly by SEMTA, all vehicle maintenance could be handled by SEMTA directly, SEMTA could provide back-up and extra vehicles, and trip scheduling could be done locally by persons partially covered by SEMTA. Alternatively, all personnel could be hired and administered at the local level with the agency having a contract with SEMTA to actually deliver the services using SEMTA-owned vehicles. Whatever the arrangement, the net result of SEMTA involvement should be a smoother delivery of more comprehensive services without compromising the personalized nature of the service.

In further support of this contention, it is difficult to believe that the current administrative arrangement will continue to be productive over time, especially if the providers involved or the services provided increase.

Over the long term, the alternative of simply expanding the existing services will result in a patchwork of uneven service or, alternatively, if acceptable service continues, a large-scale agency that competes with SEMTA for scarce funds. Neither of these alternatives makes sense in an era of plentiful resources, let alone when resources are scarce. This conclusion can be generalized to other areas. If an established transportation provider exists, primary consideration should be given to that agency providing the assisted elderly and handicapped service directly, or alternatively, especially if the service area is relatively large, to that agency assuming the key coordinating role with the actual provider being an agency that is actively dealing with the client groups.

SUMMARY AND CONCLUSIONS

The provision of assisted elderly and handicapped services in Detroit and other urban areas is clearly needed since there is a sizable population that does not currently receive adequate transportation service benefits. The LETS GO program is an attempt to deliver this service to selected communities in Detroit and elsewhere.

A substantial service is being delivered by the providers although it is unlikely that any of them are completely meeting the needs in their respective neighborhoods. This is indirectly demonstrated by noting that there is a significant variation in the types of trips being serviced in the different neighborhoods, and yet all of the services are being "consumed." Thus, it is argued that, for example, there is an unmet need for medical trips in neighborhoods where the emphasis is on social-service-center activity trips. Conversely, there is a need for food and friendship trips in neighborhoods where the emphasis is on medical trips.

Given that the demand for assisted elderly and handicapped services is established, the principal questions concern how best to deliver the service. It is the contention here that such services should be expanded both in scope, that is, a more comprehensive service needs to be offered, and geographically, that is, there are other neighborhoods that need such service.

In light of the foregoing, the recommendations resulting from the review of the LETS GO program were as follows:

- Assisted, as opposed to curb-to-curb, transportation services should be expanded in Detroit and other areas for specific client groups, specifically the elderly and handicapped.
- More work needs to be done on the assessment of the scope of the demand, in terms of both the services offered and the spatial distribution of the clients.
- Regardless of the form of any future funding, funding agencies need to explicitly specify to the providers which data must be collected and how collection is to be accomplished. This is not only so that the service delivery of the providers can be evaluated, but also so that ongoing needs assessment can be made to support, for example, requests for additional resources.
- Established funding agencies, such as UPTRAN, and providers, such as SEMTA, need to be made aware of the real needs of the client groups.
- Local providers need to be made more aware of why operational data need to be collected and reported, and why it is important to track, for example, operating efficiency, regardless of the type of service being offered.
- SEMTA, and possibly DDOT, should become the focus for program expansion in Detroit. Current providers should continue to be the actual providers of the service under some sort of adminstrative arrangement with SEMTA. Such an arrangement could, for example, consist of the local provider operating under contract to SEMTA. SEMTA would then become responsible for basic support services such as provision and maintenance of principal and back-up vehicles.

- LETS-GO-type programs elsewhere should, where possible, be set up to operate through the principal transit provider on a contractual or similar basis.

It is unlikely that assisted elderly and handicapped transportation services can be financially self-sufficient. Therefore, these services will require significant levels of public subsidy if they are continued or expanded.

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Travel Mode Choice Behavior and Physical Barrier Constraints Among the Elderly and Handicapped: An Examination of Travel Mode Preferences

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The objective of this research is to obtain a clearer understanding of the relationships between physical barrier disability characteristics and the processes of travel mode choice. Specifically, the attempt is to understand the second stage of the travel decision-making process—the formation of travel mode preferences among the elderly and handicapped. To this end, an integrated methodology using personal construct theory, multidimensional unfolding, and cluster analysis was developed and tested for a sample population of the elderly and handicapped in Columbus, Ohio. Cognitive dimensions were latently derived for five internally homogeneous groups. Latently derived dimensions for the five groups highlighted preference sensitivities toward accessibility, level of service, cost, and travel burden concerns in the process of travel mode preference formation. These sensitivities were found to be related to varying levels of personal physical disabilities. In essence, it is the varying levels of physical disabilities that define the dimensions of travel mode preference used in the second stage of the travel mode choice decision-making process. These findings are discussed in terms of their policy implications.

In the last decade, one important focus of transportation research has been the "paradigm of travel behavior." The structure of travel mode choice behavior considered by this paradigm is expressed in various models of perception, preference, and choice (*1–4*). Numerous applications of the paradigm in transportation research contexts have largely been confined to the urban mobile population. Transportation disadvantaged, or mobility restricted, segments of the population, such as the elderly and handicapped, have received only limited attention in terms of the travel mode choice decision-making paradigm. Recognition of the importance of this paradigm is evident in the literature on the elderly and handicapped (*5, 6*).

The need for more extensive research using the travel mode choice behavior paradigm among the elderly and handicapped is pressing. This stems from the legislative guidelines and transportation policies that have been introduced in the United States, in the last decade, to improve the mobility and accessibility of the elderly and handicapped in urban areas. Programs and policies have generally been implemented without prior knowledge of the structural relationships between individual physical disability characteristics and the processes of travel mode choice. To date, research that attempts to understand the elderly and handicapped's formation of perception of travel modes—how perceptions combine to determine travel mode preferences and how, conditioned by individual and situational characteristics, final travel choices are made—is very limited (*7, 8*).

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Research that uses an attitudinal approach toward the travel mode choice processes of the elderly and handicapped is reported in this paper. Fundamental to this approach is a focus on the second stage of the travel decision-making process, that is, how preferences for travel mode alternatives considered by the elderly and handicapped, with varying levels of personal physical disabilities, are formed for purposes of determining final mode choice.

The purpose of these objectives is to better understand the relationships between varying levels of personal physical disabilities among the elderly and handicapped and the attributes that compose broader dimensions of travel mode preference. Knowledge of these relationships should provide useful information to policy makers and transit managers alike. This knowledge should enable decision makers to identify the supply components of a responsive and equitable transportation system for the elderly and handicapped.

LITERATURE

A substantial body of literature exists on the transportation problems of the elderly and physically handicapped. The focus of this section is on those few examples of research that stress relationships between personal physical disabilities, preferences for travel mode alternatives, and preferred travel mode attributes.

An attitudinal assessment of preferences among the elderly and handicapped is seen in the research of Paaswell and Recker (*9*). The findings of interest to this research relate to the results of using multivariate scaling methods in attitudes toward more general characteristics of travel modes. Several modal characteristics were rated as very important by the sample. In order of importance they were vehicle safety; vehicle riding time; vehicle comfort; and familiarity with routes, fares, and schedules. These findings emphasize the importance of travel burden (ease of travel) factors when using travel modes.

Other research by Gauthier (*10*) also identified those travel mode attributes that contribute most to the elderly and handicapped's perceptual evaluation of a transportation system in Columbus, Ohio. Perceptual evaluation was determined to consist of five dimensions, identified as difficulty of travel, convenience, flexibility, safety, and comfort. The preferred attributes on the difficulty of travel dimension were assistance to the vehicle and assistance to a service pick-up point. The preferred attributes of convenience were identified with the type of vehicle being used. In terms of the flexibility dimension, the sample displayed preferences for control over route scheduling. Preferred attributes of safety and comfort dimensions were limited seating capacity, ability to restrict number and types of passengers, and the provision of grabrails, seatbelts, and wheelchair locks.

These preferred attributes demonstrate the elderly and handicapped's concern with accessibility in the travel environment and a minimal effort to use any travel mode. More important, the study found that travel mode preference is for a dial-a-ride service known as Project Mainstream Van Service. Project Mainstream is a preferred travel mode alternative because it is perceived to meet the elderly and handicapped's criteria of accessibility and minimal effort in the travel environment. The findings of Paaswell and Recker suggested the introduction of a dial-a-ride service in Buffalo, New York (*8*).

A consideration of the effects of physical disabilities on travel mode attribute preferences is represented by several researchers (*11–13*). In the former, three market segments of the elderly and handicapped are defined according to functional disability. It was found that travel and mobility patterns varied by market segment according to the severity of functional disability. More important, it was found that preferences for travel mode improvements also varied according to identified market segments. The tendency of preference for both segregated (e.g., special van service) and integrated (e.g., public bus) modes was seen as a result of the diminishing desire to use the private automobile as the severity of functional disability became more extreme.

The research of Dallmeyer and Surti (*12*) analyzed six classifications, or market segments, based on severity of physical disability. These ranged from "need a person's help to get around" to "no limitations." Several findings are of interest. First, those segments with more severe physical disabilities relied almost exclusively on special van services or other people for travel. Those segments characterized by fewer and less severe physical disabilities relied more on less expensive modes such as the bus or family and friends. Second, the preferred attributes toward transportation improvements varied by market segment. For the two wheelchair user segments, preference was displayed for more accessible buses, and installing wheelchair lifts and tie-downs on buses. Finally, the less constrained and more ambulatory segments displayed preference for buses with lower stairs, wider doors, larger route signs, driver courtesy, and no long waits for transfer between points.

The research of Miller (*13*) focused on those attributes of transportation systems that are of most importance to segments of the elderly and handicapped. Market segments of the elderly and handicapped are defined by the types of physical disabilities they experience using the statistical technique of cluster analysis. Seven distinct market segments emerge, ranging from most disabled to least disabled. It was found that attribute importance, as measured along an interval scale, varied according to the type of physical disability possessed and, thus, by market segment. Furthermore, it was found that more disabled segments attach greater importance to travel mode attributes than do less disabled groups. Finally, it was found that more of the sample population were concerned with accessibility and travel burden attributes—a lot of stairs and standing while waiting for a travel mode.

More recent research has investigated the relationships between physical disabilities among the elderly and handicapped and the dimensions of travel mode attribute perceptions (*14*). Although dealing only with the first stage of the travel mode choice process, several findings are of interest. First, attributes used in the process of evaluating travel modes were examined and cognitive dimensions of travel mode attribute perceptions were latently derived for five internally homogeneous groups of the elderly and handicapped sample population. Groups were statistically determined from data on types of personal physical disabilities.

Second, latently derived dimensions for the five groups highlighted differences in perceptual sensitivities. Groups with minor or no physical disabilities possessed dimensional structures concerned with effort and mobility in the travel environment. The travel mode that most satisfied their perceptual criteria was the fixed-route bus service. The dimensional structure of the more physically disabled groups indicated a concern with modal accessibility. The automobile-passenger travel mode satisfied the perceptual criteria of the more physically disabled groups.

Finally, a statistical analysis of group evaluations of elicited attributes indicated the existence of significant group differences in the way that elicited travel mode attributes are rated. This finding suggested that it is the varying levels of physical disabilities that define the dimensions of travel mode attribute perceptions used in the first stage of the travel mode choice process. How travel mode attribute perceptions combine to determine preferences among the elderly and handicapped—with varying levels of personal physical disabilities—is the next least understood aspect of the travel mode choice process.

In reviewing this literature, it is evident that certain relationships exist between physical disability, preferred attributes of a transportation system, and preference for travel mode alternatives. Preference for accessibility attributes might indicate that they are the more salient attributes in the travel mode choice process. In turn, preference for certain types of travel modes (e.g., dial-a-ride van services) might indicate that they are the only modes that satisfy attribute screening criteria in the process of modal evaluation. However, this knowledge is not known from the literature because the travel environment of the elderly and handicapped has generally not been viewed as a travel mode choice process (i.e., how perceptions of travel modes and travel attributes are combined to determine preferences for alternative travel modes). Travel mode preferences and the formation of cognitive preference dimensions among the elderly and handicapped is the second stage of the travel choice process that this research seeks to understand.

An examination of the aforementioned problems was conducted through the use of an interview survey in Columbus, Ohio.

RESEARCH METHODOLOGY

A research methodology is outlined that operationalizes the major tasks of the research. In the winter of 1982, an extensive interview survey was undertaken of 81 elderly and handicapped residents in Columbus, Ohio. Finding the residential location of the elderly and handicapped did not prove difficult. The local transit authority maintains an updated mailing list of subscribers to its Project Mainstream Van Service—a special wheelchair-lift-equipped van service sponsored by the Central Ohio Transit Authority (COTA). Most addresses on the list are simply those of nursing homes, convalescent centers, and retirement villages where individuals reside—some who subscribe to the service and some who do not—who possess the full range of personal physical disabilities.

The interview survey was composed of two portions: (a) a collection of socioeconomic and travel-related characteristics (travel mode preference rank orders) and (b) a determination of individual attributes and attribute evaluation through the construction of repertory grids (*15*). Repertory girds are designed to provide data describing the nature and organization of each individual's subjective attributes of importance via the triad sort method. Several procedures are involved.

In the first procedure, interview respondents are presented with three cards containing the names of three travel modes (i.e., a triad). The respondent is asked to indicate an important way in which two modes are similar and different from the third (i.e., a triad sort). A one-word response was elicited to represent the individual's perceived attribute in the discrimination process (i.e., a personal construct). Each respondent's elicited response is recorded and another triad presented. Triad sorts of different modal combinations are presented until all modal attributes are exhausted or until no additional constructs can be elicited. Travel modes included in the study were the automobile passenger, automobile driver, taxi (personal payment), taxi (social service agency), COTA (regularly scheduled bus), Project Mainstream Van Service, and Magic Carpet Service—a privately operated lift-equipped van service.

The second task sought an evaluation of travel modes on the constructs through a scoring procedure. Each respondent was asked to indicate what level of that construct was possessed by each of the travel modes. A seven-point Likert rating scale was adopted, in which a value of one represented a low perceived construct level and a value of seven represented a high perceived construct level. The first and second procedures produce a matrix for each individual. Each matrix represents the individual's personal attributes used as a criterion in distinguishing between travel mode alternatives. Each travel mode is positioned along the respective single scales.

Before the preference dimensions are derived, the personal physical disabilities among the interview sample are used as a basis for market segmentation. Ten types of personal physical disabilities are used to determine internally homogeneous groups (Table 1). Each group member possesses similar physical disabilities. Individual responses on the types of physical disabilities possessed formed input into a cluster analysis. Ward's HGROUP clustering routine was used in this research (*16*). The broader cognitive preference dimensions are therefore latently derived for each internally homogeneous group.

TABLE 1 PERSONAL PHYSICAL DISABILITIES OF THE INTERVIEW SAMPLE

Physical Disability	Percentage
No serious restrictions affecting use of the transportation system	40.7
Need some special aid such as wheelchair	37.0
No serious problems in standing or walking	29.6
Difficulty in standing	24.6
Difficulty in walking to curb or bus stop	20.9
Severe difficulty in climbing stairs (need assistance)	18.5
Minor difficulty in climbing stairs	17.2
Serious visual impairment	0.0
Must stay in bed all or most of the time	0.0
Must stay in house all or most of the time	0.0

The rationale for establishing homogeneous groups among the interview sample stems from the reviewed literature. Preferred travel mode attributes and preferences for travel mode alternatives differed according to groups who share similar physical disabilities. Generally, the preferred travel modes and attributes are those that overcome physical disability in travel and enhance accessibility and mobility. These findings suggest that the second stage of the travel mode choice process—the formation of preferences for travel mode alternatives—may differ for each identified homogeneous group. An examination of group differences on travel mode preferences and on derived cognitive preference dimensions will further expand knowledge of the relationships between physical disability and the travel-mode choice process.

Interview respondents also provided information on travel mode preference rankings. Each individual rank ordered the seven travel modes on a scale of one to seven with one representing least preferred and seven representing most preferred. The travel mode preference rank orders for each identified group form matrices with n (number of individuals) rows and m (number of travel modes) columns.

The travel mode preference rank order matrix for each identified group was subjected to a multidimensional unfolding analysis (MDU). MDU is used to identify a representative set of travel mode preference dimensions for each group. The MDU model is conceptually similar to the more commonly used multidimensional scaling model (*17*). The object of the MDU model is to find psychological spaces used by individuals in preference choices. Output consists of a stimulus configuration in which both travel modes and subjects are mapped in a multidimensional space. The derived dimensions become the key to assessing relationships between physical disability and the second stage of the travel-mode choice process.

In this research, the interpretation of MDU preference dimensions for each identified group, as supplied by ALSCAL-4, is attempted by a complementary procedure that uses the original repertory grid information (*18*). Unidimensional scale values, based on the Law of Comparative Judgment, are created from original attribute ratings on the repertory grid matrices (*19*). Each attribute construct is treated as a unidimensional solution and each travel mode is positioned along the respective single dimension. Travel mode positions on each unidimensional scale are correlated with travel mode positions on the MDU stimulus configurations. Generally, the higher the correlation between modes on the stimulus configuration and

unidimensional scales, the greater the cognitive salience of that attribute on the preference dimension. This method enables a clearer and more concise interpretation of the MDU cognitive preference dimensions.

RESEARCH RESULTS

In Table 1, the data indicate that the interview sample faces multiple physical disabilities that limit use of public and private travel mode alternatives. A large percentage (30.7 percent) of the sample needs to use a wheelchair. Those less disabled (not confined to a wheelchair), who are able to carry out some functions, still have difficulties in walking and standing. A small percentage (7.4 percent) is visually impaired; when using public transportation this group has problems with being in a crowd. Note that from the first and third categories, an even larger percentage of the sample (17.3 percent) has no restrictions affecting use of the transportation system and no problems in standing or walking. These individuals possess the physical capability to travel, but they do not travel frequently because of age and driver's license constraints. These individuals can be expected to possess different travel mode preference profiles because of the absence of personal physical disabilities.

A total of 39 constructs were elicited from the interview sample using the triad sort method. The 14 most frequently elicited constructs are given in Table 2. Those constructs elicited only once or twice were not included for analysis. In terms of rank, the cost of travel construct was most frequently elicited. This is clearly indicative of the importance attached to cost by a predominantly low-income sample. For this reason the cost of travel becomes an important criterion in distinguishing between travel mode alternatives.

TABLE 2 FOURTEEN MOST FREQUENTLY ELICITED CONSTRUCTS

Construct Label	Frequency of Elicitation
Cost of travel	45
Convenience	30
Friendly and courteous drivers	26
Dependability	25
Assistance on and off the vehicle	23
Flexibility	22
Comfort	16
Suitability of travel mode to needs	15
Independence	14
Frequency of service	13
Ready availability	10
Personal nature of travel mode	7
Sensitivity and understanding of mobility needs	6
Privacy	5

The elicitation of constructs of convenience, friendly and courteous drivers, dependability, and assistance are strongly associated with concerns for accessibility to travel modes and minimal effort in travel. The diverse physical disabilities of the interview sample demand the ability to move from home residence to a travel mode with a minimal effort. Without easy access to a travel mode and some form of assistance, the possibilities for satisfying travel needs and travel demands are limited.

These attribute constructs are therefore important criteria perceived by the interview sample in the first stage of the travel decision-making process. As such, the accessibility and travel burden concerns provide transit managers and transport planners alike with criteria to evaluate the performance of travel mode alternatives available to the elderly and handicapped.

Of interest is the elicitation of the independence construct. It is a clear expression of the notion of personal freedom and mobility. In addition, the independence construct would appear to express the cognitive desire to be like a mobile population (i.e., have access to a car and perform desired activities). The independence construct was most often elicited from wheelchair–bound individuals who associated the automobile-passenger travel mode most highly with personal freedom. The findings of Paaswell and Recker, and Recker and Stevens, also confirm the desire of the mobility limited to be more mobile and to have access to a car and freedom of travel (*9, 20*). Clearly, the independence construct of travel is an additional criterion for planners and others when deciding on the supply and quality of travel services to the elderly and handicapped.

It is argued that differences in cognitive preference dimensions are likely to exist between identified groups who possess diverse travel needs and travel requirements. Ward's HGROUP clustering algorithm was adopted to determine groups with internally homogeneous physical disabilities. Identified in Table 3 are the selected characteristics of the five groups, which are defined as follows:

- Group 1—severe physical disabilities,
- Group 2—wheelchair users,
- Group 3—minor physical disabilities,
- Group 4—visually impaired, and
- Group 5—no serious physical disabilities.

The situational characteristics reveal respective group members to be predominantly female, older, not likely to be employed, and residing in nursing homes or retirement centers. Trip frequency and trip purpose statistics indicate that group members, and indeed the sample population, travel infrequently. The least disabled members of Groups 3 and 4 travel more frequently for more purposes. Medical trips do have importance to the sample, indicating the status of health among the predominantly older sample and the physical disabilities that require specialized medical attention. The shopping and personal pleasure trips are the most popular trips. In general, most group members simply make one or two trips per week to purchase food, visit a doctor, or attend senior citizen functions.

In terms of travel mode preference and use, each group displays orientations to particular travel modes. The travel characteristics of Group 1 indicate that it is automobile-passenger-mode biased. Travel mode use is clearly toward the more private modes. An interesting aspect to this group is its strong preference for Project Mainstream Van Service, followed by automobile-passenger service, with which assistance on and off the vehicle, convenience, comfort, and more personalized service attributes are found. Group 2 members are also automobile-passenger-mode oriented in preference and use. Project Mainstream Van Service, which was primarily implemented for wheelchair users, is neither frequently used nor highly preferred.

TABLE 3 CHARACTERISTICS OF GROUPS

	Group (%)				
	1 (*N*=14)	2 (*N*=24)	3 (*N*=7)	4 (*N*=15)	5 (*N*=21)
Age					
16–29	0	29	0	13	0
30–44	0	12	0	0	0
45–49	16	8	0	6	0
60 or older	84	45	100	80	100
Sex					
Male	35	33	57	26	28
Female	64	66	42	73	71
Dwelling					
House	0	0	28	6	14
Apartment	7	29	0	20	9
Nursing home	71	54	14	53	23
Retirement center	21	4	57	13	52
Employment					
Employed full-time	0	4	0	6	0
Unemployed	23	8	0	6	5
Retired	77	50	100	86	95
Travel Modes Frequently Used					
Automobile-passenger	85	66	57	60	71
Automobile-driver	0	25	42	0	33
Taxi (personal payment)	0	1	28	53	28
Taxi (social service)	0	1	0	0	0
COTA regular bus	35	2	57	60	76
Project Mainstream	0	30	0	100	0
Magic Carpet Service	28	25	0	6	0
Trips per Week on Most Frequently Used Mode					
1	76	45	28	40	47
2–3	15	18	14	20	21
4–5	0	18	28	26	5
6–7	7	9	14	0	15
8–9	0	4	14	6	5
10 or more	0	4	0	6	5
Trip Types					
Work	7	12	14	6	9
Education	0	20	0	6	9
Medical	42	41	42	66	38
Shopping	71	75	85	80	90
Personal business	28	37	85	66	38
Personal pleasure	78	62	85	80	66

The minor disabilities segment (Group 3) is oriented toward the regular bus and automobile-passenger modes in terms of preference and use. Note that private automobile use is highest for this group and that members tend to travel more frequently than other groups. Because of minor physical disabilities, this group is more mobile and oriented to modes with curb-to-curb service, convenience, level of service, and privacy attributes. The visually impaired members of Group 4 travel most frequently on Project Mainstream Van Service. Regular bus and automobile-passenger modes are equally used and taxi service is used by more than half (53 percent) of the members. Group 4 members appear to be oriented toward travel modes that offer high levels of assistance, comfort, and convenience. The most preferred travel mode for the group is the automobile-passenger mode followed by regular bus service. The concern with attributes of access and reduced travel burden appears important.

The least physically disabled group (Group 5) is composed of members who have no serious physical disabilities affecting use of travel modes. The frequently used modes are bus and automobile-passenger, with the most popular being the bus (76 percent). One reason for bus popularity is that over 61 percent of the group resides less than one block from a bus stop. Group 5 members can be characterized as an elderly mobile population. They appear to be a well-developed group of COTA bus patrons where convenience, flexibility, and dependability service attributes are found. Travel mode preference is equally shared by COTA regular bus service and the private automobile. The mean rankings of the travel mode preferences for the five groups are given in Table 4.

The identified groups represent five diverse market segments that possess distinctive physical disabilities and different travel needs and display differences in preferences for travel modes. It is argued that the diversity of disability and mobility among the identified groups would also be associated with distinctive dimensions of travel mode preference. To this end, the MDU analysis of each group's preference matrix provides the cognitive dimensions for each group. Correlations between the MDU stimulus configurations and unidimensional scale values are used for the interpretation of dimensions.

TABLE 4 TRAVEL MODEL PREFERENCES IN MEAN RANKINGS

	Group (%)				
	1 (*N*=14)	2 (*N*=24)	3 (*N*=7)	4 (*N*=15)	5 (*N*=21)
Automobile-passenger	4.6	5.5	5.2	6.0	4.9
Automobile-driver	3.2	4.7	4.8	4.0	5.8
Taxi (personal payment)	4.0	3.1	5.2	4.2	4.7
Taxi (social service)	3.6	2.8	2.8	3.4	2.4
COTA regular bus	3.1	2.4	6.0	5.0	5.5
Project Mainstream	5.0	4.6	2.4	2.8	2.3
Magic Carpet Service	4.2	4.6	1.2	2.4	2.2

Group 1

The preference structure of the severely disabled group is represented by three dimensions of travel mode preference (Table 5):

- Dimension 1—accessibility,
- Dimension 2—travel burden, and
- Dimension 3—personal assistance.

Dimension 1 is highly correlated with the flexibility, convenience, and dependability attributes. This dimension provides a scale for a factor termed accessibility. Preferred travel modes have been ranked in terms of the accessibility they provide—the opportunity to go where and when needed with a dependable travel mode. Dimension 2 is a complex dimension termed travel burden. It correlates most highly with the attributes of independence, availability, comfort, and personal service. It is a dimension that highlights a preference for travel modes offering minimal effort, performance, and personal freedom in the travel environment. Dimension 3 highlights a preference for travel modes providing assistance on and off the vehicle. The concern with assistance appears to represent concern with ease of access to travel modes in order to overcome severe personal physical disabilities.

TABLE 5 GROUP 1: CORRELATIONS BETWEEN ATTRIBUTES AND MDU PREFERENCE DIMENSIONS

	Dimension		
	1	2	3
Independence	0.19	0.89	0.42
	0.33	0.00	0.16
Convenience	0.79	0.56	0.10
	0.01	0.09	0.40
Personal attention	0.33	0.71	0.65
	0.23	0.03	0.05
Flexibility	0.89	0.23	0.01
	0.00	0.30	0.49
Comfort	0.12	0.69	0.71
	0.39	0.04	0.03
Dependability	0.62	0.41	0.13
	0.06	0.17	0.38
Availability	0.41	–0.84	–0.02
	0.17	0.00	0.48
Privacy	0.28	0.59	0.50
	0.27	0.08	0.12
Cost of travel	–0.12	0.03	0.02
	0.39	0.46	0.47
Assistance	–0.17	0.59	0.79
	0.35	0.07	0.01
Suitability	–0.05	0.42	0.73
	0.45	0.16	0.31
Frequency of service	0.45	0.35	0.40
	0.12	0.21	0.18
Sensitivity and understanding	0.44	0.66	0.71
	0.15	0.05	0.03
Friendly and courteous drivers	0.48	0.53	0.65
	0.13	0.10	0.05

NOTE: The second number in each cell is the probability of the correlation coefficient's being equal to zero.

Group 2

The best overall fit for the wheelchair group is a four-dimensional preference solution (Table 6):

- Dimension 1—flexibility,
- Dimension 2—assistance,
- Dimension 3—travel burden, and
- Dimension 4—dependability.

Dimension 1 is associated with travel modes that offer flexibility in traveling to multiple destinations without any difficulty. Most highly correlated with Dimension 2 is the assistance attribute. Dimension 3 is a complex dimension termed travel burden. It correlates most highly with the constructs of sensitivity and understanding and friendly and courteous drivers. Minimal effort in the travel environment is again an important dimension on which travel mode preferences are formed. Dimension 4 is most highly correlated with the dependability attribute. Dependability is interpreted as meaning

TABLE 6 GROUP 2: CORRELATIONS BETWEEN ATTRIBUTES AND MDU PREFERENCE DIMENSIONS

	Dimension			
	1	2	3	4
Independence	0.28	0.37	0.63	–0.37
	0.26	0.20	0.06	0.20
Convenience	0.27	–0.41	0.48	–0.56
	0.27	0.17	0.13	0.09
Personal attention	0.26	0.39	0.58	–0.28
	0.28	0.19	0.08	0.26
Flexibility	0.60	–0.37	0.05	–0.31
	0.07	0.20	0.45	0.24
Comfort	–0.20	0.32	0.68	–0.67
	0.32	0.24	0.04	0.04
Dependability	–0.13	–0.50	0.42	–0.88
	0.38	0.12	0.17	0.00
Availability	–0.18	–0.54	–0.49	0.27
	0.34	0.10	0.13	0.27
Privacy	0.56	0.51	0.29	–0.11
	0.09	0.11	0.25	0.40
Cost of travel	0.33	0.40	–0.49	–0.07
	0.22	0.18	0.12	0.43
Assistance	0.00	0.77	0.50	–0.17
	0.49	0.02	0.12	0.35
Suitability	0.24	0.76	0.32	0.12
	0.29	0.02	0.24	0.39
Frequency of service	0.14	0.01	0.07	–0.69
	0.38	0.49	0.43	0.04
Sensitivity and understanding	0.11	0.22	0.70	–0.39
	0.40	0.31	0.03	0.19
Friendly and courteous drivers	–0.31	–0.10	0.72	–0.74
	0.24	0.40	0.03	0.02

NOTE: The second number in each cell is the probability of the correlation coefficient's being equal to zero.

prompt arrival at origin and destination and availability on a regular basis.

The preference structure of Group 1 and Group 2 represents more of a concern with modal accessibility and effort in the travel environment.

Group 3

Two dimensions of travel mode preference characterize the minor disabilities group (Table 7):

- Dimension 1—level of service and
- Dimension 2—cost of travel.

The minor disabilities group is a mobile one by comparison to the more disabled groups. The dimensions that underlie travel mode preference are simple when compared to those of other groups. Dimension 1 is the most complex of the dimensions and is labeled a level of service dimension. It is a factor composed of comfort, availability, assistance, and independence attributes. Most highly correlated with Dimension 1 is the comfort attribute. Dimension 2 highlights a preference for travel modes that are inexpensive.

TABLE 7 GROUP 3: CORRELATIONS BETWEEN ATTRIBUTES AND MDU PREFERENCE DIMENSIONS

	Dimension	
	1	2
Independence	0.70	−0.03
	0.03	0.47
Convenience	0.10	−0.00
	0.40	0.49
Personal attention	0.56	0.01
	0.09	0.49
Flexibility	−0.28	−0.01
	0.26	0.48
Comfort	0.82	−0.12
	0.01	0.39
Dependability	0.24	−0.06
	0.30	0.28
Availability	−0.80	0.28
	0.01	0.26
Privacy	0.39	−0.04
	0.19	0.46
Cost of travel	0.24	0.45
	0.29	0.15
Assistance	0.79	−0.07
	0.01	0.43
Suitability	0.49	0.00
	0.12	0.49
Frequency of service	0.38	0.24
	0.20	0.29
Sensitivity and understanding	0.48	−0.12
	0.13	0.39
Friendly and courteous drivers	0.52	−0.08
	0.11	0.42

NOTE: The second number in each cell is the probability of the correlation coefficient's being equal to zero.

Group 4

Two dimensions of travel mode preference provide the best fit for the visually impaired group (Table 8):

- Dimension 1—cost of travel and
- Dimension 2—level of service.

For the members of Group 4, the broader dimensions of travel mode preference are also of a reduced complexity. Dimension 1 is the straightforward attribute of cost of travel. Dimension 2 is primarily associated with the convenience and flexibility attributes. The visually impaired prefer travel modes that inexpensive and offer high levels of service in the travel environment.

TABLE 8 GROUP 4: CORRELATIONS BETWEEN ATTRIBUTES AND MDU PREFERENCE DIMENSIONS

	Dimension	
	1	2
Independence	−0.50	0.24
	0.12	0.29
Convenience	−0.03	0.86
	0.46	0.00
Personal attention	−0.45	0.18
	0.15	0.34
Flexibility	0.11	0.86
	0.40	0.00
Comfort	−0.54	0.08
	0.10	0.42
Dependability	−0.12	0.76
	0.39	0.02
Availability	0.40	0.12
	0.18	0.39
Privacy	−0.39	0.15
	0.18	0.37
Cost of travel	−0.73	−0.00
	0.02	0.49
Assistance	−0.60	−0.34
	0.07	0.22
Suitability	−0.45	−0.32
	0.15	0.23
Frequency of service	−0.63	0.52
	0.06	0.11
Sensitivity and understanding	−0.26	0.25
	0.27	0.29
Friendly and courteous drivers	−0.28	0.37
	0.26	0.20

NOTE: The second number in each cell is the probability of the correlation coefficient's being equal to zero.

Group 5

The preference structure of the no disabilities group is represented by four dimensions (Table 9):

- Dimension 1—level of service,
- Dimension 2—availability,
- Dimension 3—flexibility, and
- Dimension 4—cost of travel.

Dimension 1 scales the travel mode preferences in terms of their level of service performance attributes. Dimension 2 scales travel mode preferences that are more readily available, especially for emergencies and at pick-up points for return home journeys. Dimension 3 highlights a preference for travel modes taking members where they want to go. Preference for inexpensive travel modes (Dimension 4) continues to be of importance.

