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Small City Transit Characteristics: an Overview



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ABSTRACT

This report is based on information and operating data from thirteen small community transit systems which were studied as part of a larger project on small community transit and its potential. It summarizes organizational, institutional, and operational aspects of the case studies and contains an analysis of some of the relationships among service, cost and community response. Hypotheses are offered regarding the types of trips which are served, the cost and service trade-offs which are relevant when choosing between fixed-route and demand-responsive modes of operation, the critical variables such as labor agreements and maintenance arrangements which affect operating costs, the level of subsidy which may be anticipated, and the trade-offs between single-ride fares and transit passes as a means of fare collection. A number of conclusions are offered which bear on these topics, but the uniqueness of each community situation is stressed as an often-dominant factor.

PREFACE

This document was prepared by the Transportation Systems Center (TSC) as part of the information dissemination function of the Office of Service and Methods Demonstrations, Urban Mass Transportation Administration. It is intended to summarize the findings from a series of case studies of small community transit operations which were conducted by TSC personnel during 1975. Individual reports describing each of these case studies are also being published. The conclusions presented here are based entirely on the content of the reported studies. These documents are intended to serve as an information resource for other communities in the process of planning or considering public transportation.

The authors gratefully acknowledge the cooperation of local officials and operators at all of the sites selected for study, and of the TSC staff in compiling the information gained from these studies and assisting in its interpretation.

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Chapter I

INTRODUCTION

This report summarizes the material discussed in the individual case studies of thirteen selected transit systems chosen as representative of small city transit operations. It examines the process through which small communities can respond to specific needs for transit service within varying local contexts. Organizational, institutional and operational aspects of the case studies are summarized together with an analysis of some of the relationships between service, cost, and community response.

The case studies have been prepared to document the experience of small communities which have recently begun providing transit service so as to assist similar communities in the process of planning or considering public transportation. The case studies are intended to describe the process of providing improved transit service, including the community response and operating experience. No attempt is made here or in the individual case studies to evaluate these systems in terms of their effectiveness in meeting the needs of the community. All operating data and historical information was obtained from local records and newspaper files; no additional data collection was conducted.

The case study sites were chosen to illustrate not only a range of service options and results, but also a variety of community settings, service objectives, financing mechanisms, and political environments. Table 1 contains a summary of the characteristics of the case study sites. Populations range from 9,500 to 170,000; most cities are under 60,000. While the larger cities, namely Eugene, Evansville, and Ann Arbor, are admittedly larger than some would consider to be small cities, the features of their transit systems were felt to be representative of and appropriate to small city transit operations.

The remainder of this report is comprised of four additional chapters. Chapter II discusses the funding, planning, and organizational aspects of the thirteen transit systems. Chapter III describes the types of service selected, and the associated service policies, fares, and marketing activities. Ridership and cost characteristics are compared and analyzed in Chapter IV. Finally, Chapter V contains a summary of community impacts attributed to the transit systems.

TABLE 1. SUMMARY OF CASE STUDY SITES

Case Study Sites	Population in Service Area	Population Density Persons/sq.mi.	Type of Service	Name of Transit Operator/Vehicle	Type of Operator	Transit System Source of Capital	Transit System Source of Deficit Funds
Amherst, Mass.	17,000	1,000	Fixed-route	Student Senate Transit Service	Balanced Transportation & Parking Office (Univ.)	University funds, UMTA Section 3 capital grant	University funds
Ann Arbor, Mich	16,000	7,300	Pilot DAR	AATA	Transit Authority	Federal&Local	Federal&Local
Bremerton, Wash	35,000	3,600	Subscription Bus & Fixed route	Bremerton-Charleston Transit (Private Co.)	Private operator	Private operator	No deficit
Chapel Hill, N.C.	32,000	3,300	Fixed-route	Chapel Hill Community Transit	Municipal transit commission	Local funds - bond issue, prop. tax	Local funds
East Chicago, Ill.	47,000	4,000	Fixed-route	East Chicago Transit	Municipal department	Revenue sharing funds	Revenue sharing funds
El Cajon, Cal.	60,500	5,000	Shared taxi	El Cajon Express	Taxi cab company	Municipal contract	Revenue sharing funds
Eugene, Ore.	170,000	1,700	Fixed-route	Lane Transit District	Transit district	Local; UMTA Section 3 capital grant	Local payroll tax
Evansville, Ind.	139,000	3,900	Fixed-route	Metropolitan Evansville Transit (METS)	Municipal department	Local funds	14% revenue sharing, 86% local funds
Merced, Cal.	30,000	3,000	Dial-a-ride	Merced Transit	Municipal department	State gas tax funds	State gas tax revenue
Merrill, Wis	9,500	1,700	Route deviation	Merrill Transit Commission Merrill-Go-Round	Municipal transit commission	State 90% Local 10%	90% state 10% local revenues
Sudbury, Mass.	13,500	550	Fixed-route	Sudbus	Private bus company	Municipal contract	Local revenue
Westport, Conn.	28,000	1,300	Fixed-route	Minnny-bus	Transit district	UMTA Section 3 capital grant	44% state 27% local revenue
Xenia, Ohio	27,600	3,100	Fixed-route	X-line	Municipal department	UMTA demonstration grant	UMTA demonstration grant

Chapter II

TRANSIT DEVELOPMENT

Initiation and Funding

The communities studied had a wide variety of reasons for instituting a new transit service. In many cases, such as Evansville, Indiana, and Eugene, Oregon, the need for public transportation stemmed from discontinuation of unprofitable service that had been provided by a private carrier. This left these communities with the option of subsidizing the private carrier, doing without the service, or developing a public transit system. Evansville first tried subsidization, which proved too costly, so it established a public transit operation. In two university towns, Chapel Hill, North Carolina, and Amherst, Massachusetts, where there was concern over downtown congestion and campus parking conditions, campus-community transit services were introduced. Often, it was simply recognized that there was a need to provide transit service to those members of the community whose mobility was severely restricted by their inability to drive or have access to an auto. "Transit dependent" is a frequently used designation for these mobility limited persons, who may comprise the primary market segment of small city transit systems.

Proposals for new transit services came from a number of different sources, including private citizens, citizen groups, local agencies, and local government officials. The speed at which such proposals were acted on seems related to the proximity of the initiator to the local government. Table 2 shows the implementation time from proposal to commencement of service for eleven of the small cities studied. Transit developments which originated with private citizens or citizen's groups, such as the League of Women Voters in Eugene, generally required more time to gain approval than those initiated by a mayor or a member of the City Council. Access to the decision-making process apparently reduced the time required for transit proposals to be enacted.

Selection of a financing mechanism also affected the time taken to establish an operating transit system. When funding sources were local in origin, small community transit systems were generally implemented quickly. A shared taxi service in El Cajon, California, implemented within a year after the idea was first proposed, has been locally financed, using an initial allocation of \$25,000 from Federal Revenue Sharing funds. Revenue sharing funds have frequently been used to cover either a local share or the total capital and/or operating costs.

TABLE 2. CASE STUDY SITES: TIME REQUIRED TO IMPLEMENT TRANSIT

	YEARS									
	0	1	2	3	4	5	6	7	8	
EUGENE	X	-	-	-	-	-	-	-	-	X
EVANSVILLE	X	-	-	-	-	X				
EAST CHICAGO	X	-	-	-	X					
XENIA	X	-	X							
MERCED	X	-	-	-	-	-	X			
WESTPORT	X	-	-	-	-	-	-	X		
EL CAJON	X	-	-	-	X					
AMHERST	X	-	-	-	X					
CHAPEL HILL	X	-	-	-	-	-	-	-	-	X
SUDBURY	X	-	-	-	-	-	X			
MERRILL	X	-	-	-	-	X				

In other communities, such as Merced, California, and Merrill, Wisconsin, state funding has been used. In Merced, interest in public transit was solidified by the California State Senate's passage of Senate Bill 325. This bill allocates state gasoline tax revenue to localities to develop and operate public transit systems. Merced has supported its operating cost deficit from the funds provided by SB 325. Other observed means of financing small city transit have included local property tax revenues, local employee payroll tax, Federal demonstration project grants, and student body revenues for a university-community transit system.

