

The Tri-County Commuter Rail System in Southeast Florida: A Ridership Survey and its Planning Implications¹

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Southeast Florida, comprised of Palm Beach, Broward and Dade Counties, is one of the fastest growing regions in the nation. Transportation has been a major planning issue in southeast Florida due to the region's rapid growth. Costs associated with highway expansion projects to accommodate the ever-increasing traffic have skyrocketed. Ironically, expanded highway capacity only seems to attract more traffic and create greater congestion. Interstate 95 (I-95), the major north-south arterial in the region, has been carrying an excessive amount of traffic generated by the rapid growth of the region.

In 1983, the Florida Department of Transportation (FDOT) commissioned a study to determine whether a feasible public transportation system could be developed (FDOT, 1984). After a review of forty-four possible public transportation options, a decision was made in 1986 to develop a commuter rail system extending from the West Palm Beach Amtrak station to the Miami International Airport along the I-95 corridor (Figure 1).

Through an on-board survey of rail system riders, this study examines the trip origin/destination distribution patterns and the

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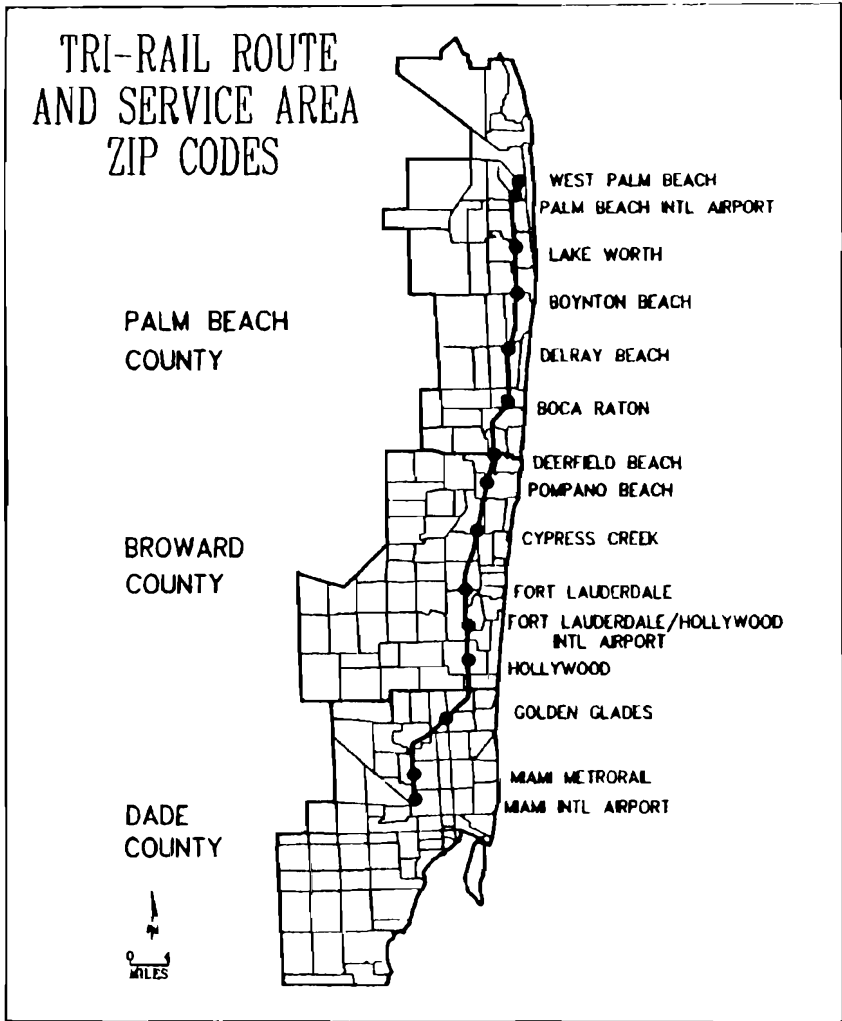


Figure 1

demographic and travel characteristics of the riders, as well as their perceptions of the rail system. The results of the survey indicate that: (1) there exists a significant contrast between the

origin and the destination distribution patterns; (2) both private automobiles and local transit systems are important access modes of the rail system; (3) demographic profiles of the commuter rail riders are different from the national norm of local transit users; (4) income is related to riders' perceptions of the rail system; and (5) most rail riders are not "captive" riders and can easily shift back to the already congested highways. These results have significant implications for more effective planning of commuter rail systems.