For the predominantly elderly and mobile members of Group 5, the broader dimensions of travel mode preference indicate a

TABLE 9 GROUP 5: CORRELATIONS BETWEEN ATTRIBUTES AND MDU PREFERENCE DIMENSIONS

	Dimension			
	1	2	3	4
Independence	0.69	−0.50	−0.03	−0.00
	0.40	0.12	0.47	0.49
Convenience	−0.82	0.16	−0.36	−0.37
	0.01	0.36	0.21	0.20
Personal attention	−0.60	−0.35	0.03	−0.05
	0.07	0.22	0.46	0.45
Flexibility	−0.52	0.37	−0.66	−0.21
	0.11	0.20	0.05	0.32
Comfort	−0.65	−0.49	0.22	0.16
	0.05	0.12	0.31	0.35
Dependability	−0.81	0.13	−0.22	−0.18
	0.01	0.38	0.31	0.34
Availability	0.30	0.87	0.02	−0.04
	0.25	0.00	0.47	0.46
Privacy	−0.39	−0.34	−0.20	0.18
	0.18	0.22	0.32	0.34
Cost of travel	−0.26	−0.07	−0.22	0.75
	0.28	0.43	0.31	0.02
Assistance	−0.27	−0.66	0.33	0.35
	0.27	0.05	0.23	0.22
Suitability	−0.11	−0.47	0.21	0.30
	0.40	0.14	0.31	0.25
Frequency of service	−0.80	0.04	−0.24	0.41
	0.01	0.46	0.30	0.17
Sensitivity and understanding	−0.58	−0.27	0.07	−0.01
	0.08	0.27	0.43	0.41
Friendly and courteous drivers	−0.73	−0.11	0.19	−0.09
	0.03	0.40	0.33	0.41

NOTE: The second number in each cell is the probability of the correlation coefficient's being equal to zero.

strong preference for travel modes that make traveling easy and pleasant and that offer high levels of service. As with the minor disabilities group and the visually impaired group, the members of Group 5 show less of a preference for modal accessibility in the travel environment.

Several comments are relevant based on emerging patterns in the derived travel mode preference dimensions. The occurrence of the cost of travel dimension across preference structures for the less disabled groups reinforces part of the repertory grid analysis findings. Despite the inexpensive nature of public travel services available to the elderly and handicapped in Columbus, Ohio, the cost dimension is an important variable when deciding travel mode preferences—a consistent finding considering that the majority of the sample population's sole means of support is a federal pension.

The ubiquitous nature of the flexibility preference dimension confirms the preference expressed by respondents during the interview for travel modes to take them where they want to go when they want to go. The respondents also expressed a strong preference for travel modes to wait for individuals to finish their business and then return them to their residence. Much concern was expressed over certain travel modes that tend to leave the shopping or medical center after drop-off only to return following a long waiting period for the individual. This notion is probably linked to a greater need for security when traveling. The research of Miller (*13*) and Gauthier (*10*) indicated that certain components of the flexibility dimension are important in travel mode preference decisions, for example, more control over route scheduling and control over arrival and departure times. Travel modes that are most preferred for their flexibility fall into two categories: public (regular bus, Project Mainstream) and private (automobile-passenger, automobile-driver).

The dimensional structures identified for each group are also indicative of several relationships between personal physical disabilities and travel mode preference. First, those groups with minor or no physical disabilities possess preference sensitivities for travel modes associated with level of service and low-cost attributes. These preference sensitivities represent more of a concern with travel modes that make traveling easy and pleasant and provide mobility. They reveal less of a concern with modal accessibility. Relative freedom from physical disabilities allows for a preference structure that ranks travel modes in terms of whether they can meet minimal effort and mobility requirements. Reported travel mode preferences, from the ALSCAL-4 MDU analysis, indicate that it is the fixed-route bus service and the automobile that meet the screening criteria. Predicted preferences indicate that a taxi service and a privately operated wheelchair-lift-equipped van service would also meet the criteria of good service, minimal effort, and mobility.

Second, the preference structure of the more physically disabled members of Group 1 and Group 2 is indicative of a concern for travel modes associated with modal accessibility and minimal effort in travel. For both groups, the provisions of access and, in particular, the availability of personal assistance on and off the vehicle are important criteria in the rank ordering of travel mode preference alternatives. Access to travel modes is imperative in overcoming the constraints imposed by severe physical disabilities and by confinement to a wheelchair.

The most preferred travel modes for the more physically disabled groups are Project Mainstream and the automobile-passenger travel mode. Traveling as a passenger in an automobile driven by family members, friends, or volunteers or in a wheelchair-lift-equipped van service provides high levels of personalized assistance, flexibility, and dependability of service. These attributes also favor a travel environment in which minimal effort is expended. Predicted preferences (Magic Carpet Service and taxi) are also for travel modes that possess similar attributes.

Of interest to the wheelchair users is the travel mode that is neither most preferred nor predicted as a first preference—Project Mainstream Van Service. At the time of the interview survey, Project Mainstream was perceived to be unsatisfactory on the wheelchair users' criteria of flexibility, assistance, travel burden, and dependability dimensions. As a dial-a-ride service, Project Mainstream was primarily implemented for wheelchair-confined individuals. However, since its implementation, and up to the time of the interview survey, the service had suffered from scheduling and supply and demand problems (i.e., inability to secure regular service) (*21*). These problems were all articulated by the wheelchair users during the interview survey. Most indicated that level of service would need to be markedly improved before they would use the service.

In order for Project Mainstream patronage to increase, the service should be upgraded along the dimensions used by the wheelchair users to determine the formation of travel mode preferences. Other potential patrons of Project Mainstream, the severely disabled, would also benefit from increased service standards (i.e., the service would become a viable alternative to

the automobile-passenger mode on the dimensions of accessibility and minimal effort.

It must be noted that since completion of the interview survey, the service standards of Project Mainstream have been improved by COTA. The result has been a dramatic increase in patronage, and a more positive perception of and preference for Project Mainstream now exist among the elderly and handicapped community in Columbus, Ohio (*7*). In addition, a new subsidized service, termed Project Mainstream Taxi Service, was introduced by COTA in 1983.

SUMMARY AND POLICY IMPLICATIONS

The objective of this research was to obtain a clearer understanding of the relationships between personal physical disabilities and the formation of dimensions of travel-mode-preference alternatives. To this end, elicited personal constructs were examined and broader dimensions of travel mode preference were latently derived for five internally homogeneous groups of the elderly and handicapped sample population.

Latently derived dimensions for the five groups highlighted preference sensitivities toward accessibility, travel burden, level of service, and cost concerns in the process of travel-mode-preference formation. These sensitivities were found to vary depending on the levels of personal physical disabilities. In essence, it is the varying levels of physical disabilities that define not only the dimensions of travel mode preference, but the way preferences for travel mode alternatives are formed in the second stage of the travel choice decision-making process. Preference sensitivities were found to be similar in their components to perceptual sensitivities.

The findings of this study have several policy implications for the elderly and handicapped. First, the sample population's broader concern with accessibility, travel burden, level of service, and cost in travel-mode-preference decision making provides policy makers and planners with criteria to use in establishing and improving travel services to the elderly and handicapped. Furthermore, the attributes that form the respective preference dimensions provide detail on specific components of a "preferred" or "ideal" transportation system for the elderly and handicapped.

For Columbus, Ohio, the sample population does not perceive the need for a markedly different transportation system. Mode use statistics and travel mode preferences for the automobile-passenger, COTA bus, and Project Mainstream modes are indicative of "ideal" travel services. However, the more disabled group members perceive necessary improvements to those attributes that enhance their accessibility to the demand-responsive travel service.

Second, the early problems of supply and demand for Project Mainstream service suggest that other frequently used travel modes should be investigated. For example, the automobile-passenger mode is most frequently used by the sample population. Family members, friends, or volunteer workers provide a vital function in meeting the travel needs of the elderly and handicapped on a demand-responsive basis. A service strategy that incorporates the automobile-passenger mode will increase mobility and travel services. A further alternative, as suggested from the predicted preferences, is a service strategy that subsidizes the use of demand-responsive taxi services. In Columbus, Ohio, Project Mainstream Taxi Service was established to provide such a demand-responsive alternative.

A final implication exists for transit authorities with travel service provision responsibilities to the elderly and handicapped. Such agencies must realize that the elderly and handicapped population that they serve is a heterogeneous one. There are varying levels of personal physical disabilities that are associated with internally homogeneous groups displaying diversity in travel behavior. Only when this heterogeneity is clearly identified can transit agencies implement responsive and equitable service strategies that reduce the burden of travel and improve overall accessibility and levels of service.

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The Role of Private Enterprise in Elderly and Handicapped Transportation in Canada

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Presented in this paper is Canadian experience with successful partnerships between public agencies and private carriers to deliver special transit service for the elderly and the handicapped, often called "E&H transportation" by North American agencies. The policies and initiatives that encouraged these partnership arrangements are described, as well as two examples of the implementation of new or restructured service organizations. The examples provided include the Brokerage Demonstration Project in the city of Edmonton, Alberta, and experience in the province of Quebec with specialized taxi services for the more ambulatory handicapped. The development of the system in Edmonton, which involves the distribution of trips among a multiplicity of carriers depending on the user needs, is described in some detail. The discussion includes Edmonton's successful experience with a challenge from the Amalgamated Transit Union and in the selection of carriers that were able to perform under the new brokerage organization. The paper concludes with a discussion of current trends with respect to the use of private and public partnerships to deliver E&H transportation services in Canada.

With few exceptions, the Canadian approach to the delivery of urban transit service to the elderly and the disabled has been based on two nationally accepted but generally unwritten policies:

- That the conventional transit services should be made as accessible as possible for the ambulatory portions of the elderly and disabled population, and
- That parallel or special separate transit services should be operated for the exclusive use of the mobility-impaired.

By December 1986, this approach had resulted in the implementation of some 350 special transit systems, many of which operate in parallel with conventional transit service, serving about 75 percent of the urban population of Canada. The aggregate characteristics of these systems are presented in Table 1. The quality of service provided by these special transit systems has been very good, with the result that there have been few demands to provide full accessibility to the conventional transit systems.

Many of these special transit systems were initiated by community agencies and associations of the elderly and the handicapped. About one-third of the systems are operated by municipal government agencies. The remaining two-thirds are operated by a variety of nonprofit agencies and through contractual arrangements with private enterprise. Examples of these partnerships can be found in every province in Canada.

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TABLE 1 AGGREGATE CHARACTERISTICS OF SPECIAL TRANSIT SERVICES IN CANADA (*1*)

Characteristic	1986 Data
Total number of systems	350
Total number of communities served	720
Estimated annual ridership (one-way trips)	4,500,000
Estimated vehicle fleet	1,300 to 1,400
Estimated annual operating cost ($)	64,000,000
Estimated annual capital amortization ($)	7,000,000
Estimated average total annual cost ($)	71,000,000
Average operating cost per trip ($)	14.00
Average user charge (fare) ($)	1.00
Average system productivity (rides per vehicle hour)	2.3

FUNDING RESPONSIBILITIES

The provision of urban transit services in Canada is a joint municipal and provincial responsibility. Eight of the ten provinces in Canada have funding programs for transit service to the disabled. Most municipalities of 25,000 or more persons have special transit systems for the disabled. The federal government is supportive of the delivery process through research and development and demonstration projects but has not been involved in developing service policies. Federal initiatives are discussed later in this paper. There are substantial variations in municipal and provincial funding levels and service policies across Canada.

In spite of these variations, reciprocity between systems for the disabled is generally good, so that visitors with identification cards from another community can access the local service. On a national basis, operating funds for transit systems for the disabled are derived from the following sources:

Operating Fund Source	*Percentage*
Provincial funding	52
Municipal funding	38
Fares	8
Other local sources	2

Capital funds are effectively derived, on average, from the following sources:

Capital Fund Source	*Percentage*
Federal	7
Provincial	75
Municipal	18

SERVICE GAPS AND OPERATOR NEEDS

A number of gaps in the provision of service to the elderly and disabled that could provide opportunities for private enterprise have been identified by both federal and provincial agencies. These service gaps exist partly because initial priorities directed most of the available funding toward the improvement of urban mobility. More recently identified needs include

- Making the interurban transportation systems more accessible,
- Improving pedestrian access to both urban and interurban transport modes,
- Developing multipurpose systems for small communities and rural areas where conventional transit often does not exist, and
- Providing more cost-effective services.

A national survey of operator needs undertaken by the Canadian Urban Transit Association in 1985 for Transport Canada identified an approaching crisis with respect to the management of ridership growth on the parallel systems (*1*). The national growth rate, which averaged 13 percent in both 1984 and 1985, had placed a severe burden on service and system expansion at a time when economic conditions were placing constraints on funding. Among the most critical management needs identified by the operators were

- Management and organization strategies to cope with growth and change,
- Funding strategies to cope with capacity constraints, and
- Computer-assisted scheduling systems.

FEDERAL INITIATIVES

Although not directly involved in the provision of urban transit services for the disabled in Canada, the federal government has a substantial interest in accessibility for the disabled and an impact on the development of systems and services. For example, a new 5-year federal assistance program was introduced in 1985 to provide assistance for the acquisition of vehicles for the transportation of the handicapped in small urban or rural communities. This program, administered by the director general of surface policy and programs at Transport Canada, provided capital assistance to purchase vehicles for small communities in New Brunswick, the Northwest Territories, and Manitoba to date (2).

Within Transport Canada, the Transportation Development Center (TDC) has a long-term systematic effort in research and development (R&D) under way to bring about innovations and improvements in the transportation system. Emphasis is placed on R&D to achieve a higher level of transportation safety and efficiency, as well as to ensure accessibility for Canadians, including the elderly and the disabled (*3*). TDC has undertaken several projects designed to foster the development of technology in the form of equipment, systems, and procedures to improve accessibility for elderly or handicapped persons with an emphasis on federally regulated transportation modes. TDC also sponsors projects that aid in the development and evaluation of accessible vehicles and transit services for the elderly and handicapped, comprising wheelchairs, automobiles, buses, and transfer vehicles.

Two major brokerage demonstration projects were implemented in 1985, one sponsored by BC Transit and one by the city of Edmonton. Both projects included contractual arrangements with private enterprise operators using computer-aided scheduling systems. Both received funding assistance from TDC. The British Columbia (BC) Transit project has been described in another paper (*4*). The Edmonton project is described later in this paper.

NEW PROVINCIAL AND MUNICIPAL INITIATIVES

One of the most significant trends offering opportunities for private enterprise is the growth of special transit services in small urban populations (less than 5,000 persons) and rural communities. The province of Quebec has a unique approach of encouraging several adjacent small communities to share one system. This approach has provided service to more than 200 such communities. The province of Alberta introduced a grant program in 1979 that has resulted in the establishment of service in more than 40 small communities to date. This was followed by the province of Saskatchewan, which now has service in 37 such communities, and the province of Manitoba, where some 22 small urban and rural communities have service.

A growing concern over the high cost of transporting elderly and disabled passengers in lift-equipped vehicles is resulting in a shift to greater use of taxis. Experience in Hamilton, Calgary, and Edmonton has shown that for the ambulatory disabled and the elderly, taxi service can be provided at about 50 percent of the cost of lift-equipped bus services. Typical operating costs experienced by these systems in 1986 were $8.00 per person trip by taxi versus $16.00 by bus.

In British Columbia, in 1986, financial assistance was being provided for custom transit services in 12 communities and for paratransit service in another 10 communities. All of these systems were contracted out to either private enterprise operators or nonprofit organizations.

THE QUEBEC EXPERIENCE

Responsibility for Service Delivery

Most parallel transit services for the disabled in the province of Quebec are delivered through local public transit systems or regional systems that provide service to several communities. These systems may operate the service themselves or contract with private enterprise for service.

Provincial funding is provided through the Quebec Ministry of Transport. The Provincial Government program provides grants to public transportation agencies and municipalities equal to 75 percent of the cost of transportation services for the disabled. The remaining 25 percent of the cost is obtained from municipal sources and user fares. The fares paid by the users

are equivalent to the fares charged for conventional transit services, covering about 5 percent of the cost of the special transit services.

Special transit services for the disabled offer on-demand, door-to-door service. The services generally use minibuses and require advanced registration. Some 55 transit delivery organizations for the disabled have been created since the inauguration of the program in 1979. Nearly 400 of Quebec's 1,500 municipalities are now served, covering almost 70 percent of the population. In 1985, the 20,000 disabled persons registered for the special transit services made over one million trips.

Introduction of Taxi Operators

In January 1982, Transport Adapte du Quebec Metro, Inc., a specialized transport service and a subsidiary of the Quebec City Transit Commission, first introduced the use of taxis for transportation of disabled persons throughout the Quebec City metro area. This new measure substantially changed the operation of the Quebec City system, which had previously used lift-equipped small buses. The reported results of these changes were most positive for the corporation, its users, and the taxicab industry (*5*). The introduction of taxi service has accomplished the following:

- Service refusals were virtually eliminated.
- Costs per passenger trip were reduced by one-third.
- Travel times were substantially reduced.
- Advance reservation notice was reduced from 24 hr to 8 hr.
- Ability to provide service at time requested improved.
- Vehicle requirements were reduced.
- New sources of income were provided to the taxi industry.
- Overall, users were better served than by conventional transit service.

A majority of the corporation's clientele, such as the visually and mentally impaired and those persons using manually operated wheelchairs, are now transported by taxi. In addition, vehicles with ramps are used almost exclusively to transport users of motorized wheelchairs. In 1986, some 44 percent of the users were being transported by taxis and 56 percent by modified vans.

New Opportunities for Private Enterprise

The success of the Quebec City initiative has encouraged the Government of Quebec to broaden the role of the taxi industry in that province to permit taxi companies to offer new paratransit service (*6*). Although it is not official policy of the Quebec Ministry of Transport, municipalities applying for funding for special transit systems are encouraged to apply the least costly solutions that are appropriate to the mobility needs of the disabled. For example, the Montreal Urban Community Transportation Commission has developed a comprehensive plan to integrate taxi services into the existing system for the disabled (*7*).

EDMONTON BROKERAGE DEMONSTRATION PROGRAM

Responsibility for Service Delivery

The Transportation Department of the city of Edmonton, Alberta, has successfully implemented a new delivery organization for the Disabled Adult Transportation System (DATS). The new brokerage organization allows the city to manage and schedule a complex mix of privately operated paratransit services designed to meet specific needs of their disabled clientele. This mix of services includes lift-equipped dial-a-bus service, shared-ride taxis, and special bus and van services for group travel (*8*).

Edmonton, Alberta, is Canada's largest northern city. The 1981 census for the metropolitan area showed 657,000 persons. Edmonton is a unique self-contained city, providing city-operated public utilities and services including power, telephone, municipal airport, transportation, and public works services, as well as police and fire departments. Conventional transit and paratransit services for the disabled are provided through the Transportation Department of the city. The city's contribution toward the cost of providing paratransit services to the disabled is one of the largest of the municipal subsidies in Canada.

DATS has been operating in the city of Edmonton since April 1975. DATS evolved from a system initially operated by one taxi firm through several bus and van operators and through administrative and organizational structures. After 10 years of experience, DATS was well established with its target clientele, meeting specific and unique requirements of the adult disabled population in Edmonton.

Introduction of the Brokerage Concept

In 1984, the Edmonton Transportation Department began a review of the "brokerage" concept as it applied to DATS. Brokerage implied that the agency dispatching the service was not necessarily the vehicle operator. This was found to be common with taxi firms in which the vehicles were owned by individuals and dispatched by a broker. It was found that substantial research was apparently under way in North America on the potential for computerized brokerage systems that could be considerably more cost-effective than the system then in use in Edmonton. As a result of this interest, consultants were engaged in January 1985 to review DATS and the feasibility of a brokerage demonstration project (*9*). At the same time, an application was made to the TDC of Transport Canada for the funding of a demonstration project. In April 1985, the Edmonton City Council concurred in the recommendations of the Public Affairs Committee that a brokerage demonstration project be undertaken.

Restructured Organization

With financial support from TDC, a new delivery organization was established to direct the demonstration project. The objective of the 18-month demonstration project was to evaluate the brokerage concept as a means of achieving the coordinated assignment of trips with greater fiscal control. In addition, the project would develop and test a computer-assisted scheduling and management system. The 1986 DATS functional organization

is shown in Figure 1. DATS provides prebooked subscription trips for regular users, previous-day reservation trips for casual users, and on-demand trips for emergency travel.

The major features of the new brokerage organization included the following:

- The Brokerage Center was located in a city garage facility.
- The manager of the Brokerage Center was one of only four city employees in the administration.
- City and administrative staff handled the registration files, complaint investigations, and statistical analyses.
- The city-owned lift-equipped vehicles were maintained by the city but operated by a private bus contractor.
- Up to six taxi and limousine firms were involved in providing services for those persons who did not require a lift-equipped vehicle.
- The brokerage supervisor and dispatch staff (14 persons) were provided under a management contract.

All city-owned bus and van drivers reported for work to their own supervisor, who gave them their routing instructions, which the dispatcher had provided. After leaving the garage, the drivers were subject to instructions from the dispatcher on duty. In case of a problem between the dispatcher and a driver, the brokerage supervisor and the contractor supervisor would investigate and arrive at a solution. If these persons could not solve the problem, the manager of the brokerage center would be asked to make a decision.

The close proximity of the contractor supervisor and their employees to the city staff provided easy access for coordination and problem solving and a good learning environment. The only negative aspect of this close proximity was that policy decisions and instructions were often verbal rather than written, and complaint investigators often appeared in person requesting immediate answers, which interrupted the normal flow of work in the dispatch office.

Contract Services

A summary of the services provided by private enterprise is presented in Table 2.

TABLE 2 DATS CONTRACT SERVICES

Contractor	Payment Basis	Service Provided
Bus company	Hourly rate	Drivers and supervisors for city-owned vans and buses with lifts
Taxi company	Hourly rate	Shared-ride subscription trips
Taxi company	Flat rate	Van service for group trips
Taxi company	Flat rate	Shared-ride reservation trips
Consulting firm	Cost plus	Scheduling and dispatch staff

Labor Relations Experience

The project team anticipated that a change in contractors and procedures could trigger jurisdictional challenges from one or more of the labor unions with which the city of Edmonton had labor agreements. What was not anticipated was a dispute between the taxi drivers and Yellow Cab, and a claim of succession bargaining rights by the Amalgamated Transit Union (ATU) for the employees of all contractors with the exception of the taxi drivers.

Taxi Dispute

In September 1985, a majority of the taxi operators withdrew their services. This affected the contracts for the hourly rate subscription service and the flat rate reservation service.

Since the dispute was between the drivers and the taxi contractor (not with the city) and the hourly service was prescheduled by the Brokerage Center, the brokerage supervisor

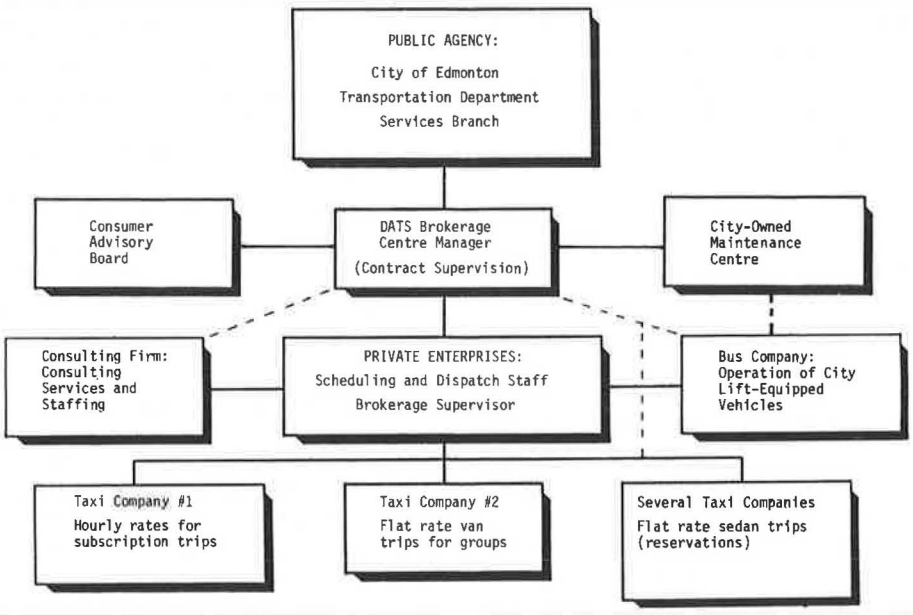

FIGURE 1 DATS functional organization (August 1986).

was able to maintain the service by contacting the taxi operators directly to supply their daily run sheets. Some vandalism occurred to the privately owned taxi vehicles that may have been perceived to be working in regular taxi service.

Because the flat rate taxi trip service had not been performing satisfactorily before the strike, the city invoked a labor dispute clause in the contract, effectively canceling this contract. The brokerage supervisor then negotiated a new flat rate service with two smaller taxi firms who had submitted tenders previously. One of these firms subsequently went into bankruptcy, with the result that new arrangements had to be made with larger firms.

ATU Challenge

Previous to August 1, 1985, the dispatch staff, maintenance staff, and bus drivers for the city-owned bus and van service were members of Local 569 of the ATU. The employees of the one private contractor providing supplementary services were not members of a labor union. Effective August 1, 1985, the following changes applied:

- Existing bus drivers of the new contractor were members of a Teamster local.
- Maintenance of the DATS buses would be performed by city employees who were members of the Canadian Union of Public Employees.
- Dispatch staff were now employed by the contractor.

In August 1985, the ATU made applications to the Alberta Labor Relations Board for rulings that employees driving or working with or on the city-owned DATS buses were included in the scope of the 1978 certification of the ATU as bargaining agent for the city of Edmonton Transit System employees. A lengthy hearing was conducted, at which city staff and consultants gave evidence. In January 1986, the Labor Relations Board dismissed the several applications of the ATU on the basis that the public transportation system terminology in the 1978 ATU certification "did not, in our opinion, encompass DATS." This decision hinged on the definition of "paratransit" and on the fact that the city did not buy the private company.

Impact of Scheduling Technology

For several years before 1984, DATS sedan and bus operations had been contracted out but administered by the Edmonton Transit System. During this time a unique but somewhat cumbersome computer-scheduled system had been developed. In 1984 the operating contracts provided for the major bus contractor to perform the scheduling. For the demonstration project, the existing scheduling system was transferred to the new brokerage center. Subsequently, in October 1986, the city replaced the computer-aided system with a less sophisticated computer-aided scheduling system and assumed direct control over the scheduling and dispatch staff who became city employees on January 1, 1987. Following are unit scheduling cost per ride comparisons based on current and past experience with DATS and projections for similar large systems under private and public operation. The costs shown for public agency operation are about 25 percent higher because of shorter work weeks and higher fringe benefit costs. Data are 1987 MANOP Services, Ltd. estimates.

Scheduling Options for Large System	*Cost per One-Way Trip ($)*	
	Private Enterprise	*Public Operation*
Manual scheduling	2.00–2.25	2.25–2.75
Computer-aided	1.15–1.35	1.35–1.65
Computer-scheduled	0.90–1.10	1.15–1.35

Impact of the Brokerage Organization

The impact of the DATS Brokerage Organization, as of August 1986, was as follows (*10*):

- About 57 percent of the passengers were being carried on the automobile services operated by the taxi firms compared to 31 percent previously.
- Average unit operating costs per ride had declined by about 20 percent (i.e., from about $12.65 per ride in 1985 to $10.05 in 1986).
- Overall ridership increased by about 9 percent.
- Operating budgets were being held constant.
- Confidence in the service was generating new programs at activity centers.
- Trip refusals declined significantly from about 20 percent to less than 5 percent.
- Trip productivity was maintained at existing levels.
- An ATU local in a neighboring city offered a lower wage scale for paratransit services to avoid the contracting out of transit feeder services.
- Scheduling and dispatch center costs were expected to increase by about 35 percent in 1987.

CONCLUSIONS AND TRENDS

The major conclusions from the Canadian experience with private and public partnerships to provide mobility to the disabled are as follows:

- Existing municipal agencies and transit organizations may not provide for the use of the most cost-effective mix of public and private service operators.
- The use of private enterprise contractors can significantly lower operating costs.
- Coordination of services requires good communications with the managers of the private companies. Coordinators must closely monitor the performance of the contractors.
- The major difficulty in contracting with private firms is to maintain the continuity and quality of service, particularly when ownership or key personnel change during the life of a contract.
- Since more than 50 percent of the disabled do not require lift-equipped vehicles, there is potential for greater use of automobile services at substantial cost savings. These savings can be used to meet some of the latent demand for service.
- Taxi companies can provide service at low unit trip cost because their existing overhead costs are already accounted for.
- There is no substitute for reliable and enthusiastic taxi service providers. Trial and error methods may be required to identify the best performers.

- The most important elements controlling the reliability and the cost-effectiveness of a special transit service for the disabled are the functions of vehicle scheduling and dispatching. Because of this, public agencies may elect to retain these functions even though they could be contracted out at a lower cost.
- Where scheduling is performed by a contractor who also operates some of the system vehicles, the contracting process must provide incentives for the scheduling contractor to be cost-effective, to monitor operations, and to provide the community with sufficient data to assess the reliability of the service.
- Special transit systems for the disabled, like most paratransit services, are management-intensive requiring dedicated management with good interpersonal skills, patience, and diplomacy.
- Organized labor is taking an increasing interest in the attempts of management to replace higher-cost bus services with lower-cost taxi services. Both the ATU and the Independent Canadian Transit Union (ICTU) have opposed the use of taxis as a substitute for conventional transit. In 1985 the ATU lost a dispute with the city of Edmonton over the new brokerage system, which makes substantial use of taxi service. Such challenges must be anticipated and a response planned in advance.

Following are the authors' projections based on current trends in Canada:

- Many special transit systems for the disabled are operating at capacity within tight budget constraints. This means that either new sources of funds must be found, higher fares charged, or less costly services or more efficient methods introduced to accommodate unsatisfied travel demands.
- About 20 percent of the existing special transit systems in Canada are using taxis to serve their more ambulatory clients. Some systems are unable or unwilling to include these lower-cost options because of institutional constraints. The substitution of about 40 percent of the existing trips to lower-cost automobile services on a national basis would save about $5 million annually in Canada. In the short term, this would only accommodate 1 year's growth in demand. In the long term, the shift would lower the cost curve for all funding agencies as average costs per trip declined.
- The coordination of a variety of private enterprise operators using the brokerage concept and employing computer-aided dispatching systems is likely to become more widespread.
- Should system operators fail to use these techniques to meet the continuing growth in demand, challenges can be expected under provincial and federal human rights legislation.

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Special Transportation Service in Sweden—Involvement of Private Operators

AGNETA STÅHL

Since 1979, every municipality in Sweden has been able to offer its inhabitants Special Transportation Service (STS). STS has a firm primary-municipality connection and organization. The municipality, however, receives a national subsidy, which today amounts to a maximum of 35 percent of a municipality's overall costs for STS. In 1986, 5 percent of the Swedish population was entitled to Special Transportation Service. As things have developed, STS has become primarily a means of transportation for the elderly. Every fifth person over age 65 is entitled, and the elderly constitute more than 85 percent of entitlements nationwide. Travel by Special Transportation Service has increased greatly during the past 10 years. The overall costs for the STS transportation in Sweden in 1986 were approximately $200 million. The nationwide average municipal cost for an STS trip in 1986 was $13. The cost range is wide, however, from a low cost of $6 to a high cost of $30. The range in the costs for different municipalities is mainly a result of the variations in policy among municipalities, such as prior reservation of a trip, obligatory collective travel, and the amount to be paid by the entitled person. Because of the increased costs of STS travel, many municipalities have now started to review the organization of STS. Until now the municipality has purchased the main part (95 percent) of the Special Transportation Service from the taxi companies. Many municipalities, however, are now trying new solutions in providing transportation for the elderly and disabled. In some municipalities, this has already led to a declining role for the private sector's (taxis') involvement in providing this transportation service. There are indications that this development will continue in the future.

Special Transportation Service was introduced in Sweden at the end of the 1960s. At first it was conducted on a volunteer basis, but municipalities gradually assumed responsibility for providing Special Transportation Service (STS). A rapid development occurred during the 1970s, and since 1979, every municipality in the country has been able to offer this service. In 1974, Parliament decided to introduce national subsidization, which today amounts to a maximum of 35 percent of a municipality's overall costs. The result of the parliamentary action is that Special Transportation Service has a firm primary-municipality connection and organization.

The purpose of STS is to make transportation available to people whose handicaps preclude them from using public transportation facilities. Thus, at the outset the Swedish policy was to have a separate transportation system for the elderly and disabled. During the late 1970s, however, this thinking changed. Today the goal of Swedish policy regarding disabled people and the elderly can be summarized in two words—integration and normalization. In transportation terms this means that adaptation of transportation facilities to the needs of users should be an important part of planning by the transportation enterprise and vehicle manufacturers.

In 1979 Sweden implemented a law requiring the gradual adaptation of public transport vehicles and terminals in local surroundings to the needs of the disabled and elderly. With respect to the rate and extent of the adaptation, a period of 10 years was deemed feasible. This law applies to the manufacture of vehicles in 1984 and after. Without going into detail about what is required, it can be mentioned that on buses running in urban areas this law does apply to, among other things, the height of the steps, the design of the handrails, the size of the letters on destination signs, marked steps, handrails, and so on.

The law in 1979 was based on an investigation by a special commission called the HAKO Commission. The study defined a disabled person as anyone who, "on account of impaired physical or mental capacity, cannot use the existing public transport services, and who encounters substantial difficulties in getting about and travelling." This commission estimated that approximately 1 million people in Sweden (12 percent of the population) are disabled in some way with regard to getting around out of doors. These individuals can be divided into the following groups:

- Serious movement disability—250,000 people,
- Other disabilities involving manifest difficulty in traveling—250,000 people, and
- Other disabilities that to a certain extent can be considered as restricting the ability to travel—500,000 people.

In addition to these three groups there are large numbers of people, adding up to about the same total of 1 million, who have less ability to use public vehicles than fully active people. Included here, for example, is the large number of older people whose advancing age has resulted in reduced physical and mental capacity.

It is clear that there is a great need for both Special Transportation Service and an adaptation of public transportation in the society. When the Special Transportation Service was introduced, it was estimated that approximately 1 percent of the Swedish population would qualify for entitlement. However, the need proved to be considerably greater. In 1986, 5 percent of the population was entitled. As things have developed, STS has become primarily a means of transportation for the elderly. Every fifth person over 65 is entitled, and the elderly constitute more than 85 percent of entitlements nationwide.