Decisions regarding the preparation of the transportation plans affected the subsequent evolution of small community transit systems. Typically, small communities used the following resources for planning: application for an UMTA Section 9 Technical Study grant, use of state, regional, or local agency resources and consultants, or use of local talent. The requirements of the UMTA Section 9 planning process call for regional planning in urbanized areas. However, some communities chose to avoid being subject to the regional planning agency having the transportation planning authority for the region, which meant that they may have had to conduct planning without recourse to federal assistance.

An important consideration in developing a transportation plan is that in order to receive UMTA Capital Assistance funding, often the main source of capital assistance, the community must develop a plan that meets with UMTA's approval. (UMTA's approval is in the form of a certification of adequate transportation planning.) This does not necessarily mean that the community has to request a Section 9 Technical Study grant, or that planning has to be done by professionals or consultants. It does mean that the planning must meet currently accepted standards of professional transportation planning and that all appropriate alternatives should be considered. Typically, state departments of transportation or private consultants conducted the planning studies, which included determining routes, schedules, and anticipated fare structures. Where UMTA Capital Assistance was applied for, it was also necessary to document sources of a three to five year operating subsidy.

Organizational Decisions

Organizational structures for managing and operating a transit system were found to vary with the type of service, area served, and preference of the local government (see Table 1). Organizational alternatives included service provision through a municipal contract, creation of a city

transit department, or establishment of a new transit district. The decision about organizational structure was often influenced by the major funding sources used for capital and operating expenses.

A municipal contract for service with a private carrier or taxicab company, as in El Cajon and Sudbury, Massachusetts, has been the minimal organization employed. The supplier has provided the personnel, vehicles, and maintenance. Neither initial capital expenditure of public funds for the vehicle fleet or maintenance facility nor the need for personnel management were required. Typically, however, the municipality has been responsible for the marketing, ticket sales, monitoring and auditing of the transit service.

A municipally run transportation system has been the most commonly employed organization. It has the advantage of great flexibility in adapting operations to achieve service goals. Also, it can be housed in an existing municipal department, thereby sharing overhead and administrative costs. Existing city facilities have often been used for the garage and maintenance facilities, and the staff advisers have been city employees. Where existing maintenance facilities were not adequate for a transit fleet, some cities have provided for vehicle maintenance by contract with a private garage or with the school bus maintenance facilities.

Transit districts were formed to provide area-wide transportation service. A locality or group of towns interested in establishing a transit district would typically ask for approval from the state government. Frequently, the state's designation of a transit district parallels previous formulation of an area-wide planning body. A transit district is well suited to provide efficient transportation service to larger geographic areas or communities without clear-cut boundaries. UMTA planning grants encourage regionalization of planning to maximize use of facilities and to effect good area-wide transportation flow independent of jurisdictional boundaries.

Institutional Constraints

The operation of small community transit is often influenced by a variety of institutional constraints. Issues affecting service design, implementation, and delivery will frequently arise due to the regulatory power of state public utility commissions, local actions filed by competing carriers within the same locality, and labor practices and requirements.

The power of state governments to regulate common carrier service varies by state. In many states, an operator must obtain common carrier certification from the state public utility commission to deliver specific services to a designated area. This regulatory power may constrain vehicle use for public transport and can result in limitations on the use of school buses for transit. Any change in service hours or routes may require hearings before the commission; this can be time-consuming, especially if there are objections filed.

A state certification/hearings process is required in Wisconsin. Prior to initiation of service on the Merrill-Go-Round, the Merrill Transit System had to obtain common carrier certification for the area. Because the Merrill-Go-Round was a demonstration project, where it might be important to observe the effects of service option changes, Merrill requested an exemption of the Merrill-Go-Round from the constraints of the certification. However, the request was denied. This denial meant that any future plans to revise Merrill-Go-Round service routes or frequencies would require Public Service Commission permission following a hearing procedure. Such a requirement may affect the ability of a small community transit system to be responsive to requests for new or altered transit service.

The issue of competing modes and competition between public and private transportation providers is an important one. In some jurisdictions, laws exist prohibiting use of public funds to provide a service in direct competition with a private carrier. This requires the purchase of, or service contract with, the private carrier. On the other hand, in California, SB 325 funds for transit operation may not be used to subsidize a private operator. Laws regarding this situation vary widely and are being reviewed. In Merced, a public dial-a-ride system was introduced by the city after a group-ride taxi service provided by the local taxi operator proved to be inadequate and too expensive. When the city solicited bids for implementation of a transit service package, the contract was awarded to a consulting firm. Subsequent to introduction of the new system, the taxi operator initiated a lawsuit, still pending, claiming he was being unfairly put out of business by the public system. This conflict was avoided in communities such as El Cajon, where the city was able to reach a satisfactory service agreement with the taxi operator.

Labor

Most of the systems studied have been staffed with part-time workers, city employees, students, or by the employees of a contractor who was providing the transit

service. Union labor has been used in the Eugene, Evansville, and East Chicago, Indiana, operations.

Receipt of UMTA funds for transportation expenditures, either operating or capital, requires adherence to the UMTA regulations, including the "13-C" provision of the Urban Mass Transportation Assistance Act of 1964. This provision requires that the Secretary of Labor certify that regulations for the protection of employees have been met. Consequently, federal funding may be withheld if a local union opposed the labor practices, such as the use of non-union employees.

Chapter III

TRANSIT SERVICES

Service Concepts

The case studies describe several variations of fixed-route and demand-responsive service, including combinations of both in integrated systems. Although many small communities have offered what appears to be conventional fixed-route or dial-a-ride service, closer examination reveals special features which have had the effect of customizing the service to the needs of the users.

In a fixed-route service, buses follow a fixed and announced schedule and route. The capacity of the buses providing fixed-route service in the small communities studied has ranged from 16 to 49-passenger vehicles. A summary of vehicle types used in the case study systems is shown in Table 3.

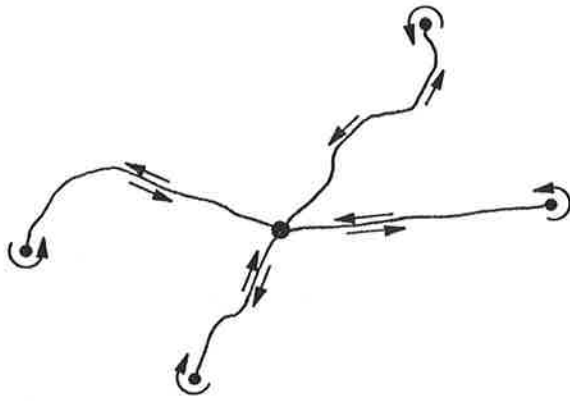
The fixed-route systems have made use of a number of special features. Hailing of buses has been permitted to reduce the number of designated stops in low population density areas. By providing a central transfer point where all routes converge, passengers can reach any destination with a maximum of one transfer. Also, since all buses converge at the scheduled times and do not depart until all have arrived, the wait time for transferring is minimal, and no walk is required. East Chicago, Evansville, Westport, Connecticut, and Xenia, Ohio, have had a coordinated transfer point at the common end of all of their routes. Eugene, a larger system, has had several coordinated transfer "nodes" at which a number of routes have been synchronized. It is clear that transfer coordination is easier to arrange with the relatively simple routes and schedules that typify small community transit operations.

