Evaluation of DRT Systems in Richmond and Santa Barbara

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This study evaluated system performance and the economics of a publicly operated demand-responsive transportation system in Richmond, California, and a privately owned and operated demand-responsive transit service in Santa Barbara, California. The systems were evaluated from the viewpoint of users, nonusers, and system operators. The major conclusion from the research was that ownership and operation of demand-responsive transit by the private sector demonstrate significant potential and should be given serious consideration by policy makers. By subsidizing a private operator at approximately $1.00 per passenger-trip, it should be possible for a local government to provide increased mobility to transit-disadvantaged sectors of the population with a greater degree of efficiency and equity than would be possible if the service were operated by a transit district.

This paper reports on a study of demand-responsive transportation (DRT) systems in Richmond and Santa Barbara, California. Since this research was performed, both systems have gone out of operation. This study should be seen as an attempt to analyze the reasons underlying the failure of the two systems. I hope it will provide some insight into the pitfalls that must be avoided in planning new DRT service.

SYSTEM STRUCTURE

Dial-a-ride was initiated in Richmond on September 16, 1974. The system was sponsored, operated, and managed by the Alameda-Contra Costa (AC) Transit District and was coordinated with Bay Area Rapid Transit (BART). The Board of Control for the AC/BART Coordination Project authorized the Richmond DRT experiment (1) in order to

1. Develop information from the pilot project that would be useful in implementing similar service elsewhere in the Bay area,
2. Acquire experience in coordinating DRT service, AC Transit, and BART services, and
3. Obtain guidance in terms of technology, personnel, and facilities requirements for expanding DRT service beyond the boundaries of the initial service area.

In contrast to Richmond's DRT, Santa Barbara's dial-a-ride operation was privately owned and operated. The system was initiated on September 1, 1973, and was operated as a service of the Yellow Cab Company, the only taxi firm in Santa Barbara. Ernie Parks, the system operator, said his objectives were "to prove that we could operate it cheaper than if it were operated by a city or transit district" and "to salvage the taxi business so the transit district couldn't put us out of business.... We hoped it would help the cab industry.... We looked at the Haddonfield system and figured that, if we could operate a dial-a-ride service and show that it fulfilled community needs, it would be worthwhile."

Although, like AC Transit, the owner of the Santa Barbara dial-a-ride service did not formulate any set of criteria by which to judge the success or failure of the system, he wanted to break even. The original goal was to carry 500 passengers a day by the end of the first 8 to 12 weeks, although the service was never aimed toward any particular market sector. The operator was quoted in a newspaper interview as saying that the system would be the first one to be put into operation without a federal subsidy and that it would be "learn and go" (2).

Area Served

Richmond is located about 16 km (10 miles) north of Oakland on the northeast shore of the San Francisco Bay. The site selected for the dial-a-ride demonstration project was an area of 12.7 km^2 (4.9 miles^2) covering the center of the city. The total population of the service area is 44 000, and the population density is 3542 persons/km^2 (9173 persons/mile^2).

The city of Santa Barbara is located on the southeast coastal plain of Santa Barbara County, approximately 161 km (100 miles) northwest of Los Angeles. Nearly 28 km^2 (11 miles^2) are contained within the service area with a total population of 54 605 and a population density of 1974 persons/km^2 (5112 persons/mile^2).

While the Santa Barbara service area was about twice the size of Richmond's, the population was half as dense. Thus, on the basis of physical characteristics alone, the Santa Barbara system began with a double handicap compared with Richmond's system.

The median income in Richmond's initial service area was approximately $10 000 (3). The racial composition

was 39 percent black, 56 percent Caucasian, and 5 percent other. Automobile ownership in the service area was generally high. One-third of the population was under 18 years of age. The elderly, another major group the DRT system was designed to serve, constituted only 14 percent of the population.

The median income for the Santa Barbara service area was $9247. Its racial composition was 24 percent Chicano, 72 percent Caucasian, and 4 percent black. As in Richmond, automobile ownership was high. The percentage of young, middle-aged, and elderly was fairly even. Those 18 and under made up 25 percent of the population, while those over 60 made up 23 percent.