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Many municipalities have now started to review the organization of STS because of the increased number of entitled persons as well as the increased costs. Until now the municipality has purchased the main part of the Special Transportation Service from various transportation companies, primarily the taxi companies. Partly because 85 percent of those entitled are elderly, an average of about 95 percent of the Special Transportation Service is conducted by means of taxis. The remaining 5 percent is handled by lift-equipped vehicles to accommodate people with serious motor disability.

This paper will focus on the involvement of the private sector in providing transportation for the elderly and disabled. Because of increasing costs for providing the Special Transportation Service, many municipalities are trying new solutions in providing transportation for the elderly and disabled. In some municipalities this has already led to a declining role for the private sector's (taxis') involvement in providing this transportation service. There are indications that this development will continue in the future.

INVOLVEMENT OF TAXIS IN STS

Special Transportation Service is a municipal concern, and every municipality sets its own guidelines, with regard to

- Rules for granting entitlement,
- Amount paid by an entitled person, and
- Possible limitations (e.g., number of trips per month, length of trip, etc.).

The design of STS in Sweden means that the individual user does not have freedom of choice when requesting a trip. When an individual is granted entitlement to this service, the decision is also made whether travel will be by taxi or lift-equipped vehicle. Furthermore, the municipality often has just one telephone number for the entitled person to use to request a trip.

As mentioned earlier, the Special Transportation Service in Sweden has become mainly a means of transportation for the elderly. Since STS was begun in the early 1970s, taxis have provided most of the service. This is possible since most of the riders are ambulatory and do not need a lift-equipped vehicle with ramp or hoist facilities. Only a minority of trips are conducted by such vehicles.

Generally, it can be said that the cost of a trip via lift-equipped vehicle is higher for the municipality than a trip by taxi. Available information indicates that such costs are 50 to 100 percent higher. The reason is partly that lift-equipped vehicles are often double staffed and partly that they involve longer travel times because of assistance required by the travelers both during the trip and during transportation to and from the vehicle.

However, for that portion of STS that is provided by lift-equipped vehicles, there are some differences among municipalities depending on whether the vehicles are municipally owned, or, if not, from whom such services are contracted. In most cases, it is also the local taxi company that provides transportation in lift-equipped vehicles. Sometimes the company itself owns the vehicles; sometimes it contracts out these services. Many municipalities do own these vehicles and thus have specially employed personnel for this kind of transportation. In certain cases, the local bus companies own lift-equipped vehicles and the municipality negotiates an agreement with these companies.

Because the trips provided by taxi have turned out to be less expensive than those in special vehicles, there has been no serious discussion until now about changing the organization of the private sector's involvement in STS. Taxis have always been providing this service, so there is no obvious source to go to in search of why and how it all started. The situation is very likely to remain as it is in many municipalities for the near future, even if some municipalities have increased the portion of STS provided by lift-equipped vehicles and other operators. At the end of this paper, an example is presented of how one municipality has started to use more lift-equipped vehicles in conducting STS and the consequences of this.

In Sweden, there is no competition in the area of taxi services. In principle, all the taxi companies in the country are affiliated with the Swedish Taxi Association. Consequently, there is no competition between various transportation companies when it comes to entering into agreements concerning the major portion of Special Transportation Service. Agreements are reached on the local level through municipal negotiations with the local taxi organizations, but the central taxi organization, in collaboration with the Association of Swedish Municipalities (that is, the umbrella organization for the country's municipalities), has drawn up guidelines that determine the parameters within which agreements on the local level should fall.

These guidelines govern, among other things, taxi fares for STS. Driving speed (i.e., the practical time needed for a certain kind of trip) plays the decisive role in setting the rate of payment per kilometer and for taxi assignments in general. Over and above the cost of the trip itself, additional fees are added for such assistance as the entitled person may need in getting to and from the vehicle. The size of this amount depends on the time involved and is based on a standard rate of about $17/hr.

In general, all taxi owners and drivers are engaged in STS assignments because an entitled person can, in most municipalities, either phone and order a trip or hail a cab on the street. In the latter case, some municipalities charge the entitled person a higher fee than that for a trip ordered in advance. It is important to point out, however, that this kind of "spontaneous" trip is not allowed in all municipalities. This is especially true of places where computerized booking centers have been installed to organize Special Transportation Service. But because it is possible in many places to hail a cab on the street, all taxi drivers in those places are engaged in STS.

Therefore, the central guidelines state that it is important for all drivers to receive training in municipal STS regulation, as well as in such areas as the psychology of the disabled and techniques for lifting and supporting. The Taxi Association plans to introduce such training into the basic education of taxi drivers, as well as into advanced courses. Before this training becomes obligatory, the basic education for taxi drivers consists of a 1- to 2-day course financed by the municipalities. If such education is offered by a municipality, it can require that all those who drive STS-entitled people receive special training. Parenthetically, it is worth mentioning that such training is already obligatory for drivers of lift-equipped vehicles.

The taxi driver is required to ascertain that a passenger is entitled to STS. The driver must also add the STS fee established by the municipality. Here, there are great differences among municipalities. Some issue a card to entitled people for a certain period of time, which the driver only needs to check. Others issue coupons that are used to pay for trips. However, the most usual system is that the entitled person pays a certain share of the amount shown on the meter, ordinarily 20 to 30 percent. This is usually paid in cash, but sometimes coupons are used.

The taxi driver records the passenger's name, the fare for the trip, and how much the passenger has paid, on a special form. The passenger signs the form to indicate that the figures are accurate. The driver then turns in the forms, accounting to the municipality for STS trips made. Trip and assistance costs are totaled, and whatever amount the passenger may have paid is deducted. This accounting occurs in accord with local agreements, which can vary from weekly to monthly or longer intervals.

EFFECT OF GROWING STS COSTS ON TAXIS

Travel by Special Transportation Service has increased greatly during the past 10 years, as have the costs to municipalities. The overall costs for the STS in Sweden in 1986 were about $200 million. The nationwide average municipal cost for an STS trip in 1986 was $13. The cost range is wide, however, from a low of $6 to a high of $30. Thirty-five percent of this cost is subsidized by the government. This wide range in the costs for different municipalities is mainly a result of the considerable variations among municipalities in policies, such as prior reservation of a trip, obligatory collective travel, and the amount to be paid by the entitled person.

The municipalities are in agreement, however, that the great cost increases for Special Transportation Service over the past few years are primarily the result of rising taxi fares. It appears that in the local negotiations between the municipality and the taxi organization, the taxis are in the driver's seat and can push through rather drastic fare increases. This is because at present there is no other "private operator" who can compete for providing this service to the municipalities, and nearly 95 percent of STS trips are made by taxi nationwide.

Of course, STS trips are a large source of income for the taxis. In Stockholm, nearly 50 percent of the total taxi business consists of STS trips. That figure is fairly representative for the country. In certain sparsely populated municipalities, the figure is much over 50 percent. Therefore, it should be reasonable for the municipalities to put pressure on the taxi prices and thereby hold down their costs. For the moment, however, it appears that the taxis have the upper hand because the municipalities are obliged to provide STS for people who cannot use public transportation facilities and because there are no competitors for the taxis as a resource.

The rising costs have meant that the municipalities have taken various steps to save money on STS or to ration the service, for example, by raising the contribution paid by the entitled person, restricting the number of trips per month or year, or coordinating Special Transportation Service trips. Therefore, in many municipalities, a review of the Special Transportation Service situation is being conducted. This review process includes the question of who should provide transportation services. Many municipalities are beginning to either buy more lift-equipped vehicles or let local bus companies, for example, provide more STS transportation with lift-equipped vehicles. One of the goals is to be able to coordinate trips to as great an extent as possible and thereby reduce the cost per trip.

To do this effectively often leads to a computerized booking center where trips are coordinated. This leads in turn to a new limitation for the entitled person because a trip must be ordered in advance. In some places where a booking center has been introduced, it has been possible to reduce the reservation time to 30 to 60 min, which should not be regarded as too great an inconvenience for the passenger.

The installation of a booking center and obligatory coordination of trips influence the involvement of taxis in STS transportation. Below is described the organization of STS in a Swedish city where a booking center has been installed, and what effects the booking center has had on the STS transportation.

DECREASED STS ROLE FOR TAXIS IN BORÅS

Borås is a city with a population of about 60,000 situated near Gothenburg. Coordination of STS trips was introduced in Borås in 1981. In the beginning, coordination was done manually, but by 1984 a computerized planning system was in operation. In Borås, according to an agreement with the Social Services Authority, the local public transportation company is responsible for planning, operation, and follow-up of all Special Transportation Service. The company has 10 lift-equipped vehicles and taxis at its disposal. The drivers of the special vehicles have received special training and are employees of the bus company.

The computerized system means that taxi personnel handle taxis and STS for taxi passengers. One full-time position is allocated to the STS part of the business. The bus company's personnel manually coordinate STS for lift-equipped vehicle customers. Thanks to cooperation with the taxi through neighboring switchboards, regular taxi passengers can be assigned to empty places in lift-equipped vehicles when appropriate according to time and route.

When booking an STS trip, the passenger states the point of departure, destination, number of people, and desired time of departure. An eligibility check is automatically carried out when the order is placed. Then the computer finds the least expensive trip (considering length of journey, multiple-passenger trip savings, and so on) within a certain interval (plus or minus 15 min) from the requested time of departure.

When the coordination system was introduced, the implications for the taxi company and the municipality, as well as the Special Transportation Service customers, were great.

For taxis the new system has had a number of consequences. One is that a large number of taxi trips for Special Transportation Service are now multiple-passenger trips—about 25 percent. Another is that many people entitled to STS trips by taxi now travel by lift-equipped vehicle instead, if time and route are appropriate. Lift-equipped vehicles, therefore, receive highest priority in trip coordination; they are used first. This means that the share of trips by lift-equipped vehicle has risen from 7 percent in 1979 to about 25 percent in 1986. As mentioned at

the outset, the average for the country is about 5 percent. Consequently, the taxis have lost a relatively large share of STS transportation in Borås.

For the municipality the introduction of the manual system led to a decrease of 23,000 trips in 1 year. Until 1982 there had been a large increase in traveling; in 1979 there had been some 160,000 trips, and in 1981, 195,000. Thereafter, the number of trips decreased to a rate of 165,000 per year in 1984. The municipality's costs for Special Transportation Service decreased from $1.3 million in 1981 to $1.1 million in 1984. The number of trips per entitled person per year also decreased from 66 in 1980 to 50 in 1984, and gross cost per trip decreased from $13 in 1979 to $7 in 1984.

The reduction in costs resulted partly from the reduced number of trips per entitled passenger, but primarily from the coordination effects achieved. It can also be noted that the number of those entitled to STS increased from 2.9 percent of the population in 1979 to 3.5 percent in 1984. Despite this increase, the total cost of Special Transportation Service decreased.

The development after 1984 when the computerized booking center was introduced has meant a continued increase in the number of entitled persons. In 1986, 4.2 percent of the population in Borås was entitled to Special Transportation Service. The total number of trips as well as the number of trips per entitled person per year have also continued to increase. In 1986, 185,000 STS trips were made in Borås, which means 42 trips per entitled person per year. Gross cost per trip has increased to $9 per trip. This means that the total costs for Special Transportation Service in Borås in 1986 were $1.8 million.

Despite these growing costs for the STS service in Borås, the municipality shows great differences compared with the situation in Sweden overall. The average cost per Special Transportation Service trip in Sweden in 1986 was $13 compared to $9 in Borås. The average cost in the country for an STS trip with a lift-equipped vehicle was $23; in Borås the cost was half that price at $12 dollars. Consequently the introduction of a computerized booking center has meant savings for the municipality compared to the average in the country. This is achieved mainly by a low cost per trip.

The coordination system has also imposed certain restrictions on the STS passenger because of prebooking and obligatory trip-sharing when that is deemed necessary. The decreasing number of trips per entitled person per year implies reduced travel with the Special Transportation Service. This can be a result of the obligatory coordination of trips. Many STS-entitled persons have reacted strongly against the prebooking of trips, which they believe limits their possibilities to travel. Therefore, it is very important that regulations in Special Transportation Service be handled with great care in order to avoid causing the users too much inconvenience. Special Transportation Service is often the only possible way of getting around out of doors for these individuals.

CONCLUSION

More and more municipalities have begun to introduce computerized booking centers to coordinate STS. Therefore, it appears that the trend will be that the taxis' involvement in Special Transportation Service will diminish. On the other hand, the involvement of other "private operators" in providing STS transportation with lift-equipped vehicles will probably increase.

These developments are not uniform throughout the country. In Borås, for example, the municipality purchased the STS service from the local bus company. In other places, the municipality owns the lift-equipped vehicles but leases them to the local bus company and then purchases STS transportation from the company. In still other places, the taxi company provides transportation in special vehicles. Consequently, the drivers of lift-equipped vehicles are most often employees of the local bus company. It can be concluded that the influence of "private operators" in Special Transportation Service remains, but that the taxi companies' share in this service will probably decrease in the future.

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Role of the Private Sector in the Delivery of Transportation Services to the Elderly and Handicapped in the United States

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In the last 20 years the private sector has become increasingly more involved in formal arrangements with local transit authorities and municipalities in the delivery of elderly and handicapped (E&H) transport in the United States. Today, when there are strong calls to intensify the involvement of the private sector in the delivery of a range of publicly financed services, it might be wise to reflect on the lessons to be learned from two decades of private delivery of public transit and paratransit services to the elderly and handicapped. Reviewed in this paper is the state of the art in the private provision of E&H service in the United States, as a complement to other papers in this Record that report the experiences of several countries with the private delivery of special public transport services. Then, based on this overview, answers are suggested to an important policy question: What is known about the impact of private service delivery on the short- and long-term costs and service characteristics of E&H service? These analyses show that communities often decide on economic grounds to use private providers, but they so constrain private operations or so limit the overall competitive market for institutional reasons that they reduce or even remove the inherent efficiencies of the private market. While decisions not to contract with private providers are often open to political debate, organizational "details," which have such a profound impact on efficiency and performance, are often largely invisible to policy makers.

Analyzed in this paper is the way communities actually organize and structure new and continued private service provision and how these organizational and structural decisions ultimately affect efficiency and effectiveness. The analyses focus only on those communities that have elected to use private providers for all or some of their elderly and handicapped (E&H) services; those communities who have, for their own reasons, chosen direct public service delivery are not evaluated.

The information and data discussed in this paper are part of a 3-year study undertaken by the author. The focus of the study is the role of the private sector in the financing and delivery of several public services including transportation.

In the following section, the paper will describe the general state of the art in private-public partnerships in the provision of E&H service in the United States. The kinds of operational decisions routinely made by public systems that actually have profound impacts on service quality and cost in both the short and long run are emphasized in this paper.

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HOW PRIVATE-PUBLIC PARTNERSHIPS OPERATE

Public agencies contracting for service must make a number of important decisions once private provision is chosen. They must decide the type of subsidy mechanism, how the private provider will operate services, how those services are to be priced, how and when services are to be billed to the public agency, and how the consumer will initiate service and verify and pay some part of the fare.

SYSTEM STRUCTURE

Almost all E&H transportation services assume that the public sector will have to subsidize some or all of the users' travel costs. Arguably the most important decision a community makes is whether to pay a subsidy directly to the user—and allow the user to choose among potential service providers—or to provide the subsidies directly to the providers of service, reducing consumer choice. Most formal E&H systems choose to subsidize the private provider directly for losses incurred because users cannot pay full costs.

There are both advantages and disadvantages to user-side subsidies. The most obvious advantage is that such an arrangement supports competition in transport service delivery. The consumer has the ultimate "vote," choosing desired services and rewarding providers who respond accordingly. Although such subsidies create less than a perfect market (because users rarely are allowed to decide between paying for transport and paying for a movie, for example), user-side subsidies allow for consumer evaluation of service provision.

Unfortunately, real user-side subsidies are uncommon. Many communities do not have multiple providers; there simply is no market. Even where there are multiple providers for ambulatory travelers, multiple carriers for those in wheelchairs may be uncommon..

Provider-side subsidies may be a rational response to a limited private market in a community. However, it is unfortunate that user-side subsidies are not more common even in communities with larger markets. By effectively removing the consumer's economic choice, direct-provider subsidies remove one of the safeguards of the free market system—consumer sovereignty.

SERVICE ARRANGEMENTS

The public sector makes another fundamental decision about competition and ultimately service efficiency when choosing both the number of providers and the way those providers are selected. In general, competitively contracting with a larger number of providers ensures cost-effective service because available operators compete over price and create pressure for service innovation as well.

Number of Providers

Cities can choose to give only one contract or multiple contracts; they can choose the provider or providers competitively, through a bidding process, or they can award individual or multiple contracts using noncompetitive methods.

In short, there is a four-way matrix. Austin is a city that competitively awards one contract; Lancaster (Pennsylvania) is a community that competitively awards multiple contracts. Until recently the Twin Cities awarded multiple contracts noncompetitively by simply giving a share to every licensed taxi operator; San Antonio is a city awarding one contract noncompetitively.

If multiple providers are chosen noncompetitively, the public agency must use some method of dividing riders among participating firms; even in competitive systems, there is sometimes the need to administratively divide trips among successful bidders. Some common methods include individual providers being assigned a given number of trips (Twin Cities), a given geographic area (Houston), or certain types of clients (Pittsburgh).

It is not unusual for the public agency to separate the ambulatory and nonambulatory services and to contract separately for each type of service. In some communities the public agency contracts for one type of E&H service, usually for ambulatory travelers, and itself publicly provides service for those in wheelchairs; Austin and San Antonio are examples. Some communities contract for both services but with different providers; Chicago is an example. Some communities both contract for and directly provide both types of E&H service; until recently the public agency in the Twin Cities contracted for services but also directly provided service in public vehicles.

The reasons for choosing an exclusive provider (with or without competitive contracting) vary but usually depend on institutional rather than economic factors. Some cities have little choice of provider—there simply are not enough firms with the expertise or resources to engage in service contracting (*1*). Or the private providers that do exist are unwilling to engage in contract activities (2). Sometimes this is true for chaircar (wheelchair) carriers even if multiple providers are available for ambulatory passengers.

Even in cities where willing and able providers exist, many public agencies choose to involve only one provider (or only one for the vast majority of trips) because single contractors are less difficult to control and monitor. Exclusive contracts make it easier to ensure the availability of service, evaluate the provider, and allow the provider to make vehicle investments. (Taxi operators often talk of "going to the bank" with their signed contract, using it as collateral for vehicle loans.)

Competitive Bid Process

Whether they have multiple or exclusive providers, many E&H systems today do have formalized procurement or bidding processes, at least for initial service contracts. However, the existence of a competitive bidding process can be misleading; the process can be manipulated to limit competition and it may unintentionally do so as well. If a city faces a competitive market but wants only one provider, it is not difficult to structure that process to ensure the desired outcome.

However, cities often unintentionally reduce competition in the way they structure their bids; their requirements may make bidding difficult for potential providers. For example, providers inexperienced in contract service may not be able to serve the entire city, or they may want to take a small contract as a "trial." If the public agency were willing to divide service by geographic areas, or types of consumers, or limited service hours, for example, several providers might be able to bid.

Even if there is competitive bidding, initially granting an exclusive contract may ensure market dominance. If the largest firm is always awarded the bid, potential competitors will simply never arise. In fact, a number of cities that first awarded E&H service contracts competitively, or at least through a bidding process, did not bother to do so for contract renewals (*3*).

CONTRACT ARRANGEMENTS

There are two major types of operational arrangements for pricing service delivery, although there are many hybrid arrangements. In the first, the public sector purchases individual trips; in the second, it buys dedicated vehicle and driver services, usually independent of the number of trips actually carried. These models are summarized as follows:

- Subsidy direct to client
  - Direct user-side subsidies, and
  - Client reimbursement.
- Subsidy direct to provider
  - Per trip
    - Flat rate per ride or per trip,
    - Metered trip, and
    - Zone rate.
  - Dedicated service
    - Per vehicle-hour,
    - Per vehicle-mile, and
    - Combination of above.

Per-Trip Arrangements

When paid only for the riders actually carried, the private provider usually continues to provide service to the general or unsubsidized public, mixing the contract trips into the overall scheduling process. Riders are not mixed on board a vehicle at the same time, but the same vehicle and driver provide service to both subsidized and general public riders over a day.

In this arrangement, the provider can often go with its "strength," that is, providing under contract a service very

similar to the one it has traditionally provided. Providers can often lower their average costs by more fully using all vehicles. In a competitive system some of these savings come back to the public agency in lowered charges.

There are a number of ways to charge the public sector for these services: (a) a flat rate per rider or, less commonly, per vehicle trip; (b) the fare recorded on the taxi meter; and (c) a nonmetered distance- or zone-based fare.

The flat rate is probably the most common; charging a flat price per trip regardless of distance is most appropriate for centrally dispatched systems and least appropriate for nondedicated taxi services (although used by both types of systems). Its use makes the most sense when there are no wide variations in trip lengths and the amount of driver assistance required by the passenger is slight (special assistance takes time).

The flat rate reduces the need for complicated bookkeeping and for client involvement in certifying fares. It also allows the client who shares some of the cost to know what a trip will cost before it is made. And it makes agency budgeting calculations simpler: most systems using this fare-setting procedure establish a maximum weekly or monthly amount that can be paid to the provider.

However, there are many disadvantages to flat rates in practice. Flat rates do not encourage efficiency by either consumer or driver and they can directly and indirectly cause diminished service levels. Consumers have no incentive to make shorter trips; providing long trips often reduces the responsiveness of the system to other travelers. Drivers have real disincentives to making long trips; if they have a choice they may avoid (or even strand) travelers with long or time-consuming trips (such as the nonambulatory requiring substantial assistance).

The metered rate is probably the next most common; it is ultimately fairer since there are not as many cross subsidies between riders (i.e., short trips subsidizing longer trips, etc.). Moreover meter rates may be more conducive to a competitive market by providing incentives to consumers to control trip length and even to group their own trips.

There are some serious problems with meter rates, however. Meter charges are hard to validate administratively because most meters charge for congestion time as well as distance; trips at different times of day can have different meter fares. The more varied traveler trip patterns are, the more difficult administrative verification becomes.

Given the difficulty of administratively verifying meter fares, most systems put a great burden on the client to verify not only that a trip has been made but that the recorded meter fare is correct. It is ironic that most systems are unwilling to allow clients to be real consumers, choosing among providers and services, but they require substantial effort from them in a more difficult situation.

Requiring the rider to validate the meter fare poses two serious problems. First, if the meter is correct, the consumer cannot easily deal with circuitous routing designed to increase the fare. Second, in the majority of situations, the user either is unable to verify the meter amount (and routing) or has no incentive to do so. Verification may be difficult because many systems carry substantial numbers of mentally retarded, blind, or severely handicapped travelers, all of whom would have trouble verifying a meter fare.

Additionally, only two situations provide an incentive for the rider to contest what the driver charges the system: when the user pays a set percentage of the meter fare or when the user pays the amount over a given maximum. (Even then collusion between driver and rider is possible.) And these cases may put an elderly or handicapped traveler in the position of fighting with an able-bodied driver.

The least common pricing arrangement, the zone rate, is used by several large systems including Houston and Pittsburgh. For some reason it has only been used with large centrally dispatched systems where the fare is often calculated by computer. Its lack of popularity is hard to explain because the zone rate could solve some of the economic and service problems of the first two rate systems. Ideally, the zone rate could be used for all types of systems and would not require central dispatching or computer technology; zone rates were common for taxi services in small cities until recently (and are still used in Washington, D.C.).

With an agreed-upon zone system, a traveler could know what a trip would cost ahead of time and administrative verification would be far easier. Conflicts between driver and client could be easily resolved. Drivers would have far less incentive to avoid taking longer trips and no reason for circuitous routing to increase the fare. Consumers would have an incentive to make shorter trips; those required to make longer trips could be additionally subsidized.

Dedicated Service Arrangements

Per-trip arrangements are the first major service option; at the other extreme is the second major type of arrangement, dedicated service. In this option the private provider sells to the public sector the availability of service to the elderly and handicapped. In general, the private provider gets paid per vehicle-hour or per vehicle-mile of service or some combination of the two. Rarely is the provider paid for the actual number of travelers carried. Since it is even rarer for the provider to continue to use the vehicles or drivers in question for traditional noncontract services, there is little opportunity to increase overall vehicle use or lower average costs.

Dedicated services are required when a large private market does not exist and where service availability must—by law or policy—be guaranteed. Dedicated services are common in rural areas or where private providers are very marginal and may go out of business without such contracts. They are often useful when small providers must buy additional vehicles and are unable or unwilling to do so without a contract guaranteeing vehicle amortization. Not surprisingly, chaircar carriers who must purchase lift-equipped vehicles often have such contracts even in systems which have per-trip contracts with private providers for ambulatory riders.

This model of service delivery can be extremely inefficient and noncompetitive. There are no incentives for providers to increase ridership and some actual disincentives (i.e., they get paid whether or not they expend gasoline and vehicle wear and tear). Such contracts are best only when local market conditions offer no other alternative or political realities require such a decision.

It is technically possible to structure dedicated service contracts with performance incentives that encourage increased ridership or better vehicle use. The operational efficacy of such performance contracts, however, is limited both by the amount

of supervision and monitoring the public sector is willing to do and the amount of control the provider can have over ridership patterns.

SCHEDULING DECISIONS

The public sector often makes significant decisions about system efficiency when it decides how vehicles are to be scheduled and dispatched; whether there is one provider or many, these operational decisions can have profound impact on service and costs.

The public agency could use its contractor(s) to handle all aspects of service, from receiving consumer calls to calculating fares to dispatching vehicles. This is the system used by almost all direct user-side subsidy programs.

However, most public agencies choose to have fairly formal and centralized scheduling and dispatching systems. Even where only one provider is awarded a contract, many public agencies choose to maintain separate scheduling units. These centralized systems usually require the consumer to make an appointment from 2 to 3 days in advance of service (although recent federal policy mandates less reservation time).

Most public agencies use a centralized system because it intuitively appears to offer a large number of advantages and few disadvantages. Yet the impact of this decision is counterintuitive. Operating experience suggests, first, that there are a number of costs to such centralized systems and, second, that many promised benefits simply do not appear.

Most of the advantages of centralized systems are illusory or could be easily achieved less formally. At the same time there are some serious disadvantages that ultimately bear on service delivery. First, almost all centralized systems require substantial reservations, which have a negative impact on service quality; because they are not set up to do "real-time" dispatching, they often cannot handle unscheduled needs—even if they have extra space at the time. Second, there are far fewer opportunities for group trips than intuitively thought; regardless of the reservation requirement, most systems with general E&H ridership rarely achieve more than 1.2 to 1.4 riders per vehicle-hour, a figure close to average taxi occupancy, regardless of how the system is operated.

The reality is that easy trips to group are easy in any system and achieve little from centralized scheduling; difficult trips are difficult in any system. The few systems that have experienced higher operating productivities carry large numbers of riders to congregate activities (e.g., day care for the elderly, sheltered workshops for cerebral palsy victims, etc.). Systems with many travelers who are difficult to group, such as severely handicapped riders making individual trips from highly variable origins and destinations and sometimes requiring significant time to board and deboard, always have low productivity.

Overall, most systems, even those actually computerized, have not achieved remarkable productivities unless (a) they require substantial prereservations, (b) they require clients to be ready for pickup for long periods of time (up to 2 hr in some systems), and (c) the system has many naturally grouped trips. The first two requirements impose significant hardships on many consumers; if other operational systems offer higher efficiencies without such loss of service quality, they should be seriously examined.

Centralized systems also cost a great deal; they can add from 10 to 30 percent to the cost of an individual ride (*4*). A 1984 study of the centralized system in a large city noted,

> Early 1984 data indicate that the direct transportation costs per shared ride taxi passenger is between $1.35 and $1.80 less than an exclusive ride fare. In 1983 . . . $373,000 was required to process requests and share the taxi trips. This cost was about $2.00 per passenger carried. Thus, it would have been more cost-effective to have paid every rider's exclusive fare than expend the center resources setting up taxi tours. In addition, given the huge volume of taxi trips to be subsidized [the system] could have obtained discounts on the exclusive fares and developed real incentives for the providers themselves to group or share rides when feasible.

Centralized systems are problematic because they are expensive, reduce service levels, and do not increase productivity. Moreover, there is some evidence that they actually reduce productivity by interfering in the way an operator runs his or her traditional business. Because major operating decisions are made by noncompany dispatchers, providers may have no opportunity to increase the use of vehicles and drivers, ultimately lowering average costs.

The irony is that conventional taxi dispatchers can handle between 20 and 25 individual trip calls per hour; they can accommodate clients in "real time" without requiring lengthy reservations, and they can schedule requested trips without more than a 20 to 30 min advance notice. If vehicles are available, multiple dispatchers can be used.

Centralized systems meet a number of institutional goals, if not economic ones, and this explains their popularity. They give public agencies a great deal of control over the few providers involved; there is an intuitive sense of efficiency about centralizing their operations.

Yet taxi operators and other private providers are masters at being responsive to individual market demands; they may not inherently master all economies but there is little evidence that large centralized systems can show productivity or cost advantages over more direct scheduling by the contract providers.

ROLE OF THE CONSUMER

The consumer plays several major roles in most systems, although rarely the valuable role played in a private market. Consumers (or their advocates) initiate service, pay all or part of service costs, verify trips and trip charges, and monitor service performance. Consumers, once certified as eligible for either travel or subsidy, or both, may contact systems in different ways. Generally the trip initiation procedure is a direct function of the model of scheduling chosen by the public sector.

Major methods of consumer service payment are as follows:

- Client uses coupon, which is given to driver
  - Client has paid part of the face value of coupon.
  - Client has not paid part of the face value of coupon.
  - Third party (e.g., social agency) has paid all of the face value of coupon.
  - Third party has paid part of the face value of coupon.

- Client pays percentage of fare to driver
  - Client pays preestablished flat rate.
  - Clients pays percentage of meter fare.
  - Client pays percentage of nonmetered zone- or distance-based fare.
  - Client pays only that amount above set maximum.
  - Client pays a preestablished flat rate and the amount above a set maximum or distance-based fare.

Most systems do require some client payment and many use a prepaid coupon system. After being certified as eligible for travel or subsidy (or both) clients may be required to obtain or to buy tickets in advance of travel; they generally pay some percentage of face or fare value for those tickets. In either case, when a trip is concluded, the rider gives the driver the coupon as his or her full or partial share of the fare; additional cash may be required as well. Usually the driver must have this coupon, often signed by the rider, sometimes with additional documentation, to receive reimbursement.

Requiring travelers to obtain tickets or coupons before travel has three major advantages: it allows providers to have some idea of potential demand (from ticket sales), third parties such as churches and social service agencies can pay the user's remaining share, and riders make quasi-economic decisions about services because they are not free.

However, users must pay in advance for service so that emergency responses become problematic and the actual cash outlay may be difficult. Moreover, ticket sales have been a miserable indicator of system demand; a 1981 study found that between 40 and 65 percent of all coupons purchased were never used at all (*5*). Lastly, these coupons create little incentive for the rider to verify drivers' charges to the system for variable fares unless they pay proportionately.

In some systems the rider does pay a set percentage of the meter fare or of each zone charge; in others the consumer pays one initial rate (commonly $1.00) and then everything over a given maximum. In Milwaukee, for example, elderly users must pay $1.00 and then all costs above a $9 meter fare (unless they are eligible for additional subsidy). Such systems usually require cash transactions although some allow or even require the payment of these partial charges with prepaid coupons or scrip as previously described.

BALANCING THEORETICAL WITH PRAGMATIC ADVANTAGES

Discussions of the theoretical advantages of private-sector service delivery have recently become an active part of public debate (*3, 5*), many arguing that the private sector is more efficient and cost-effective than government service delivery (*6*). These arguments seem to have major impact on many policy debates.

However, decision makers have not gone far enough in their theoretical understanding of private markets. Economic theory offers an equally persuasive explanation of why the private sector may not work well—unless it is used in ways that encourage competition and do not interfere with private operations. Just as significantly, theory clearly explains why fraud and poor performance can accompany private-sector involvement.

LOOKING AT THE EVIDENCE

Cost Comparisons

This paper has made the claim that private-sector provision of E&H services might not be more effective than public provision if the operational decisions made in support of institutional goals cause the private sector to operate inefficiently.

If the private sector were always less expensive or more efficient, numbers could be found to support that assertion. In fact, as the following data (*7*) make clear, direct public provision displays both the highest and lowest costs in a range. There is a great area in the middle of the range where the two sectors overlap.

Provider	*1986 Costs per Trip ($)*
Private providers	4.30–27.10
Public providers	3.80–31.40

The cost figures presented here were collected from a total of 70 systems—some from 1978 to 1981 and others from 1985 to 1987; the data shown were inflated to 1986 dollars and were additionally reconstructed to represent underreported cost items, for example, depreciation and missing labor costs. The data had to be recalculated because system-reported data are often incomplete; systems contracting with private operators frequently do not report their own accounting, monitoring, or administrative costs. Public agencies do not account for vehicle depreciation since they rarely pay for their vehicles; the public sector actually undercounts between 15 and 40 percent of their actual service costs. Because these data were not collected during the same period, and because some are almost 10 years old, they can only give a general idea of differences in costs. The preliminary analyses are, however, informative.

Table 1 breaks down costs by service factors; for all types of services there still is considerable overlap between the private and public sectors. It is clear that neither service type nor provider type fully explains variation in service costs. Without further disaggregation of the data, the reasons for these differences remain unclear, but there is some preliminary indication that the organization of the private service has an effect on costs.

TABLE 1 COSTS PER TRIP: TRIP PROVIDER SUBSIDY (*7*)

	Private Delivery ($)	Public Delivery ($)
Ambulatory, congregate	4.20–11.00	3.80–6.90
Ambulatory, independent	6.30–11.00	12.00–18.00
Nonambulatory, congregate	9.90–17.90	14.50–29.00
Nonambulatory, independent	11.10–27.10	14.00–31.40
User-side	5.10–8.40	N.A.

NOTE: All data were reconstructed to take account of all actual cost items and inflation (where appropriate).