An effective means of providing maximum fixed-route coverage involves the use of "loop" routes (see Figure 1). Loops can be planned over the entire route, or only over the outer portion, as illustrated. The effect of looping is to increase geographical coverage of the system without increasing the number of routes or vehicles required. Obviously, the service is somewhat inferior to that of a conventional system with twice as many vehicles, since some people can only come to the center of the system by first traveling to the periphery. The smaller the area of the community, the less serious is this deficiency, suggesting that loop routes may be especially applicable in geographically small communities. Many of the communities studied here -- Westport, Eugene, Sudbury, Chapel Hill,

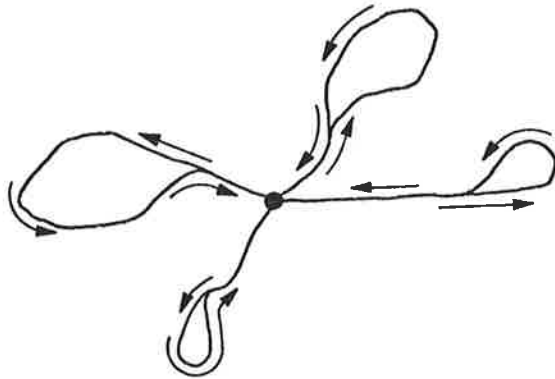
TABLE 3. TRANSIT VEHICLES - CASE STUDY COMMUNITIES

<u>FULL SIZE COACH</u>	<u>SMALL BUS</u>	<u>VAN</u>	<u>TAXI</u>
EUGENE	EUGENE	ANN ARBOR	EL CAJON
BREMERTON	XENIA	MERCED	XENIA
CHAPEL HILL	AMHERST		
	CHAPEL HILL		
	E. CHICAGO		
	EVANSVILLE		
	MERRILL		
	SUDBURY		
	WESTPORT		

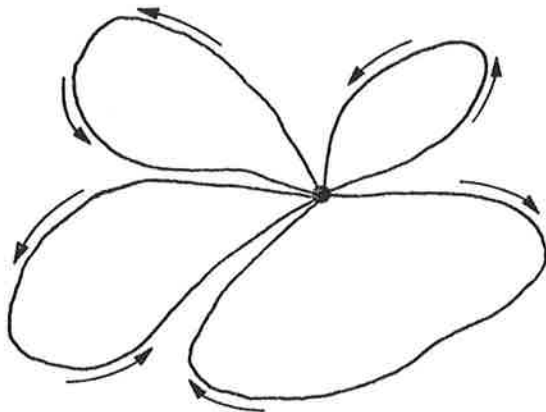
Figure 1
Conventional vs. Loop Routing



(a) Conventional routes



(b) Partial loop routes



(c) Full loop routes

Evansville, and Amherst -- have made some use of loop routing.

In addition to special routing, a small community can have greater coverage and higher vehicle productivity through higher vehicle speeds than are possible in larger, more congested settings. Westport has been able to run its buses at average speeds of 15 to 20 mph in contrast to the 8 to 12 mph typical in large bus operations. The higher speeds permit the operation of longer routes at any given headway limit, thus increasing system capacity.

Varying forms of demand-responsive, or door-to-door, service have been used in Merced, El Cajon, and Ann Arbor, Michigan. The names attached to demand-responsive service forms, such as dial-a-ride, dial-a-bus, or shared taxi, refer to the mechanism for providing the service. From the point of view of the user, they are identical in the sense that the user calls in to request service, waits to be picked up, and is transported to his destination, while other passengers may be picked up or dropped off enroute. Demand-responsive service is usually more direct than fixed-route transit, although the travel time may not be any less.

Dial-a-ride systems tend to be operated by public transit systems (Merced, Ann Arbor) and shared taxi service has been operated by the local taxi company (El Cajon). Shared taxi vehicles are usually autos or vans, while dial-a-ride systems typically use vans or small buses.

An interesting hybrid version of demand-responsive and fixed-route service was adopted in Merrill, Wisconsin. In this concept, referred to as point deviation, the vehicles must stop at fixed checkpoints. Vehicles are not required to follow a specific path travelling from checkpoint to checkpoint. Users can hail the buses, board at checkpoints, or call in for a pickup. Passengers who board at a checkpoint may request doorstep delivery or travel to another checkpoint. A premium fare is charged for the doorstep service. The basic advantage of this concept is that it provides greater coverage than fixed-route service and increased capacity over purely demand-responsive services.

Considerations Regarding Choice of Service Mode

Characteristics of the community are considered in developing a transit system. These include the size and shape of the community, the potential users, population density (or in some cases, the estimated demand density), area to be served, and the location and size of major attractors such as the downtown, shopping centers, schools, and large employers. If the system is not aimed at a

population which is "mobility-limited" (e.g., elderly or handicapped), and if much of the travel appears to be related to a few main activity centers such as a downtown area, a railroad station, or a high school, then fixed-route systems can perform very efficiently. The clearest illustration of this pattern has been the performance of the two fixed-route systems which have provided service to university campuses: Amherst and Chapel Hill have provided comparatively frequent service, at least in peak hours, and have achieved high productivities, 85 and 26 passengers per vehicle hour, respectively.

Among systems serving a more general population, Evansville and East Chicago have also been able to operate with high productivities, around 25 passengers per vehicle hour. In Evansville, a defined and concentrated downtown area appears to have been the crucial ingredient, while in East Chicago, the extremely high residential density has apparently accounted for the high vehicle productivity. (About 85 percent of East Chicago's land area is devoted to industrial uses, so that the residential density on the remaining land is about 16,500 persons per square mile.) Even without these special circumstances, the fixed-route systems in Westport and Eugene have operated with moderately high vehicle productivities, averaging about 15 persons per vehicle hour.

There are, nonetheless, several arguments for the use of demand-responsive service in many small community situations. One argument is based simply on cost: Vehicle utilization would be improved in low-density environments and cost per passenger lowered, if vehicles were not required to travel at times or in places where few people want to go. This viewpoint is examined below in the section on costs. Two other arguments are based on the service advantages of a demand-responsive system. It is claimed that such a system would offer riders better service than is possible through fixed-route systems by providing more flexibility in choosing their destinations and departure times. Furthermore, demand-responsive systems usually provide door-to-door service in a single vehicle, eliminating both walk time and transfer time.

This latter advantage of a demand-responsive system, i.e., the ability to provide door-to-door service, is likely to be particularly important in a small community. First, the best headways which seem economically attractive in a small community are rather long, 30 minutes or more for all except the systems providing service to college campuses. This places a considerable burden on the potential rider to familiarize himself with the schedule and arrange his activities and departure times accordingly. Second, activity centers are often not as concentrated in small

communities as in large ones. This is particularly true if the community is a residential part of a larger urban area, so that most internal trips are to visit relatives and friends or to do minor shopping errands. In such an environment, many trips would require at least one transfer if they were made on a fixed-route service.

In addition, a community in which service to the elderly is a major goal may have no alternative but to provide demand-responsive service, even when it involves an additional cost. For elderly people, the task of walking to a bus stop and waiting for the bus to arrive can be onerous and is often impossible. El Cajon, for instance, has a high population density for shared-taxi service (about 5,000 per square mile), but the existing fixed-route service was attracting few elderly riders. However, two-thirds of the riders of the new shared-taxi service have been elderly. It seems evident that usage of transit by elderly residents is greatly increased by the door-to-door nature of demand-responsive service. Two of the three systems which attracted 30 percent or more of their riders from among the elderly have offered door-to-door service. In Westport, the lack of door-to-door service is thought to be the cause of the unexpectedly low usage of the system by elderly riders, who have comprised less than 3 percent of the total ridership.