Background of the Study

The Tri-County Commuter Rail (or Tri-Rail) system instituted service in January 1989, parallel with the schedule for the I-95 reconstruction project in the tri-county area in the hope that it could serve a "maintenance-of-traffic" function and mitigate traffic congestion on I-95. Since the start of the Tri-Rail service, it has encountered a variety of problems, including the scheduling of the trains, the controversial location of a station within the "clear zone" of the Fort Lauderdale/Hollywood International Airport, the lack of linkage with Dade County's Metrorail system, delays in opening some rail stations, and, most important, ridership levels.

In its original estimate, FDOT expected a total of 14,192 passengers to use Tri-Rail service per day (Broward County Office of Planning, 1987). The actual ridership had been stagnant at about 3,000 passengers per day until the institution of midday service in January 1990, raising the ridership level to about 4,000

passengers per day². Part of the reason for the difference between the two figures is due to some over optimistic assumptions made in the FDOT estimation models. Examples of these assumptions include a high level of bus feeder service, unlimited free parking at all stations, 30-35 minute headways during peak hours, and the opening of all stations³.

This kind of optimistic forecasting is not uncommon in the history of public transit due to the need to obtain legislative support to secure funds for starting a new transit system. For example, during the planning stage of the Miami rapid transit system, the ridership level estimated from the models was 100,000 passengers per day for the first segment of the system. However, the daily ridership was only about 9,500 when that segment opened in 1984 (Fielding, 1986). The San Francisco Bay Area Rapid Transit (BART) system had a similar experience. In 1974, two years into its operation, the BART system only attracted about 50% of its originally estimated ridership level. Even by 1984, twelve years into its operation, the ridership level was still 17% below the initial forecast (Fielding, 1986).

During the 1970s, some advocates of public transit considered it a panacea to all kinds of transportation-related problems. For example, Altshuler, Womack, and Pucher (1979) stated:

“Whether one’s concern was the economic vitality of cities, protecting the environment, stopping

² Tri-Rail carried about 5,000 passengers per day by March 1990.

³ At the time of this survey, only 12 of the 15 planned stations were open. The unopened stations were Boynton Beach, Cypress Creek and Fort Lauderdale Airport.

highways, energy conservation, assisting the elderly and handicapped and poor, or simply getting other people off the road so as to be able to drive faster, transit was a policy that could be embraced.” (p. 36)

The history of public transit, however, has never been as successful as it was projected. This is due to the difficulty involved in changing travel behaviors in the face of continued urban sprawl. Nevertheless, a carefully planned public transit system “could fill a more narrowly defined role quite successfully.” (Hanson, 1986, 20)

According to the national transit data (APTA, 1989), commuter rail systems experienced a growth of 24.2% in total passenger trips while buses had an increase of 13.4% between 1975 and 1988. During fiscal year 1988, the total passenger trips, in millions, carried by commuter rail systems in different U.S. cities were: New York (204.6), Chicago (69.9), Philadelphia (25.4), Boston (16.7), San Francisco (5.6), Washington, D.C. (2.1), Los Angeles (0.3), and Pittsburgh (0.2). The wide range of ridership levels is a reflection of the commuter patterns, population size, number of commuter rail routes, service levels of commuter rail and supporting transit systems, and other differences among these cities.

Southeast Florida’s Tri-Rail system will undergo its first major review after its third year of operation. The purpose of this review is to determine if it should continue its service after its fifth year of operation. According to the Florida Legislature, Tri-Rail must increase its ridership level to 9,300 riders per day to achieve the goal of paying forty percent of its operating costs (Tri-County Commuter Rail Authority, 1990). Otherwise, the State could

discontinue the service.