The data in Table 1 suggest how dependent on operating characteristics are the cost patterns of a system. Some of these operating characteristics are dictated by the clients and their needs; others are dictated by the public agency, which has chosen only one operator or a centralized dispatching system. The only area in which the private sector consistently displays

costs at the lowest end of the range is for user-side subsidies; here the taxi operator is providing his or her traditional service with a minimum of intervention by the public sector in its operational details.

These data are consistent with the recent work of Teal (*8*), which found that there were no clear cost differences between private providers awarded competitive contracts and those that were not; the author concluded that the possibility of competition may keep costs down. However, the data can be interpreted to be consistent with the institutional issues raised here; competitive contracts, which consistently favor one operator or are disguised sole-source contracts, would not be appreciably less expensive than openly noncompetitive contracts.

It should be noted that even if the private sector were currently less expensive than public provision, the cost advantage may be short-lived if it is not a result of inherent efficiencies. Some of the current cost advantages enjoyed by private providers are simply a result of lower labor costs and not more efficient management or production; over time, labor costs will rise in any industry which is noncompetitive, particularly one heavily engaged in public-sector contracting. The best that can be hoped for in that situation is that private costs will always stay slightly below the public sector's costs.

Fraud in Service Delivery

Consumers in a free market force the private sector to deliver quality service at competitive prices. In the absence of competition and consumer oversight, these theoretical advantages may diminish or disappear.

Moreover, even when strong competition exists, market activities have sometimes complex and far-reaching implications. Some communities, while recognizing the power of the profit motive in the private sector, often fail to see that they have created strong economic incentives within their service arrangements for either contractors or their individual drivers—in search of profit—to behave in counterproductive or even fraudulent ways.

Two well-publicized cases of fraud are informative—both in detail and in the political impact of the publicity. In Dallas, a number of taxi operators were indicted by the County Grand Jury for fraudulently redeeming client vouchers; the Transit Board immediately began plans to begin public delivery of services.

Yet the voucher system had been established in Dallas in a way that invited fraud; clients were not required to pay for vouchers on receipt although the vouchers meant instant reimbursement of up to $9 to individual drivers. A market for vouchers arose; one story describes vouchers deposited in church collection plates. Ironically the E&H system required clients to undergo a lengthy eligibility certification process because riders might cheat to obtain low-cost travel, but the private market was seen as policing itself.

The other publicized fraud case occurred in Milwaukee, which has a large user-side subsidy program. A number of drivers submitted charges for trips not made or they inflated individual trips. There was, apparently, substantial collusion between drivers and clients. Again the results were inevitable given the noticeable lack of program monitoring; once a few problems were uncovered there was a solid "paper trail," which could easily have been discovered before. However, again, once the decision was made to use the private sector, the public sector abdicated responsibility—and common sense.

Other operational experiences are striking. In systems with payment for no-shows, there are substantially more no-shows reported by drivers. Across the country, in spite of major differences in maximum allowable trip charges, average trip charges are almost always close to the maximum. There can be, of course, innocent explanations for all these situations, but some suspicion lingers.

The private sector will not monitor itself without reason; individual drivers will rarely fail to respond to clear incentives to enrich themselves—if no continuing interest is shown in their behavior. The most deserving client may act together with a driver to defraud the system and increase his or her income. These facts suggest that the cost and service advantages offered by the private sector can be reduced, unless there is meaningful attention to internal incentives to fraud and serious monitoring of driver and operator behavior.

SUMMARY

Two messages stand out in this analysis of the role of the private sector in the delivery of E&H services. First, many communities do not encourage competition in E&H service delivery; their contract award system may directly or indirectly reduce local competition. Second, many communities organize private providers in ways that create private monopolies in place of public transit monopolies or cause private operators to inefficiently use their resources.

These problems arise because of dysfunctional organizational decisions made by public agencies: (a) choosing only one contract provider, (b) maintaining a large centralized scheduling and dispatching system for all providers, and (c) removing rider choice while requiring excessive rider monitoring of driver billing practices.

While some cities make these decisions on an ad hoc basis—not realizing their import—other communities are consciously trying to develop a system that both uses the private sector and requires little public monitoring. Unfortunately, as the author has attempted to show in this paper, cost-effective private service comes only from a competitive private market. Avoidance of fraud or poor performance comes only from active public monitoring of the service delivered by that market. It does not appear possible to achieve the two goals with one simple delivery system.

POLICY RECOMMENDATIONS

Having chosen private-sector delivery of E&H transport services, many public agencies actively reduce competition, either purposely or as the side effect of their other operational choices; the lack of competition reduces incentives for innovation or effective performance by the contract provider. Over the long run, in the absence of a competitive environment, costs may rise substantially.

To avoid these problems and obtain the economic advantages offered by the private sector, communities must carefully structure their E&H transport systems in three important ways:

- They should actively encourage competition by dividing service units if necessary to attract smaller operators, working with inexperienced operators during the bidding process, giving consumers more choice and ultimately more control over service quality, and removing inappropriate bond or insurance requirements in their service bills.
- Communities should effectively use private operators by allowing those operators to do what they demonstrably do best—provide their traditional service, making most (if not all) of their own operating, scheduling, and dispatching decisions. This both avoids inefficiencies introduced by centralized systems and potentially decreases costs by allowing individual providers to optimally organize their own resources.
- Communities must recognize that the profit motive, which causes firms in the presence of competition to provide cost-effective transport service, can also create incentives to poor or even fraudulent performance. Systems must be sure that there are no hidden incentives that cause operators or drivers to act improperly, and they must expend sufficient resources to monitor driver behavior and service performance.

Overall, communities must recognize that every organizational detail has performance implications that often reduce competition and the advantages of private provision. Communities should act to create and foster competitive markets in order to keep long-term costs down and service quality high. To the extent possible, communities should allow consumers more choice while reducing internal incentives to drivers to act in dysfunctional ways.

ACKNOWLEDGMENT

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Suburban Activity Center Transportation Demand Management Market Research Study

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The background and findings of a study designed to assist in planning and implementing transportation demand management (TDM) strategies at a major suburban activity center are presented. The results are based on a representative sample of all employers in the activity center with six or more employees. Three survey instruments were developed for the study: an employee questionnaire, an employer questionnaire, and a senior management survey. Data were collected from 2,600 employees and 144 employers. Interviews were completed with members of senior management of 24 of the 37 largest firms in the area. The findings suggest that major opportunities exist to improve mobility through implementation of TDM measures. The potential for traffic rerouting is shown by the heavy use of one freeway and exit and by the perception of significant congestion. Alternative work hours could make a substantial contribution to reducing demand given the peaking of employee arrival and departure times. The availability of adequate, low-fee parking suggests potential for parking management strategies. There is a willingness on the part of both employees and management to consider TDM measures. Employees are willing to consider commute alternatives to driving alone and to change work hours. Management expressed interest in adopting alternative work hours programs and in offering ridesharing incentives. They feel that employers not only have a responsibility to help reduce traffic congestion but that it is in the self-interest of business to do so. Management was also willing to participate in a cooperative effort to help solve area traffic problems.

Orange County, California, has experienced tremendous growth in jobs and population over the past 15 years and this urbanization trend is expected to continue into the 21st century. Unlike many urbanized areas with jobs concentrated in one central business district (CBD), Orange County has experienced the emergence of a complex grouping of at least 11 major activity centers spread along transportation corridors in central and north county (Figure 1). These centers cumulatively accounted for over 300,000 jobs in 1985 and are expected to contain more than 425,000 jobs (a 42 percent increase) by the year 2000.

The county's current transportation infrastructure already has been overburdened by existing travel demand associated with these centers. Even with planned and programmed improvements to the transportation network, commute times will continue to lengthen and commuter stress will become more pervasive during peak hours. Public agencies are attacking the problem with a complexity of programs and actions aimed at enlarging the local transportation system, but the initiation of transportation demand management (TDM) actions within the activity centers is the additional ingredient needed to enhance commuter mobility in Orange County.

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FIGURE 1 Orange County activity centers.

The first step in planning and implementing TDM actions at an activity center is to obtain necessary information about travel characteristics in the center and the appropriateness of strategies for that area. The Orange County Transit District (OCTD) has recently conducted major transportation studies at two Orange County activity centers, one in Newport Beach (Newport Center) and one in the cities of Santa Ana and Costa Mesa (South Coast Metro), for these purposes. Although the findings from the South Coast Metro (SCM) activity center study as they specifically relate to TDM planning for that area

will be highlighted in this paper, the study actually had three major objectives, which will be discussed in the next section.

STUDY OBJECTIVES

The South Coast Metro study was initiated during 1985 by the OCTD in cooperation with other public agencies and local cities. The study had three planning and research objectives:

- To expand and update the existing database,
- To assess the effects of preferential facilities on ridesharing, and
- To investigate potential for TDM strategies and their implementation.

Database Development

Given the fast-growing nature of major activity centers in Orange County and their resultant traffic, existing studies of travel to these centers were insufficient for travel analysis, service development, and facilities design. In light of this, the first study objective was to expand and update the existing database of activity center employee travel information for application in planning studies and future marketing efforts for a preferential facilities program, as well as for transit service planning. The data collected from the study will also assist OCTD, the California State Department of Transportation (Caltrans), and others, in validating models used in travel forecasting.

Effects of Preferential Facilities on Ridesharing

Facilities for transit and high occupancy vehicles (HOVs) are receiving increased attention throughout the nation. Orange County is no exception to this current trend with the recent opening of the preferential HOV lanes on the Costa Mesa Freeway, the upcoming implementation of preferential lanes on the San Diego Freeway, and OCTD's recent initiation of a Transitway Program for Orange County. Nationwide studies show that exclusive facilities and lanes greatly affect commuters' propensities to form carpools and vanpools and ride transit thereby reducing overall vehicle volumes within travel corridors. With this in mind, the second project objective was to investigate the potential effects that bus and carpool lanes would have on ridesharing in Orange County.

Potential for TDM Implementation

Employers within a major activity center can play a significant role in developing and marketing programs for managing transportation demand to and within the activity center. Increasing numbers of employers have shown a willingness to take an active, rather than a passive, role in TDM programs.

However, little experience exists in conducting large-scale employer-based TDM programs within Orange County's major activity centers. Information is required pertaining to employer characteristics and their abilities to develop TDM programs within a major activity center. Toward this end, the third objective was to investigate the ability of employers within a major activity center to jointly develop, market, and implement a comprehensive TDM strategy with the assistance of local jurisdictions and public transportation providers.

Employers in the area have been contacted and progress has been made toward the initiation of a Transportation Management Association (TMA) in the area and the establishment of a TDM program for that activity center based on study findings.

METHOD

Sample

The South Coast Metro area contains approximately 1,114 employers with a total of 25,545 employees. The results presented in this paper are based on a representative sample of all employers in the South Coast Metro area with six or more employees. Three survey instruments were developed for the study: an employee questionnaire, an employer questionnaire, and a survey designed to be administered in a face-to-face interview with company executives.

The objectives of the employee survey were to

- Assess commuter travel characteristics including current mode and willingness to consider alternatives, trip distance and travel time, and origin and destination of work trip,
- Assess employee work schedule characteristics, and
- Assess employee need for a car before, during, and after work.

The objectives of the employer survey were to obtain a descriptive profile of employers including

- Parking costs and availability,
- Availability of on-site services,
- Ridesharing incentives offered, and
- Work schedule policy.

The objectives of the senior management survey were to

- Obtain upper management's perception of traffic conditions,
- Obtain perception of the effects of traffic on the organization, and
- Assess willingness to participate in a cooperative effort to help solve traffic problems.

Data Collection

With the assistance of Crain & Associates, data collection was conducted during October and November 1986. Data were collected from 2,600 employees, which represented an overall response rate of 57 percent. One hundred forty-four employer surveys were completed, which represented a 47 percent response rate; the response rate for large organizations (more than 100 employees) was substantially higher (79 percent). In February and March 1987, the interviews were completed with members of senior management of 24 of the 37 largest firms in the area, for a 65 percent response rate.

PERCEPTION OF CONGESTION AND STRESS

Employee Survey Results

The responses of employees indicated that they experienced significant stress and congestion during their commute to work. About a fourth (28 percent) responded that their commute was more stressful than their other daily activities. Three-fourths (77 percent) stated that streets were congested, whereas 85 percent believed that freeways they used during their commute were congested. A third (34 percent) indicated that the freeways were always congested (Table 1).

TABLE 1 EMPLOYEE PERCEPTION OF CONGESTION DURING COMMUTE

	Freeways (%)	Streets (%)
Always congested	34	18
Usually congested	29	26
Sometimes congested	22	33
Rarely congested	10	17
Never congested	5	6
Total	100	100

The longer the commute time the more severe the congestion was perceived to be. The average commute time of those who perceived the freeways as "always congested" was 43 min, compared with 22 min for those who considered them "never congested." A similar pattern occurred for perception of street congestion.

Senior Management Survey Results

Perception of Traffic Congestion and Its Effects

Given a list of social issues, more executives indicated that traffic congestion affected their company more than any other issue. Moreover, as shown in Table 2, these executives believed that the effect of traffic congestion was severe.

TABLE 2 SENIOR MANAGEMENT PERCEPTION OF EFFECTS OF SOCIAL ISSUES ON THEIR ORGANIZATIONS

Social Issue	Percent Indicating Issue Affects Company[a]	Extent of Effect[b] (%)			
		4	3	2	1
Traffic congestion	88	50	25	15	10
A shortage of affordable housing	54	15	23	39	23
Parking	33	12	50	12	26
Quality of schools	25	0	17	68	17
Crime	17	25	25	50	0

[a]Percentages represent those responding yes to each item separately.
[b]4 is severe; 1 is slight.

Although most executives (79 percent) indicated that their company would not consider relocating if traffic conditions got worse, over half (58 percent) believed that conditions adversely affected their operations. The ways in which operations were affected are shown in Table 3.

An overwhelming majority of managers (71 percent) believed that traffic conditions affected their employees. The ways in which management believed their employees were affected are presented in Table 4.

TABLE 3 SENIOR MANAGEMENT PERCEPTION OF EFFECTS OF TRAFFIC CONDITIONS ON COMPANY OPERATIONS

Effect	Percent[a]
Delivery of products	29
Employee tardiness	29
Accessibility problems for clients or customers	21
Health claims, stress	14
Shrinking of recruitment base	7

[a]Percentages represent those mentioning each item.

A majority of executives (61 percent) also believed that traffic in the South Coast Metro area was better when their company first moved to the area. A third (39 percent) believed that traffic in the area had become worse than in other parts of Orange County; very few (9 percent) believed that it was better. The majority (62 percent) believed that traffic conditions will be much worse in 5 yr; only a small proportion (17 percent) foresaw that conditions would be about the same or somewhat better.

TABLE 4 SENIOR MANAGEMENT PERCEPTION OF EFFECTS OF TRAFFIC CONDITIONS ON EMPLOYEES

Effect	Percent[a]
Tardiness	77
Stress	18
Absenteeism	12
Health claims	6

[a]Percentages represent those mentioning each item separately.

Responsibility of Employers

The majority of executives believed that employers have a responsibility to help reduce traffic problems in South Coast Metro. Moreover, they believed that it is in the long-run self-interest of business to get directly involved in reducing traffic congestion (Table 5).

POTENTIAL FOR CARPOOLING OR VANPOOLING

Employee Survey Results

Distance and Time

Almost half of all employees (40 percent) working in the South Coast Metro area commuted 10 or more mi to work (one way). The majority of employees (76 percent) had commutes of half an hour or less.

Car Availability

Almost all employees (97 percent) had a car available to get to work, but more than a fourth of the employees (28 percent)

TABLE 5 SENIOR MANAGEMENT PERCEPTION OF THE RESPONSIBILITY OF EMPLOYERS

Statement	Percent in Agreement				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Employers have a responsibility to help reduce traffic problems in SCM	17	66	13	4	0
Attempting to solve transportation problems interferes with main purpose of business	8	8	8	55	21
It is in the long-run self-interest of business to get directly involved in reducing traffic congestion	22	70	4	4	0

indicated that they had no need for their personal car at work any day during their work week. However, a third (37 percent) indicated that they needed their car at work every day.

Stops on Way to and from Work

While 62 percent responded that they went directly to work with no stops, 5 days a week, most people (90 percent) did make stops on the way home. The most frequently mentioned reasons for stopping included shopping (43 percent), banking (25 percent), and eating (18 percent).

Current Mode Choice and Willingness To Change

The usual mode chosen by employees to get to work was driving alone (89.8 percent). However, 57 percent indicated a willingness to consider other commute modes at least 2 days a week. A comparison of current mode choice and modes employees would consider is presented in Figure 2.

Transit

The most frequently mentioned reasons for not using transit were that employees needed a car before or after work (37 percent) and that there was no direct service (29 percent). Infrequent service (17 percent) and lack of information (11 percent) were the next frequently mentioned reasons for not using the bus.

Perception of Ridesharing Incentives

Of the possible ridesharing incentives that employers might offer, employees were most favorable about "adjustments to work schedules" and "providing company vanpools or buspools."

Commuter Lane

The opportunity to use a commuter lane was also viewed as an important incentive for ridesharing. A fourth (26 percent) of those who currently used a planned commuter lane indicated that they would be likely to try carpooling, vanpooling, or riding the bus in order to use a commuter lane.

Employer Survey Results

Levels of Support Offered by Employers

Most employers did not currently provide information, active assistance, or operational support for ridesharing. They had not typically provided them in the past, nor did they plan to provide them in the future. Larger firms were more likely to offer incentives than smaller firms. A comparison of the ridesharing incentives offered by large and small organizations is presented in Table 6.

Availability of Company Car

Most organizations (69 percent) did not have company cars at their work sites. In those organizations with company cars, the

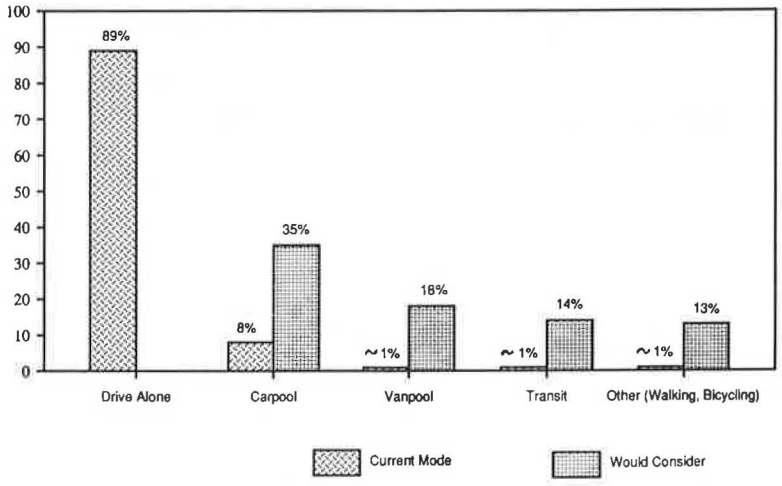

FIGURE 2 Employee commute modes.

TABLE 6 COMPARISON OF LEVELS OF SUPPORT OFFERED BY COMPANY SIZE

Support	Percent of Employers[a]	
	With Less Than 100 Employees	With More Than 100 Employees
Information		
Distribute ridesharing information to new employees	0	23
Display bus schedules and maps	3	20
Distribute matchlists	0	20
Display posters	0	27
Prepare Air Quality Management District (AQMD) traffic plan	0	17
Active Assistance		
Employ transportation coordinator	0	7
Conduct meetings for potential ridesharers	2	0
Find riders for vanpools	2	3
Operational Support		
Operate vanpools	2	7
Subsidize vanpools	2	0
Provide preferential parking for carpools	2	10
Sell monthly bus passes	0	10
Subsidize monthly bus passes	2	3
Conduct contests	0	0

[a]Percentages represent those responding yes to each item separately.

availability was typically limited to management and, to a lesser extent, professional and technical workers.

Senior Management Survey Results

Perception of the Effectiveness of Ridesharing Actions

Most executives (71 percent) believed that providing more information to commuters about carpool, vanpool, and bus options and encouraging them to use these commuting modes would be slightly effective in improving mobility in the area. Only 16 percent believed that this strategy would not be effective at all.

Interest in Increasing Ridesharing Incentives Offered

The majority of senior management (72 percent) indicated that their company would be "somewhat interested" in considering increased incentives to encourage carpooling, vanpooling, or riding the bus. A small minority (13 percent) expressed no interest at all.

POTENTIAL FOR ALTERNATIVE WORK SCHEDULES

Employee Survey Results

Employee Work Hours

Sixty-five percent of all employees arrived at work in the 7:00 to 9:00 a.m. peak period. A fourth of this group, or 17 percent of the entire employee population, arrived at 8:00 a.m. The distribution of morning peak period arrival times is presented in Figure 3.

Sixty-seven percent of all employees left work in the 4:00 to 6:00 p.m. peak period. About a fourth of this group, or 18 percent of the entire employee population, left at 5:00 p.m. A distribution of p.m. peak period departure times is presented in Figure 4.

Employee Willingness To Change Hours

If employers allowed their employees to change their starting times, they would begin an average of 25 min earlier. The largest proportion (16 percent) indicated that they would start at 7:00 a.m.

Flexibility of Schedules

Most employees (71 percent) had no choice in determining their work schedules (i.e., they were required to arrive and depart at specific times set by their employers). About 13 percent could choose times that then had to be approved, and about 16 percent had considerable flexibility (i.e., they could vary their start and end times on a day-to-day basis).

Employer Survey Results

About a fourth of all employers currently offered staggered work hours (29 percent) or flex-time (23 percent). Few employers indicated that they were considering any of the schedules for future use.

Senior Management Survey Results

Interest in Adopting Alternative Work Hours

There was some interest on the part of senior management in the large organizations to consider adoption of an alternative work schedule; 55 percent were somewhat or very interested in adopting one.

Perception of Effects of Alternative Schedules on Traffic

Most executives (96 percent) believed that allowing employees to shift work schedules to avoid peak-hour traffic was an

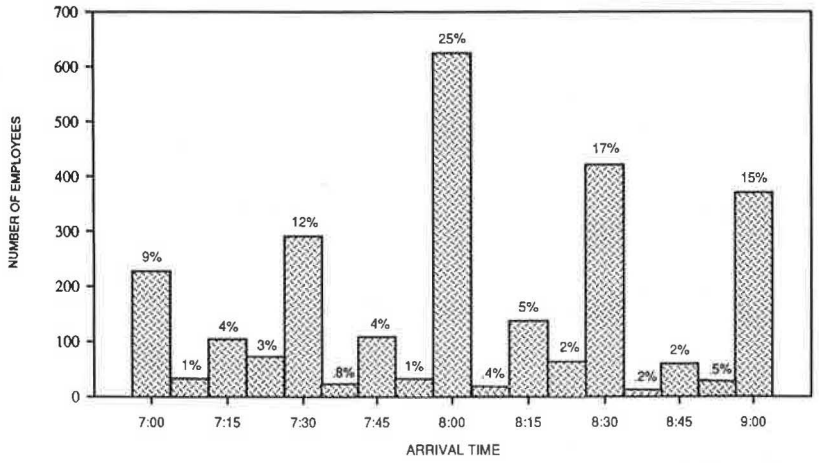

FIGURE 3 Employee arrival times (peak period 7:00 a.m. to 9:00 a.m.).

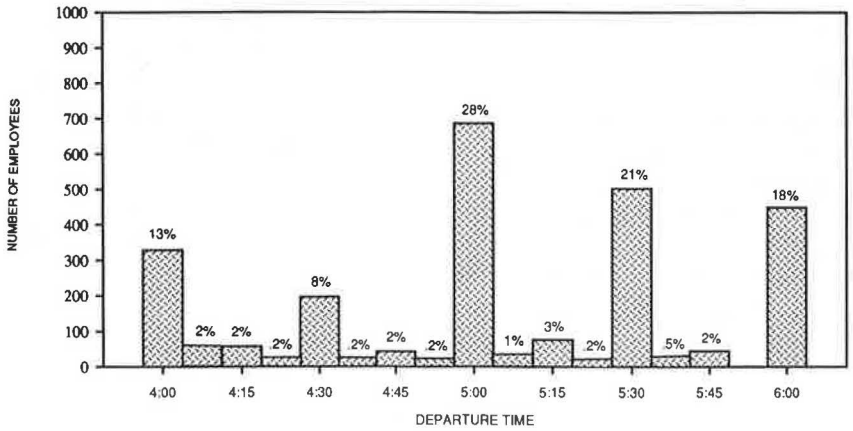

FIGURE 4 Employee departure times (peak period 4:00 p.m. to 6:00 p.m.).

effective strategy for reducing traffic in the South Coast Metro area.

POTENTIAL FOR TRAFFIC REROUTING

Employee Survey Results

One freeway route was used by a larger percentage (43 percent) of employees than any other. Of those using a freeway, one exit was used by a third (30 percent) of all employees.

POTENTIAL FOR PARKING MANAGEMENT STRATEGIES

Employee Survey Results

Parking Costs

Most employees (93 percent) indicated that they did not pay for parking.

Parking Problems

Almost all employees (91 percent) indicated that they had no difficulty in finding a parking space at the start of their work day. However, over a fourth (27 percent) indicated that they experienced some difficulty in finding a parking space if they left work and returned during the day.

Employer Survey Results

Parking Costs to Employers

Most of the employers (80 percent) indicated that they did not pay for the cost of employee parking. Approximately a third of these employers owned their own lots. The remaining 20 percent paid for all or part of the cost of employee parking. The cost to these employers ranged from $20 to $55 a month per employee; the average cost was $41 a month.

Parking Costs to Employees

Most employers (88 percent) indicated that parking was free for their employees. The cost to employees of the remaining companies ranged from $20 to $75 a month; the average cost was $41 a month.

Parking Subsidies for Ridesharing

Only one organization indicated that it offered a special parking subsidy for employees who participated in ridesharing.

Parking Situation

Although most employers did not perceive a parking shortage for employees on a regular basis, over a fourth noted occasional shortages for employees. A larger proportion indicated that shortages for visitors occurred (Table 7).

TABLE 7 EMPLOYER PERCEPTION OF PARKING SITUATION

	Percent of Employers	
Parking Situation	Employees	Visitors
No shortages	64	49
Occasional shortages	29	41
Frequent shortages	7	10
Total	100	100

POTENTIAL FOR ON-SITE SERVICES

Employee Survey Results

Use of Facilities During the Work Day

Employees used eating facilities both in the South Coast Plaza area (46 percent) and outside the area (34 percent) during the work day more than they used any other type of facility. The overwhelming majority (over 70 percent) used these facilities more than once a week. Banking facilities were the next most frequently mentioned type (27 percent in the South Coast Plaza area and 29 percent outside the area).

Frequency of Use

Eating facilities were also likely to be used several times a week; about three-fourths used eating facilities within the South Coast Plaza area more than once a week and almost as many used the facilities outside that area more than once a week (71 percent).

While only about a tenth of all employees (12 percent) used exercise facilities, it is interesting to note that those who did use them did so several times a week.

Differences Between Zones

As would be expected, the use of facilities inside or outside the South Coast Plaza area varied by zone; use of facilities in the Plaza area was greater for those working in that area.

Employer Survey Results

Location of Services

A large percentage of employers indicated that a cafeteria or restaurant was located on site (38 percent) or within three blocks of their site (61 percent). The accessibility of banks or credit unions was similar.

TMA PARTICIPATION

Senior Management Survey Results

Willingness To Participate

The overwhelming majority (83 percent) of executives indicated that they would want to participate in the cooperative effort of South Coast business people to help solve the traffic problems in the area.

Preferred Arrangement

The overwhelming majority of executives (95 percent) viewed a joint public and private effort as the most appropriate means for organizing a transportation management program for South Coast Metro. They believed that both groups were needed for the program to be effective.

Preferred Organizational Arrangement

Respondents were asked which organizational arrangement they would prefer if the Executive Task Force were made into a permanent organization. The responses were divided: a little over a third (36 percent) preferred that it continue as an Executive Task Force of OCTD; an equal proportion (36 percent) preferred that a new and totally separate organization be created; and the remainder (27 percent) preferred that it be piggybacked onto an existing business association such as the South Coast Metro Alliance, the Personnel Industrial Relations Association (PIRA), or the Personnel Employee Management Association (PERMA).

CONCLUSIONS

The findings of this market research study suggest that major opportunities exist to improve mobility through the implementation of TDM measures. The opportunity to improve mobility through parking management strategies is evidenced by the availability of adequate, low-fee parking, which is a disincentive for ridesharing. In addition, some parking problems are evolving as the activity center continues to grow in size and density.

The potential for traffic rerouting is suggested by the heavy use of one freeway and exit, and by the perception of significant congestion. Alternative work hour programs could also make a substantial contribution to reducing demand given the peaking of employee arrival and departure times.

Moreover, there is a willingness on the part of both employees and senior management to consider alternatives that would decrease demand on the system. Employees are willing to consider commute alternatives to driving alone and to change their work hours.

Senior management expressed interest in adopting alternative work hour programs and in offering increased incentives to encourage carpooling, vanpooling, or riding the bus. They also believe not only that employers have responsibility to help reduce traffic problems, but that it is in the long-term self-interest of business to get directly involved in reducing traffic congestion. Furthermore, executives indicated that they would participate in a cooperative effort to help solve traffic problems in the area.

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Commuting Behavior of Hawaii State Workers in Honolulu: Implications for Transportation System Management Strategies

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A survey of state employees working in downtown Honolulu was conducted to determine what measures could be undertaken to help reduce traffic congestion. The results of this study suggest that several transportation system management (TSM) strategies be implemented, including the expansion of existing high occupancy vehicle (HOV) lanes and changes in parking rates to encourage carpools and vanpools. High interest in express bus service among workers and their willingness to pay extra for a guaranteed seat indicate a possible market for paratransit services such as commercial vanpools and subscription buses. Given the high rate of family carpooling in the population studied, it is believed that restructuring the work schedules of state employees by staggering hours or initiating a 4-day work week will have only a minimal effect on peak-hour traffic congestion.

Like most major cities throughout the United States, Honolulu suffers severe weekday traffic congestion along the major arteries into its downtown area during the morning and evening commuting hours. With only one or two routes into town from each direction, and virtually no alternates because of the topography of Oahu, the island on which Honolulu is located, peak-hour traffic congestion is far worse than might be expected for a city with a population of less than 1 million people. A typical 10-mi commute into the city, for example, takes 45 to 60 min during the rush hour. And recent data show that the average time of work trips is roughly half an hour. This is more than a third longer than the national average (*1*), even though Oahu is only 45 mi long at its widest point.

With traffic congestion being the major concern of the voting public, several government proposals have been made to reduce congestion by changing the work schedules and commuting habits of state workers on Oahu, the most populous island in the state. Since information on the commuting behavior of state workers was needed to assess the potential effects of such plans, a survey of state employees was conducted to provide the necessary data base.

METHODS

Questionnaire

The questionnaire was designed to obtain three types of data: demographics, travel behavior, and the interest and attitudes of commuters toward various transportation alternatives. The questionnaire, which was developed from previous survey instruments reported in the transportation literature (*2, 3*), was distributed to a random sample of state workers in December 1986.

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Sampling

The population of interest was the approximately 11,000 state employees working in government offices in downtown Honolulu. Cluster sampling was used to achieve a representative sample of this population by randomly selecting a number of downtown offices from each of the state's departments. The number of offices selected from each department was roughly proportional to the number of downtown offices in each department. A predetermined number of questionnaires was sent to each office with instructions to distribute them in alphabetical order by last name, skipping every other employee. A total of 1,005 questionnaires were distributed, 739 of which were completed and returned, yielding a response rate of roughly 74 percent.

Statistical Analyses

The overall sampling error for the study is approximately ±1.8 percent. Since this is only a crude estimate of the standard error of measurement for those measures in which participants are classified into dichotomous categories, various statistical tests were used to analyze the data more thoroughly. Frequency data, such as the percentage of people using different modes (mode split), were analyzed by chi square (χ^2). Continuous variables, such as miles traveled to work, were analyzed using parametric statistical tests, which use the standard error of the mean (SEM) to assess differences between group means.

Many of the questionnaire items required participants to rate their attitudes and opinions on a scale of 0 through 10. These were analyzed in two ways: first, as dichotomous variables in which respondents who gave a zero rating were contrasted with respondents who gave ratings of 1 through 10 for the item; second, respondents' ratings of 1 through 10 were analyzed separately as continuous variables. In this way, a question such as, "How interested are you in commuting by express bus?" was broken into two logical and statistically independent components for analysis: "Are you interested in commuting by

bus?" and "If you are interested, how interested are you?" The first analysis gives the proportion of people who are interested to some degree (ratings between 1 and 10) versus those who are not interested (rating = 0). The second analysis gives a measurement of the degree of interest of those people who express an interest.

There were three advantages to this approach. It allowed a simplification of the questionnaire by eliminating the need for many two-part questions. It permitted a determination of people's strength of interest or likelihood of engaging in some behavior, which cannot be assessed by commonly used, forced-choice questions. And it provided two independent measures of people's attitudes and behavioral inclinations.

RESULTS AND DISCUSSION

Mode Choice

As expected, the automobile proved to be the most commonly used travel mode with 78.3 percent of the employees surveyed commuting daily to and from work by car (includes trucks and vans). Approximately 12.5 percent of workers in the sample make the daily work trip by bus, which is the only public transit. Another 7.2 percent commute by car less than 5 days per week, using the bus to get to or from work when they do not travel by car. The percentage of workers who walk, or ride a bicycle or motorcycle, to work is very small (2 percent). Roughly 47 percent of the workers in the sample who regularly commute by automobile travel alone. About 31 percent share a ride with one other person, and nearly 23 percent commute with three or more people. Thus, as found in other urban areas (*4*), a majority of carpools consist of only two people.

To examine carpool composition, carpools were divided into three categories: carpools whose members are all from the same household (family carpools); carpools composed of people who are not from the same household, such as friends and coworkers (nonfamily); and carpools composed of some combination of the two (mixed). These data reveal that a vast majority of carpools with two or more people are composed of people from the same household, with family carpools accounting for a significantly higher percentage of all carpools (80.7 percent) than the two other categories combined ($\chi^2 = 123.6$, $df = 1$, $p < 0.001$). The percentage (14.7 percent) of nonfamily carpools in the sample was also reliably greater than the percentage (4.6 percent) of mixed carpools ($\chi^2 = 17.28$, $df = 1$, $p < 0.001$). No difference was found in the sizes of family and nonfamily carpools, which contained, on average, 2.6 and 2.3 people, respectively.