Size of System

Since AC Transit officials believed there was no small vehicle available that could meet their stringent reliability criteria, they shortened 13 of the 10.5-m (35-ft) transit coaches that normally seat 45 passengers so that they contained 18 seats.

The vehicle used for Santa Barbara's dial-a-ride operation was a B200 Dodge Sportsman Maxiwagon. The operator decided to use vans rather than taxis for Dial-a-Ride because it was feared that, if taxis were used at the cheaper dial-a-ride fares, too many taxi customers would switch to Dial-a-Ride. There were originally two vans in service, but when ridership dropped, one van was taken out of service.

The average distance traveled per day in Richmond's dial-a-ride operation was 164 km (102 miles) per bus per day (4). Santa Barbara's van system covered approximately 200 km (125 miles) per day.

During the initial months of operation, Richmond's dial-a-ride system employed 26 drivers, 12 control-room operators, and 2 control supervisors. In February 1975, in an effort to reduce the cost of operation, 2 controllers and 6 drivers were laid off. The personnel cutbacks, however, resulted in increased waiting times, a drop in patronage, and complaints concerning reliability of the service. For these reasons, the employees laid off in February returned to their jobs in March.

During its initial period of operation, Santa Barbara's dial-a-ride staff consisted of two drivers. Apart from the drivers, the only other employees who spent time on Dial-a-Ride were the dispatchers who were employed by the taxi operation. No more than 8 to 9 percent of a dispatcher's time was spent on Dial-a-Ride.

Financing

AC Transit relied on five sources of revenue to finance the dial-a-ride operation: a two-thirds capital grant from the Urban Mass Transportation Administration (UMTA) to redesign the transit coaches, a one-time allocation from the Metropolitan Transportation Commission (MTC) to be applied to net operating loss, a federal subsidy for operating costs, fare-box revenues, and a property-tax assessment (the normal means of financing all AC Transit operations). The percentage of the total cost of operation (including capital costs) supplied by each revenue source is shown below.

Revenue Source	Percentage
UMTA grant	9
MTC funds	14
Fare-box revenue	5
Property-tax assessment	72

Unlike Richmond's system, Santa Barbara's dial-a-ride system receives no outside subsidies. The cost of operation depends wholly on fare-box revenues and cross-subsidy from the Yellow Cab operation. Package delivery and night charter operations also bring in additional revenue.

Marketing

A wide range of advertising techniques was used to inform Richmond residents of the existence of Dial-a-Ride, e.g., mapboards, brochures, posters, directional signs, decals, bus cards, telephone stickers, and plastic bags. In addition, community consultants from the Model Cities program canvassed the service area distributing free tokens, and the service was advertised on local radio and television stations and in the local newspaper.

Santa Barbara's dial-a-ride operation was much less publicized. Prior to start-up of service, only one short news article and one full-page ad appeared in the local newspaper. Following this initial period, small ads were run occasionally. The last ad appeared in September or October of 1974. In addition to these advertisements, the News-Press printed one or two stories about dial-a-ride service, and the local television station provided some coverage of the operation. The operator's reluctance to advertise more heavily was a source of discouragement to dial-a-ride employees and passengers.

SYSTEMS PERFORMANCE

Opinions about the performance of the two dial-a-ride systems were gathered from users, nonusers, and system owners. The method used for each group was: (a) users—surveys conducted on board the vehicles, (b) nonusers—random telephone surveys of the general population in each service area, and (c) system owners—individual interviews.

The Richmond dial-a-ride users were surveyed by questionnaires handed out on three different days during October 1974 (3). From the 110 riders approached, 102 completed surveys were obtained (93 percent response rate). Additional information was gathered by means of simple observation.

Original data on Santa Barbara dial-a-ride users were obtained through an on-board survey conducted during January and February 1975. During the periods the interviewer rode the van, there were 81 dial-a-ride users. Although a goal of 100 surveys had been set, only 32 could be completed, largely due to two factors. First, more than 40 percent of the passenger-trips were made by regular passengers who rode more than once during the survey period; although information was recorded separately each time a passenger rode, each passenger was asked to complete a survey only once. Second, many of the passengers were mentally retarded and could not be interviewed.