The Tri-Rail system offers a potential alternative to handling the constantly growing travel demand in this region. But, its effectiveness depends on careful planning. The objective of the study is to identify the profile of existing Tri-Rail riders in terms of the spatial distribution patterns of their trip origins and destinations, their demographic and travel characteristics, and their perceptions of the rail system. The results are expected to provide some information about the users of the system, what attracted them to the system, and their trip patterns. These results can be used as the basis for designing detailed studies aimed at improving the effectiveness of the Tri-Rail system.

Methodology

A survey was conducted on board Tri-Rail in March 1989. The survey covered two trains in both the north and southbound directions during the morning and afternoon service hours⁴. Questionnaires were distributed to everyone in the rail cars and were collected as riders exited. A total of 170 questionnaires were completed although some respondents did not answer all the questions.

The questions on the survey can be categorized into four groups. The **first group** obtains information on riders' attitudes toward the performance of the train, its feeder bus connections, and two other alternative travel modes (i.e., automobile and car/van pool). The **second group** obtains information on the trip and locational characteristics of the respondents. The **third group** collects

⁴ Tri-Rail ran only during the AM and PM peak hours at the time of this survey.

information on each respondent's age, gender and annual income. The **last group** of questions deals with the potential impact on highway traffic if Tri-Rail is discontinued.

Given the somewhat small sample size of the survey, it is important to discuss its ability to represent the entire Tri-Rail rider population. The survey followed the concepts of a clustered random sampling design (Clark and Hosking, 1986). That is, certain trains were first selected for the survey; then, samples were drawn from all riders in the selected cars of these trains. This sampling technique is often used when the available resources, such as time and money, for a survey are limited. Although this sampling technique meets the basic requirements of a random sample, it rarely generates a strict random sample, especially with a small sample size. For example, the spatial distribution patterns presented by the results of this survey may be biased, to a degree, due to the unequal numbers of valid responses from the northbound versus the southbound riders. Thus the results should be taken as indicative of general patterns.

Survey Results

(1) Trip Origins and Destinations.

Commuter rail systems have fixed routes and few, widely-spaced stations. They rely heavily on other travel modes to transport riders between rail stations and the trip origins and destinations. It is therefore important to identify the spatial distribution patterns of trip origins and destinations of commuter rail riders. In this study, these distribution patterns are identified by the zip codes of the respondents' residence locations (i.e., trip origins) and their primary trip destinations.

The survey indicates that a significant contrast exists between the origin distribution pattern and the destination distribution pattern of the Tri-Rail riders. The trip origins show a dispersed distribution with more zip code zones reported in Palm Beach and Broward counties (Figure 2). On the other hand, the trip destinations are concentrated in fewer zip code zones located mainly in Broward and Dade counties (Figure 3).

The difference between the origin and the destination distribution patterns can be explained by other data collected from the survey. First, “work” was the trip purpose for about 78% of the respondents. This certainly results in a concentration of trip destinations in areas of major employment and activity centers. Secondly, Tri-Rail riders have the flexibility to select the most convenient travel mode to get to the rail stations where they board the train. They are, however, severely constrained in choosing a travel mode to get from the exit stations to their final destinations. This results in a situation in which Tri-Rail can attract its riders from a variety of areas, but can distribute them only to limited areas. The data supporting this argument will be discussed in detail in the next section.

When the data are examined by the boarding and the exit stations of home-to-destination trips, it further reveals the north-to-south commuting pattern in this region. This pattern is shown by the heavy concentration of trips in the lower-triangle of the origin-destination tables (Tables 1 & 2). Table 1 also shows that about 45% of the respondents traveled no more than three stations between their boarding and exit stations. Such a high proportion of shorter trips of the Tri-Rail system was probably due to the free