Of those carpools with three or more people, it was found that over 78 percent are made up solely of family members, and that this percentage is reliably greater than that of other types of carpools ($\chi^2 = 42.12$, $df = 1$, $p < 0.001$). The percentages of nonfamily (10 percent) and mixed (11.5 percent) carpools with three or more people are comparable.

Travel Distance

The daily one-way commute distances of all participants in the survey are shown in Figure 1. About 32 percent of employees living within 5 mi of work commutes by bus, 2 percent uses a bicycle or walks, and the remaining 66 percent is split almost evenly between carpoolers and solo drivers. The proportion of transit users decreases to 15 to 20 percent at distances over 5 mi. No reliable differences were found in the percentage of solo drivers and carpoolers at various distances.

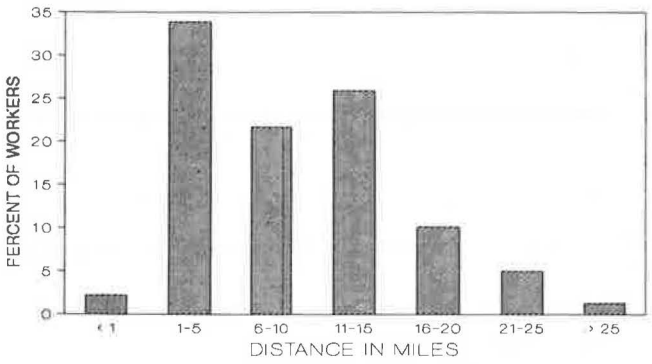

FIGURE 1 Distribution of the one-way commute distances of workers.

The mean commute distance for the entire sample is 9.7 mi, very close to the national average of 10 mi (*1*). Analysis of variance revealed that mean commute distance differs significantly across travel modes ($F = 5.23$, $df = 2, 686$, $p < 0.001$). On average, state workers who commute by bus travel a significantly shorter distance each way (mean = 7.7 mi, SEM = 0.6) than workers who carpool (mean = 10.3, SEM = 0.4) or drive alone (mean = 9.7, SEM = 0.6; $t = 3.09$, $df = 687$, $p < 0.001$). These figures are also comparable with national averages (*1*), although it would be expected that the average commute distance of carpoolers would be greater than that of solo drivers (*1, 5, 6*). The absence of any difference in the work-trip distances of solo drivers and carpoolers in the present sample may be explained by the fact that most of the carpoolers in the study belong to family carpools, which, according to Richardson and Young (*7*), are more similar in their travel characteristics to solo drivers than to nonfamily carpools.

Travel Time

The one-way commuting time for all employees averages 31.4 min, which is almost 10 min longer than the national average. The average travel time at various distances is presented in Table 1. Based on these data it is calculated that average commuting travel speed lies between 10 and 20 mph, which is far below the national average of 29 mph.

TABLE 1 TRAVEL TIME OF STATE EMPLOYEES AS A FUNCTION OF COMMUTE DISTANCE

	Time in Minutes	
Miles	Mean	SEM
<5	17.9	0.7
5–10	26.7	0.9
10–15	40.3	1.0
>15	51.6	2.0

Since mode of travel obviously affects travel time, the travel times for car and bus users were compared. Surprisingly, the average travel time of people who drive less than 10 mi to work

is only 1 min (or 4.5 percent) less than that for people who take the bus the same distance (car = 21.5 min, bus = 22.6 min). For workers who commute more than 10 mi each way, taking a car reduces travel time from 53.5 to 44.1 min, or 17.6 percent, compared to taking the bus. These data are striking because national statistics indicate that trips by public transit take twice as much time, on average, as trips by private vehicle. Of equal interest is the fact that commuters think they save far more time by traveling by car than they actually do. It was found that workers who commute less than 10 mi by car believe that they achieve a 39 percent savings in time by doing so, and those who drive more than 10 mi estimate a 27.6 percent time savings over traveling by bus.

Express Bus Service

Because it was suspected that the additional time (real or perceived) associated with bus travel deters transit use, participants were asked how interested they would be in express bus service. Specifically, they were asked to rate how likely they would be to use express bus service, on a scale of 0 through 10.

A significant percentage of respondents (57.9 percent) said they might use express bus service if it were available (χ^2 = 15.0, df = 1, $p < 0.001$). The average interest rating for those who reported that they were interested (i.e., rated their likelihood of taking the bus as 1 or higher) was 5.8 (SEM = 0.2) out of 10. Significantly more transit commuters (78.1 percent) than car commuters (53.2 percent) expressed a willingness to use an express bus (χ^2 = 27.12, df = 1, $p < 0.001$). Although the percentage of car commuters expressing an interest was reasonably high, those who said they were interested gave significantly (t = 3.89, df = 425, $p < 0.001$) lower interest ratings (mean = 4.8, SEM = 0.2) than did regular bus users (mean = 8.7, SEM = 0.2). Further analysis of these data revealed that a significantly higher percentage of carpoolers (56.6 percent) than solo drivers (47.4 percent) had a positive interest in commuting by express bus (χ^2 = 4.75, df = 1, $p < 0.05$). The two groups did not differ reliably with regard to their ratings of interest.

Thus, the primary market for express bus service consists of people who already use the bus. However, carpoolers provide a second potential market segment for such service. Although the overall interest is not as great as that among regular bus users, because carpoolers represent a larger proportion of the commuting population, this market may be substantial. It would therefore be valuable to provide the kind of transportation service that appeals to this market. To more clearly define the demand for express bus service, participants were asked to rate their interest in such service if the fare were increased by $0.50, or $1.00 round trip. A hypothetical fare increase of $0.50 round trip did not appreciably affect respondents' interest in the express bus; a significant majority (57.1 percent) still reported some degree of interest. The proportions of respondents who were and were not interested were essentially reversed when a $1 increase in the round-trip fare was posed, with 42.9 percent giving a positive interest rating and 57.1 percent rating their interest as zero. Overall, these findings indicate that demand for express bus service is relatively inelastic within this price range. To put these results in perspective, it should be noted that the current one-way fare for city buses on Oahu is $0.60, but most residents purchase bus passes that allow unlimited travel on the bus for $15 per month.

Value of a Bus Seat

Because comfort is considered an important—albeit, little studied—service characteristic favoring automobile use (2), and because buses on Oahu are extremely crowded during peak-hours, an attempt was made to gauge people's interest in an express bus if riders were guaranteed a seat at an additional cost of $1 to $5 round trip. These data were examined in two ways: first, in terms of people's present commute mode, and, second, in terms of commute distance. People's interest in express service if the fare were increased $1 round trip (without a guaranteed seat) provided a baseline against which to assess the value of a seat.

As shown in Figure 2, a large percentage of commuters reported an interest in taking an express bus if they were guaranteed a seat, even at a fare of $1 extra round trip. Overall, the percentage of respondents who appear to be willing to pay the additional dollar for a seat is almost as high as that interested in express bus service at the regular fare. Moreover, the concept of a guaranteed seat increased the number of people willing to pay an extra dollar for express bus service by over 20 percent.

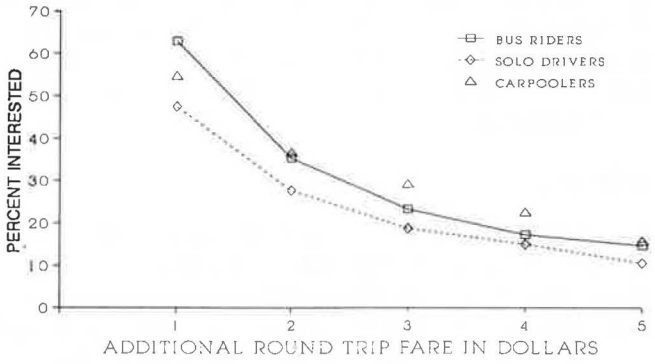

FIGURE 2 Percentage of workers interested in paying extra for a seat on an express bus, as a function of present mode.

Proportionally, regular bus riders showed the largest interest in express bus service at a fare increase of $1 round trip, followed by carpoolers and solo drivers, and this difference among groups was statistically reliable (χ^2 = 8.41, df = 2, $p < 0.02$). Increasing the price of a seat produced a systematic decline in the percentage of respondents interested in the service regardless of travel mode, although consistently fewer solo drivers expressed interest, at any fare, than other commuters.

A 3 × 5 analysis of variance, with repeated measures, showed that respondents' ratings of interest follow a similar decline as the fare is increased from $1 to $5, regardless of their usual mode of travel to work (F = 380.3, df = 4, 1,692, $p < 0.001$). Across groups, interest in taking the bus was highest if a seat cost only an extra $1 (mean = 6.0, SEM = 0.2). When the proposed round-trip fare was $5, interest was extremely low (mean = 0.6, SEM = 0.03).

If the value of a seat is viewed from another perspective, it can be seen that interest in paying extra for a seat is directly

related to commute distance (Figure 3). This is true in terms of both the percentage of people who commute various distances and their ratings of interest. Overall, the farther people travel to work, the greater their interest in a guaranteed seat, regardless of price ($F = 7.01$, $df = 3, 421$, $p < 0.001$).

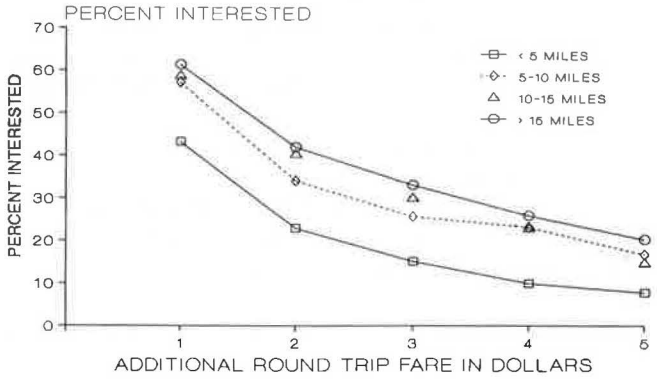

FIGURE 3 Percentage of workers interested in paying extra for a seat on an express bus, as a function of one-way commute distance.

Taken together, these analyses suggest that providing an alternate kind of bus service that ensures the rider a degree of comfort not guaranteed by the existing bus system could attract new riders, especially among those commuters who now drive farthest to work. The demand for express bus service with a guaranteed seat appears to be sufficiently large, even at higher fares, that such a service might be able to operate without governmental subsidy.

HOV Lanes

Because the state plans to expand the system of HOV lanes along the highways leading to downtown Honolulu, it was of interest to find out how useful people think HOV lanes are and how likely they are to use them. Specifically, participants were asked to rate (a) how much an HOV lane along the route they take to work would reduce their travel time and (b) how likely they would be to use it. Present and future HOV lanes on Oahu are intended for use only by carpools with three or more people, and this was explicitly stated in the survey instrument.

In examining the responses of car commuters (Table 2), it was found that ratings of time savings rose systematically as commute distance increased ($F = 27.14$, $df = 3, 608$, $p < 0.001$). There was, in addition, a significant effect of travel mode: carpoolers rated the time savings nearly twice as high as solo drivers ($F = 57.03$, $df = 1, 608$, $p < 0.001$).

Significant effects of distance ($\chi^2 = 42.14$, $df = 3$, $p < 0.001$) and mode ($\chi^2 = 45.68$, $df = 1$, $p < 0.001$) were also found for the proportions of people who said that they were at least somewhat likely to use an HOV lane and their ratings of how likely they were to use it (mode: $F = 131.68$, $df = 2, 576$, $p < 0.001$; distance: $F = 15.36$, $df = 3, 576$, $p < 0.001$). As seen in Table 2, both carpoolers and solo drivers are more likely to use an HOV lane the farther they live from work ($F = 18.76$, $df = 3, 608$, $p < 0.001$), but carpoolers say they are more likely to do so ($F = 107.62$, $df = 1, 608$, $p < 0.001$). Although the percentage of people belonging to two-person carpools who said that they were likely to use an HOV lane was substantially higher than that for people who drive alone, their likelihood of doing so is not very high, it appears. This, in part, appears to be a result of the composition of existing carpools, in that people in family carpools showed less interest than those in nonfamily carpools.

TABLE 2 PERCENT OF STATE EMPLOYEES SAYING THEY ARE LIKELY TO USE HOV LANES AND THEIR LIKELIHOOD RATINGS AS A FUNCTION OF TRAVEL MODE AND COMMUTE DISTANCE

		Miles			
Present Mode	Measure	<5	5–10	10–15	>15
Drive alone	%[a]	23.5	34.3	37.9	36.4
	$\bar{x}$[b]	3.1	2.6	3.6	4.7
Two-person carpool	%[a]	22.8	51.0	55.6	70.8
	$\bar{x}$[b]	4.5	5.2	5.1	4.8
Three-person carpool	%[a]	54.8	73.7	90.0	90.9
	$\bar{x}$[b]	5.3	8.9	8.1	9.0

[a] % = Percent of respondents saying that they are likely to use HOV lanes, that is, those giving ratings of 1 through 10.
[b] $\bar{x}$ = Mean rating of "how likely" they are; means are based on those respondents giving ratings of 1 through 10.

In sum, respondents who belong to carpools composed of three or more people are clearly the most likely to use HOV lanes, and their ratings are significantly higher than other carpoolers regardless of commute distance ($t = 9.15$, $df = 307$, $p < 0.001$). This difference between carpoolers is not surprising, since people traveling in three-person carpools could immediately use such lanes if they were available, whereas those in two-person carpools would have to find another rider before they could use the lane. The low likelihood ratings given by people in two-person carpools suggest that they are not inclined to seek additional riders in order to gain the benefits of using an HOV lane. This may reflect resistance on the part of family carpools to seeking additional riders from outside their own household.

A related series of questions helps to explain these results. These questions asked participants how likely they were to join a three-person carpool if doing so would reduce their travel time by 10 percent, 25 percent, or 40 percent. The data from people who drive alone and those who ride in two-person carpools are given in Table 3. As found for ratings of HOV lane use, which were presented in Table 2, solo drivers gave significantly lower ratings of their likelihood of carpooling ($F = 6.49$,

TABLE 3 RESPONDENTS' MEAN RATINGS OF THEIR LIKELIHOOD TO JOIN A THREE-PERSON CARPOOL IF DOING SO REDUCED THEIR TRAVEL TIME

		Reduction in Travel Time		
Present Mode	Miles to Work	10%	25%	40%
Drive alone	<5	3.2	3.9	5.3
	5–10	3.4	3.9	5.1
	10–15	3.2	4.4	6.3
	<15	4.8	5.9	7.4
Two-person carpool	<5	3.5	4.4	5.5
	5–10	3.3	4.1	6.0
	10–15	3.9	4.7	6.7
	>15	4.4	5.3	6.7

NOTE: Means are based on the data from those respondents saying they are likely to do so, that is, giving ratings of 1 through 10.

$df = 1, 434, p < 0.05$). More to the point, however, examination of the ratings of both groups to a 10 percent reduction in travel time shows that they are very close to their ratings of HOV lane use at all four commute distances (compare Tables 2 and 3). By contrast, their likelihood ratings for carpooling, if doing so could reduce travel time by 40 percent, consistently exceed their likelihood ratings for using HOV lanes. What these findings appear to indicate is that respondents who are not already in three-person carpools do not think that HOV lanes will save them enough time to make carpooling worth their while. Although the ratings increase with time savings ($F = 143.79$, $df = 2, 868$, $p < 0.001$), a significant interaction found between commute distance and amount of time savings (percent reduction) indicates that the effects of these two factors are additive ($F = 2.29$, $df = 2, 868$, $p < 0.05$), that is, the greater the distance traveled, the greater the value of the time savings to the commuter.

Parking Incentives and Disincentives

While access to an HOV lane provides some incentive for carpooling, it does not appear to be a strong incentive for many solo drivers, or even for those carpoolers who would have to find additional riders to use it. Because it was expected that this might be the case, participants were asked about the price they pay for parking and what changes in parking costs (decreasing costs for carpools or increasing costs for noncarpools) would alter their interest in carpooling. The three-person criterion of a carpool was used based on state policies and the legislative definition of carpooling pertaining to HOV lane use and parking at state facilities. It is state policy to provide preferential parking to employees who carpool with at least two other people, but it is not well known and has not been promoted.

It was found that 27 percent of the respondents who take their cars to work do not pay for parking. Roughly 68 percent of those who drive to work pay less than $10, whereas fewer than 11 percent pay over $10 per week. Because free parking is not provided for employees, many workers must be parking on residential streets situated a half mile or more from state offices. Those paying $10 or less per week probably park in state facilities or in commercial parking lots just outside the downtown area, while those paying more than this park in downtown commercial lots.

The responses of the sample to hypothetical increases and decreases in parking costs, respectively, are given in Tables 4 and 5. Only data from people who drive alone or commute in two-person carpools are presented since the interest was in seeing if the proposed incentives and disincentives would encourage the formation of carpools with three or more people. Ratings data were analyzed by analysis of variance, with mode (solo or two-person carpool) and present price paid for parking (zero, <$10, >$10) as between factors, and the hypothetical changes in cost as a within factor. Because present price paid for parking was not found to have an effect in any of the analyses, the data are collapsed across this factor in the tables.

As indicated in Table 4, both the percentage of people expressing an interest in carpooling and their ratings of interest increase with increases in hypothetical parking costs ($F = 46.68$, $df = 3, 1,287$, $p < 0.001$). Although people who currently commute in two-person carpools expressed somewhat greater willingness to form three-person carpools, no significant differences between modes were found for either measure.

TABLE 4 LIKELIHOOD OF JOINING A CARPOOL OF THREE OR MORE PEOPLE IF WEEKLY PARKING COSTS WERE INCREASED

		Rate Increase			
Present Mode	Measure	None	$10	$20	$30
Drive alone	%[a]	45.6	50.9	56.9	59.2
	$\bar{x}$[b]	2.9	3.9	5.0	6.3
Two-person carpool	%[a]	49.7	57.7	66.3	67.4
	$\bar{x}$[b]	3.2	4.3	5.1	6.0

[a] % = Percent of respondents saying they are likely to join a carpool with three or more people.

[b] $\bar{x}$ = Mean rating of "how likely" participants are to join a carpool of three or more people; means are based on those respondents giving ratings of 1 through 10.

TABLE 5 LIKELIHOOD OF JOINING A CARPOOL OF THREE OR MORE PEOPLE IF WEEKLY PARKING COSTS WERE DECREASED FOR SUCH CARPOOLS

		Rate Increase			
Present Mode	Measure	None	25%	50%	100%
Drive alone	%[a]	49.8	53.3	61.3	67.5
	$\bar{x}$[b]	3.0	3.9	4.9	6.4
Two-person carpool	%[a]	47.9	66.4	69.0	75.0
	$\bar{x}$[b]	3.1	4.8	5.8	6.8

[a] % = Percent of respondents saying they are likely to join a carpool with three or more people.

[b] $\bar{x}$ = Mean rating of "how likely" participants are to join a carpool of three or more people; means are based on those respondents giving ratings of 1 through 10.

Decreasing parking costs for carpools (Table 5) produced a similar increase in both the percentage of people (i.e., respondents who now pay for parking) who said they were likely to carpool, as well as their ratings ($F = 29.51$, $df = 3, 909$, $p < 0.001$). Again, no reliable differences between solo drivers and carpoolers were found for either measure. But when family and nonfamily carpoolers are compared, it was found that people in nonfamily carpools looked more favorably on expanding their carpool size in order to benefit from the incentives posed ($F = 3.94$, $df = 1, 163$, $p < 0.05$).

Work Schedules

The times that full-time state employees in the downtown area arrive at and depart from work are depicted in Figures 4 and 5, respectively. Since many downtown state offices permit workers to set their own schedules to some degree, a broad distribution of arrival and departure times is to be expected. Looking first at Figure 5, it can be seen that departure times are distributed over a period of almost 4 hr. Roughly 92 percent of departures occur within a 1½ hr period between 4:00 and 5:30 p.m. However, the greatest proportion (35.4 percent) of employees leaves for home at 4:30 p.m., the standard closing time for state offices. Since the work day is 8 hr and 45 min (including 45 min for lunch), the same distribution could be

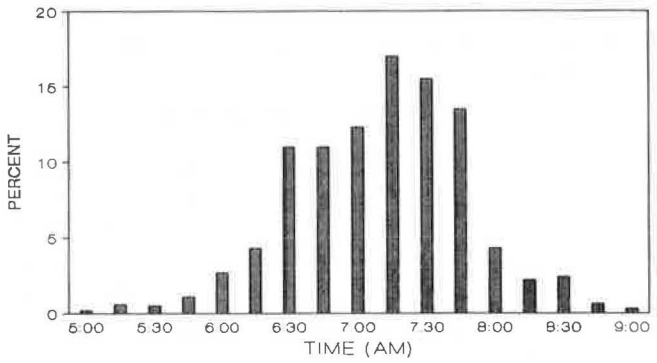

FIGURE 4 Distribution of times of arrival at work.

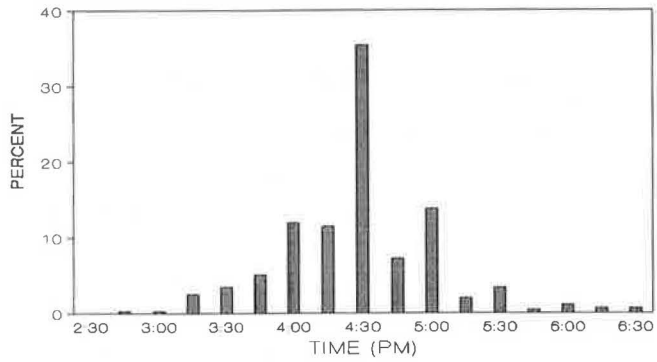

FIGURE 5 Distribution of times of departure from work.

expected for morning arrival at work, with a peak around 7:45 a.m. or so. Instead, as indicated in Figure 4, the distribution of arrivals is platykurtic, with a broad peak in arrivals shifted toward earlier times than would be expected. Although arrivals are distributed across the same time interval (4 hr), 92 percent of arrivals occur within a period of 2½ hr.

These data suggest that some workers, at least, may arrive at work earlier than they need to in order to avoid peak traffic congestion that occurs on all corridors into town (as measured 5 to 7 mi from downtown) between 6:15 and 7:15 a.m. The obvious implication of these data for proposals for shifting the work hours of state employees is that start times would have to be pushed back until after 8:00 a.m. if changes in work schedules were to have an effect on reducing congestion during the morning peak.

CONCLUSIONS AND RECOMMENDATIONS

The present results are consistent with the 1980 census showing that Hawaii has one of the highest rates of carpooling (two or more persons per vehicle) in the nation. The analyses reveal, however, that the vast majority (78 to 87 percent depending on carpool size) of carpoolers in the sample commute with only members of their family. This proportion is substantially higher than that reported nationally (*4, 6*). In part, the high rate of family carpooling in Hawaii is probably a consequence of the high percentage of households in which both spouses work and, as the data show, travel together to work. This high rate of family carpooling has implications for several of the transportation management strategies to be considered.

While the average one-way commute distance of the sample (9.7 mi) is comparable to national figures on work trips into the central city, travel time is considerably higher than the national average (*1*). Several factors contribute to this situation, including the limited number of highways into the city and the nature of these highways. Only one is a limited access freeway and the other four are actually suburban arterials, having numerous traffic lights and driveway accesses.

Since the data indicate that travel time is substantially less for car commuters than bus riders at distances of over 10 mi, time savings would appear to be a prime motive for traveling to work by car. The finding that workers who commute by car travel significantly farther than those who take the bus is consistent with this premise. That time savings is an important factor in the selection of the automobile as the preferred mode is, of course, well recognized (*2–4*). But, according to the results, the real time savings is not nearly so great as those who commute by car believe it to be. Such misjudgments and overestimates of savings are very common in commuters' perceptions of the characteristics of different modes (*8, 9*).

Two alternatives were examined to reduce travel time, which also help to reduce congestion generally. The first is the expansion of express bus service—buses that pick up passengers at a few key stops in suburban areas and then travel nonstop into the downtown area. The second is the extension of existing HOV lanes and the expansion of the HOV lane system.

Interest in express bus service is quite high among regular bus riders, and carpoolers, especially when passengers are guaranteed a seat. The degree of interest in a guaranteed seat on an express bus, even at a considerable increase in fare, suggests that a market exists for such service among people who commute more than 5 mi each way. The growth of commercial vanpool operations throughout the country demonstrates the feasibility of such alternate transportation modes as subscription buses and vans, and it is recommended that such services be provided by existing private transportation suppliers (tour companies) on Oahu.

Not surprisingly, the present results show that people who now commute in carpools of three or more people are quite interested in using HOV lanes. The problem is getting other people to carpool so that they can use the HOV lanes. The limited length of the existing lanes and, therefore, their limited potential time-savings do not seem to be sufficient to make carpooling worthwhile. As suggested by the findings of Margolin and Misch (*2*), the time savings afforded by an HOV lane must be close to 50 percent to be a strong inducement for solo drivers to carpool. And this, of course, also depends upon the distance traveled.

Nevertheless, the extension of existing HOV lanes and the establishment of HOV lanes along other corridors should increase carpooling, especially among automobile commuters traveling 10 mi or more (*5*). A combination of parking incentives for carpoolers and disincentives for solo drivers should also help to encourage carpooling, and a proposal to adjust the rate structure of parking facilities in accordance with the findings has been submitted to the agency that controls the state's parking lots. The findings provide limited evidence, however, that people belonging to family carpools of only two persons may be resistant to expanding their carpools to take advantage of these incentives.

Finally, the results indicate that restructuring the work schedules of state workers by staggering hours or instituting a 4-day work week will have only a minimal effect on traffic congestion during the peak period, at least during the morning. Most workers already seem to be arriving at work in order to avoid the "rush hour," between 6:15 and 7:15 a.m., and the number of state workers that would be removed from the highways between these times, by delaying start times or going to a 4-day week, would be small in comparison with the total traffic volume during this period. Nor is it clear that removing state workers from the roads at a given time, or on a given day, will reduce the number of cars. Given the large number of family carpools, unless the work or school schedules of all family members who now commute together are also changed, the same numbers of cars may simply be driven into town with fewer passengers.

Since these problems are clearly not unique to Hawaii and the results have much in common with research conducted in other major U.S. cities, it is believed that this assessment of the various transportation system management strategies will be of value to transportation planners in other metropolitan areas.

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Mobility and Specialized Transportation for Elderly and for Disabled Persons: A View from Four Selected Countries

WILLIAM G. BELL

A cross-cultural comparison of specialized transportation developments in Canada, Sweden, the United Kingdom, and the United States offers a useful perspective on contrasting policy and practices. The United States, in contrast to the other three industrial countries, gives major policy attention to both the elderly and the disabled, whereas the other three countries regard the disabled, regardless of age, as the primary target group for specialized transit service and support. A number of features and approaches in the four countries are revealed, among them the common high subsidization of special transport service from public funds ranging from approximately 76 percent in the United States to an estimated 92 percent (for disabled riders) in Canada. In Sweden, where the data on subsidization are firm, the public subsidy for the disabled who qualify for specialized transport, 85 percent of whom are 65 years and over, is 80 percent of costs.

The intent of this paper is to contrast and compare some aspects of specialized transportation developments, in terms of policy and practices, in four selected industrial countries, namely, Canada, Sweden, the United Kingdom, and the United States. These countries were selected for review largely because there are comparable data available in the literature.

Specialized transportation is a term of choice, and refers to that form of transportation concerned with selected groups in society whose mobility may be impaired when contrasted to other groups. Characteristically these groups, largely composed of older people and disabled persons, are restricted in their normal mobility, for reasons both social and economic, from using such generic forms of mobility as walking, private automobiles, or public transit services, where the latter are available. Transportation planners have not agreed on a single term to designate this new branch of the broad transportation network; some call this new and burgeoning field paratransit, or community transportation, or specialized transportation.

Attention to the issue of mobility for transportation-disadvantaged groups has emerged as a priority in developing as well as developed countries, focused primarily on older persons and disabled persons, premised on the issue of equity and the normalization principle (*1*). Some have argued that the capacity to move with reasonable ease from one place to another, which many nonelderly and nondisabled persons tend to take for granted, represents a basic determinant of the quality of an individual's life (*2*). Others have argued more strongly that mobility for special groups has the status of a civil right (*3*). It has been pointed out that older people, for example, do not regard mobility as an abstract concept. Rather, they value mobility as access to good health care, visitations with family and friends, opportunities for recreation, shopping in major establishments and, in some cases, an opportunity to continue in the labor force. Thus, the availability of specialized or personal transportation concretizes the level of an individual's mobility. The presence or absence of appropriate transportation resources can be the means to either integrate or isolate a person in relation to his or her environment. It has been argued that in the case of older people, the availability of transportation at a reasonable cost is a key ingredient in a potentially productive and healthy old age, especially for those who might otherwise be transportation disadvantaged.

To attempt comprehensive coverage of specialized transportation developments in the four countries selected is neither feasible nor possible. The material to follow, therefore, will highlight some of the essential features of socially provided transit service to elderly and disabled persons.

Since the focus of this paper is on publicly provided transportation for aging and disabled persons, this paper will not touch on privately provided forms of transportation. For example, there will be no discussion of walking practices among the elderly or use of private automobiles and vans, whether modified for the disabled or not. There is, however, acknowledgment that the vast majority of older people, regardless of the country of residence, prefer and use the automobile in far greater proportion than public buses or other such conveyances. In the United States, older people as well as younger people prefer and use the automobile. As one researcher found (*2*), "Eighty-nine percent of all vehicle trips made by people over the age of 65 were made in automobiles, though the elderly were more likely than younger groups to be passengers and somewhat less likely to be drivers. Only 7 percent of trips by older people in Los Angeles were made on public transit."

One way of estimating the significance of a new field is the extent and quality of its professional literature. Since the late 1970s a remarkable and still expanding literature on specialized transportation has emerged, much of it derived from research and recent service demonstrations. The writing has come mainly out of Western countries including Europe, Canada, and the United States. Enrichment of the literature and cross-cultural contributions can be attributed in part to four publications collating papers from recent international conferences on mobility and transport for older people and disabled persons (*4–7*). These materials were the product of the first four international conferences held in the United Kingdom in 1978 and

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1981, in the United States in 1984, and in Canada in 1986. Much of the material in this paper will use data that came to light from these four international events. The fifth international conference will be held in Stockholm, Sweden, in May 1989.

LINKING MOBILITY REQUIREMENTS OF ELDERLY WITH DISABLED PERSONS

Because not all elderly are handicapped and not all handicapped are elderly, a basic issue of national policy and local service provision is the linkage of these two groups, as reflected in legislation, the literature, and the operations of transportation agencies. On a cross-cultural level the respective approaches to merging or separating the mobility requirements of these two population groups may be a function of policy preferences, legislative intent, or the respective political power of older persons and disabled persons in that society (*8*). The travel needs of both groups may overlap but they are not necessarily identical. One general definition suggests that 25 to 40 percent of all elderly are disabled, hence they require specialized services.

On the issue of cross-national comparisons of analogous services, Katz (*9*) cites this caveat:

> Because of different embedded cultural assumptions in different countries, successful methods and technologies from one country cannot automatically serve as models for another country unless the two countries share similar values, beliefs, attitudes, resources, demographies, and so on. Furthermore, one may find that there are other means of addressing the same problem in another culture to which neither country was fully aware, since a particular approach was taken for granted as the 'normal' way to do things.

Comparative population statistics on Canada, Sweden, the United Kingdom, and the United States are presented in Table 1. Note that comparable firm statistics on the variations in the proportion of disabled persons in these four countries are not available. A 1986 report by the European Conference of Ministers of Transport (ECMT) (*11*) offers this comment:

> For any one country there is often a range of estimates provided by different sources. . . . The differences appear to be mainly due to differences in definition, or in the quality of data collection, rather than to real differences between the various countries. . . . A reasonable estimate (in the ECMT countries) appears to be about 10 percent. The ECMT report notes that the 10 percent estimate was also the figure used during the UN [United Nations] International Year of the Disabled. Since Canada, Sweden, and the United Kingdom are members of ECMT, the 10 percent estimate is a useful one.

TABLE 1 COMPARATIVE STATISTICS ON CANADA, SWEDEN, THE UNITED KINGDOM, AND THE UNITED STATES, 1987 (*10*)

Statistic	Canada	Sweden	United Kingdom	United States
Estimated population (in millions)	25.9	8.4	56.8	243.8
Proportion of population 65+ years (%)	10	17	15	12

In Canada, Sweden, the United Kingdom, and other European countries, the disabled are the primary group for whom specialized transit services are designed and operated. In these countries age is irrelevant in qualifying for designated special transit services. Specific handicapping conditions constitute admission to specialized services.

By contrast, in the United States local transportation services are expected to target both groups uniformly, addressing the able-bodied aging as well as the disabled of all ages. In the United States the aging and the disabled are treated by specialized transit as a single constituency, whereas in most Western countries they are treated as two constituencies.

The European and Canadian approach does not imply that aging persons are ignored in their respective countries. For example, they may qualify for special attention on public transit systems in the form of reduced or concessionary fares, and in the case of Sweden, 85 percent of the disabled riders who qualify for Sweden's specialized services are aged 65 years and above (*12*).

Combining the elderly with the handicapped in local special transit services has generated both positive and negative responses. On the negative side, many able-bodied elderly tend to resent the implication that aged persons are "like" the handicapped. On the positive side, grouping aging persons with the disabled may have resulted in more attention to the mobility needs of elders than might otherwise have been the case (*2*).

On balance, it may be more advantageous for the elderly in some countries to be grouped with the handicapped in order to gain the policy attention of decision makers. Collaboration by both groups on transportation issues is more desirable than having older people forced to compete with the handicapped for limited transportation resources.

As an observation on the issue of handicapped persons as the target for special transport services, there is variance among countries on the central handicapped constituency of interest to specialized services; there tends to be a bias favoring the physically impaired and less apparent concern for the sensory impaired such as the sightless or the hard of hearing. Sweden's special transport system appears to be more comprehensive in scope and serves all handicapped persons including the mentally ill.