Ridership Characteristics

The percentage of riders in each age group and the age structure of the total population in each service area are compared below.

	Richmond		Santa Barbara	
Age Group	Percent of Riders	Percent of Total Population	Percent of Riders	Percent of Total Population
Under 18	29	33	0	25
18 to 24	30	12	9	13
25 to 44	17	22	13	22
45 to 59	13	19	25	17
60 and over	10	14	53	23

As with so many other features of the systems, Richmond and Santa Barbara were at opposite ends of the spectrum. Whereas there was a predominance of younger riders in Richmond, the majority of Santa Barbara users were elderly. In addition, 75 percent of the users in Richmond and 65 percent of the users in Santa Barbara were female.

The most frequent type of trip in Richmond was work trips; shopping was the second most frequent type. In Santa Barbara medical visits were responsible for the greatest number of trips.

No information is available on frequency of use for Richmond dial-a-ride users. In Santa Barbara there appeared to be a fairly even split between occasional customers and regular passengers.

Although the door-to-door feature of dial-a-ride service should have made transportation more accessible to people with some types of disabilities, the fact that the buses used in Richmond did not differ significantly from the vehicles used in fixed-route service suggests that Dial-a-Ride served few categories of disabled people who could not have ridden the regular AC Transit buses. Nineteen percent of the households in Richmond were without automobiles. In comparison, 72 percent of all dial-a-ride users did not have a car available.

Several aspects of the dial-a-ride operation in Santa Barbara made it more accessible to the handicapped, notably the low step on the van, which facilitated boarding by the elderly and handicapped, and the personal interest taken by the driver in each dial-a-ride passenger, as demonstrated by his calling out directions to the blind passengers to aid them in entering the building at their destination. In the hours the interviewers rode the van, 36 percent of the 81 passenger-trips were made by handicapped people. The types of disabilities represented were mental retardation, blindness, and problems with balance and walking. In addition to these more obvious handicaps, approximately 34 percent of the riders indicated that they have health problems that make it difficult for them to walk more than a block or two. Only 12 percent of 32 riders surveyed had a driver's license.

User Evaluation

Fare

The fare on the Richmond dial-a-ride system was 25 cents. There were no transfer privileges to BART or regular AC Transit buses. Two children under five years of age rode free with a fare-paying adult.

The fare on the Santa Barbara system changed several times. From September 1, 1973, to September 30, 1974, the fare was 60 cents for a one-way trip. On October 1, 1974, this fare was doubled to $1.20. The increase was deemed necessary to offset a 19 percent decline in the taxi business, which resulted primarily from the Metropolitan Transit District's move to place eight new minibuses in service. Shortly after the fare was increased, dial-a-ride patronage dropped from between 110 and 120 riders per day to approximately 60 to 70 per day. On January 6, 1975, the fare was changed again—this time to $1.00 per ride.

Most of the Santa Barbara dial-a-ride users were very appreciative of the service. Two-thirds of the riders indicated that they would continue using the system even if the fare were increased to $1.50. For most of the passengers, the choice was between taxi or Dial-a-Ride. As long as the dial-a-ride fare remained less than $2.00, it was still cheaper than a taxi for most trips within the city. At a fare that almost covered the cost of the service (assuming a fare of $1.50 and a cost per trip of $1.60), between 70 and 90 percent of the weekly ridership would still have used the system.

It is fair to say that, despite the fact that the cost per trip in Santa Barbara was higher than that for most other dial-a-ride systems, the passengers were not considerably dissatisfied with that aspect of the service. Although the satisfaction expressed with the fare in Santa Barbara should not be taken as wholly representative of all system users, since the passengers surveyed were the residue of the 110 to 120 riders who used the system daily before the fare increase, the passenger ratings do have some degree of validity and might be used as an example for the Richmond system. Since the passengers were very well satisfied with the fare in Richmond, it is reasonable to believe that riders would still have been willing to use the service if the cost per trip in Richmond were increased to 45 or 50 cents. One of the drivers in the Richmond operation indicated that neither he nor his passengers would have been opposed to a 50-cent fare.