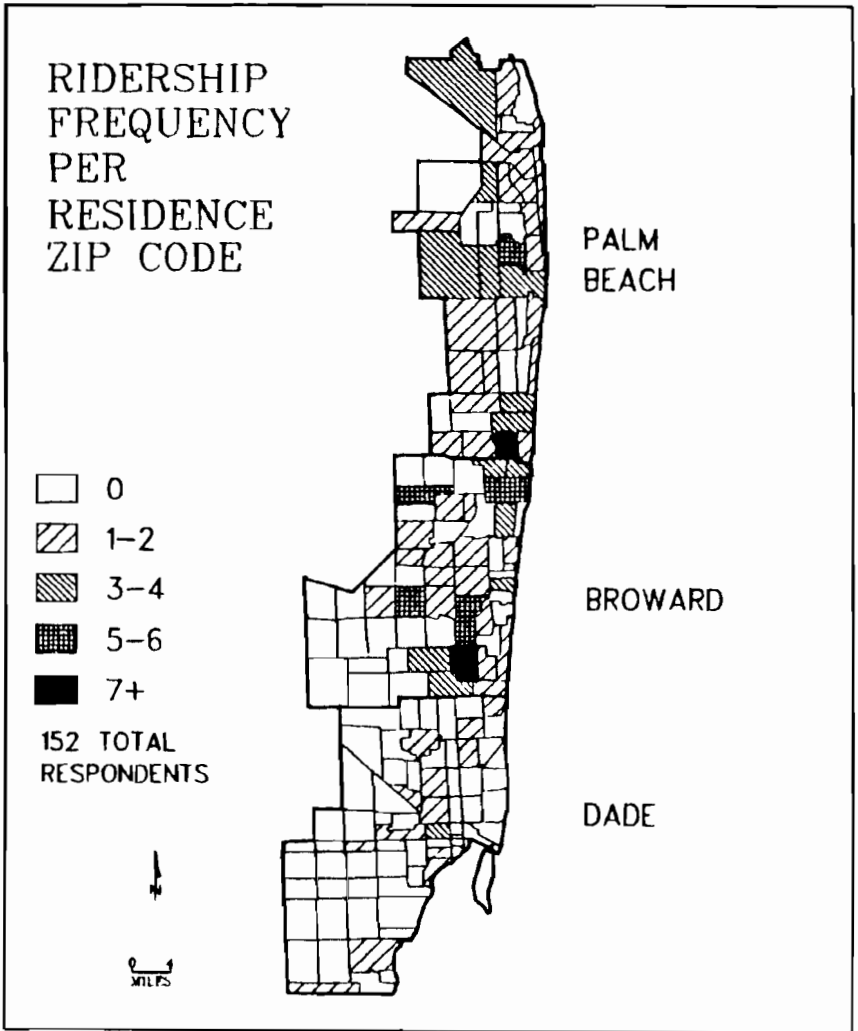


Figure 2

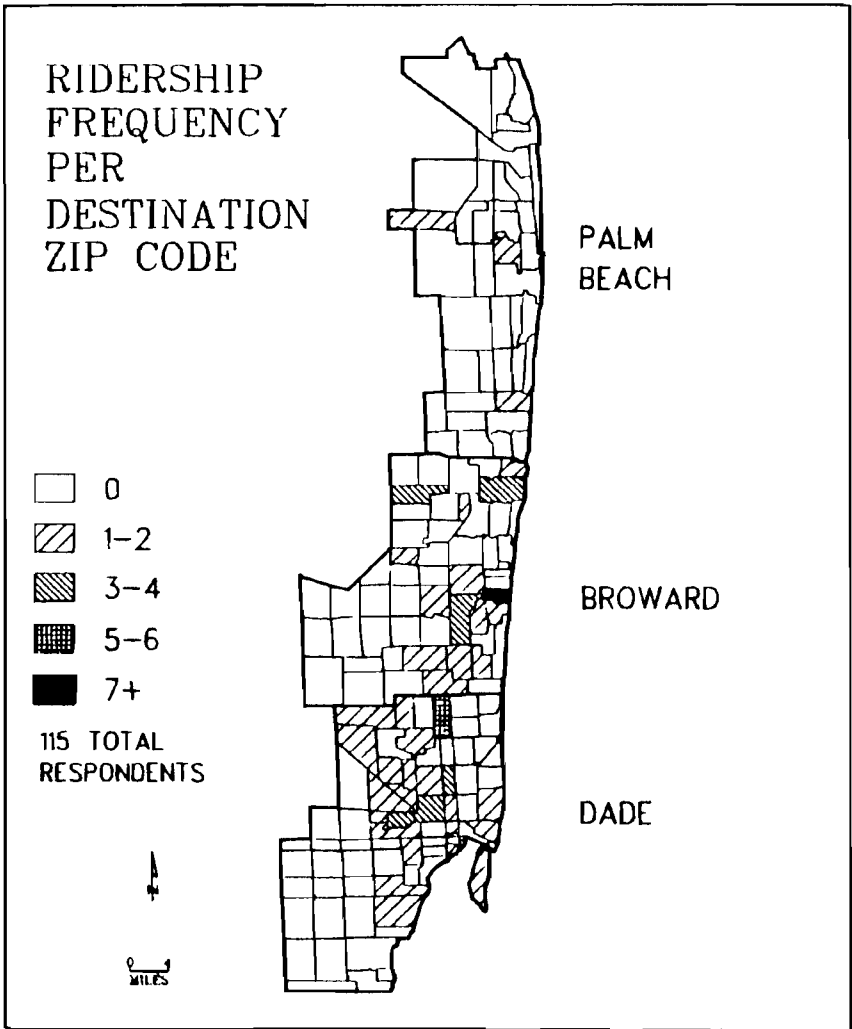


Figure 3

Tri-Rail rides at the time of this survey⁵. However, no origin-destination data of Tri-Rail riders has been published since initiation of a fare in April 1989. A comparative study is therefore not possible now.

Table 1: Origin Destination Table by Rail Station (in %) (N = 138)

Origin	Destination												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
1			0.7	0.7		2.9							4.3
2					0.7							1.5	2.2
3	0.7												0.7
4	3.6	2.9			5.8	0.7						1.5	14.5
5	8.0	8.0	0.7	0.7									17.4
6	2.9	1.5			3.6								8.0
7		1.5	2.2		5.1				0.7	0.7			10.2
8	0.7	1.5	1.5		8.0								11.7
9	1.5	0.7		0.7	0.7								3.6
10	6.5	1.5	2.9	1.5	0.7	0.7	0.7	0.7					15.2
11			0.7		0.7								1.4
12	0.7	2.9	2.2	0.7	2.9		0.7	0.7					10.8
Total	24.6	20.5	10.9	4.3	28.2	4.3	1.4	1.4	0.7	0.7	0.0	3.0	100.0

Stations

- 1: Miami Airport
- 2: Metrorail
- 3: Golden Glades
- 4: Hollywood
- 5: Ft. Lauderdale Airport
- 6: Pompano
- 7: Deerfield Beach
- 8: Boca Raton
- 9: Delray Beach
- 10: Lake Worth
- 11: Palm Beach Airport
- 12: West Palm Beach

⁵ Tri-rail was free January-March 1989. Half-fare (\$1.00 each way) was charged in April and May 1989. Starting June 1989, full fare (\$2.00 each way) was charged.

Table 2: Origin-Destination Table by County (N=138)

O R I G I N		Destination			Total
		Dade	Broward	Palm Beach	
	Dade	1.4%	4.3%	1.5%	7.2%
	Broward	31.3%	15.9%	2.9%	50.1%
	Palm Beach	23.3%	18.0%	1.4%	42.7%
	Total	56.0%	38.2%	5.8%	100.0%

(2) Access and Egress Modes.

“Park and ride” was identified by 79% of the respondents as their dominant travel mode between their residences and rail stations. Another 9% were dropped off at the stations by someone else (“kiss and ride” (Table 3). To get from the stations to their final destinations, 41% used the Tri-Rail feeder buses, and another 16% used the regular transit buses. In addition, 10% of the respondents walked from exit stations to their final destinations (Table 3).