It seems fair to conclude that demand-responsive service will generally be superior to fixed-route service with respect to comfort, convenience, and flexibility. However, it is important to observe that demand-responsive operations do not provide unambiguously better service than fixed-route systems. Demand-responsive service shows no evident advantage with respect to overall travel time, and it can be inferior to fixed-route service with respect to reliability. The traveler cannot be confident about either his wait time or his travel time, since both depend on the volume of total demands on the system at the time he seeks to travel. In the pilot demonstration in Ann Arbor, for instance, the average wait time for dial-a-ride service was about 11 minutes, but about 15 percent of the riders were required to wait more than 20 minutes. The fixed-route buses serving the area ran on half-hour headways, so that once a person familiarized himself with the system, he could arrange his departure time so as to minimize the wait, and thus assure himself of a shorter wait time than he could expect to obtain from the dial-a-ride. Once aboard the vehicle, average travel times in Ann Arbor were nearly identical for the fixed-route and dial-a-ride service, but again the fixed-route vehicle was subject to less variation resulting from intermediate pick-ups of other passengers. However, a significant feature of the dial-a-ride service was that it eliminated about seven minutes of average walk

TABLE 4. CASE STUDY TRANSIT SYSTEMS FARES & PAYMENT

	BASIC FARE	TOKENS	COINS	TICKET BOOKS	PASSES		
					WEEKLY	MONTHLY	ANNUAL
ANN ARBOR	FREE/60¢			X		X	
AMHERST	FREE	--	--	--	--	--	--
BREMERTON	.35 - .50		X		X		
CHAPEL HILL	.25			X			X
E. CHICAGO	FREE	--	--	--	--	--	--
EL CAJON	.50			X			
EUGENE	.25	X	X			X	
EVANSVILLE	.35		X				
MERCED	.25		X	X			
MERRILL	.25		X		X		
SUDBURY	.25			X			
WESTPORT	.50		X				X
XENIA	.25	X				X	

NOTE: Table 4 is referred to on page 20.

TABLE 5. OPERATING STATISTICS FROM CASE STUDY SITES (1)

	Amherst, Mass.	Chapel Hill, N.C.	East Chicago Ind.	Eugene, Ore.	Evansville, Ind.	Sudbury, Mass.	Westport, Conn.
TYPE OF SERVICE	Fixed-route	Fixed-route	Fixed-route	Fixed-route	Fixed-route	Fixed-route	Fixed-r
SERVICE AREA							
DEMOGRAPHICS							
Population in Service Area	17,000	32,000	47,000	170,000	139,000	13,500	28,000
Population Density (persons/sq. mi.)	1,000	3,300	4,000	1,700	3,900	550	1,300
COVERAGE AND SERVICE							
Number of Routes	5 regular 3 others	10	3	20	13	7	7 commu 7 regula
Average Route Length(one-way mi.)	6	N/A	9	13 @ 10 mi. 7 @ 32 mi.	8	5	
Average Route Time (one-way min.)	25	N/A	45	13 @ 40 min. 7 @ 60 min.	35	15	
Average Headways (min.)	10 regular 30 others	5 to 40	45	13 @ 30 min 7 longer	30 on half 60 on half	120	15 comm 35 regula
Service Area (sq. mi.)	-	-	-	-	-	-	-
Average Wait Time (min.)	-	-	-	-	-	-	-
Number of Vehicles in Service	16	27	5	47	16	2	
COST AND PRODUCTIVITY							
Operating Costs per Vehicle-Hour	\$7.74	\$11.10	\$14.50	\$16.90	\$8.54	\$9.85	\$11.10
Operating Costs per Passenger (2)	\$0.09	\$ 0.43	\$ 0.57	\$ 1.07	\$0.37	\$1.08	\$ 0.70
Passengers per Vehicle Hour (2)	85	26	26	16	23	9.3	16
Driver Wage Rate (5) (\$/ hr.)	\$3.00	\$ 3.80	\$ 4.00	\$ 5.25	\$5.00	N/A	\$ 4.40
Total Capital Cost (3) (thousand \$)	439	1,075	N/A	1,190	N/A	close to 0	255
Lease or Buy Vehicles?	B	B	B	B	B	I	B
Base Fare (4)	0	25c(6)	0	30c	35c	25c	50c
Revenue per Passenger (2)	0	\$ 0.20	0	\$ 0.25	\$0.30	\$0.20	\$ 0.20
Operating Subsidy per Passenger (2)	\$0.09	\$ 0.23	\$ 0.57	\$ 0.82	\$0.07	\$0.88	\$0.54
Operating Ratio (costs/revenues)	undefined	2.1	undefined	4.3	1.3	5.4	3.7
RIDERSHIP							
Average Passengers per Weekday (2)	15,200(school yr) 5,400(summer)	13,500(school yr) 4,000(summer)	1,050	10,500	3,500	170	1,400
Percentage of Youth Riders	N/A	small	high	25	17	80	50
Percentage of Elderly Riders	small	small	high	10-15	27	small	small
Major Trip Purposes	85% university	86% university	shopping, recreational	work school shopping	42% work 21% shopping	school recreation	school recreational work

NOTES TO TABLE:

(1) "N/A" = not available.

(2) "Passengers" refers to completed trips (excluding transfers) when this can be determined.

(3) "Capital Cost" excludes the cost of leasing vehicles, equipment, or garage space, but includes planning and evaluation costs.

(4) "Base fare" is the single-ride fare charged to an adult rider, excluding all discounts.

(5) "Driver wage rate" is the standard base hourly pay, including fringe benefits when this can be determined.

(6) These cities rely heavily on transit passes rather than single fares for their revenue from operations.

TABLE 5. (CONTINUED)

	Xenia, Ohio	Bremerton, Wash.	Merrill, Wis.	Ann Arbor, Mich.	El Cajon, Cal.	Merced, Cal.
TYPE OF SERVICE	Fixed-route	Subscription Bus	Point Deviation	Pilot DAR	Shared Taxi	Dial-A-Ride
SERVICE AREA						
DEMOGRAPHICS						
Population in Service Area	27,600	35,000	9,500	16,000	60,500	30,000
Population Density (persons/sq. mi.)	3,100	3,600	1,700	7,300	5,000	3,000
COVERAGE AND SERVICE						
Number of Routes	4	24	1	-	-	-
Average Route Length(one-way mi.)	6	-	5	-	-	-
Average Route Time (one-way min.)	15	20	30	-	-	-
Average Headways (min.)	30	45	30	-	-	-
Service Area (sq. mi.)	-	-	-	4	12	10
Average Wait Time (min.)	-	-	-	11	20	21
Number of Vehicles in Service	7	28	2	3	15	4
COST AND PRODUCTIVITY						
Operating Costs per Vehicle-Hour	\$11.70	\$9.16	\$9.50	\$10.50	\$8.16	\$9.70
Operating Costs per Passenger (2)	\$ 1.34	\$0.17	\$0.99	\$ 1.74	\$1.28	\$0.84
Passengers per Vehicle Hour (2)	8.7	53	9.6	6.3	6.4	11.5
Driver Wage Rate (5) (\$/ hr.)	\$ 3.70	\$10/day	\$4.00	\$ 6.00	commission + tips	\$3.75
Total Capital Cost (3) (thousand \$)	223	N/A	95	35	close to 0	65
Lease or Buy Vehicles?	B	L	B	L	L	B
Base Fare (4)	25c	35c	25c	60c(6)	50c	25c
Revenue per Passenger(2)	\$ 0.15	\$ 0.21	\$0.26	\$ 0.47	\$ 0.38	\$0.25
Operating Subsidy per Passenger (2)	\$ 1.19	0	\$0.73	\$ 1.27	\$ 0.90	\$0.59
Operating Ratio (costs/revenues)	8.9	0.8	3.8	3.7	3.4	3.4
RIDERSHIP						
Average Passengers per Weekday (2)	900	2,240	228	190	600	330
Percentage of Youth Riders	31	0	45	23	N/A	15
Percentage of Elderly Riders	10	0	20	11	67	30
Major Trip Purposes	35% work 33% shopping	100% work	school shopping	34% work 23% school	40% shopping 27% medical dental	35% school 26% work

NOTE: Table 5 is referred to on page 23.

time (about 20 percent of total trip time) at both ends of the trip which were necessary with the fixed-route service, and did enable the passenger wait time to be shifted from the bus stop to the traveler's residence -- an important improvement in comfort and convenience.