Trip Destinations

Lack of major activity centers in the Richmond service area had a detrimental impact on the dial-a-ride operation. Analysis of trip tickets indicated that there was no major origin-destination point. The major trip generators included Brookside Hospital, Kaiser Hospital, Montgomery Ward, K-Mart Shopping Center, the Richmond BART station, Hacienda Senior Citizens' Center, the welfare department, Contra Costa County Building, the library, city hall, and the art center. Because there was no major employer in the service area, only a small percentage of dial-a-ride trips were commuter oriented. In particular, trips to BART were far below expectations. Although school trips constituted a significant part of the ridership, these trips were discouraged since student demand overwhelmed the system when the service was first initiated.

In contrast, the Santa Barbara service area, which encompassed most of the city of Santa Barbara, had no lack of trip destinations. Medical offices were the major attractors for dial-a-ride trips. The main work destination was Work, Inc., a rehabilitation center on lower State Street where handicapped persons are taught employment skills. The school trips made by Dial-a-Ride were limited to transportation of the mentally retarded students between the Montecito area and Alpha School.

Speed of Service

During the first quarter of operation, waiting time in Richmond averaged 26.5 min, while riding time averaged 14 min.

Passengers who called for dial-a-ride service in Santa Barbara were told that they would be picked up within 30 min. This was the average waiting time for the system. When the patronage levels fluctuated around 110 to 120, however, this 30-min promise often could not be fulfilled. With such heavy demands on a two-vehicle system and so large an area to traverse, there were times when a vehicle did not show at all. Waiting time was the major complaint against the service.

Nonuser Survey

To determine how the general population—in particular, nonusers—viewed dial-a-ride service, a telephone survey was conducted in each service area. The primary purpose of the Richmond survey (5) was to discover how people in Richmond became aware of Dial-a-Ride and to determine whether any advertising medium had particular effectiveness with any one group of people. Although the Santa Barbara survey asked many of the same ques-

tions, it was broader in scope. Its objectives were: (a) to test the researcher's suspicion that few residents in Santa Barbara were aware of the existence of Dial-a-Ride because of its sparse publicity, (b) to discover what percentage of those surveyed were currently using the service or had used it at any time in the past, and (c) to determine which aspects of Dial-a-Ride inhibited people from using the system.

Most respondents in Richmond were well aware of Dial-a-Ride. Of the 91 percent of those interviewed who had heard of the service, the largest number had found out about Dial-a-Ride by seeing the bus or reading about it in the newspaper. Changes suggested by those who had used the system fell into four categories: extension of the service area, improvements in the system, improvements in the equipment, and driver practices. Almost $^2/_3$ of the suggestions were recommendations to expand the service area. Only 10 percent of those interviewed said that riders should have to wait less.

In Santa Barbara 73 percent of the respondents had heard of Dial-a-Ride. Newspapers and personal conversations far surpassed all other sources of information about the service. Of the 27 percent of the respondents who had not heard of Dial-a-Ride, 75 percent indicated that they would be interested in such a service and 83 percent of this group stated that they would be interested if they could travel anywhere within the city limits for a fare of $1.00.

The age groups that showed the greatest degree of interest were those 25 to 44 (41.6 percent of the respondents) and those 65 and over (33.3 percent of the respondents). This point is significant since the bulk of the ridership was composed of elderly riders; people 25 to 44 constituted only 12.5 percent of the ridership. Thus, there may have been a latent demand for such a service among people of this age.

The other major finding was that 75 percent of the respondents who expressed interest in dial-a-ride service lived on the east side of town, where the greatest proportion of low-income and minority persons are clustered. It may be that, although these transit-disadvantaged persons had great latent demand for DRT, they had difficulty in obtaining information about Dial-a-Ride (perhaps because of a language barrier) or in knowing how to use the system.

None of the respondents who had used the service indicated use within the previous week and, from the comments and desired changes mentioned, it can be assumed that they were all former users. Among these former users, 85 percent were female, and 71 percent were 65 or older, while the remaining 29 percent were between 45 and 59 years of age. Also, newspaper items and personal conversations were the only two sources by which they had found out about the dial-a-ride service. While the suggestions for change in Richmond dealt mainly with expansion of the service area, the Santa Barbara respondents were concerned with three more basic factors: waiting time, cost of service, and reliability.