BASES OF SPECIALIZED TRANSPORTATION EFFORTS

Specialized transportation has established itself as an integral part of the broad transportation network of services in most industrial or developed countries. The movement that put forth the view that certain groups in society had a claim on a country's resources and were entitled to a measure of mobility approximating that enjoyed by others in society rests on legal, ethical, and political grounds.

Legal Grounds

Canada, perhaps, has gone further than any country in asserting the legal grounds for service to the handicapped by both the general transportation system and special transit programs. Support for the rights of the handicapped rests on sections of the National Transportation Act, the Canadian Human Rights

Act, and the recently approved Canadian Charter of Rights and Freedoms, among others, all of which address aspects of avoidance of discrimination based on physical disability (*3, 13*).

Also important in the annals of Canadian law is the landmark decision by the Canadian Rail Transport Committee in the case of Kelly v. VIA Rail Canada, 1 CHRR D/97 at 107/8 (1980) (*14*). The case involved Clariss Kelly, a young law student in a wheelchair who sought to travel from her home to school and back by train. The nationalized railway, VIA Canada, denied her assistance to board the train and required that she be accompanied by an attendant who would have to pay a separate fare. The commission ruled in favor of Kelly and established what has come to be known as the Canadian Model of Accessibility: *self determination*, as to whether an aide is required; *one person/one fare*, whereby an attendant is included on the one ticket; *equality of access*, requiring the railroad to provide manual boarding for disabled persons; and *dignity of risk*, enjoining the railroad from extracting waivers of liability from handicapped travelers.

Legal provisions in other countries establishing national policy on the handicapped and elderly are less elaborate than in Canada but no less effective. In the United States there are sections in two acts worth noting, Section 5.04 of the Rehabilitation Act of 1973, and Section 16(b)(2) of the 1970 amendment of the Urban Mass Transportation Act of 1964. Section 5.04 says handicapped persons cannot be denied the benefits of or be subject to discrimination in any program funded by federal funds. The 16(b)(2) amendment says that elderly and handicapped persons have the same right as other persons to use mass transit facilities and services.

Legal provisions are significant and potent, but where there may be no such law in existence, this author and others have argued that there are ethical grounds that provide a basic rationale for specialized transportation services.

Ethical Arguments

As indicated previously, there are two principles that legitimate special transport efforts, the normalization principle and the principle of equity (*1*).

> The normalization principle holds that elderly and handicapped persons should be assisted to maintain a pattern of living and a lifestyle approximating the norm associated with a given culture. In a transportation framework the principle suggests . . . first, that elderly and handicapped persons shall be assured a level of mobility approximating that achieved by other 'normal' and equivalent sections of the population. Second, that transportation programs support the desire of the elderly and the disabled to live out their lives at home, a setting deemed more desirable and normal than is the institution, as long as it is feasibly possible.

A second principle, that of equity, further elaborates the normalization principle. In transportation terms the principle of equity is implicit in Section 5.04 of the Rehabilitation Act mandating equity for handicapped persons in the United States; the principle is asserted directly in the language of Section 16(b)(2) of the Urban Mass Transportation Act.

Political Activity

It would be naive not to recognize that when large sums of money from national and state sources for transportation are involved that political influences can be ignored. In Sweden and Canada, organizations of the handicapped exercise constant pressure on national legislators and local transportation-related officials to ensure maintenance of adequate levels of service for the disabled. In the United States, organizations of and advocates for the elderly tend to be more prominent politically than those associated with the handicapped, though the latter are far from silent. Although the evidence on the voting behavior of elderly persons reveals that they do not vote as a bloc, they do vote, and in substantial numbers. Advocates for older Americans remind legislators of this practice on the part of the elderly, if they need reminding, in soliciting support for and improvements in community services for the elderly, including transportation.

ALTERNATIVES IN SERVICE APPROACH AT THE LOCAL LEVEL

A pervasive and controversial operational issue faced by planners of specialized transportation in several countries is the recommended policy on local services for the disabled (*5, 15*). In some instances the issue becomes charged with emotion, particularly for the disabled in wheelchairs and their advocates. In terms of national policy to be imposed on local services, the issue can be framed as selecting among two alternative approaches: Can the special transport needs of the disabled and the elderly be met best by a fully accessible modified regular public transit service or by a specialized door-to-door service? The first approach is identified widely as the mainstream strategy, the second alternative as the parallel transit services strategy.

The mainstream approach requires traditional public transit systems to modify schedules, equipment, and facilities to make them more adaptive to the transportation requirements of the transportation disadvantaged (*5*, p. 183). These adaptations require change in public transit's normal operating procedures, including changing the attitudinal response of transportation planners to the needs of the disabled, as well as a major outlay of funds for the retrofitting of vehicles, facilities, and equipment not designed with the handicapped in mind. The parallel method calls for the development of special-purpose transit programs geared to the scheduling needs, trip destinations, and physical and other attributes of elderly and disabled persons. The specialized method represents a customized system, using appropriately designed small buses or vans, to provide a door-to-door demand-responsive service. Specialized transit may be administered as part of a local public transit agency, if one exists, or can be a free-standing new service where none existed previously.

In examining arguments for mainstreaming transport for the disabled, the case rests essentially on a reassurance that stability of the specialized service will be maintained in the event financial resources are threatened in the future. Advocates for this approach argue that in a financial pinch when transportation budgets may become tight and cuts are made, free-standing,

relatively new specialized services are vulnerable and may be eliminated, whereas an established service within a public transit agency is more likely to weather a financial storm. A second argument is that the disabled do not want to be treated differently than others—the agency responsible for public transportation should serve all area constituents including the disabled.

The case for specialized service rests on three points. First, not every community, urban or rural, has a local public transit service. Therefore, the mainstream approach will do nothing for disabled persons in these communities. Second, public transportation was designed mainly for going-to-work trip destinations, and these are not congruent with the diversified nonwork trips made by disabled persons and older people. A substantial number of nonwork trips are made in off-peak hours when there are fewer buses on the road and schedules are different. Third, in bad weather passengers in wheelchairs have difficulty maneuvering from home to inconveniently located bus stops.

A Canadian transportation official argues that in light of the financial demands placed on aging transportation networks by retrofitting vehicles and equipment, parallel systems are more cost-effective when comparative capital and operating costs, as well as climate conditions, are considered (*15*).

The specialized transportation program in Stockholm, Sweden, operating as a subsidiary of the public transit agency in the area is a prototype of an integrated system, in which planners have incorporated both approaches in services for the disabled. With the proviso that only persons with specific disabling conditions qualify for the specialized service, the Stockholm program has integrated three discrete components. These include:

- A demand response unit using commercial taxis for individualized trips that can originate from home or elsewhere;
- A fleet of accessible minibuses and vans for routinized and repetitive trips offering door-to-door service; and
- A program of continued modification of conventional public transit vehicles, equipment, and facilities to extend accessibility to the handicapped trip maker (*16*).

In any event, these two major approaches coexist and deserve equal planning attention. In the United States, under recent regulations promulgated for enforcement of Section 5.04, national policy allows for a local community option. Either approach is acceptable. The local community is free to make the decision, taking into account local conditions and the feasibility of one approach over the other. For an excellent retrospective analysis of the tortuous path of national policy on the disabled in the United States, see Katzman (*17*).

SCOPE OF TRANSPORT POLICY FOR THE DISABLED

Addressing the mobility needs of disabled persons is a complex issue whose parameters can be perceived by policy analysts and decision makers as either narrow or comprehensive in scope. It would appear that a comprehensive policy or a multimodal integration of the travel requirements of the disabled best serves their interests. Canada and Sweden are two countries that have elected a comprehensive transportation policy for the disabled and the elderly.

According to Latham (*13*), in Canada,

> It is the policy of the Government of Canada to ensure that all persons have access to a safe, economic, efficient, and adequate transportation system . . . the federal Minister of Transport has the authority under the Canadian Human Rights Act, the Ferries Act, the Canadian Shipping Act, the Transport Act, the National Transportation Act, the Railway Act, and the Aeronautics Act to establish standards for accessibility by disabled people to facilities and services under federal jurisdiction.

The Minister of Transport has established a Transportation of Disabled Persons Implementation Committee (TDPIC) to obtain consultation and advice on policy and measures to improve and extend access for the disabled on rail, surface transportation, air, and marine vessels. Membership in TDPIC is composed of representatives of major disabled consumer organizations, staff from the national transportation providers like VIA Rail, and government officials. Recommendations prepared by task groups of TDPIC are directed to the minister for consideration and implementation.

Sweden has taken major steps over the past 15 years toward changing its policy to facilitate use of most transport services by the disabled and the elderly. The intent of Swedish policy is to integrate the disabled and the elderly into society to as large an extent as possible. Hence, it regards public transportation as playing a major role in satisfying that goal.

In 1979 the Swedish Parliament established a Swedish Board of Transport to recommend and implement national policy on transportation, with special attention to the disabled. As part of its responsibility the board was given a mandate to plan, initiate, and monitor the adaptation of most forms of public conveyances to attain an improved level of accessibility for impaired persons (*12, 18*). After consultation with organizations of the disabled and of the aging, operators, vehicle manufacturers, and government officials, the board promulgated a series of regulations and performance standards for buses, subway trains, commuter trains, locomotive-driven carriages, and seagoing vessels. An interval of several years was allowed before the regulations became operational; the new standards became effective in 1984 and 1985.

Additionally, the Department of Traffic Planning, Lund University, was charged with evaluating the impact of the new regulations, the pace of adaptation, how the adaptation process was implemented and accepted by operators, the benefits of the changes for elderly and disabled riders, and recommendations for additional measures to be taken (*12*).

The new directives set standards that were substantive in nature. For example, in new buses they covered features of the vehicle's interior and exterior, such as height of the first step, width of the entry door, design and function of the interior handrails, number and placement of seats reserved for elderly and disabled, announcement of bus stops and other information offered vocally by the driver, floor covering, ventilation of the bus, height of letters and figures on destination signs, and the like. The board estimates that on the average, the extra cost for these adaptations did not add more than 1 percent to the cost of the vehicle; for railway carriages the added cost is higher (*18*).

It is noteworthy that one other outcome of the 1979 redirection of national policy on the disabled in Sweden was a set of

amendments to the building code regulations. Sweden now requires that all freshly constructed commercial buildings and offices be fully accessible to the disabled.

APPROACHES TO FINANCIAL SUPPORT FOR SPECIALIZED TRANSPORTATION

The final area to be reviewed is the financial support for specialized transportation in the respective countries. This area proved to be a most difficult one to compile. Despite the growth of special systems for the aging and the disabled in the four countries surveyed, and although funding arrangements of major national programs constitute the lifeblood for survival, comparable data on funding support have not yet found their way into the literature. The delay by planners and others in the field to develop information about this aspect of public or governmental subsidization of this form of national transportation suggests the field has not yet matured compared to other established forms of transportation supported by national budgets.

The various sources of specialized transportation expenditures were difficult to trace. In the United States, federal allocations for transportation for special groups are treated in the budgets of the transportation sector differently than are funds for specialized transportation in the human services sector, despite the fact that the latter are a major source of transportation funding for special groups far in excess of the former. For example, in the transportation sector, specialized transportation funds are a line budget item and allocations to subsidiary units are derived from a specific appropriation with a designated dollar amount. In the human services sector, transportation costs for special groups are buried and not broken out because transportation is permitted as a component expenditure within the broad service category budget.

There are other factors that complicate the task of preparing comparatives in national investments in specialized transportation. The leadership role of the national government in funding specialized transit differs among the four countries by reason of differences in their political orientation or structure. In the United States the central government exercises a strong leadership role, whereas in Canada the provinces retain considerable power on transport policy and services, leaving the national government a residual role. Similarly, there are marked differences in the philosophy governing the merits of subsidization of special transportation from governmental budgets. Sweden's approach calls for a substantial subsidy from national and other governmental units, whereas in the United Kingdom a strong conservative strain evident at the national level has supported voluntary systems at the local level but with limited designated financial assistance from the national level. It may not be possible, therefore, to offer meaningful comparisons of national investments in specialized transportation among the four countries.

The issue of funding cannot, however, be discussed without some consideration of such operational matters as program constituency, eligibility for service, the approach to rider subsidization, and the like. There is some information on a limited and uneven basis from each country on such features as the size of the current specialized transportation constituency, auspice of service in multiple sources of financial support, and estimates of the total national investment in specialized transportation.

Canada

According to Hewson (*19*), and quoting him directly on the national picture in Canada, on transit for the disabled,

> In 1985 there were approximately 330 operators of special urban transit services for disabled persons in Canada, operating 1,300 vehicles at an annual cost, excluding capital, of $60 million. . . . Some 20 percent of these services were either operated or administered by conventional transit systems.
>
> The major significant features of transit services for the disabled include
>
> - A rapid implementation of new systems since 1981;
> - An explosive annual ridership growth rate averaging 13 percent nationally;
> - A demand exceeding the capacity . . . particularly in larger communities;
> - A need for better organization and management . . . to cope with growth;
> - A great variety of eligibility criteria by provinces; [and]
> - A great variety of delivery mechanisms.
>
> Eligibility criteria for transit services for the disabled in local communities . . . except in New Brunswick and Prince Edward Island . . . reflect provincial funding policies. . . . At present three major categories of persons are eligible for special transit services:
>
> - The elderly and disabled, i.e., 1 to 15 percent of the population eligible in Alberta, Saskatchewan, and . . . in British Columbia;
> - The disabled, i.e., 2 to 3 percent of the population unable to use conventional transit in Quebec, the Yukon, Newfoundland, . . . and parts of British Columbia; [and]
> - The physically disabled, i.e., 1 to 2 percent of the population unable to board conventional transit in Ontario, Manitoba, and Nova Scotia.
>
> A great variety of service options for the disabled exist throughout Canada. As a category most of the elderly and the ambulatory disabled are able to use conventional transit services . . . who have undertaken significant modifications. . . . Accessibility to conventional systems has not been a major issue because of high quality parallel systems. . . . For those of the ambulatory disabled unable to use conventional transit services but who do not require a lift-equipped vehicle, taxis are often used . . . for nonambulatory disabled, lift-equipped bus systems are operating in most urban communities of 25,000 or more persons . . . many provinces have . . . similar services in small urban and rural communities.
>
> The estimated total annual operating cost, including administration for the 330 special transit services for the disabled . . . as of March 1985 was $60 million, as stated, divided by source . . . from provincial funds $34 million (52 percent); from municipalities $23 million (38 percent); fares $1.5 million (8 percent); and other sources $1.5 million (2 percent). . . . The proportion of revenues from user fares has declined from a high of 15 percent in 1979 to 11 percent in 1981 . . . and to 8 percent in 1985. . . . Revenues are based on an estimated total ridership of 1.5 million trips and an average fare of $1.00. Capital costs are normally about 12 percent of total costs . . . and are estimated to be $7 million . . . [of which] 7 percent came from federal funding, 75 percent from provincial funding, and 18 percent from municipal funds.

United Kingdom

An overview of voluntary organized community transport in the United Kingdom offering regularized special services for the disabled and the elderly is provided in part by Sutton (*20*) and by Taylor (*21*). The operational details come from Sutton.

> While the public sector agencies may account for the majority of special transport services, the growth in voluntary organized community transport in the United Kingdom has, in many respects, been the more remarkable. The first recognized community transport scheme, for example, only began operations in Birmingham in 1966, and in the years since there has been a phenomenal growth in the number of these types of special transport projects . . . estimated to number 300 in 1984.
>
> The term community transport is used here to refer to secondary transport modes . . . and includes the following services:
>
> - Voluntary car schemes,
> - Community minibus schemes, [and]
> - Dial-a-ride services.
>
> Community transport is normally associated with voluntary effort . . . [however] within community transport . . . there are projects that employ full time staff to organize and provide services, and the voluntary input is located in the Management Committee. . . . As community transport has grown and developed over the years their operating practices have come to resemble the public sector services in type and range of services provided to client groups without gaining recognition of their status as transport providers.
>
> There are four types of voluntary car services, as follows:
>
> 1. Nonorganized 'informal' lift giving, such as between neighbors;
> 2. Locally organized car pools meeting general needs, such as a rural car scheme;
> 3. Local agencies that recruit drivers to meet social needs over a larger area, such as district-wide Volunteer Bureau or Councils for Voluntary Service; [and]
> 4. Centrally organized schemes in collaboration with a public agency such as the Hospital Car Service.
>
> Community minibuses (more than 8 and less than 17 seats) and ambulances, which can also be operated with a minibus permit, are used extensively by voluntary groups and fall into four categories:
>
> 1. Minibuses operated solely for use of the owner organization;
> 2. Minibuses owned by an organization that allows other groups to use them within carefully designed criteria;
> 3. Minibus 'pools' deliberately organized to overcome the limitations of 1 and 2 above, allowing rider use through sharing arrangements; [and]
> 4. Rural community bus projects, which are supported by local authorities and undertake scheduled 'public transport' trips as well as group hire.
>
> Minibus Dial-A-Ride (DAR) . . . for the disabled were [designed] to cater to widely dispersed trip patterns, 'many to many,' and to provide a service in suburban, low density, areas to mainly nonwork journeys, including feeders onto conventional bus and rail service. Their lack of success was attributed to the following:
>
> 1. Trip generation was disappointing.
> 2. The ability to handle 'many to many' dispersed journey patterns remained uneven.
> 3. The cost of DAR is high . . . not even meeting operating costs.

With regard to funding arrangements in the United Kingdom, Taylor claims that community groups have an advantage over conventional transport in the multiplicity of funding sources potentially available to match different objectives of local community transport operators (*21*).

> Most start with their local authority using either Section 137 of the Local Government Act 1972 or Section 83 of the Local Government [Scotland] Act 1973, or direct powers under the Health Services and Public Health Act 1968, the National Assistance Act 1948, or the Education Act 1944. Rating authorities must give 50 percent rate relief to charitable bodies under the General Rates Act 1967, and have discretion to put this up to 100 percent. Local authorities above parish level are empowered to include many voluntary groups in their bulk-purchase arrangements to pass on discounts received. Many authorities also administer local trust funds, and themselves run lotteries, community chests or Mayor's Funds, which are tapped for support.
>
> Shire county, Regional or Islands Councils, and Passenger Transport Executives are put under a duty by the Transport Act 1985 to . . . cover social car schemes, dial-a-rides running under social car legislation, community buses, and permit minibus service . . . directly from public transport budgets . . . and to include such groups [elderly and disabled] in concessionary fares arrangements.
>
> The above authorities and London boroughs . . . can make revenue or capital payments toward the provision of vehicles and equipment carrying the disabled.
>
> Central government assistance has come mainly through the Urban Programs administered by the Department of the Environment, the Welsh Office, and Scottish Development Department which provides [a] 75 percent grant to match a local authority's 25 percent contribution . . . to fund opportunities for voluntary work in health and social care schemes.
>
> The Department of Employment's Manpower Services Commission provides money under the Community Programs to create 1-year jobs for long-term unemployed people, and this support is the main source of paid staff for community transport groups . . . and for training [staff].
>
> Community bus operators can claim fuel duty rebate from the Department of Transport . . . and those in rural areas can also claim the transitional rural bus grant for the next 4 years. . . . In addition new public transport projects in rural areas can claim financial assistance from special funds.
>
> Finally, there are tax concessions for charitable groups relating to corporation tax, VAT, and Car Tax on vehicles and special equipment.

Taylor concludes, based on this melange of various forms of state aid requiring manipulation to generate funds for community transport, that the total amount of state support for community transport in the United Kingdom in 1986 exceeded 30 million pounds sterling. In February 1988 terms, these funds translate to approximately $55 million (American).

Sweden

Sweden's program is perhaps the most direct in its funding approach, as well as the most firmly subsidized of any country. According to Ståhl the special transport program reaches into every municipality of Sweden (*12*).

> Today all of Sweden's 279 municipalities can offer their inhabitants a special transport system, which requires applying and qualifying for a special permit. This permit is meant mainly for persons with quite serious disabilities who qualify for special services provided either by vans or by subsidized taxis.
>
> A [state] governmental grant of 35 percent of the gross operating cost of this service is given to the municipalities. The

rules vary considerably between municipalities concerning the way persons qualify for this service and the fare to be paid by the person traveling. The most common rate of payment for the use of the special transit system is 20 percent of the costs of the journey when using subsidized taxis. A person with a special permit can use the special transport service for almost any purpose such as travel to and from work, treatment programs, shopping, visits to friends, entertainment, and so on.

Annual costs of this special transport system have increased considerably. About 300,000 persons, almost 4 percent of Sweden's population, in 1984, had a permit for use of special transport and about 85 percent of these were 65 years of age and over. This means that approximately 18 percent of the population in this age group of elders are traveling on the special transport service. About 95 percent of the journeys are made by taxicab. The cost for this service in the early 1980s was over 800 million Swedish crowns (approximately $133 million as of February 1988) and the estimated increase per year is about 10 percent. . . . The increasing cost of the special transport service has forced Sweden to improve public transport to encourage its use by elderly and handicapped persons.

United States

Financial support for specialized transportation at the national level in the United States comes from the transportation sector, the U.S. Department of Transportation (DOT) and other governmental agencies including the human services sector, of which the dominant source of funds is the U.S. Department of Health and Human Services. A 1977 government study uncovered 114 federal agencies with some funds for transportation for special groups, and 57 percent of these funding sources were located in the human services cluster of agencies (Government Accounting Office data, 1977). The total financial contribution for specialized transportation from federal human services funds is considerably higher than for DOT funds. For example, one 1987 estimate by Rural America suggests community transport is a $1.9 billion industry, when community transport is viewed comprehensively to include services to poor children, the disabled, and the elderly. Of the $1.7 billion, 7 percent is from UMTA but 53 percent is from other federal agencies, and 16 percent is from state governments, and the final 24 percent is from local sources including farebox revenues (*22*).

Rural America estimates there were some 11,000 community transportation systems in the United States in 1987, offering service in 86 percent of the 3,050 counties in the United States, serving an estimated 15 million persons through 500 million one-way trips annually. The voluntary sector dominates this burgeoning field, with 84 percent of the 11,000 systems under private nonprofit auspices; 14 percent are administered by public agencies and 2 percent are private for-profit agencies.

Four of the major sources of funding for elderly and handicapped transportation programs in the United States are

- *Section 16(b)(2) of the Urban Mass Transportation Act.* Provides grants covering capital costs, such as purchase of vans, buses, or equipment including wheelchair lifts. In 1988 the federal deferral allocation in this program was $35 million.
- *Section 18, Surface Transportation Assistance Act.* Provides grants for rural public transportation for both capital and operating costs. Recipients of grant awards are expected to give special attention to elderly and handicapped groups in their area. National funds made available to state and local agencies for 1988 under this program were $64.7 million.
- *Older Americans Act of 1964 as amended.* Transportation costs for the elderly are permitted under expenditures authorized under the act for state and local agencies in Title III (community services) and Title VII (nutrition programs) serving older Americans aged 60 years and over. Rural America estimates about $100 million of Older Americans Act funds are allocated to transportation for the elderly.
- *Social Security Act.* Transportation reimbursement is also available to disabled and elderly clients under Title XIX (Medicaid) and Title XX (Social Service Block Grants) of the Social Security Act. Unfortunately, precise expenditures or even reliable estimates of expenditures under these titles are not available.

This summary listing does not take into account provider-side funding from a number of other sources, such as state and local government contributions, and transportation contributions from the voluntary agencies offering service to the aging and the disabled.

Selected features of specialized transportation in the four countries are synthesized in Table 2.

An unusual form of dedicated funding for transit for older persons is used in two states in the United States. Pennsylvania's program of transportation for its aging is heavily reliant on a portion of dedicated proceeds from the state lottery. New Jersey has exploited casino gambling in its major city of Atlantic City, which dedicates a portion of state revenues from casinos to transport for the elderly. Kane reports that in the final 6 months of 1985, casino gambling contributions accounted for 22 percent of the total trips for aging persons (*23*). The dedicated fund from casinos was second behind revenues from Title III of the Older Americans Act (33 percent) and well ahead of funds from Title XX of the Social Security Act (12 percent).

The United States has experimented for at least a decade with the concept of user-side subsidy but with limited ultimate success. The first user-side experiment began in the early 1970s with Virginia's multimodal Transportation Remuneration Incentive Program (TRIP) and, subsequently, a number of demonstrations were tested in several other states (*24*). The concept of user-side subsidy for special transit is borrowed from practices in other fields such as education, and its successful implementation rests on the preexistence of the service for which the subsidy is provided. In a new and growing field like specialized transportation, which requires the initiation of new services where none previously existed, user-side subsidies have had limited success in generating new services. One version of user-side subsidy that is practiced is the underwriting of approved trips for clients of social agencies by the agencies provided financial and social support. The Title XIX, or Medicaid program, provides a user-side subsidy for Medicaid clients requiring transport to hospitals and clinics. On balance, it appears that the concept of user-side subsidy, while attractive and well received by operators, has not caught on in the United States.

As a final comment on user-side subsidies, it has been suggested that the ultimate in user-side subsidies for the disabled is to follow the example of the United Kingdom's Mobility Allowance, which provides qualified disabled persons a one-time grant to modify a private automobile for personal use.

TABLE 2 SELECTED FEATURES OF SPECIALIZED TRANSPORTATION PROGRAMS IN CANADA, SWEDEN, THE UNITED KINGDOM, AND THE UNITED STATES

Feature	Canada	Sweden	United Kingdom	United States
Year of data	1985	1984	1984	1987
Major constituency	Disabled	Disabled and elderly	Disabled	Elderly and disabled
Estimated no. of operational systems	330	279	300	11,000
Coverage	1–15 percent of eligible population	4 percent of national population, 85 percent of riders are 65+	Not known	86 percent of all counties in United States have service
Auspices of specialized transportation	80 percent in conventional transportation, 20 percent in specialized transportation	In conventional transportation, where available	Voluntary agencies	84 percent private nonprofit, 14 percent administered by public agencies, 2 percent private for-profit
Estimated ridership	1.5 million one-way trips	300,000 persons; no. of one-way trips not known	Not known	15 million persons; 500 million one-way trips
Source of financial support	52 percent provincial, 38 percent municipal, 8 percent fees, 2 percent other	35 percent state, 45 percent municipal, 20 percent fees	Not known; some funds for start-up costs and operational budgets from state nontransportation funds	7 percent UMTA, 53 percent other federal programs, 16 percent state government, 24 percent local government and user fees
Extent of subsidy	92 percent	80 percent	Not known	Approximately 76 percent
Direction of subsidy over time	Increasing	Decreasing	Not known	Not known
Estimated 1988 cost ($ U.S.)	42 million ($60 million Canadian)	133 million (800,000 krona)	55 million (£ 30 million)	1.9 billion

NOTE: Most of the data are estimates.

[One author (*25*) suggests that the effect of the Mobility Allowance in the United Kingdom has been to encourage greater recognition of the needs of the disabled people to travel, rather than simply to give them the necessary spending power to demand better transport.]

In the United States, recent demographic changes among the elderly are likely to increase the demand for specialized transportation. Among other implications of the 1980 U.S. census, Bell and Revis (*26*) argued that while car ownership will be maintained by a high proportion of reasonably affluent elderly, the demands for specialized transportation will increase if for no other reason than the continual rise in the number and proportion of older people in the United States. They suggest that most of the riders of specialized transportation are likely to be female, of advanced age, and drawn from minority groups. The one-sixth of the aging who are living in poverty constitutes the core group who are transportation disadvantaged in the full sense of that term. They suggest further that

> The paramount issue in the mid-1980s is not whether specialized transportation in the United States will survive, for clearly it is here to stay. Rather what is at stake is the extent to which the specialized transportation network will muster the resources to structure an appropriately designed and effectively operated modernized transit program to serve the intrinsic and established mobility needs of elderly and handicapped persons.

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An Inventory of Twelve Paratransit Service Delivery Experiences

DAVID J. CYRA, MARY J. MULROY, AND ROBERT JANS

The provision of any public transportation service is costly, but the costs associated with transporting the disabled are particularly high. These costs vary considerably from city to city, depending on the extent and quality of the service. An informal inventory of transportation for persons with disabilities in some of the urban areas of the United States and Canada is presented in this paper. Information was collected from 12 cities in an attempt to investigate alternative forms of service and observe the level of uniformity and equity in the delivery of this specialized transportation. These data are summarized in order to give readers a picture of the current state of paratransit service in selected urban areas. In addition, the authors include their suggestions for what would constitute "state-of-the-art" service.

The setting in which specialized transport for the disabled has developed is complicated. Various geographical, demographic, social, political, and economic factors all helped shape these systems and continue to influence the availability, accessibility, and affordability of specialized service. Working with limited funds, local units of government have developed their own individual guidelines for both quality and extent of service to variously defined user groups. In many cases this service has evolved largely as a by-product of other programs to help the elderly and disabled reach services.

From a national perspective, then, the current provision of specialized transit for disabled users is both variable and inequitable. Because this service has usually evolved "after the fact" of regular public transit service, and under pressure from different local political influences, it usually has not had the benefit of comprehensive long-term planning. Furthermore, since each system has been unique, adequate comparisons have been lacking. The advent of federal "504" regulations, however, marks a first step in standardization of service for disabled users nationwide. It is, therefore, an appropriate time to take a look at what a cross section of communities are currently doing to provide specialized transportation service.

The results of a survey of 12 specialized transit providers are presented in this paper. As expected, results showed great variability in all areas, including extent of service, hours of operation, fares, trip subsidies, administrative costs, and so on. The purpose of this paper is to

- Clarify the differences that obviously exist;
- Review "504" and its possible effect on existing services;
- Heighten awareness of good practices;
- Review "state-of-the-art" practices;
- Suggest areas and methodologies for further study; and
- Encourage public-private cooperation in service delivery.

One concern of the authors of this paper is that, in the incredibly complicated morass of regulations, escalating costs, and paper trails, the real goal of specialized transit is being lost, namely, providing safe, affordable, equitable public transportation to the disabled.

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PROJECT OVERVIEW

Public transit operators offer two types of transportation service for the handicapped population. The first is their traditional fixed-route bus or rail service, which many disabled persons cannot use. In some localities these fixed-route services have been made more accessible through the use of vehicles modified for the semiambulatory and persons in wheelchairs.

In addition to regular transit services, public transit operators often provide, or purchase from private providers, paratransit services, including shared-ride taxi or van services on a demand-responsive or subscription basis. These services are offered to meet the specific needs of that portion of the elderly and disabled population who cannot use the fixed-route system because it is not accessible to them.

In most cases, service is purchased rather than provided directly. The providers being hired include private for-profit taxi or van carriers, human service agency providers, and nonprofit transportation operators (usually supplying wheelchair accessible services). Purchase of service contracts is done either directly with carriers or indirectly through a brokerage organization. The method of subsidy can be either a user-side subsidy issued in ticket form directly to potential riders or a reimbursement to carriers for units of service rendered, in hourly or trip unit measures.

In this project, most of the cities studied used private for-profit carriers and some nonprofits. Private for-profit carriers, such as taxis and van and bus companies, contract with public transit authorities to provide transportation for disabled persons. (In most cases, private carriers can only be direct recipients of public funding if sponsored by another local public agency. Often the continued availability of such carriers for providing privately requested services is only a result of their subsidy from other public sources.)

There are also a number of private nonprofit carriers that may receive some types of public funding directly, as do public

transit agencies, but they are incorporated by private individuals independent of the government. The mission of these carriers may range from general transportation for the elderly to accessible services for disabled persons.

The purpose of this project is to present an overview of the major findings from an informal survey in order to provide information for transit decision makers at all levels.

Methodology

This study was conducted in two stages. First the authors sent out an exploratory survey asking for information regarding city size, area served, and description of service. This written survey was followed by telephone interviews in which the written information was clarified and detailed.

The results of the survey are summarized and commented on in this paper. Also presented are discussions of "504" regulations and how current services match up to the new rules. The paper concludes with observations regarding efficiency, effectiveness, demand estimation, policy objectives, and several operational issues.

Provider Objectives

The transit agencies from the 12 cities studied were interested in sharing information and, therefore, cooperated in data collection. Their objectives for participating included

- Improving service;
- Gathering material to present to boards for comparisons;
- Boosting productivity;
- Preserving a "free-market system" for the user and provider;
- Complementing existing public transit; and
- Making program administration as simple and inexpensive as possible.

Comparing service from different cities creates an awareness of effective and innovative paratransit techniques. The authors hope that this information sharing among specialized transit providers from different cities will lead to further discussion and joint planning endeavors.

"504" Requirements

Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), states that no otherwise qualified individual shall, solely by reason of his or her disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. Section 16 of the Urban Mass Transportation Act of 1964, as amended (49 U.S.C. 1612), and Section 105 of the Federal-Aid Highway Amendments of 1974 (23 U.S.C. 142 nt), also require that special efforts be made in the planning and design of facilities and services to ensure the availability of mass transportation which can be effectively used by the elderly and disabled population.

In April 1976, the Urban Mass Transportation Administration (UMTA) issued regulations requiring that transit operators receiving financial assistance make special efforts to provide transportation that disabled persons could use. In January 1978, the Department of Health, Education, and Welfare issued guidelines on the responsibilities of each federal agency under Section 504. On May 31, 1978, the U.S. Department of Transportation (DOT) issued a regulation that required all recipients of financial assistance from DOT to make their facilities and programs accessible to disabled persons by specified deadlines. These regulations superseded the existing UMTA regulations.

For recipients of mass transportation funds, DOT's regulations meant that all buses purchased had to be equipped with wheelchair lifts until at least half of the peak-hour fleets were equipped with lifts; all new rapid rail facilities had to be accessible; key stations of existing rail systems had to be retrofitted to make them accessible; and, by July 1982, interim accessible transportation had to be provided for handicapped persons until transit service accessibility was achieved.

These regulations aroused considerably controversy in DOT, the transit system receiving federal mass transit assistance, and the various organizations for the elderly and disabled. The American Public Transit Association, among others, filed a suit challenging the rule. On May 26, 1981, a federal court decided that the rule exceeded the authority provided by Section 504 and returned the regulations to the Secretary of Transportation for a determination of whether the mass transit accessibility requirements might be authorized by other statutes.