Service Policy and Quality of Service

Demand-responsive systems can be structured to serve a few destinations only (many-to-few) or provide service anywhere in the area (many-to-many). In an attempt to balance the demand over the day and serve the largest number of users, several special features have been employed in the cities studied. Merced has provided prearranged subscription service (many-to-few) for school and work trips during the busiest (peak) period and many-to-many service in the off-peak. The Merrill system has transported small children to and from day care centers in addition to providing public school transportation for students ineligible for the local school bus service. Charter trips to shopping destinations for senior citizens and telegram and package delivery have also been included in the Merrill service.

Westport has been operated as a pure fixed-route service, but the drivers have occasionally deviated from their route to take a passenger to his door, particularly in inclement weather or if the person was elderly. In most small cities, the bus drivers have assisted elderly or infirm passengers who may have had difficulty boarding the bus. Such examples of courteous, personalized service designed to meet the needs of individual travelers seem to be an important unique feature of transit in small communities.

The mode of service does not completely define the level of service. In addition to the choice between scheduled and demand-responsive service, a community must decide such questions as the days and hours of service, and the extent to which back-up vehicles will be provided. If a fixed-route system is chosen, decisions must also be made about routes, frequencies, and arrangements for transferring from one route to another. For demand-responsive service, the number of vehicles which are to be in service at each time of the day must be determined, and consideration should be given to modification of the service during periods of higher demand (e.g., by switching to fixed-route or subscription service at some hours of the day).

Hours. In small as in large transit systems, there is a wide variation in days and hours of service. In our sample, hours have ranged from a low of eight hours per day in East Chicago (which has deliberately avoided serving the

morning peak period) up to 24-hour service in El Cajon. A majority of services have operated Monday through Saturday. Only Merced has omitted Saturday service.

On weekends, the level of service in these systems has usually been cut back. Hours of service have usually been decreased; headways on fixed-route systems have been increased; and the number of vehicles available on demand-responsive systems has been reduced. Xenia has had fixed-route service on weekdays and demand-responsive service on Sundays and holidays. In the campus-community systems, service has also been cut back during semester breaks and during the summer. In the case of fixed-route systems, such a reduction in vehicle hours has necessarily resulted in a deterioration in service quality, because headways have had to be lengthened. The demand-responsive systems have been more flexible in this respect; fewer vehicle hours have not ordinarily resulted in longer wait times since the demands of riders for service have also been lower in off-hours.

Headways. Fixed-route systems typically adjust their service to the demands of riders by providing more frequent service at times of the day when ridership is greatest, thereby increasing both capacity and service quality. Since the "peak" in small community systems often occurs at different times of day than the traditional commuter peak, and often extends over more hours, it is important to note that the following discussion of peak and off-peak headways refers to the system peak rather than the conventional morning-and-evening peak.

Headways have generally been about 30 minutes, but lower for the two campus-community systems. Some minor routes in the larger systems have had headways of up to an hour, and the now-suspended Sudbury system operated on two-hour headways. This minimal level of service was a primary cause of the lack of usage by the community, which forced the town to terminate operations.

In the smaller fixed-route systems, only negligible adjustments in schedules have been made between peak and off-peak. East Chicago and Xenia have made no changes in headways at different times of the day, and Westport has added only a single extra high school shuttle route in the after-school hours (although a greater increase in afternoon capacity is planned).

The larger systems have made a greater adjustment. In the campus-community systems, headways have been reduced to about 10 minutes at peak hours. In Amherst and Eugene, additional routes have been added. Chapel Hill has deployed 27 buses in the peak and only 17 in off-peak periods.

Demand-responsive services must also adjust their vehicle deployment to the level of demand if they are to maintain a consistent level of service with respect to wait-time at all hours of the day. In El Cajon, the taxi operator has apparently done this to the extent that labor agreements permitted. In Merced and Ann Arbor, which have had only enough vehicles available to serve off-peak demand, wait times have deteriorated during peak periods. Merced has attempted to deal with this problem by providing a subscription service in the morning and evening; it is during these periods that average vehicle productivities have been highest. Ann Arbor's pilot dial-a-ride project provided many-to-few service between the service area and selected points downtown, and, on an "as-available" basis, many-to-many service within the service area. In peak periods the many-to-many service was generally not available.

Reliability. Reliability is often an important component of service quality, particularly for discretionary riders. Ordinarily, reliability problems arise from problems with either vehicle performance (measured by the frequency and seriousness of vehicle failures) or on-time performance. For fixed-route systems, schedule adherence is used as a measure of on-time performance; for demand-responsive systems, perhaps the best single measure is the relationship between promised and actual pick-up time.

A community will guard against service interruptions due to vehicle breakdowns by making arrangements to have back-up vehicles available. All but one of the communities studied did make such arrangements. As a result, they have been able to cope with breakdowns without affecting system reliability more than momentarily.

Maintaining reliable time and schedule performance appears to be primarily a matter of managerial vigilance. Several communities found it useful to establish standards (e.g., "not more than x percent of trips will be more than y minutes late") against which actual performance could be compared. Where transit managers maintain interest in obtaining community feedback, this feedback is used to identify and correct performance problems.

Fare Policies

A variety of methods of fare payment were encountered. Coins, tokens, coupon or ticket books, and prepaid passes have been used, as shown in Table 4, which also shows the standard fare charged in each city.

On the fixed-route systems studied, fares have varied from zero to 35 cents for systems which have relied primarily on single ride fares, rather than passes, for revenue. While Merced's dial-a-ride fare has only been 25 cents, Ann Arbor's was 60 cents, and El Cajon's shared-taxi service has been 50 cents. In Merrill, the fare has depended on the type of service. Checkpoint-to-checkpoint service has been 25 cents, checkpoint-to-doorstep fare has been 40 cents, and doorstep-to-doorstep service has cost 50 cents. In most cities, discounts have been offered to youth and senior citizens.

Prepaid passes, sold on a weekly, monthly, or annual basis, permit unlimited rides for a fixed cost. This results in substantial discounts for regular users; in Westport, where the basic fare has been 50 cents, over 20 percent of the population have purchased annual passes and the average fare per ride for regular users has been less than 20 cents. Tickets and passes have often been purchased in bulk by institutions in the community. Some communities have controlled pass misuse by including a photograph of the user on the pass.

Free fare service has been provided by the campus-community fixed-route operation in Amherst and by the East Chicago system, which was designed to serve low income transit dependent citizens. In East Chicago, the free fare policy caused much joy-riding by teenage users, but this problem has been overcome by the provision of passes for teenagers which limited them to two rides per day.

Marketing and Promotion

A transit marketing program generally has four components: (1) determination of who will use the system and how they need to use it, (2) development of a transit system image, (3) promotion and advertising, and (4) developing and updating rider information handouts describing how to use the service. Marketing activities encountered in the small cities studied did not always include all four of these components; however, the last three were considered essential by almost all of the cities.

Marketing research, or surveys of the consumers' needs, enable the transit operator to develop and modify service strategies so as to permit the resources to be allocated in the most productive way. In Eugene, a general survey was conducted during the planning phase which resulted in a number of recommendations influencing the service plan. Westport recently conducted a survey of its users to determine their attitude toward existing service and where they would like to see it changed.