Operator Evaluation

From the point of view of the operator, patronage figures and the operating deficit are the main indicators of system performance. In both Richmond and Santa Barbara, patronage figures were below the original goals of the system operators.

In Richmond, the highest number of riders to use the system on any single day was 1103 on April 16, 1975 (a Wednesday), and the lowest number was 385 on September 22, 1974 (a Sunday). The consultants projected patronage at a level of 1000 per day by the end of the first 6 months of operation and 2000 per day after 18 months (6, p. 4-1). The control supervisor had his own goal—3500 per day by the end of the first year. After Christmas 1974, dial-a-ride patronage began to drop and in January 1975 it leveled off at about 850 per day.

On August 26, 1973, the Santa Barbara News-Press featured a story (2) that quoted Ernie Parks, the system operator, as saying "the La Habra system was carrying 500 customers a day within 8 to 12 weeks, and that's the goal in Santa Barbara." The hoped-for patronage of 500 per day never materialized. When the system first started, there were some Fridays when ridership reached 200, but on the average patronage fluctuated around 110 to 120 from September 1, 1973, to September 30, 1974.

In October 1974, the fare was increased from 60 cents to $1.20, with a subsequent decline in patronage to half the former level. Between October 1, 1974, and December 25, 1974, ridership averaged 60 to 70 passengers per day. It is interesting to note that the industry's rule of thumb is a decline of 3 percent in passengers for an increase of 10 percent in fares (7). Santa Barbara's fare increase of 200 percent should therefore have produced a 60 percent decline in patronage (66 to 72 passengers per day). As in Richmond, there was a further decline after Christmas that brought the average patronage to 20 per day.

A sizable operating deficit posed the greatest threat to the continued existence of Richmond's dial-a-ride operation. The estimated net operating loss for 1975 was $1 018 062 (4). This was equivalent to a net operating loss per passenger of $3.73, assuming 272 711 passengers per year (747 passengers per day).

Santa Barbara's dial-a-ride system was also a deficit operation, but the size of the deficit was minuscule compared with that for Richmond's system. The operation usually managed to break even by means of fare increases. It finally had an annual net operating deficit of $3000 and a deficit per passenger-trip of 60 to 65 cents at a patronage level of 20 passengers per day.

OVERALL EVALUATION

Efficiency

To determine the efficiency of the two systems, I have looked at two performance measures—operating cost, expressed as cost per kilometer and cost per passenger, balanced against the increase in mobility afforded by the services, and vehicle productivity.

Although any increase in mobility and the associated value of this increase are difficult to measure, it is possible to suggest some criteria for judging how well the systems are satisfying the needs of transit-disadvantaged people.

Criterion 1: Number of Created Trips

Only 16 percent of the total users in Richmond (714 passenger-trips per day) indicated they would not have made the trip if Dial-a-Ride did not exist. Of these created trips, 31 percent were shopping trips, 25 percent were for medical purposes, 19 percent were social-recreational, 13 percent were to work, 6 percent were to school, and 6 percent were for personal business. Of those riders who did not have a car available, 21 percent would not have made their trips if Dial-a-Ride had not existed, while 20 percent of the nondrivers would not have made their trips without Dial-a-Ride. Projecting the 16 percent figure over an entire day yielded 112 created trips per day.

In Santa Barbara, induced demand was responsible for only 10 percent of the total trips (three riders)—one medical trip, one trip for personal business, and one

shopping trip. If mobility was created for only three out of 32 passengers surveyed and there were usually 20 passengers per day, this would suggest that less than two trips per day were created trips.

Criterion 2: Number of Passengers Substituting From an Inferior Mode

Inferior modes include taxicab (because it provides nearly the same service at a higher price), fixed-route bus (which lacks the door-to-door feature), walking (which is not safe and exposes people to the weather), and other (hitchhiking, motorcycle, bicycle, and so on) (3, p. 54).