Thus Tri-Rail riders rely on their automobiles to get to the rail stations from their residences. They are, however, heavily dependent on public transit to transport them from the rail stations to their final destinations. This indicates the importance of local transit connections for the success of the Tri-Rail system. Without an adequate means of transporting riders from rail stations to destinations, increases in ridership will be difficult to attain.

With regard to the travel time spent at each end of a trip, the survey showed that people are willing to tolerate longer travel time

Table 3 Travel Modes: Home and Destination Ends of Tri-Rail Trips			
Home-to-Station Travel Mode	Percentage	Station-to- Destination Travel Mode	Percentage
Park & Ride	78.8%	Feeder Bus	41.0%
Drop-off	8.6%	Transit Bus	15.5%
Walk	4.6%	Walk	9.9%
Feeder Bus	7.9%	Pick-up	8.1%
Transit Bus	0.0%	Other	25.5%
Other	0.1%		
Total	100.0%	Total	100.0%

Table 4 Travel Times at the Home and Destination Ends of Tri-Rail Trips		
Travel Time	Home-to-Station	Station-to-Destination
Less than 5 minutes	15.2%	12.5%
5 - 10 minutes	34.5%	19.4%
11 - 15 minutes	23.0%	25.6%
16 - 20 minutes	15.8%	21.9%
More than 20 minutes	11.5%	20.6%
Total	100.0%	100.0%

at the destination end than at the home end (Table 4). This is probably self-evident since most respondents use buses from the rail stations to their destinations. However, it also indicates that 20-25 minutes bus connection time at the destination end is acceptable to more than one fifth of Tri-Rail riders. This number could be used to define the potential bus service areas around each rail station.

(3) Demographic Data.

There is a general belief that many transit riders come from low-income households. For example, the U.S. Department of Transportation (1984) stated that about 40% of local transit trips were made by people from households with less than \$10,000 annual incomes. The same source also indicated that almost 62% of the transit riders were female. However, the income and gender data collected from the Tri-Rail survey showed quite different results. Only 13% of those on Tri-Rail earn less than \$15,000 a year, and about 31% have annual incomes higher than \$35,000 (Table 5). Also, the gender split among the respondents is 51% male and 49% female.

These results indicate that Tri-Rail riders have different profiles from the national norm of local transit users. Several factors may be responsible for these differences. First, commuter rail systems are primarily line-haul operations over longer distances and rely on private automobiles and other transit systems as access modes. For low-income people, many of whom do not always have access to automobiles and tend to find jobs closer to their residences, a commuter rail system is not a viable alternative. Second, because Tri-Rail is mainly for work trips during the AM and the PM peak hours, it significantly reduces the possibility of its use for shopping and social trips for which female passengers are a larger

Table 5: Income of Tri-Rail Riders	
Income Group	Percent
Less than \$15,000	12.6%
\$15,000 - \$25,000	30.0%
\$25,001 - \$35,000	26.6%
\$35,001 - \$50,000	20.3%
More than \$50,000	10.5%
Total	100.0%

Table 6 Age of Tri-Rail Riders vs. National Transit Data		
Age Group	Tri-Rail	National
Under 18	0.6%	15.2%
18 - 24	11.3%	20.3%
25 - 55	65.5%	43.2%
Over 55	22.5%	21.3%
Total	100.0%	100.0%

percentage. Third, while most transit systems in this nation are CBD-oriented, Tri-Rail is not. Given that a good percentage of the downtown labor force is female and most low-income people live near downtown areas, Tri-Rail is not designed for these two population groups.

In terms of the age distribution, Tri-Rail has more riders between the ages of 25 and 55 and fewer riders below the age of 25 than the national transit data (Table 6). The figures show that Tri-Rail does not

attract many school-age riders. These results further indicate that Tri-Rail has a different ridership profile from other transit systems.

(4) Perceptions of Tri-Rail and Alternative Modes.

Based on the discussions above, it is clear that most Tri-Rail users are not “captive” riders, since about 79% parked their cars at the boarding stations and rode the trains. In addition, about 50% of the respondents use Tri-Rail daily, and another 20% use it three to four times a week⁶. The figures show that riders decided to use Tri-Rail because it was considered preferable to other travel modes for their trips.