A transit system's image is commonly recognized as a key element in whether or not public attitudes can be influenced toward using the transit service. Almost all of the communities studied have sought to create an image of a personal, friendly, convenient, and courteous service. The choice of vehicles, color schemes, logos, and advertising all reflect this orientation. Merrill and Westport held "name-the-bus" system contests to encourage community involvement and identification with the system.

While marketing budgets are constrained due to cost-conscious management policies, the small cities studied have demonstrated a great deal of ingenuity in obtaining free advertising in local media and contributed services of printers, chambers of commerce, and merchants in developing and distributing transit information. For example, in Evansville, the Chamber of Commerce was persuaded to prepare the route/schedule brochure, and a local utility company agreed to distribute it with the monthly utility bills.

The style and content of user information handouts observed in these systems indicate an emphasis on design quality and legibility. Almost all of the handouts were found to be clear and informative, making use of sophisticated color coding and graphics to communicate the route and schedule information. Users were also encouraged to call in for more specific information on how to make their trips.

Chapter IV

RIDERSHIP AND COST

Ridership Response

It should be apparent that because of the uniqueness of each small community site and the transit service provided at each site, ridership responses have varied considerably from site to site. Table 5 contains a summary of ridership, as well as cost characteristics of the small community systems. The highest ridership has been found on the university-community fixed-route services, the lowest on the demand-responsive and route-deviation services. In Eugene, which has offered a comprehensive city-wide, fixed-route transit service throughout a fairly large-sized community, ridership has also been high (an average of 10,500 passengers per weekday). Ridership on the other fixed-route services and the subscription bus service has been considerably lower than that of Eugene but higher than those of the demand-responsive systems. Ridership on Sudbury's fixed-route system was an exception, being lower than any of the demand-responsive services.

In all of the case study services except Sudbury, ridership grew significantly following the introduction of service (see Table 6). In all of the services except Chapel Hill, ridership at least doubled during the first year of operation. It is possible that Chapel Hill's ridership grew no more than it did because soon after the system was implemented it reached capacity during the periods of high demand. Similarly, it is possible that the other services at capacity may have had further ridership increases had system capacity been increased. El Cajon's ridership may not have stabilized as soon as it did had the City of El Cajon been vigorously marketing its transit service. However, with the manner in which the taxi operator has billed the city for the shared taxi service, the subsidy per passenger that the City has been paying the operator would not decrease as the number of passengers carried increased. Because of their limited budget and inability to achieve any economies of scale, El Cajon has not sought further ridership increases. It seems apparent from the case studies that considerable ridership growth is likely during at least the first year of service providing supply is sufficient to meet demand. In at least three cases, Eugene, Evansville, and Amherst, ridership continued to grow for several years.

The most dominant users of transit in the case study communities have been the transit dependent (see Table 7). Among transit dependents, the elderly are an important

TABLE 6. CASE STUDY COMMUNITIES RIDERSHIP GROWTH

<u>DECLINE</u>	<u>STABILIZED</u>	<u>STILL RISING</u>	<u>AT CAPACITY</u>
SUDBURY (1/2 YR)	EL CAJON (X2 IN 1 YR)	MERRILL (X2 in 3/4 YR)	CHAPEL HILL (X1/3 IN 1 YR)
	XENIA (X2 IN 1 YR)	EVANSVILLE (X4 IN 4-1/2 YRS)	WESTPORT (X2 IN 1 YR)
	EUGENE (X5 IN 5 YRS)	ANN ARBOR (X3 IN 1 YR)	MERCED (X2 IN 1 YR)
		AMHERST (X6 IN 3 YR)	

<u>COMMUNITY</u>	<u>PURPOSES</u>	<u>USERS</u>
ANN ARBOR	WORK, SCHOOL	ALL
AMHERST	SCHOOL	STUDENTS
BREMERTON	WORK	SHIPYARD EMPLOYEES
CHAPEL HILL	SCHOOL	STUDENTS
E. CHICAGO	SHOPPING, RECREATION	ALL TRANSIT DEPENDENTS
EL CAJON	SHOPPING, MEDICAL	ELDERLY
EUGENE	WORK, SHOPPING	ALL
EVANSVILLE	WORK, SHOPPING	ALL
MERCED	ALL	ALL
MERRILL	SCHOOL, SHOPPING	YOUTH, ELDERLY
SUDBURY	SCHOOL, RECREATION	YOUTH
WESTPORT	SCHOOL, RECREATION, WORK	YOUTH, COMMUTERS
XENIA	WORK, SHOPPING	ALL

segment requiring service. However, in only three of the communities have elderly riders exceeded 30 percent of the total ridership (with over two-thirds of the riders in El Cajon being elderly), and in six cases the elderly have accounted for less than 10 percent. This is in large part because only three of the small communities have offered door-to-door service. Of the three communities that have attracted over 30 percent elderly riders, two have provided door-to-door demand-responsive service.

A particular transit dependent user group which stood out in several communities has been the youth market, consisting chiefly of young teenagers in the age range of 11 to 15. Westport has been the clearest illustration of the potential attractiveness of public transit for this group. Transit has freed youth from dependence on their parents for transportation, and has relieved their parents of chauffeuring duties. In another site, East Chicago, transit passes had to be required on a free-fare system to limit teenage riders to two rides per day.

Another large group of users of transit in the small communities have been those for whom auto travel has been possible, but inconvenient, such as members of one-car families or college students wishing to avoid campus parking problems.

There does not appear to have been one dominant trip purpose for users of the different small community services. In the two college-community services and in the Merrill and Westport services, school has been the major trip purpose. In general, considerably less emphasis has been placed on serving the work trip in small community transit than in large urban area transit. Bremerton, Washington, has had the only transit operation primarily directed at serving the work trip. However, in four of the other small cities, at least one-third of the trips have been work trips. East Chicago, because of limited funds, purposely avoided serving many work trips by simply not offering service until 10:00 a.m. Other major trip purposes of small community transit users have included recreation, shopping, and medical trips.

Factors Influencing Operating Costs

In designing their transit systems, the small communities had to consider the cost implications in making the final decisions on which service options and policies to select. In some cases, cost constraints may have ruled out the more costly options. Of the two cost categories -- operating and capital costs -- operating costs were the major concern because the small communities had to cover a large percentage of these costs. Capital costs, while not

minor, were almost entirely subsidized by Federal and state grants.*

A basic measure of operating cost is the average cost per ride. In our sample, this has ranged from nine cents in Amherst to \$1.74 in the Ann Arbor pilot dial-a-ride project. The cost per passenger clearly depends on both the efficiency with which the transit vehicles are operated, which can be measured by the cost per vehicle hour of service, and the number of passengers carried per vehicle hour (vehicle productivity). The cost per passenger trip, then, is exactly the quotient of the cost per vehicle hour and the vehicle productivity.

Factors which affect operating costs necessarily do so by affecting either operating efficiency or vehicle productivity. Reducing idle labor time produces a cost savings by reducing the cost of each vehicle hour of service; streamlining of routes reduces the cost of carrying each passenger by carrying more passengers in the same number of vehicle hours. In some cases, particular operational changes will affect both operating efficiency and vehicle productivity. For all factors being considered, it is important to distinguish the way in which costs are being affected.

Choice of Service Mode. The choice of mode is an important determinant of operating costs. A common argument for demand-responsive service is that in low-density environments it is cheaper per passenger than fixed-route service. This argument is based on the premise that, in such environments, a vehicle's productivity will be improved if it alters its route to meet the demands of passengers rather than following a route which is fixed in advance.