In Richmond, 42 percent of the passengers substituted from fixed-route bus, 13 percent would have walked, 6 percent would have taken a taxi, and 3 percent would have used another means of transportation. Thus, 64 percent of the total passengers surveyed (448 riders/day) were benefiting from improved mobility.

In Santa Barbara, 50 percent of the passengers substituted from taxi, 25 percent from fixed-route bus, and 5 percent from cab or bus; no passengers indicated that they would have walked or used another mode not listed. Thus, 80 percent of the passengers (16 riders/day) were benefiting from improved mobility.

Criterion 3: Number of Passengers From Areas Not Well Served by Fixed-Route Transit

Although exact numbers were not available, analysis of the trip tickets in Richmond showed that most of the riders were from the census tracts in the southwestern portion of the service area (6, p. 4-8), which is poorly served by transit lines. Although there are several lines in the area, many of the residents live more than 0.4 km (0.25 mile) from the nearest bus stop. The rest of the service area appears to be adequately covered.

In Santa Barbara, the origins and destinations of all 81 passenger-trips recorded by the interviewers were mapped to determine which trips had either their origin or destination in an area poorly served by buses. Excluding those trips made outside of the service-area boundaries, only five of the passenger-trips had their origin or destination in an area not well served by a bus line. No attempt was made to determine the exact distance each origin and destination was located from the nearest bus stop. A more thorough analysis would also have considered the number of transfers required as an indicator of transit coverage.

Criterion 4: Number of Passengers Who Have Difficulty Walking More Than a Block or Two

No information was collected for Richmond on the number of passengers who had health problems that made walking difficult. In Santa Barbara, 1/3 of the passengers surveyed (7 riders/day) indicated that they had health problems that made it difficult for them to walk more than a block or two.

Criterion 5: Number of Riders Who Would Have Been Automobile Passengers

Some people would have had to impose on another person to drive them if it were not for dial-a-ride service. In Richmond, 15 percent of the riders surveyed (105 people) indicated they were in this situation, as were 3 persons in Santa Barbara (approximately 10 percent of the total riders).

Two cost measures commonly used in the transit industry are operating cost per vehicle-kilometer and operating cost per passenger-trip. These measures are shown below.

Item	Richmond	Santa Barbara
Operating cost/vehicle-kilometer, $	3.89	0.43
Operating deficit/vehicle-kilometer, $	3.65	0.16
Operating cost/passenger, $	3.98	1.60
Operating deficit/passenger, $	3.73	0.60

It is apparent that the operating cost per passenger of the Santa Barbara service is less than half the cost of the Richmond system (and the cost per vehicle-kilometer is one-ninth the cost in Richmond). Richmond's operating deficit per passenger-trip is more than six times that of the Santa Barbara operation. Since the average revenue per taxi trip in Richmond is $1.95, the gap between the operating deficit and taxi fare makes the problem even more apparent.

The tremendous difference in cost between the two systems is primarily attributable to the high transit wages prevailing in the Bay area. An AC Transit bus driver receives an average wage of $6.85 per hour. Controllers are paid between $5.42 and $6.84 as an hourly base wage. In addition to labor, the overhead costs of the control center are a major expense.

Vehicle productivity—the key indicator of economic performance—was defined earlier as the average number of passengers per vehicle per hour. Based on experience from other DRT systems, vehicle productivity in the many-to-many mode generally averages 7.0 (8). Maximum achievable productivity to date is 15 to 20.

The goal in Richmond was to achieve a vehicle productivity of 10 passengers per vehicle-hour. As of April 23, 1974, the average productivity was 6 to 7 riders per vehicle-hour.

In Santa Barbara, vehicle productivity was extremely low—approximately 2 passengers per vehicle-hour. When patronage levels were 110 to 120 passengers per day and two vans were in service, productivity was probably about 6 passengers per vehicle-hour.

Thus, the number of passengers carried per vehicle-hour in each system was low, indicating an inefficient use of the vehicles.

Equity

A case has been made to show that approximately 1 out of every 44 residents in the Richmond service area (or 1 out of 88, if each passenger made a round trip) benefited from Dial-a-Ride each day, while the burden of operating costs was borne by a much wider range of individuals. The 25-cent fare paid by the user represented only 5 percent of the total cost of operation. The remaining 95 percent was paid by six different entities.