About 76% of the respondents rated the overall performance of Tri-Rail as satisfactory or very satisfactory. The overall performance was then broken down into five dimensions: convenience, comfort, travel time, travel cost, and reliability. Each respondent was asked to use these five dimensions to rate each of the four travel modes considered on the survey, which are Tri-Rail only, Tri-Rail and feeder bus, automobile, and car/van pool.

Cross comparisons of these ratings indicate that Tri-Rail was rated higher than automobiles for comfort, travel time and travel cost; while automobiles were rated higher for convenience and reliability. Evidently, Tri-Rail riders traded a more convenient and reliable travel mode for a more comfortable, faster and less expensive travel mode. The feeder bus and Tri-Rail service, combined were rated higher than automobiles only on the dimensions of travel time and cost. This is another indication of the different characteristics of the combined train and bus service. Similar cross comparisons indicate that car/van pool is considered far inferior to the Tri-Rail or Tri-Rail/feeder bus alternatives. This may be a discouraging fact for transit agencies trying to

⁶ Tri-Rail was available only on weekdays at the time of this survey.

promote the car/van pool option in this region.

To examine the relationship between income and satisfaction levels with Tri-Rail, the data have been crosstabulated by income group. The ratings of the convenience of Tri-Rail shifted from very satisfactory, to satisfactory to fair as income rises. This suggests that riders with higher incomes may need higher flexibility with their mode of travel. In addition, the middle income group (\$25,000 to \$35,000) appears to be the most critical group among the five income groups. It had the highest percentages of negative ratings on all the five dimensions of Tri-Rail performance.

(5) Impact of Tri-Rail on the Highway Systems.

Automobile availability has always been considered a deterrent to transit use. For Tri-Rail, however, about 70% of the respondents reported that they “always” have access to an automobile and another 10% “usually” do. This indicates that most Tri-Rail users are not “captive” riders. Also, given the earlier finding that most Tri-Rail riders park their cars at the rail stations and ride the trains, the availability of automobiles actually works as a positive factor for the Tri-Rail. Without readily-available access to an automobile, many existing Tri-Rail riders might not be able to use the service.

On the other hand, this also means that most Tri-Rail users can easily shift back to automobiles if the Tri-Rail service is discontinued or if they are not satisfied with the service. Seventy-nine percent of the respondents indicate that they would drive alone if Tri-Rail were not available. Another 5% would be auto passengers. In terms of the major highways they would use, I-95, is their first choice (81%), followed by the Florida Turnpike (12%).

Summary

Historically, public transit systems in this nation have shown mixed levels of success. Efforts have continued to be made to use public transit systems to, at least partially, alleviate the continuously worsening traffic congestion problems. Implementation of the Tri-County Commuter Rail (or Tri-Rail) system in southeast Florida is a recent example.

One common problem found with most public transit systems is that ridership levels are often significantly lower than the original estimates. Travel is a “derived” demand. It is a means to fulfill the needs of other activities. Therefore, a public transit system must be planned carefully based on a good understanding of the characteristics of its target population. The Tri-Rail system is different from most other commuter rail systems in this nation in certain aspects. For example, commuter rail systems in New York, Chicago, and Philadelphia all have radial, suburb-to-CBD type of route structures. The service area of Tri-Rail stretches in a long, narrow corridor and does not have a clear suburb versus CBD contrast. Tri-Rail thus has a shorter average trip length than other commuter rail systems. This characteristic makes it more difficult to compete with private automobiles. In addition, given that Tri-Rail is not a CBD-oriented system, it has to provide reasonable connecting services at most of its stations rather than rely on a good transit system in the CBD.

This study examined the ridership profile of the Tri-Rail system using an on-board questionnaire. The survey results provide useful information on travel patterns, demographic characteristics and perceptions of alternative modes. The information can be used for designing other studies to define the system’s target groups, to adjust bus service, and to reevaluate the ridership estimate.

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