A direct comparison of per-passenger costs between the fixed-route and the demand-responsive systems in our sample

*Because capital costs are subsidized by Federal and state grants, they are not discussed in this summary. However, it should be noted that the cost data in Table 5 are not in all cases limited to operating costs. The systems which leased their vehicles or service have contributed to the capital cost of the vehicles through their lease payments. In cases such as El Cajon where the service was purchased from a private operator, the fee has included not only a charge for depreciation of the vehicles, but also a contribution to the taxes paid by the leasing company. Both of these items are excluded from the cost data for publicly owned and operated systems.

would initially show that demand-responsive systems have generally been more expensive. The operating costs per passenger in the four demand-responsive systems (including the point deviation system in Merrill) have been in the \$0.75 to \$1.75 range, while the fixed-route services typically have had per-passenger costs in the range of \$0.35 to \$1.25, and have run as low as nine cents in the high-density Amherst campus service and seventeen cents in the highly specialized Bremerton subscription bus service. These variations in cost are a direct reflection of the differences in vehicle productivity, which have averaged above 50 riders per hour in the Amherst and Bremerton systems, dropping to between 9 and 25 passengers per hour in the other fixed-route systems, and falling to the neighborhood of 6 to 11 passengers per hour in the demand-responsive systems.

The data available does not contain any examples of demand-responsive service in truly low-density settings (Merced, at 3,000 persons per square mile, is the closest case). Merrill, with a density of 1,700, has operated a system that cannot be classified as fully demand-responsive. Apparently, then, a determination of whether demand-responsive service is cheaper per passenger than fixed-route service in a low density environment cannot be made with the data from the thirteen case study transit systems. Nonetheless, the data does contain examples of fixed-route service which appear to have worked in low density areas.

Westport, with a population density below 1,500, has provided fixed-route service at least as cheaply on a per-passenger basis as Merced's dial-a-ride, and Evansville, with a population density only slightly higher than Merced, has provided fixed-route service at a third of Merced's cost per passenger. In the extreme is Amherst, with a population density of only 1,000 per square mile, but a high demand generated by university traffic which has resulted in a vehicle productivity of 85 passengers per vehicle hour. The vehicle productivities of these fixed-route systems have been significantly higher than those in Merced, which have themselves been high compared to most U.S. demand-responsive systems. The other fully demand-responsive systems (Ann Arbor and El Cajon) have operated at lower vehicle productivities and thus have had higher costs per passenger.

It appears that at least two situations can be isolated in which fixed-route systems can operate viably in low density areas. The first is a setting in which activity centers are geographically concentrated, even though residences are dispersed. Amherst is an example of this, as are Evansville and, to some extent, Westport. This sort of a situation can be created by a defined downtown area, by a high school or a university, a railroad station, or even a

recreation area such as a park or a beach. Demand-responsive service is likely to achieve its greatest efficiency (relative to fixed-route service) in places where such large activity centers do not exist, or at times when they are not in operation.

A second situation is one in which the trips being served are not rigidly confined to particular times of departure or arrival. This will often be the case with shopping trips, or with trips to visit friends, or other recreational trips, which are often made by both youthful and elderly riders. For these trips, travelers may not find it difficult to adapt their departure times, and even their destination choices, to the available service. In this case, a fixed-route service may cause demand patterns to be more concentrated, and vehicle productivities to be higher, than they would be if a more flexible service were provided in the same setting. If costs per vehicle hour are comparable, and if passengers in fact behave in this way, then fixed-route service will be cheaper even in a low-density environment. (Of course, the quality of service will also be lower, since passengers are not as free to choose their own travel times as they would be with demand-responsive service.)

The above comparison of the costs of fixed-route and demand-responsive services has emphasized the vehicle productivity component of the cost per passenger statistic. But the choice of service mode may also affect operating efficiency by influencing the kinds of labor agreements which are institutionally feasible. In our sample, two of the demand-responsive systems (Merced and El Cajon) and the Merrill point deviation system have shown operating costs per vehicle hour which have been among the lowest of the thirteen communities. In each case, non-unionized labor has been employed, and small vehicles have been used. It is likely that non-unionized labor can be employed more easily with demand-responsive, "taxi-like" service than with conventional fixed-route transit. This is an advantage of shared-taxi or dial-a-ride systems which is often overlooked in discussions which frame the economic justification for such services purely in terms of vehicle productivity.

One final point is relevant to the cost comparison between fixed-route and demand-responsive services. For many communities, the critical comparison will not be in the relative costs per passenger but in the relative subsidies per passenger. Often, since demand-responsive service is viewed as a premium service, relatively high fares have been charged. Ann Arbor charged 60 cents per ride for its dial-a-ride service, while El Cajon has charged 50 cents for taxi tickets. These fares have been higher than any of the fares on fixed-route systems in our sample except

Westport, the vast majority of whose riders have used prepaid passes. However, the higher fares have not been sufficient to offset the higher costs. In our sample, the operating subsidy per passenger on the publicly-funded, demand-responsive systems has generally been higher than for the fixed-route systems. Subsidy levels will be discussed in more detail later in this section.

Labor Agreements. In the small community transit operations, labor costs, typically, have accounted for the largest share of operating costs. By way of illustration, Table 8 presents a breakdown of operating expenses for the first six weeks of operation of the Westport Transit District. The total cost of operations can be regarded as approximately typical of the costs experienced by other fixed-route systems, although breakdowns of costs for most other systems are not readily available. The share of labor costs in the total cost is considered to be broadly comparable to other fixed-route and demand-responsive systems. The administrative overhead may have been somewhat higher as a percentage of total expenses than for other similar systems because of Westport's relatively high expenditures on marketing and evaluation.

TABLE 8

WESTPORT TRANSIT DISTRICT
OPERATING COSTS, FIRST SIX WEEKS

COST OF OPERATIONS

Salaries - Operating Personnel	\$14,636.00	
Payroll Taxes	1,464.00	
Insurance	2,988.95	
Maintenance	8,000.00	
Fuel	<u>2,399.91</u>	
		\$29,488.46

GENERAL & ADMINISTRATIVE EXPENSES

Advertising and Promotion	11,791.00	
Less: Connecticut State Subsidy	<u>10,000.00</u>	
Advertising and Promotion		
Less Subsidy	1,791.70	
Salaries	7,413.54	
Temporary Help	1,904.24	
Research	614.94	
Payroll Taxes	722.74	
Insurance	332.00	
Rent	1,164.00	
Telephone	1,042.93	
Office Supplies & Expenses	5,148.59	
Travel	403.16	
Legal	2,048.00	
Accounting	250.00	
Education & Subscriptions	278.35	
Interest	<u>92.47</u>	
		\$23,256.66

TOTAL \$52,745.12

It is apparent from Table 8 that public transit in a small community is a very labor-intensive undertaking, in which the biggest expense items are for drivers, maintenance personnel, and administrative salaries. In comparison, the fuel cost, while not negligible, is a much smaller fraction of the total.

It can be concluded that the arrangements under which labor is employed are the most critical element affecting the system operating costs. The wage rate is important, but so is the mix between full- and part-time labor, and the rules governing the use of labor and the protection of existing labor contracts and practices. It is not coincidental that some of the cheaper systems to operate (in terms of cost per vehicle hour) have been those such as Bremerton and Amherst which have employed, on a part-time basis, people who were primarily committed to other occupations. Likewise, those systems which provided full union protections to their drivers and maintenance personnel, Eugene, Ann Arbor, East Chicago, and Evansville, have been, with the exception of Evansville, among the most expensive systems. El Cajon's approach, of subsidizing shared-riding on an existing taxi system, has effectively utilized an inexpensive and relatively flexible labor pool, and has achieved a very low cost per vehicle hour. Towns which had locally controlled unions and less of an adversary relationship between labor and management, appear to have performed better on a cost basis than the large, more formally organized places. Again, Evansville, because of many cost saving measures discussed elsewhere, has been an exception.