Accordingly, DOT issued an interim rule on July 20, 1981, rescinding the accessible mass transit requirement by substituting a local option approach. It is now DOT's policy that ensuring the provision of transportation of disabled persons is an obligation of recipients of federal assistance for mass transit, but the responsibility for deciding how such transportation is to be provided should be returned to local communities. Under the interim rule, DOT requires that recipients of financial assistance certify that they are making special efforts to provide transportation to disabled persons through locally determined methods.

This July 1981 interim rule was replaced on May 20, 1986, by a new rule. It allows each transit authority, after consulting with disabled persons and other interested members of the public, to choose the type of service it wants to provide. For example, a transit authority could provide service through scheduled or on-call accessible buses, paratransit vans, subsidies for taxi fares, or any combination of these services. The new rule contains six "service criteria" that apply to this special service:

- Anyone who, by reason of disability, is physically unable to use the bus system for the general public must be treated as eligible for the service.
- The service must operate during the same days and hours as the bus service for the general public.
- The service must operate throughout the same geographic area as the bus service for the general public.
- Fares for trips on the two services must be comparable.
- Service must be provided within 24 hr of a request for it.
- Transit providers may not impose restrictions or priorities based on trip purpose.

The amount of money transit authorities are required by the rule to spend on service for disabled persons is limited to 3 percent of their operating expenditures. If they cannot meet all six criteria without exceeding this figure, they will be permitted

to provide service that falls short of one or more of the criteria. Court decisions have said that the DOT's requirements for service to disabled persons may not impose undue financial burdens on transit authorities. This feature of the rule is designed to prevent such burdens.

Another feature requires that each transit authority give disabled and other interested persons the opportunity to participate in the service planning process. UMTA will monitor the performance of transit authorities to ensure that they carry out their responsibilities properly.

Between the writing of this paper and its publication there have been court cases relevant to "504" that readers should be aware of:

- In a January 1988 landmark case, Patricia Patton, chief administrative judge for the Illinois Human Rights Commission, ruled that the Chicago Transit Authority (CTA) violated the civil rights of four disabled plantiffs. Patton ordered the CTA to offer its wheelchair riders both options: main-line bus access and dial-a-ride service, forcing the agency to spend millions of dollars to acquire and maintain lifts on hundreds of new buses.
- Also in January, Federal Judge Marvin Katz (Philadelphia) struck down the portion of the DOT regulations limiting the amount transit authorities have to spend to provide disabled transportation. Katz called 3 percent an arbitrary and capricious figure that was so low it denied the handicapped "the minimum quality of service mandated by the Congress."

In this paper the existing service delivery is reviewed with the six criteria established in "504." This review helps to emphasize those areas of concern in transport delivery for disabled users.

SURVEY RESULTS AND "504"

Transit systems that receive federal assistance have certified to UMTA that they are making special efforts to meet the transportation needs of the disabled users. These special efforts are not uniform nor are the service characteristics at all similar. However, some of the similar issues that are beginning to emerge include

- The financial impact of special services on the regular transit system and on private taxi operators;
- The ways to use available funds most effectively in providing special services through both public and private transportation facilities; and
- The relationship between paratransit services and regular transit systems and transit system employees.

It was with these conditions and issues in mind that a survey instrument was designed. Although this survey cannot provide a complete picture of the specialized services, it does identify the variety of options that are available to local officials and the need to fit solutions to local situations.

Service Summaries

The initial survey form used is shown in Figure 1. The first form gave the authors some idea of the type of information that

Urban Handicapped
Specialized Transit

1. CITY_____
2. Special Services Coordinator_____Date_____
3. Service Area_____
4. Number of Providers_____
5. Total population of service area_____
6. Days of service_____
7. Hours of service_____
8. Number of vehicles_____
9. Eligible Users: elderly_____handicapped_____other_____
10. Average User Fare_____
11. Annual Mileage_____
12. Annual ridership_____
13. Annual vehicle hours_____
14. Average weekday ridership_____
15. Total annual trips_____
16. Average trip cost_____
17. Trip time greater than 90 minutes (% of total trips)_____
18. Percent of trips picked up within ± 10 minutes_____
19. Percent of trips picked up 10-30 minutes late_____
20. Percent of trips picked up 60 minutes late_____
21. Total annual cost of service delivery_____
22. Administrative cost (% of total cost)_____

FIGURE 1 Initial survey form.

was readily available. Some data, such as "lateness of pickup," were not recorded by most agencies and therefore are not available. Analysis of this information helped to develop a second survey to be used in a follow-up telephone interview.

The follow-up telephone survey is shown in Figure 2. The form collected three types of information. The information at the top provides a contact specifically designed for information-sharing and the development of helping networks. The middle of the form collected information relative to service type groupings. This part elicited information on types of providers, days of service, hours of service, operations budget, and fares, to mention a few. The bottom part of the form is the comment section. It was here that miscellaneous information was collected that helped describe the service but was not uniform enough for a general comparison.

The costs, efficiency, and effectiveness of services appear to vary widely. However, the variety of both local arrangements and reporting procedures makes it misleading to directly compare service performance measures. In the interest of examining specific information pertaining to each approach, however, a completed survey of key characteristics is provided in Figure 3. Following these completed surveys is a summary table (Table 1) that allows the reader to compare information more easily.

CITY: _____

SYSTEM: _____

CONTACT: _____

TITLE: _____

ADDRESS: _____

PHONE: _____

DESCRIPTION OF SERVICE

SERVICE AREA (SQ. MILES): _____ TOTAL POPULATION: _____

OF PROVIDERS: TOTAL____ PUBLIC: __; FOR-PROF: ___; NON-PROF: ____

DAYS OF SERVICE CONVENTIONAL: _____ SPECIAL: _____

HOURS OF SERVICE CONVENTIONAL: _____

SPECIAL: _____

OPERATING BUDGET CONVENTIONAL: _____ SPECIAL: _____

ELIGIBLE USERS DISABLED ONLY: _____ ELDERLY: _____

ANNUAL MILEAGE: _____

ANNUAL HOURS OF SERVICE: _____

ANNUAL ONE-WAY TRIPS: _____

AVERAGE USER FARES: AMBULATORY_____; NON-AMBULATORY__

AVERAGE SUBSIDY PER TRIP: AMBULATORY_____; NON-AMBULATORY__

CONVENTIONAL TRANSIT FARE: _____

COMMENTS:

FIGURE 2 Follow-up telephone survey form.

Possible Changes Under "504"

The data collection for this paper appears to be rather timely. In a way it established a "benchmark" for service characteristics just before the required "504" plan submittals of June 23, 1987. With the advent of revised service criteria under "504," there are likely to be some changes in such service areas as days of service, hours of service, operating budget, and fares.

Following is a review of the "504" criteria one by one, with a brief discussion of some problems, issues, and probable changes.

"504" Criteria

1. "Anyone who, by reason of disability, is physically unable to use the bus system for the general public must be treated as eligible for the service."

The term "disability" includes such a large range of conditions and situations that any analysis of what should be done to improve transport options available to persons with disabilities is greatly complicated. Mobility is a key concern both of disabled persons and of social workers who see the lack of adequate transport as a major block to the normalization process. The major goal of specialized transit service, therefore, should be to enable such people to move about as freely as possible. Because of the diversity of disabling conditions, the transport services must be flexible and responsive in order to be available to all.

Defining and certifying eligibility for special transit services have been a continuing problem in many cities. Some systems address temporary versus permanent disability; still others attempt to address blindness, mental retardation, and deafness. There are systems that have set up a very narrow window of eligibility. Will the widening of that eligibility force the governmental entity to the brink of "bankruptcy"? Should there be standard eligibility requirements for all to follow? In certifying riders as eligible, some systems use a physician's statements; others require statements from two physicians; others remind the physician of how heavy a demand is on the system and remind the physician of his or her responsibilities. Other systems do a combination observation and physical statement.

2. "The service must operate during the same days and hours as the bus service for the general public."

The results of the telephone interviews showed that comparing the number of days and hours of special versus conventional service is complicated by reporting technicalities. Some systems report 24-hr availability with taxis, but these may not serve wheelchair users; thus the service is restrictive. Some systems match conventional transit hours, but only on a space-available basis—another restriction. Still others limit availability past certain hours to trips that require extra late hours, such as dialysis or night shift jobs.

While sounding simple, this criterion is actually quite complex. As with the other criteria, there are large cost implications. In order to reduce spending, it may be necessary for some transit systems to cut back their conventional transit service hours to match those of the handicapped service.

3. "The service must operate throughout the same geographic area as the bus service for the general public."

The question of geographic area served is often complicated by political boundaries that force limited travel patterns; and the current low fare recovery problems may cause systems with previously overlapping boundaries to withdraw to even stricter service boundaries. The situation is further complicated by differing hours of service between city and suburban boundaries. Many systems have countywide special services, even though their conventional systems are more limited geographically.

4. "Fares for trips on the two services must be comparable."

There are widely varied interpretations of "comparable fares." Where half-fares are being charged, particularly in systems offering extensive service to the elderly, what is the basis for offering a lower fare to a few if there are still people not being served by the system? In addition, the systems that charge the same as conventional service, for what is effectively express route service, without need of transfers, may want to rethink their policies, particularly where transfers are a high percentage of all conventional trips. In addition, there are systems that provide service that does not live up to the intent of law because of one or more of the following:

- Highly restrictive service zones and areas;
- Narrow windows of eligibility; and
- Subsidy ceilings.

5. Service must be provided within 24 hours of a request for it."

Service provision within 24 hr is only effective if a client can be guaranteed a trip within that time. In some systems, trip

CITY: Minneapolis, St. Paul, MN
SYSTEM: Regional Transit Board
CONTACT: Linda Ehlers
TITLE: Special Services Coordinator
ADDRESS: Suite 270 Metro Square Building, St. Paul, MN 55101
PHONE: 612-292-8789

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 633 county TOTAL POPULATION: 1,754,000

OF PROVIDERS: TOTAL: 19 (PUBLIC: 0; FOR-PROF: 16; NON-PROF: 3)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0500 - 0100

SPECIAL: 0600 - 2300 M-F/ 0800 - 2300 S-S

OPERATING BUDGET CONVENTIONAL: 92,881,000 SPECIAL: 6,635,200

ELIGIBLE USERS DISABLED ONLY: 9,300 ELDERLY:

ANNUAL MILEAGE: 4,457,700

ANNUAL HOURS OF SERVICE: N/A

ANNUAL ONE-WAY TRIPS: 658,800

AVERAGE USER FARES: AMBULATORY: 1.15 NON-AMBULATORY: 1.15

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 5.50 NON-AMBULATORY: 11.50

CONVENTIONAL TRANSIT FARE: .75

COMMENTS: Fares are charged at $1.00 base rate, plus increases per mile over 8 miles to a maximum of $3.75. Conventional transit has a zone fare of about $.75. The system has experienced substantial growth. A fixed trip rate, determined by RTB, may have inspired providers to increase the number of riders carried per trip. Riders are charged an annual registration fee ($10 for subscription and $5 per change). Trip requests are received between 0600-1430 Monday-Friday, and 0800-1430 Saturday-Sunday. Computers are being installed to assist program scheduling and statistics. Riders have a free choice of which providers to use; however, providers may turn down ridership requests. Insurance is limited to $300,000 combined single limits, similar to that of the taxi cab industry. Service is actually being provided in 2 counties; hence the comparatively large service area.

CITY: Miami, FL
SYSTEM: Metro-Dade Transportation Administration
CONTACT: Cal Marsella
TITLE: Chief, Paratransit Services
ADDRESS: 300 N.W. 32nd Avenue, Miami, FL 33152
PHONE: 305-638-6448

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 250 county TOTAL POPULATION: 1,800,000

OF PROVIDERS: TOTAL: 2 (PUBLIC: 0; FOR-PROF: 2; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0500-0200

SPECIAL: 0600-1200

OPERATING BUDGET CONVENTIONAL: 134,634,000 SPECIAL: 2,100,000

ELIGIBLE USERS DISABLED ONLY: 5,500 ELDERLY: none

ANNUAL MILEAGE: 1,200,000

ANNUAL HOURS OF SERVICE: n/a

ANNUAL ONE-WAY TRIPS: 150,000

AVERAGE USER FARES: AMBULATORY: 1.77 NON-AMBULATORY: 1.77

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 11.56 NON-AMBULATORY: 20.46

CONVENTIONAL TRANSIT FARE: .75

COMMENTS: The Metro-Dade system is administered by Dade County. The system uses a sliding scale of fares that were reduced this year by $1.00. Metro Dade also eliminated the need for a waiting list. The new service implementation plan was endorsed unanimously by disabled groups. Before riders are registered for working trips, they are first referred to the availability of a car-pool. If appropriate, two private contractors form a single consortium that subcontracts to 4 other private providers. A pick-up window of 10 minutes before or 20 minutes after is considered on-time. Administrative costs are included in the special service budget.

FIGURE 3 A completed survey of key characteristics.

CITY: Toronto, Ontario, Canada
SYSTEM: Toronto Transit Commission
CONTACT: Frank J. Ahlin
TITLE: Coordinator, WheelTrans
ADDRESS: Operations Branch, 1900 Yonge St., Toronto, Ontario M4S1Z2
PHONE: 416-393-4000

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 244 TOTAL POPULATION: 2,150,000

OF PROVIDERS: TOTAL: 1 (PUBLIC: 0; FOR-PROF: 1; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 24 hours

SPECIAL: 18 M-F, 16 S-S

OPERATING BUDGET CONVENTIONAL: SPECIAL: 11,858,300

ELIGIBLE USERS DISABLED ONLY: 14,000 ELDERLY: 0

ANNUAL MILEAGE:3,712,311

ANNUAL HOURS OF SERVICE: 278,122

ANNUAL ONE-WAY TRIPS: 526,324

AVERAGE USER FARES: AMBULATORY: 1.00 NON-AMBULATORY: 1.00

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 21.60 NON-AMBULATORY: 21.60

CONVENTIONAL TRANSIT FARE: 1.00

COMMENTS: In Canada, public transportation is a provincial responsibility. In 1975, at the request of Toronto's Human Services agencies, WheelTrans was formed. WheelTrans does all call intake, scheduling, and dispatching to a fleet of station wagons and Orion buses, which carry approximately 50% ambulatory and 50% wheelchair passengers. WheelTrans requires 2 medical signatures to qualify applicants. Subscription riders must purchase monthly passes and pay an additional fare if destinations are changed. Pick-up times may be altered by WheelTrans staff and some trip reservations are confirmed less than 24 hours in advance. 9.9% of non-subscription trips are rejected; however, many of these reschedule at a later time. WheelTrans has a rule calling for people on three-wheelers (ex., Amiga) to transfer. In other words, they are not permitted to ride their personal vehicle inside the WheelTrans vehicle. It should be noted that costs are given in Canadian dollars; current exchange rates are $1.37 U.S. Users who purchase vouchers for both conventional and specialized earn a .20 discount on trips.

CITY: Pittsburg, PA
SYSTEM: Allegheny County Port Authority (PAT)
CONTACT: Tom Letky
TITLE: Manager of Consumer Services
ADDRESS:
PHONE: 412-237-7000

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 729 county TOTAL POPULATION: 1,500,000

OF PROVIDERS: TOTAL: 15 (PUBLIC: 0; FOR-PROF: 11; NON-PROF: 4)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0500 - 0200

SPECIAL: 0600 - 2400

OPERATING BUDGET CONVENTIONAL: 170,000,000 SPECIAL: 3,500,000

ELIGIBLE USERS DISABLED ONLY: 5,800 ELDERLY: 16,000

ANNUAL MILEAGE: 8,600,000 includes all human service agencies

ANNUAL HOURS OF SERVICE: 610,000

ANNUAL ONE-WAY TRIPS: 1,400,000

AVERAGE USER FARES: AMBULATORY: .87 NON-AMBULATORY: 1.15

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 8.50 NON-AMBULATORY: 8.50

CONVENTIONAL TRANSIT FARE: 1.00

COMMENTS: PAT serves both elderly and handicapped riders according to a Port Authority designed implementation plan. The system is managed by a private management company. The PAT brokerage system involves many different human services agencies and many of the cost savings come from coordinating these services by Access Transportation System, Inc. on behalf of PAT. The number of miles, hours, and trips designated on the services represent all human services combined. The system is countywide and operates under one budget. The average hourly rate for taxis and lift vehicles is $17.25 per hour. Rides are also available to the general public at an approximate subsidy of $9.48 per revenue passenger. There has not been a purge of registered riders since 1979.

CITY: Cleveland, OH
SYSTEM: Cleveland Regional Transit Authority (CRT)
CONTACT: W. George Wiedefeld
TITLE: Superintendent of Extra Life Program
ADDRESS: 615 Superior Avenue, N.W., Cleveland, OH 44113
PHONE: 216-431-1110

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 458 TOTAL POPULATION: 1,460,561

OF PROVIDERS: TOTAL: 2 (PUBLIC: 1; FOR-PROF: 1; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 313 days

HOURS OF SERVICE CONVENTIONAL: 24 hours

SPECIAL: 0600 - 1930

OPERATING BUDGET CONVENTIONAL: 140,000,000 SPECIAL: 3,475,000

ELIGIBLE USERS DISABLED ONLY: 43,467 ELDERLY: 153,619

ANNUAL MILEAGE: 1,115,946

ANNUAL HOURS OF SERVICE: 110,959

ANNUAL ONE-WAY TRIPS: 388,088

AVERAGE USER FARES: AMBULATORY: .40 NON-AMBULATORY: .40

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 6.00 NON-AMBULATORY: 14.00

CONVENTIONAL TRANSIT FARE: .85

COMMENTS: A new service implementation plan has been submitted. CRT personnel are getting their computers programmed to better analyze different categories of trips being handled. The system offers half fare to pass holders and offers dialysis medical trips additional hours of availability. The program is divided into 18 service areas, including centralized destinations, each with a rotation of days and hours of service. The system has waiting lists of qualified users. During off-peak hours both ambulatory and non-ambulatory fares are .25.

CITY: Chicago, IL
SYSTEM: Chicago Transit Authority
CONTACT: John Roth
TITLE: Private Sector Plans and Programs/Special Services
ADDRESS: Merchandise Mart, P.O. Box 3555, Chicago, IL 60654
PHONE: 312-664-7200, ext 4577

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 242 TOTAL POPULATION: 3,300,000

OF PROVIDERS: TOTAL: 4 (PUBLIC: 0; FOR-PROF: 4; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 24 hours

SPECIAL: 0500 - 0100

OPERATING BUDGET CONVENTIONAL: 661,000,000 SPECIAL: 10,800,000

ELIGIBLE USERS DISABLED ONLY: 14,000 ELDERLY:

ANNUAL MILEAGE: 3,444,162

ANNUAL HOURS OF SERVICE: n/a

ANNUAL ONE-WAY TRIPS: 737,300

AVERAGE USER FARES: AMBULATORY: .90 NON-AMBULATORY: .90

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 12.19 NON-AMBULATORY: 14.09

CONVENTIONAL TRANSIT FARE: .90

COMMENTS: "504" service implementation plan calls for 24 hour service systemwide by October 1987. Reservation time is from 8 to 24 hours in advance. Riders can choose from any of 4 different providers to go when and where they choose. Computerized system prints tickets at provider satellite locations, where subsequent trip information is posted within 48 hours of transportation. - CTA providers accept requests for service 7 days per week.

FIGURE 3 ***continued***

4CITY: Houston, TX
SYSTEM: Metropolitan Transit Authority (Metro)
CONTACT: James Laughlin
TITLE: Manager, Metro Lift Services
ADDRESS: 500 Jefferson, P.O. Box 61429, Houston, TX 77208-1429
PHONE: 713-739-4986

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 375 TOTAL POPULATION: 2,600,000

OF PROVIDERS: TOTAL: 4 (PUBLIC: 0; FOR-PROF: 4; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0530 - 2400

SPECIAL: 0600 - 2300

OPERATING BUDGET CONVENTIONAL: 137,000,000 SPECIAL: 4,800,000

ELIGIBLE USERS DISABLED ONLY: 14,500 ELDERLY: 0

ANNUAL MILEAGE: 4,190,947

ANNUAL HOURS OF SERVICE: 246,962

ANNUAL ONE-WAY TRIPS: 411,837

AVERAGE USER FARES: AMBULATORY: 1.00 NON-AMBULATORY: 1.00

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 4.95 NON-AMBULATORY: 9.91

CONVENTIONAL TRANSIT FARE: .60

COMMENTS: "504" service implementation plans calls for meeting full requirements in next fiscal year. Trip subsidies are restricted to 8 miles. Taxi service is available 24 hours. Advanced reservations of 24 hours to 6 days are required. Metro does routing and scheduling on Metrolift service. Metrolift drivers accept only passes or tickets. Taxis accept cash fares and maximum subsidy of $8.00.

CITY: San Diego, CA
SYSTEM: City of San Diego, Paratransit Administration
CONTACT: Bijan Zayer
TITLE: Manager, Dial-A-Ride
ADDRESS: City Admin Bldg, 202 C. Street M.S. 8-A, San Diego, CA 92101
PHONE: 619-533-4671

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 403 county TOTAL POPULATION: 1,000,000

OF PROVIDERS: TOTAL: 26 (PUBLIC: 0; FOR-PROF: 25; NON-PROF: 1)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 313 days

HOURS OF SERVICE CONVENTIONAL: 0500 - 2400

SPECIAL: 24 hrs ambulatory, 11 hrs non-ambulatory

OPERATING BUDGET CONVENTIONAL: 40,451,000 SPECIAL: 1,596,750

ELIGIBLE USERS DISABLED ONLY: 11,000 ELDERLY: 0

ANNUAL MILEAGE: 760,689

ANNUAL HOURS OF SERVICE: 45,002

ANNUAL ONE-WAY TRIPS: 222,260

AVERAGE USER FARES: AMBULATORY: 1.69 NON-AMBULATORY: 1.69

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 7.18 NON-AMBULATORY: 7.18

CONVENTIONAL TRANSIT FARE: .75

COMMENTS: This system is administered by the City of San Diego. Twenty-five taxi firms provide all ambulatory and semi-ambulatory trips, while Red Cross provides non-ambulatory transit at reduced hours and days of service. Riders pay for trips with coupons purchased at 75%-85% discounts. Taxi users pay distance based fares and zone based fares if non-ambulatory. 50% of San Diego Transit is conventional buses. Buses are accessible, providing approximately 20 lift uses daily. Taxis operate 24 hours for ambulatory passengers.

CITY: Milwaukee, WI
SYSTEM: Milwaukee County Department of Public Works
CONTACT: Christopher Gran
TITLE: Paratransit Services Coordinator, Special Transit Services
ADDRESS: Courthouse Annex, 907 North 10th Street, Milwaukee, WI 53233
PHONE: 414-278-4896

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 251 county TOTAL POPULATION: 964,998

OF PROVIDERS: TOTAL: 13 (PUBLIC: 0; FOR-PROF: 12; NON-PROF: 1)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0400 - 0100

SPECIAL: 0600 - 2400

OPERATING BUDGET CONVENTIONAL: 68,600,000 SPECIAL: 3,786,559

ELIGIBLE USERS DISABLED ONLY: 9,000 ELDERLY: 0

ANNUAL MILEAGE: 4,264,000

ANNUAL HOURS OF SERVICE: 319,000

ANNUAL ONE-WAY TRIPS: 462,006

AVERAGE USER FARES: AMBULATORY: 2.00 NON-AMBULATORY: 2.00

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 6.00 NON-AMBULATORY: 9.00

CONVENTIONAL TRANSIT FARE: 1.00

COMMENTS: "504" service implementation has been submitted. The system assigns cost at which service is delivered. Subsidies are limited to 8 miles per trip. Taxi contractors provide 24 hour service. Service eligibility restricted to users of wheelchairs, walkers, 2 crutches, or the legally blind.

CITY: Dallas, TX
SYSTEM: Dallas Area Rapid Transit (DART)
CONTACT: David Naiditch
TITLE: Manager, Special Services
ADDRESS: 601 Pacific Ave., Dallas, TX 75202
PHONE: 214-748-3278

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 285 TOTAL POPULATION: 1,620,000

OF PROVIDERS: TOTAL: 8 (PUBLIC: 0; FOR-PROF: 8; NON-PROF: 1)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 313 days

HOURS OF SERVICE CONVENTIONAL: 0500 - 2200

SPECIAL: 0700 - 1800

OPERATING BUDGET CONVENTIONAL: 115,000,000 SPECIAL: 6,581,415

ELIGIBLE USERS DISABLED ONLY: 6,200 ELDERLY:

ANNUAL MILEAGE: 3,000,000

ANNUAL HOURS OF SERVICE: N/A

ANNUAL ONE-WAY TRIPS: 550,000

AVERAGE USER FARES: AMBULATORY: 1.00 NON-AMBULATORY: 1.00

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 9.25 NON-AMBULATORY: 12.25

CONVENTIONAL TRANSIT FARE: .75

COMMENTS: DART'S "504" service implementation plan calls for increasing service to the disabled to 6% of the conventional budget. Of the 950 sq. mi., the city of Dallas, with a population of just under 1,000,000, represents approximately 30%. DART accepts blind and mentally retarded as transit disadvantaged. DART employs credit card imprints as proof of riders' qualifications. Riders receive monthly allocation of 44 trips. Taxis are available 0500-2400.

FIGURE 3 ***continued***

CITY: Boston, MA
SYSTEM: Massachusetts Bay Transportation Authority MBTA
CONTACT: Joseph Curtain
TITLE: Manager, Office of Special Needs
ADDRESS: MBTA, 10 Park Plaza, Boston, MA 02116
PHONE: 617-722-5123

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 253 TOTAL POPULATION: 1,218,880

OF PROVIDERS: TOTAL: 3 (PUBLIC: 0; FOR-PROF: 1; NON-PROF: 2)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 0500 - 0100

SPECIAL: 0700 - 2300 M-T, 0700 - 0100 F-S

OPERATING BUDGET CONVENTIONAL: 543,000,000 SPECIAL: 3,356,937

ELIGIBLE USERS DISABLED ONLY: 5,600 ELDERLY: 4,400

ANNUAL MILEAGE: 1,489,654

ANNUAL HOURS OF SERVICE: n/a

ANNUAL ONE-WAY TRIPS: 202,800

AVERAGE USER FARES: AMBULATORY: .75 NON-AMBULATORY: .75

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 25.00 NON-AMBULATORY: 25.00

CONVENTIONAL TRANSIT FARE: .60

COMMENTS: MMBTA has submitted a service plan which calls for an additional contractor to serve four more cities and towns. This will increase the service area by 60 sq. mi. and population by 202,000. MBTA provides capital equipment and purchases services on a trip rate from 2 non-profit providers who subcontract with a taxi firm. MBTA services are prescheduled with variable weekend hours. MBTA serves elderly and handicapped riders on a 40%/30% ratio, as well as other human service groups. An average trip subsidy of $25.00 per trip includes cost of taxicabs.

CITY: Philadelphia, PA
SYSTEM: Southeastern Pennsylvania Transportation Athy (SEPTA)
CONTACT: Robert Corressel
TITLE: Manager, Special Services
ADDRESS: 25 South 9th Street, Philadelphia, PA 19107
PHONE: 215-574-2780

DESCRIPTION OF SERVICE
SERVICE AREA
(SQ.MILES): 138 TOTAL POPULATION: 1,688,210

OF PROVIDERS: TOTAL: 4 (PUBLIC: 0; FOR-PROF: 4; NON-PROF: 0)

DAYS OF SERVICE CONVENTIONAL: 365 days SPECIAL: 365 days

HOURS OF SERVICE CONVENTIONAL: 24 hours

SPECIAL: 16 hours

OPERATING BUDGET CONVENTIONAL: 507,822,000 SPECIAL: 3,784,000

ELIGIBLE USERS DISABLED ONLY: 8,293 ELDERLY: 256

ANNUAL MILEAGE: 1,872,302

ANNUAL HOURS OF SERVICE: 159,043

ANNUAL ONE-WAY TRIPS: 235,170

AVERAGE USER FARES: AMBULATORY: 1.25 NON-AMBULATORY: 1.25

AVERAGE SUBSIDY PER TRIP: AMBULATORY: 13.45 NON-AMBULATORY: 12.45

CONVENTIONAL TRANSIT FARE: 1.25

COMMENTS: SEPTA has submitted a service implementation plan. Some coordination of services. Includes 3% funding from human services. Service includes weekend schedule. SEPTA accepts reservations up to 1 week in advance, between the hours of 0800-1700 on weekdays. SEPTA asks wheelchair users to have seat belts on their wheelchairs.

TABLE 1 SELECTED CHARACTERISTICS OF SPECIALIZED AND CONVENTIONAL SERVICES

Service and Location	Type of Service	SPECIAL																CONVENTIONAL				
		Service Area (sq. mi.)	No. of Providers			Days of Service	Hours of Service	Operating Budget (million)	Eligible Users		Annual Mileage	Annual Hours	Annual Trips	Average Fare		Average Subsidy		Public Transit Service	Days of Service	Hours of Service	Operating Budget (million)	Fare
			Pub.	F/P	N/P				Dis.	El.				Amb	n/Amb	Amb	n/Amb					
Boston, MA Office of Special Need	• Authority owns capital equipment • Supplemental taxi service • Pre-scheduled services	253		1	2	365	16	3,357	6,600	4,400	1,489,654	129,189	202,800	.75	.75	25.00	25.00	Massachusetts Bay Transportation Authority	365	20	543,000	.60
Chicago, IL Special Services	• Same day service is available • Trip information provided CTA within 48 hrs. • Fines for poor service	242		4		365	24	10,800	14,000	None	3,444,162	N/A	737,300	.90	.90	12.19	14.09	Chicago Transit Authority	365	24	661,000	.90
Dallas, TX Handi Rides	• Credit card imprints are used to verify ride • Monthly allocation of trips	950		8		313	19	6,581	6,200	None	3,000,000	N/A	550,000	1.00	1.00	9.25	12.25	Dallas Area Rapid Transit	365	17	115,000	.75
Cleveland, OH Community Responsive Transit	• Operated in part by CRT • CRT provides capital equipment	458	1	1		313	13.5	3,475	43,467	153,619	1,115,946	110,959	388,088	.85	.85	6.00	14.00	Cleveland Regional Transit Authority	365	24	140,000	.85
Houston, TX Metro-Lift	• Mileage based fare • Taxi participation • Metro does scheduling and dispatching	375		4		365	24	4,800	14,500	None	4,190,947	246,962	411,837	1.00	1.00	4.95	9.91	Metropolitan Transit Authority	365	18.5	137,000	.60
Miami, FL Metro-Dade	• Taxi participation • County owns part of capital equipment	250		2		365	18	2,100	5,500	None	1,200,000	N/A	150,000	1.77	1.77	11.56	20.46	Metro-Dade Transportation Administration	365	21	134,634	.75
Milwaukee, WI Milwaukee County User-Side Subsidy	• User side subsidy • Taxi participation • Limited subsidy • Restrict Eligibility	241		12	1	365	24	3,786	9,000	None	4,264,000	319,000	462,002	2.00	2.00	6.00	9.00	Milwaukee County Department of Public Works	365	24	68,600	1.00
Minneapolis/St. Paul, MN Metro-Mobility	• Mileage based fare • Riders pay registration fee • Taxi participation	633		16	3	365	17	6,635	9,300	None	4,457,700	N/A	685,800	1.15	1.15	5.50	11.50	Metropolitan Transit Commission	365	20	92,881	.75 + zone
Philadelphia, PA Paratransit	• Some coordination • Pre-scheduled service • Taxi participation	138		4		365	16	3,784	8,293	256	1,872,302	159,043	235,170 includes attendants	1.25	1.25	13.45	13.45	South Eastern Pennsylvania Transportation Authority	365	24	507,822	1.25
Pittsburg, PA Access	• Operated by a private management co. • Coordinated with human service providers • Taxi participation	729		11	4	365	18	11,600	5,800	16,000	8,600,000	610,000	1,400,000	.87	1.15	8.50	8.50	Allegheny County Port Authority	365	21	170,000	1.00
San Diego, CA Dial-A-Ride Service	• Emphasis on medical & nutrition trips • Taxi participation • Distance based fares	403		25	1	313	24	1,596	11,000	None	760,689	45,002	222,260	1.69	1.69	7.18	7.18	City of San Diego Paratransit Administration	365	19	40,451	.75
Toronto, Ontario Canada Wheel Trans	• Commission owns part of capital equipment • Coordinate with Human Services	244		1		365	18	11,858	14,000	None	3,712,311	278,122	536,324	1.00	1.00	15.77 U.S.	15.77 U.S.	Toronto Transit Commission	365	24	460,000	1.00

requests are required 24 hr in advance; however, the rider is not assured of a ride until the schedule for the day is completed. Sometimes this confirmation does not come through until a few hours before actual trip time, causing great inconvenience for the rider. These problems often result from the practice of trip scheduling into vehicle tours, that is, the grouping of riders who travel at similar times and in similar geographic areas. Systems that require trip scheduling in advance of 24 hr are practicing "deficit scheduling." In other words, they have the luxury of spreading demand over a greater than 24-hr period. This practice is convenient for the scheduler, but highly restrictive for the user. A true 24-hr reservation system allows the special rider more comparable flexibility in trip planning.

6. "Transit providers may not impose restrictions or priorities based on trip purpose."

None of the properties contacted report restrictions on actual trip purpose as long as trips are available and can be scheduled. Many systems are already spending 3 percent of their conventional operating budget on special services. However, some of these do extensive transportation of the elderly and it is difficult to break out, in each case, the amount that applies to transportation of disabled alone. Systems that have met the 3 percent spending ceiling may want to consider possible cost controls or service redesign. The authors hope that by providing the results of this study, they can give these systems a basis for service reassessment.

SURVEY OBSERVATIONS

One purpose of this paper is to provide information on a wide range of service areas in order to highlight good practices and stimulate communication among providers. Following are some comments that may be helpful.

System Efficiency and Effectiveness

Efficiency and effectiveness are two often confused and competing service measures. Efficiency is a productivity measure that examines vehicle use, labor productivity, and so on. System effectiveness is a service quality measure that examines the level or quality of service in terms of population served, area covered, on-time performance, vehicle cleanliness, and so on.