1. AC Transit (ultimately the taxpayers of the district)—It suffered loss of revenue on fixed-route lines, since 42 percent of the dial-a-ride users had switched from regular buses.
2. Taxpayers at all levels—The taxpayers of the AC Transit District shouldered the greatest portion of costs, $925 000 worth of operating costs for the year. In addition, the $200 000 supplied by MTC was derived from state sales-tax funds. Finally, the capital cost of refurbishing the buses was financed by means of a $125 482 federal grant, money that was acquired through federal income taxes.
3. The city of Richmond—Some expenses for pro-

moting subscription service were financed out of the city budget.

4. Veteran's Yellow Cab Company—Switching of passengers from taxi to Dial-a-Ride cost the taxi company between $500 to $700 in revenue each day, and 12 jobs were displaced by the dial-a-ride operation.

The financial burdens of the dial-a-ride operation must be weighed against the benefits. Four different categories of beneficiaries can be identified.

1. The transit disadvantaged, in particular, the nondrivers and members of households without automobiles, residents of low-income areas, and young people;
2. AC Transit personnel employed specifically for the operation;
3. Richmond residents, since they received extra police service as a result of Dial-a-Ride; and
4. All Bay area residents, since Dial-a-Ride was used as a model for the rest of the Bay area.

In Santa Barbara, the major cost of the service was borne by the users themselves, while the small operating deficit was covered by Yellow Cab. There were no nonuser impacts or financial burdens.

The primary beneficiaries of the service were the senior citizens and the handicapped, although other categories of transit-dependent people also used the service less frequently.

CONCLUSIONS

The main conclusion to be drawn is that the Richmond operation was a public investment that was not worth the cost. Although almost 1000 people used the service daily, the transportation needs of these transit-dependent people were not being met in the most efficient manner possible, as witness the fact that it would have been cheaper to subsidize them to ride taxis.

On the basis of the evidence presented in this study, it seems fair to suggest that the advantages of privately provided dial-a-ride services outweigh the benefits of publicly provided DRT systems at this point. Not only is there a greater opportunity for equity inherent in this approach, but the gains in efficiency resulting from lower labor and fixed costs are notable. If taxi drivers were to unionize, however, the wide gap between labor costs in the private and public sectors would diminish.

A need for some type of personalized transportation exists, and DRT will become even more important in the future. There are still too many travel needs that cannot be met by conventional fixed-route systems. The major issue is not whether Dial-a-Ride should exist, but rather to find the right institutional structure for providing it.

When the Richmond and Santa Clara County dial-a-ride operations were first initiated, some people speculated that Dial-a-Ride would eventually put the taxi systems out of business. This seems not to have been the case. It appears, instead, that the role of the taxi industry may be changing. It is not yet clear just what form this evolution will take, but spokesmen for the taxi industry have already acknowledged their interest in meeting the challenge of providing shared-ride services. It is now time for decision makers to give the private sector an opportunity to prove itself.

Some of the lessons that can be learned from the Richmond and Santa Barbara dial-a-ride experiments and applied to future systems are listed below.

1. If a privately owned DRT system is to accomplish social objectives, three elements will be required: continuous advertising and promotion, perhaps publicly subsidized; widespread community support, especially the backing of local government officials and other transit operators in the area; and some means of guaranteeing a minimum level of service.
2. Transportation provided by the private sector need not entail discourteous, irresponsible drivers and low service standards.
3. Higher rates of vehicle use can be achieved by providing demand-responsive service only during periods when fixed-route headways are longest in areas that already have good arterial systems, conducting package-delivery service during slow periods of the day, and using the DRT system to replace or integrate paratransit services now provided by individual social agencies or organizations with volunteer drivers.
4. A 25-cent fare is too low for demand-responsive service. A fare of 50 cents would not be unreasonable.
5. In assessing quality of service, passengers appear to be more concerned with waiting time than with attractiveness of the vehicle.
6. Only a community that contains a significant number of major activity centers should be chosen for operation of a DRT system.

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