Balancing the demands of efficiency versus effectiveness is often the greatest challenge of paratransit service. One example of how efficiency and effectiveness can run counter to each other is the practice of a provider trying to group rides to increase vehicle use. Adding more passengers to a trip adds waiting time for riders. For some frail elderly and disabled, such increased riding and waiting time can be intolerable.

Reported administrative costs among the 12 cities vary from 5 percent to 21 percent of gross expenditures. Contract clauses requiring insurance liability vary from $100,000 to $5,000,000 per incident, with some systems permitting self-insurance. It is critical that each system recognize what these "cost driving practices" are and how to manipulate them to avoid the need for increased subsidy.

Demand Estimation

The advent of "504" has focused renewed attention on transportation for the disabled, a service that is generally more expensive than regular service. As the problems of financing low-cost transit to the general public increase, planners will have to focus increasingly on travel demand.

Special services are very sensitive to a number of different features of demand:

- Eligibility criteria for users;
- Types of service subsidized;
- Procedures for certifying eligible users;
- Trip restrictions; and
- Fares charged.

Given such diversity, it appears that the best approach for demand estimation is to review existing programs with desired design features. The revealed travel behavior can be used as a basis for prediction.

Appropriate Costing

Reaching an agreement with service providers on the value of handicapped services can be a very simple or a very complex process. Ideally, providers should have a chance to give their input during program design so that a mutually agreeable set of procedures and services can be adopted.

Some concerns of service providers include

- How many new trips will the program produce? What is the size of the contract?
- How often will reimbursement occur—could there be cash-flow problems?
- What will be required of the dispatcher and general administration?
- How much will this cost?
- What will be expected of the drivers in terms of paperwork?
- Will there be any labor negotiations required?
- What will be the reimbursement per trip—a fixed rate or a variable one based on actual trip costs?
- Will drivers be expected to provide special assistance to passengers?
- Can extra fees be charged for wheelchair-bound passengers?
- Can extra fees be charged for luggage, packages, and so on?
- Will regular fares be charged to escorts of program users?
- What fares and trip-recording procedures are to be used for shared-ride trips?

Even though these items are discussed before the service starts, they are generally questions that develop in the course of implementation. The key to successful coordination between funders and providers is open and honest communication.

Some concerns of the subsidizing agency include

- Will providers abide by all of the program rules—enforcing use limits, accurately collecting fares, completing records, and so on?
- Will the desired level and quality of service be made available to program participants?

- Will the providers be liable for personal injury or property damage occurring on trips?
- What means of recourse or penalties can be used on discovery of program fraud on the part of providers?
- Under what conditions can the provider be refused reimbursement; for example, incorrectly completed vouchers, trips by riders who have exceeded their subsidy limits, and so on?

Every effort should be made by the subsidizing agency to see that providers' concerns are met. A minimum "intrusion" into their service and operational policies should be the goal. Reimbursement should be as expeditious as possible. However, the subsidizing agency should ensure that providers meet certain minimum requirements (adequate insurance coverage, safety of vehicles, good business practices, dispatching equipment, etc.).

The 12 systems reviewed have substantial operating differences that arise from their unique origins, funding sources, planning participants, and interests served. In spite of these differences, a review of the costing figures gathered could provide valuable insights into pricing.

Policy Development

The information gathered through this and subsequent surveys can be used to help transit properties share information and develop ideal sample policies. A consortium approach could be better than a single property approach, especially in such a complex and emotionally charged area as specialized transport. Such a consortium effort could also save a substantial amount of time and effort over individual transit properties working in isolation.

Some of the policy issues that need to be addressed include

- What are the best guidelines for balancing the cost savings of grouping rides with acceptable levels of passenger comfort and convenience?
- How many vehicles should be available for a given population density or geographic area?
- Should vehicles be dedicated or, through coordination, provide transportation for all human services?
- How should contractors be monitored and performance measured?
- How should eligibility be determined?
- How should eligibility be certified and rider lists be kept up-to-date?
- How can insurance costs be controlled through a consistent safety rating system for drivers?

Ride Policy

There are many issues related to ride policy that also need to be addressed, for instance, the amount of time in advance that trip reservations must be made and whether or not return trips must be prescheduled. (Often providers assume that scheduling vehicles in tours is the only effective way to maximize vehicle use; however, this assumption is usually a result of lack of control at the operator's level and a fear that demand-based dispatching cannot be controlled.)

When measuring one service against another, some important considerations greatly affect the ride policy and subsequent cost comparisons. These include

- Whether the system pays the full subsidy or applies limits by mileage or area served;
- Whether users can call for trips during all hours of availability or only during business hours; and
- Whether weekend hours are the same as weekday hours or proportionate to conventional weekend schedules.

Attendant policy and visitor policies are also measures of the usability of a system. Since many users are first-time or seldom users, it is often very important that attendants be allowed to go; however, this does not necessarily mean that attendants should not pay a fare or that visitors should not be expected to pay fares as well.

OPERATIONAL ISSUES AND FUTURE STUDY

Through the surveys of the 12 providers, the team was able to isolate six issues that need further discussion. The final part of this paper, then, consists of further observations on some important areas of specialized transportation.

Management Structure

When transportation for riders with disabilities is provided through contracts between public and private providers, there are roles for each to play, in order to minimize subsidies and maximize trips. In short, the public provider must establish a system based on cost-effectiveness and high service standards, whereas the private provider must respond with a low-cost operation that is flexible to user needs. In both cases, there is a need to employ incentives, use current technology, and follow safe, efficient policies. Both systems must be accountable to the public they serve.

Of the 12 systems reviewed, some use computer technology to speed up call intake, document trip reservations, improve audits, and record accurate trip information. The ready access to this information makes monitoring service standards easier. Additional tasks, such as complaint monitoring, loss information collection on accidents, and updated eligibility lists and trip verifications, give credibility to those systems.

Control and Dispatch

Computerized scheduling and dispatching for demand-responsive trips will eventually allow riders to make last-minute trip decisions and to alter destinations and pick-up points. The immense "paper trail" required to follow demand-responsive transportation and the effect of radio communication on productivity and costs will ultimately demand that computer systems play a greater transportation role than just recordkeeping. With sophisticated technology and dispatching methods, a rider may be able to call for service as little as 1 hr in advance, with the request instantly integrated into a master list of trip requests. This information could be relayed to the appropriate vehicle on a visual screen in time for a timely pickup. When the rider enters the vehicle, a signal from the driver notifies the computer of load status. At that time additional rides that complement the trip could be received or the driver could be instructed to proceed directly to the user's

destination. A system of automatic vehicle locators alerts the computer when the vehicle becomes available at the rider's destination.

There are obvious efficiencies to such a system. No driver logs will be required because the trip information will already be a matter of permanent information at the contracting agency and the driver's base of operations. In fact, the trip can be automatically credited to the driver's payroll record, where incentives are a part of that pay.

The technology has already been developed for this sophisticated dispatching and recordkeeping. What remains is for these systems to be implemented.

Labor

In a labor-intensive industry, the major benefits will not come from technology or capital savings alone, but from the commitment of labor to achieve system goals. Both private for-profit and nonprofit companies need to pursue flexible employment practices. Many of the 12 systems interviewed employ taxi companies to take advantage of cost savings and extend operating hours. Today most taxis are owner-operated. In order to foster their cooperation, the contracting agency must give them reasonable incentive for services. This may take the form of a guaranteed amount of contracted business. Centralized, sophisticated dispatching could result in more trips per cab than individual cab drivers could find on their own. In addition, having blocks of business during peak periods could assure individual drivers of enough daily business to guarantee operating costs in a short time.

Another popular incentive plan consists of dedicated vehicles operated solely by independent owner-operators. The advantages of such an incentive program are multiple. If drivers are paid based on productivity and save money based on lower maintenance costs and fewer accidents, their productivity is more dependable and consistent. However, they must have access to some kind of ancillary support from the contracting agency.

Vehicle Selection

Past technology called for making body-on-chassis buses or raising tops on vans and adding wheelchair lifts. These vehicles generally provided up to 4 wheelchair positions and up to 16 seats for ambulatory passengers. Never really transit quality, these vehicles were often foisted on agencies that did not need them and had no way of handling their maintenance and repair. Many service providers learned that by using cars they could add flexibility to their bus fleets. Semiambulatory persons, who made up the majority of people transported, could enter and exit cars more easily. With the low ridership factors during most service hours, the empty seats on buses were just extra baggage. The recent advent of Chrysler Corporation's front-wheel-drive mini-van has opened the door to a new concept in paratransit services. Although more sophisticated versions of the body-on-chassis buses continue to be introduced, providers of transportation for the disabled, particularly those in high-density urban areas, have found many advantages to the smaller vehicles. Among these are

- Higher fuel mileage;
- Lower maintenance cost than rear-wheel-drive vehicles;
- Low purchase and replacement costs;
- Low center of gravity for increased safety; and
- Low-angle ramp for safer wheelchair loading.

Passengers have likewise found advantages to these vehicles:

- Greater creature comforts, including lower noise levels and automobile-like ride;
- Factory-installed seat belts for use on wheelchairs;
- Seating on an eye level with the driver; and
- Automobile-like vehicles for greater anonymity.

A single type of fleet vehicle, offering ready access to semi-ambulatory riders and fast loading by a low-angle ramp for wheelchairs, automatically assists demand-responsive dispatching and reduces boarding times associated with larger vehicles used for prescheduled tours, thus reducing ride time in the vehicle. This vehicle is preferred in owner-operator incentive programs. Some taxi companies are currently testing the potential benefit of replacing standard sedans with mini-vans, in order to participate in increased paratransit business. The potential benefit to riders would be the excess capacity of nondedicated vehicles, and transit properties could benefit from sharing the cost of paratransit with taxi-type operations.

Marketing and Promotion

In contrast to conventional transit service, specialized transit use is growing rapidly. In fact, this demand is growing in excess of 10 percent annually in cities that have had services available for over 10 yr.

As far as marketing and promotion go, the real need in these areas is educational. The riding public needs to know more about

- Ride policies and the reasons behind them;
- The cost component versus service component involved in decisions;
- How to make the best use of the system; and
- How to promote the rights of other passengers.

Client or rider education is not all that is needed. Many human service agencies have transportation budgets from other than transit sources. They should be encouraged to coordinate with transit personnel in order to provide transportation to a larger client group at lower costs.

Another reason for close coordination is that human service agencies often schedule events involving the transportation of large numbers of clients, many of whom use the paratransit system. Good communication and coordination can help avoid travel demand by these clients during peak system periods.

Cost of Operations

Of the 12 systems reviewed, each demonstrated significant operating differences that arose out of their local situations.

These include original funding sources, politically influential planning participants, or service features considered locally important. These systems have developed their operations around user-subsidy, special reservations systems, zone systems, computer scheduling, variable or limited fares, trip limitations, coupon purchases, brokerage, and so on. A formal sharing of ideas among these experienced and influential providers could go a long way toward helping standardize the specialized and disabled transportation service.

Future Study Summary

The informal written survey followed by telephone interviews was a first step in establishing an awareness of what 12 different systems are doing to provide transportation to persons with disabilities. At the present time there is no single organization that serves as a center or clearinghouse for an exchange of methods and ideas. Those providers contacted for this survey were very interested in establishing a group where problems could be discussed and practical information shared.

The next step in this information collection and sharing effort is to review industry service practices in greater depth; this will mean that standardized, quantifiable data must be established so performance can be compared.

Even though it may be difficult to develop the same standard for all providers, it is probably reasonable to expect the development of similar standards nationwide. Continuing to collect and compare information will help establish standards and identify best practices. Ideally, some kind of provider group can be formed to address the issues raised in this paper. These provider participants could rethink service objectives and develop quality standards. Such a forum could also serve as an opportunity for group problem solving and peer-to-peer transfer of technical information and assistance. Some of the areas the group could investigate include safety, driver training, costs, service reliability, maintenance, service changes, and system awareness and image.

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Integrating Social Service Client Transportation and Special Needs Transportation Systems: The Portland Experience

KENNETH J. DUEKER AND JUDY S. DAVIS

This paper examines some issues of integrating social service client transportation with the transit district's Special Needs Transportation (SNT) program in Portland, Oregon. The characteristics and problems of the Portland system, which is one of the largest and most highly integrated on the West Coast, are first described. Then this system is compared with social service client transportation provision in seven other West Coast cities. Despite great variety in the level of integration of service, all these systems face common issues. Each area must determine who will pay for social service client transportation, how much coordination with SNT systems is feasible and desirable, and how to balance supply and demand.

Social service agencies serving elderly and developmentally disabled clients often consider transportation an essential support service for their basic programs. Many of their clients do not have adequate private means of transportation. Although public transit districts are required by federal law to provide services for the elderly and handicapped, these services may lack the flexibility or capacity to meet the needs of all social service clients. Social service agencies have, therefore, turned to social service providers, volunteers, and taxis or other transportation companies to provide transportation services. Another option is to contract with transit agencies to provide additional service on their door-to-door Special Needs Transportation (SNT) programs, which serve the transportation handicapped (*1*).

Integrating social service transportation with SNT programs can be beneficial for both programs. Social service agencies may be freed from the day-to-day concerns of running transportation services while receiving better service at lower cost. SNT programs' productivity may also be enhanced. However, combining services can generate conflicts among user groups and raise questions about equity (*2*). Furthermore, integrated service may produce disagreements about (a) the allocation of costs to the various types of service, (b) the responsibility for paying for these services, and (c) the quality of service provided.

THE PORTLAND SYSTEM

Described in this section of the paper are the organization of Portland's social service and SNT transportation system, the characteristics and costs of various types of services, the funding sources for these services, and the problems the system currently faces.

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Organization

The Multnomah County Aging Services Division (ASD) and the tri-county developmentally disabled (DD) programs provide transportation services for their elderly and handicapped clients primarily by contracting with Tri-Met, the regional transit district. Tri-Met serves agency clients plus other elderly and disabled persons needing specialized transportation services on a door-to-door system called LIFT. As indicated in Table 1, ASD and the DD programs currently purchase over half the rides on LIFT.

TABLE 1 TRI-MET'S LIFT SYSTEM PASSENGERS FY 1986–1987

Type of Passenger	Monthly Average	Percentage
Agency		
Multnomah County Aging Services	8,680	26
DD programs	9,059	27
Other agency	2,154	6
Total	19,893	59
Regular SNT		
Urban	10,287	31
Rural (Section 18)	2,986	9
Total	13,273	40
Total passengers	33,166	99

NOTE: Percentages do not add to 100 because of rounding. Data do not include volunteer program (1,090 rides per month) or fixed-route service using LIFT vehicles (1,686 rides per month).
SOURCE: Tri-Met.

Tri-Met contracts with private transportation providers to operate the LIFT system using Tri-Met–owned vehicles. Providers are responsible for scheduling, dispatching, driving, and maintaining the LIFT vehicles. Separate contracts are let by competitive bidding in each of the three counties in the service area. Currently each county is served by a different provider.

Trip Characteristics

Most agency trips are on routes, but the purpose, time-of-day, length, and frequency of these trips are quite different for the two agencies. Currently about 77 percent of ASD-sponsored trips are for congregate meals, 6 percent for grocery shopping, and 17 percent for intermittent purposes, primarily medical appointments. Trips are short, as shown in Table 2, because ASD requires that most clients use neighborhood services. As indicated in Table 3, most trips are grouped at one or both ends because of the preponderance of nutrition and shopping trips.

TABLE 2 TRIP LENGTHS ON TRI-MET'S LIFT SYSTEM

	Type of Passenger (%)		
Trip Length (mi)	Aging Services	DD Programs	Regular SNT
0–4	91	49	64
4–10	9	45	31
10+	Less than 1	6	5

SOURCE: Tri-Met January 1987 trip data.

TABLE 3 INDIVIDUAL AND GROUP TRIPS ON TRI-MET LIFT SYSTEM

	Type of Passenger (%)		
Trip Type	Aging Services	DD Programs	Regular SNT
Individual	12	14	73
Grouped-at-one-end	67	42	–
Grouped-at-both-ends	21	44	27

SOURCE: Tri-Met January 1987 trip data. Number of grouped-at-one-end agency trips estimated from number reported as individual trips.

In contrast, DD trips are daily to sheltered workshops. Most of the clients are served on routes picking up people living in the same area and taking them to a single work site or to proximate work sites. Shown in Table 2 are longer trip lengths, reflecting the fact that group homes and sheltered workshops are often in different areas. There is considerable grouping evident in Table 3 because many clients live in group homes and the number of workplaces is small. The percentage of grouped-at-one-end trips is, however, only a rough estimate.

Although most agency service is on scheduled routes, most SNT service is demand-responsive. On average, SNT passengers take longer trips than ASD clients and shorter ones than DD clients. Most of the trips are individual although over one-fourth involve two or more people with the same origin and destination. The most common purposes for SNT trips are medical appointments, work, school, and shopping.

In 1986–1987, LIFT provided 433,259 trips at a total cost of $3,382,151. Thus, the average cost of a trip on LIFT was $7.83. Based on the variations in grouping and trip length, the average cost of an ASD client trip was about $4.19, a DD trip $7.83, and an SNT trip $10.17.

Funding

LIFT funding in FY 1986–1987 came from five sources: 3 percent user charges; 14 percent agency payments; 20 percent UMTA; 19 percent Special Transportation Fund (STF), a state dedicated fund for elderly and handicapped transportation; and 44 percent local payroll tax, which is Tri-Met's primary non-fare revenue source. SNT passengers pay a $0.50 fare, ASD clients are encouraged to make donations, which average about $0.05 a trip, and DD clients pay an $8.00 monthly fee.

The social service agencies use funds from several sources to purchase client transportation. ASD's funds are from the federal Older Americans Act, which prohibits fares, and from the city and county general funds. DD transportation is funded by the state. Tri-Met's policy has been that agencies should pay 60 percent of the cost of client transportation. Agencies currently pay 60 percent of billing rates that were established in 1982 and are based on grouping and length of trip. If these billing rates were applied to all trips, they would cover 96 percent of the contracted operating cost of LIFT but only about 70 percent of the total cost. In addition, the DD programs have been paying a lower rate for some of their clients because of inadequate state funding.

Federal funding for LIFT from UMTA includes 80 percent of capital costs, some planning funds, and Section 18 rural operating subsidies.

The STF is a state fund raised with a 1-cent tax on cigarettes, which is dedicated to elderly and handicapped transportation. When the STF program was approved by the 1985 legislature, many supporters expected it would be used to expand transportation services for the elderly and handicapped. Instead Tri-Met has partially used it to replace payroll tax support of door-to-door transportation services and to defray the cost of fixed-route accessibility.

The final revenue source, the payroll tax, is used to balance the LIFT budget. Tri-Met has been decreasing its payroll tax allocation for LIFT as STF funds have been received.

Issues

The Portland system is currently strained by a number of factors. The social service agencies are experiencing increased demand for transportation services because the frail elderly population is growing and more DD clients are being placed in community programs rather than the state hospital. Meanwhile social service transportation funds are not growing as rapidly as demand. In addition, the agencies are not satisfied with the quality of service they have been receiving from Tri-Met. They pay premium prices for guaranteed service, but contend it is no better than SNT service. They are also upset that Tri-Met has reduced its level of payroll tax support while expecting them to pay more. They have threatened to withdraw from the contractual relationship with Tri-Met and demand that their clients be served as regular SNT passengers.

On the other hand, SNT passengers on the LIFT system are concerned that additional agency rides are resulting in more turndowns and poorer service for them. Tri-Met's policy has been that all agency requests for service that satisfy trip purpose criteria are honored even if SNT passenger service must be reduced to supply the agency service. Furthermore, because priority is given to agency trips, SNT passengers are denied transportation at certain periods of the day when agency routes are being served.

In its 1987 budget, Tri-Met proposed a doubling of agency support for LIFT noting that agency-sponsored trips were increasing, that agency billing rates had not been increased in 5

years, and that the DD programs were not paying the same proportion of costs as other agencies. This has raised questions about how to determine the cost of an agency ride and who is responsible for paying these costs.

COMPARATIVE CITIES ANALYSIS

In hopes of finding solutions for Portland's problems, seven other West Coast cities were contacted to determine how they provide social service client transportation. These metropolitan areas were Lane (Eugene) and Marion (Salem) counties in Oregon; Pierce County (Tacoma), Seattle, and Spokane in Washington; and Sacramento, San Francisco, and Santa Clara counties in California.

Cost of Service

Trip data for most of these systems are summarized in Tables 4 through 6. The number and cost of trips for door-to-door transportation systems provided by transit and paratransit agencies are compared in Table 4. Because of differences in accounting methods and contracting procedures, some agencies include capital costs when calculating cost per trip and others do not. This is reflected in the table.

TABLE 4 COMPARATIVE TRIP DATA FOR DOOR-TO-DOOR TRANSPORTATION PROVIDED BY TRANSIT AND PARATRANSIT AGENCIES

		Cost per Trip ($)	
	Trips per Month	With Capital	Without Capital
San Francisco (group van)	9,779	6.19	
Portland	36,105	7.83	6.19
Spokane	10,500		8.51
Sacramento	15,575	8.65	
Pierce County	14,775		8.76
San Francisco (lift van)	3,960	17.12	

SOURCE: Transit or paratransit agencies. All data for 1986–1987 fiscal year, except San Francisco for 1985–1986.

The contracted operating costs of several providers are compared in Table 5. None of these figures includes capital or administrative costs. Data on transportation service of various aging services agencies are presented in Table 6. Once again, capital is treated differently by various agencies and hence cost per trip has been separated into two groups.

These tables should be interpreted cautiously because cost per trip is affected by factors other than the efficiency of the system. Complicating factors include the size of the area and the transportation system, density of the population served,

TABLE 5 COMPARATIVE TRIP DATA FOR CONTRACTED DOOR-TO-DOOR TRANSPORTATION (Operating Costs Only)

	Trips per Month	Cost per Trip ($)
Portland	36,105	5.72
Lane County	1,300	5.96
Seattle	5,000	8.72

SOURCE: Tri-Met, Lane County Council of Governments, North King County provider.

TABLE 6 COMPARATIVE TRIP DATA FOR AGING SERVICES DOOR-TO-DOOR TRANSPORTATION SERVICES

		Cost per Trip ($)	
	Trips per Month	With Capital	Without Capital
Sacramento	1,650	3.64	
Portland	8,680	4.19	3.31
Pierce County	8,137		4.29
San Francisco	5,800	4.60	
Salem	5,000		4.72
Seattle			5.00

SOURCES: Transit and social service agencies or transportation providers. All data for 1986–1987 fiscal year, except San Francisco for 1985–1986.

topography, labor costs, types of trips, proportion of passengers in wheelchairs, and the accounting methods used. The areas studied obviously vary in size, population density, and topography. The impact of labor costs is illustrated by Pierce County, Washington, where two door-to-door systems operate. Pierce Transit's door-to-door service uses drivers who are members of the transit union, while the aging agency contracts with a nonprofit organization whose drivers are volunteers, senior aides, and nonunion members. These differences are a major reason that transit rides cost $8.76 per trip while aging services cost only $4.29. San Francisco shows how different types of trips and passengers can affect costs. Group van service costs only $6.19 because, as the name implies, all trips are for groups. On the other hand, lift van service is expensive ($17.12 per trip) because it is exclusively for people in wheelchairs traveling for individual purposes.

A further issue with integrated systems is the difficulty of sorting out the cost of a particular type of trip. For instance, Tri-Met's standard budget format does not separate LIFT overhead costs from those of fixed-route accessibility and other services for the elderly and handicapped. This separation must be done as a first step in calculating costs. Then the more difficult problem is to allocate the costs to the various types of passengers. The $4.19 cost of an ASD trip reported in Table 4 was estimated using trip length and grouping data. Factors such as size of groups, proportion of passengers in wheelchairs, and loss of efficiency as a result of guaranteed agency rides were ignored because of lack of data.

Keeping these cautions in mind, Portland's cost per trip compares favorably with the others reported. This shows that Tri-Met's LIFT system is efficiently providing service. The high proportion of grouped agency trips undoubtedly contributes to this efficiency.

While comparative cost data are fairly easy to obtain, finding answers to other concerns is more illusive. Rather than providing ready solutions, the comparative cities illustrate that every area must grapple with the same issues and that the solutions will be strongly shaped by the local history of transportation and the state funding and regulatory environment.

Cost Responsibility

One basic question all areas must answer is who should pay for social service agency transportation. Funding can come from

funds dedicated to the transportation of the elderly and handicapped, social service agency budgets, and transit agency budgets. These funds may be provided by one or more levels of government. Federal sources—the Older Americans Act funds for aging programs and UMTA funds for some transit purposes—are widely used. State and local funding, however, varies greatly and is discussed here.

In Oregon all three basic sources are used to fund aging and DD client transportation. The STF is used to partially fund door-to-door systems serving both SNT passengers and agency clients in Portland and Lane County. Additional funding for door-to-door service comes from both social service and transit budgets. Lane and Marion counties also use STF and social service transportation funds to provide other types of transportation for agency clients.

Most California urban areas have SNT system for the elderly and handicapped because 5 percent of the California Transit Development Act funds (raised by a ¼ of 1 percent sales tax) is dedicated to this type of service. These programs may be administered by transit districts (San Francisco), counties or cities (Santa Clara County), or consolidated nonprofit transportation agencies (Sacramento). San Francisco and Sacramento add significant extra funding from the city and county general funds, whereas most Santa Clara County cities spend only the dedicated state funds. Some additional transportation services are provided by aging agencies using Older Americans Act funds.

California's DD programs are administered by 21 regional centers, which make the necessary transportation arrangements for their clients. Some regional centers have placed clients on the SNT systems as regular passengers effectively using the dedicated state funding to pay for DD transportation. This has severely strained some systems and raised questions about the equitable treatment of different types of passengers. For example, in 1982 Getabout in east San Gabriel Valley was providing 65 percent of its service to 125 DD clients who represented less than 3 percent of its registered users. Because of these problems some door-to-door systems have restricted access for DD clients. In other cases DD programs require more transportation than existing door-to-door systems are able to provide (*2*). Thus, many regional centers are using some of their state social service funding to contract for transportation services with private providers or transit districts. For example, the San Andreas Regional Center spends $2.5 million of its state funding to contract with providers for special transportation for 905 clients in a four-county region.

In contrast, Washington State relies mainly on transit district funding for social service transportation because there are no dedicated state funds for elderly and handicapped transportation and limited social service budgets. There is some state and federal social service funding for elderly transportation, but none for DD programs. Seattle and Pierce County aging agencies use their funds to contract with private providers while Spokane's aging agency works with the transit district. DD programs depend on transit districts, which are relatively well funded by locally levied sales taxes, to serve their clients as regular SNT passengers.

In general, the funding sources determine the nature of service delivery. California cities have elderly and handicapped transportation systems because of dedicated funding, although DD clients require so much transportation that they are often served separately from these systems. Washington State metropolitan areas rely heavily on transit districts because they are better funded than social service agencies. Oregon cities generally coordinate transit and social service programs to maximize use of multiple funding sources.

Coordination of Services

Another common concern is how much coordination and consolidation of agency and SNT passenger service is appropriate. Coordination was a principal issue at the First UMTA and Administration on Aging National Conference on Transportation for the Elderly and Handicapped held in 1985 (*3*). Perhaps as a result of the conference's recommendations, the U.S. departments of Health and Human Services and Transportation announced an agreement on October 24, 1986, to improve the coordination of federal transportation programs and policies. Some states such as California require coordination. Local areas generally do coordinate services but the degree and type of coordination vary widely.

Coordination is usually viewed as a positive step which can improve service by eliminating duplication, increasing reliability of service and efficiency of vehicle use, achieving economies of scale in management and operations, and making the system more comprehensible to users. Nonetheless, a high degree of consolidation may result in a less flexible and responsive system, difficulty in sorting out who should pay for what, and a lack of feelings of ownership by participants not involved in the day-to-day operations. Furthermore, the agencies involved may have different objectives, which can cause misunderstandings. For instance, transit districts tend to focus on efficient transportation of large numbers of people, whereas social service agencies try to match service with individual needs (*4*). Effective coordination needs to strike a balance between responsive but fragmented service on the one hand and efficient but monolithic service on the other hand.

Portland's system is one of the most highly coordinated on the West Coast. In particular, the tri-county DD contractual relationship with the transit district is unique. Other Oregon cities have emphasized specialized DD transportation rather than relying on a single type of provision. In Washington State, DD clients are treated as regular passengers on SNT transportation systems or strongly encouraged to use the fixed-route system. In California, many DD programs contract directly with private providers.

However, most aging agencies' transportation services have stronger ties to SNT systems. These connections range from some overlapping providers (Santa Clara County, Seattle) to common brokers but separate service (Sacramento, San Francisco) to highly coordinated programs (Lane County, Portland, Spokane). Only two areas studied lacked formal ties. Marion County has no SNT system, and Pierce County has separate door-to-door systems for SNT passengers and aging agency clients.

Washington State programs illustrate some problems that can occur when coordination is minimal. Transit districts in Washington have often become the primary social service providers more by default than by design. As a result, social service agencies have no control over the quantity and quality of

service except through the political process. In Seattle, political pressures have produced frequent changes in the SNT system and varying levels of cooperation. The system is currently quite fragmented and the aging agency feels that it is difficult for users to comprehend and use.

The general trend has been away from social service program provision of transportation toward brokered services that provide a single contact point. These brokered services may use multiple providers and a variety of services for different geographic areas and clientele. Lane County, Sacramento, and San Francisco have brokers separate from the transit district, which serve both SNT passenger and agency clients needing door-to-door service. In other cases, a social service agency, such as the San Andreas Regional Center, or a transit district, like Tri-Met, may be the coordinating agency.

Supply and Demand

A final universal concern is balancing supply and demand. Demand for social service agency–sponsored transportation is rising as the number of frail elderly and community-based DD clients increases. To deal with increased demand, social service agencies must find some combination of additional funding, more efficient service, or further ways to ration service. This discussion will focus on rationing mechanisms.

Social service agencies' primary mechanism for limiting service to eligible clients is trip purpose priorities. DD programs generally provide transportation only to work activities while aging programs vary in their choice of priorities. Sacramento and Spokane fund intermittent trips for medical appointments and necessary personal business, whereas Seattle and San Francisco only fund trips to congregate meal sites and other agency programs. Portland and Pierce County supply a mix of nutrition, medical, and other types of trips.

Whenever agency clients use SNT systems either through contractual relationships or as fare-paying passengers, they are subject to rationing strategies of the transit agency. Transit agencies use price, waiting time, and trip purposes as rationing mechanisms. Seattle illustrates what happens when rationing methods are changed. Seattle's transit district recently lowered the fare on its SNT system. Predictably, requests for service have risen dramatically. As a result, SNT passengers must now call at least 3 days in advance, and more of the service is being reserved by daily users. Providers are considering imposing trip purpose constraints or limits on the amount of subscription service to help bring demand and supply back into balance.

When agency clients and SNT passengers use the same system, conflicts can develop between the two types of users. These conflicts are evident in Portland and have been a major concern of some California door-to-door programs where DD clients have overwhelmed the system. Some transit agencies have reacted by limiting the amount of service available to social service clients. Others charge agencies for some or all of the cost of service. In Portland, agency clients receive guaranteed service in exchange for partial payment of costs. In Spokane, the aging agency pays the full cost of trips but its clients receive no special treatment.

Because potential demand for social service client transportation exceeds the ability of agencies to pay, some restrictions on service are necessary. These restrictions may be on price, dependability, or availability of service. As Seattle demonstrates, removing one type of restraint will cause others to increase in importance. The problem lies in finding a rationing system that is effective at balancing supply and demand, equitable in serving users, and able to fulfill other social policy goals.

CONCLUSIONS

Portland's LIFT system illustrates that integrating social service client transportation with transit district SNT service can be an effective way to share resources and provide efficient service. By participating in an integrated system, the social service agencies gain access to funds available only through transit districts. In Portland, these are the transit district's payroll tax, the state fund for elderly and handicapped transportation, and some UMTA capital, planning, and operating subsidies. By providing social service client transportation, the transit district's door-to-door system gains another funding source and is more productive. Portland's low cost per trip is one indication of this productivity.

However, an integrated system can satisfy all the participating parties only if there are effective communication and agreement on key issues. To facilitate negotiations, social service agencies should explicitly define their transportation objectives and the quality of service needed to meet those objectives. They should recognize that integrated systems work best for regular, prescheduled transportation and that other arrangements may be needed for some clients. Transit districts can facilitate the integration of service by compiling budgets and maintaining records that ease the computation of costs of various programs. Transit districts may also need to reexamine priorities and emphasize the social service mission of transit in order to satisfy the demand for both SNT passenger and agency client service.

Furthermore, social service agencies and transit districts should jointly agree on cost responsibility principles. Because of different funding sources, no specific set of recommendations will work for all areas. However, in general, transit districts should be responsible for a share of the transportation costs of all residents in their districts, irrespective of whether the residents are social service clients. Similarly, social service agencies should be responsible for the cost of service levels above that provided for the SNT passenger.

The involved parties also need to agree on an organizational structure. Integrated service can be administered by either transit districts or separate brokers. Social service agencies may feel that they have more equal standing with the transit district in a mutually established brokered system. However, equal standing may require some involvement in the details of managing a transportation system. Again the choice may reflect the local conditions such as the history of transportation provision.

The concerns of SNT passengers must not be forgotten. A limit on the number or proportion of agency rides may be needed to ensure that SNT passengers are treated fairly. In addition, a variety of programs may be needed to accommodate all needs. Subscription service might be provided for many agency trips and for SNT passengers who use the door-to-door systems on a regular basis, while demand-responsive service is

needed for intermittent trips. Volunteer programs can also be coordinated with door-to-door systems to expand the supply and increase the flexibility of transportation services.

In conclusion, integrating social service transportation with SNT programs can be mutually beneficial to social service agencies and transit districts. However, an integrated system does require the active participation and informed dialogue of all participants in order to avoid conflicts, solve problems, and maximize the benefits of the system. When there are agreement and cooperation, an integrated system can be an efficient and effective provider of transportation.

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