Maintenance. Maintenance costs are usually the second largest element in the cost structure of small community transit operations, and they represent a tractable area in which management control can be exerted. The legal-contractual arrangement under which maintenance is performed is important, with a number of options available. The mechanics can be hired and the facilities bought or constructed, or agreements can be made to share these resources with other organizations such as school bus operators. Maintenance service can be procured on contract, or the vehicles themselves can be leased and the maintenance costs covered in the leasing agreement. In choosing a contractual arrangement, the advantages of directly controlling the maintenance activity must be balanced against the expertise and potentially reduced administrative overhead that may be available by procuring outside assistance.

Frequency and ease of maintenance should also be important considerations in the selection of vehicles. In our case study communities, the experience of different

transit operators with similar makes and models of vehicles showed enough consistency to justify checking the service records of particular models before purchasing them.

Degree of Peaking. Since service is less oriented toward work trips than in most larger systems, transit ridership in small communities tends to exhibit much less peaking by time of day. The peaking which does occur is often more frequent or more extended than the usual rush-hours, reflecting school dismissal times or recreational start-up times (e.g., the opening of the swimming pool in the summer) in addition to the normal work schedules.

This extended peaking is favorable from an operating cost standpoint (in terms of cost per passenger), since it means that less extra vehicle capacity to handle peak hour demands is needed, and vehicles are less likely to be idled in off-peak hours. Also, relatively flat or extended peaks lessen the need for part-time labor, and reduce the amount of unproductive labor time which must be paid for if full-time labor must be employed on continuous shifts.

A demand-responsive service has an additional degree of flexibility in dealing with peak-hour demands: it can shift to a fixed-route, subscription, or many-to-few mode during peak periods. This has, in fact, been done in Merced with apparent success.

Entrepreneurship. Another factor which significantly influences operating cost may best be described as "entrepreneurial performance," and is well illustrated by Evansville's achievement of operating a fleet of sixteen 19-passenger vehicles at a cost of \$8.54 per vehicle-hour (despite paying its drivers a comparatively high wage of \$5.00 per hour) and covering 81 percent of its operating costs from the farebox. Among demand-responsive systems, Merced and El Cajon have similarly been successful in controlling costs through flexible and close relationships with the labor pool, and imaginative cost-saving stratagems. Some systems have taken such steps as inducing local businessmen to print schedules and contribute advertising spots, leasing unused garage space for a maintenance facility, and sharing back-up vehicles with other government agencies.

One notable aspect of this ingenuity has been the effort of several system operators to have their accounting done in such a way that other budgets absorbed a part of the overhead. By functioning as a department of the city, Evansville's transit service has avoided bearing such expense burdens as the administration of its payroll, which have been handled as part of the general city payroll. In a similar way, much of the overhead from the Amherst campus

service has been absorbed in the general university budget and has not been recognized as an operating expense of the system.

It seems clear that public transit is as sensitive as any other enterprise to the managerial ability of those who preside over it. This element of the cost structure may be relatively more important in small communities, where institutional forms are less rigid and outlets for the creative use of "goodwill" may, in consequence, be more plentiful.

Fare Levels and Manner of Fare Collection. An underlying issue in examining the effects of various factors on operating costs is the extent to which farebox revenues will cover operating costs. The experience in the sites considered here confirms a belief that is finally achieving wide acceptance: public transit in small communities cannot be expected to pay for itself out of the farebox. Among the communities considered here, only Bremerton, which employed part-time drivers and provided very limited, specific service, has succeeded in covering all of its operating costs from fare collections. All others except Evansville have covered less than half of their operating expenses from fares. In several communities, previously existing private transit services had ceased operations because of an inability to cover costs.

The total operating subsidy per passenger trip has varied in our sample from a low of seven cents in Evansville's service and nine cents in Amherst's service, up to well above a dollar for Ann Arbor's dial-a-ride and Xenia's fixed-route service. These levels of subsidy should not be regarded as the minimum levels that the transit systems could achieve in each community. The transit systems did not necessarily select their fare and service levels so as to minimize their operating losses, although most worked within the constraint of a maximum total subsidy from the financing body. The choice of fare levels and fare structures (e.g., whether and to what extent to offer discounts to special groups of riders such as the elderly) is a fundamental policy decision; it can be based on criteria other than loss-minimization, such as ridership maximization, and level of service maximization, or some combination of criteria.

It is apparent that a critical question in setting fare levels is what the effects of particular fare levels will be on ridership and revenue. About the only feasible approach for answering this question is examining the effects of fare changes on ridership in particular transit systems. There are fragmentary indications of a significant ridership

response to fare changes. In Xenia, in two instances where fare increases were implemented, significant ridership reductions were experienced. Merced's present dial-a-ride system was preceded by a more expensive shared-taxi system which was relatively poorly patronized, and high fare was suspected to be one reason. A one-week promotion in Merrill involving fare reductions and a free-fare day in Eugene achieved a strong ridership response. Furthermore, all of the systems except Bremerton which showed exceptionally high vehicle productivities have either been free-fare or pass systems (though, of course, the other factors mentioned previously may explain the high productivities in each case).

Other studies have indicated that fare elasticities may be much higher in demand-responsive than in fixed-route systems. This result may only be a reflection of the non-work trip market which the dial-a-ride systems have usually served, in which case the high elasticities might extend to fixed-route systems in small communities which are also aimed at non-work trips. It seems prudent for planners to anticipate a significant ridership response to fare changes.

The manner of fare collection may also affect ridership. Demand may be more inhibited by the need to pay cash fares than by paying for transit passes which result in comparable revenue per ride. A pass arrangement has several effects on the attractiveness of the service as perceived by the user: it makes it unnecessary for him to have change (usually exact change) each time he boards the vehicle; it avoids the delays which are involved in fare collection in crowded conditions; and it may reduce the user's average fare per trip if he rides frequently enough. Often, however, the transit operator's total revenues will be reduced when he switches from a single-ride fare to a pass system, and there is usually an extra administrative overhead resulting from a pass system, particularly if photo-ID's are deemed necessary.

Another effect of using a pass system is that it provides a structured format for collecting revenue from "contingency" riders who want the system to continue operating even though they use it only occasionally. In Westport, 18 percent of the passholders have used their passes less than once a week, possibly reflecting this kind of sentiment.

Chapter V

CONCLUDING REMARKS

Although there was no formal attempt to assess the community impact of the transit systems studied, many of the communities offered qualitative observations of transit impacts on their localities. These observations, summarized below, should be considered tentative findings in that most are unsupported by statistically significant data and are based on the early stages of transit implementation.

Positive Community Impacts

Increased Mobility. The most common impact noted has been the increase in mobility afforded those who previously had to resort to more inconvenient or expensive arrangements to make their trips. This group has included the transit dependent citizens referred to earlier in this report as well as members of one car families who have used transit when their auto was unavailable. Elderly citizens have frequently gone out of their way to express their gratitude to drivers and operators for the transit service that has been provided. They have reported that they felt more independent and were able to travel more often than when they had to pay expensive taxi fares to get around.

Mothers who were relieved of much of the burden of chauffeuring their children around town have reported that they have been able to spend this time more productively. Also, some have mentioned that their children have been taught responsibility in planning their activities to conform with the bus schedules, and that they have been able to get to jobs they couldn't otherwise have taken.

Neighborhood Effect. As a consequence of the accessibility provided by a community-wide transit system, a perceived expansion of the neighborhood to cover a larger part of the town has been noted. Those who benefited from greater access have had more choices as to where to shop, etc., and thus have tended to feel closer to places and people than before.

Reduced Parking. A reduction in parking demand has been achieved in such places as the university campus lots, downtown parking, and the limited parking area at the Westport rail station. While the reduction in parking demand at the university campuses has been more the result of university imposed restrictions than the implementation of the transit services, the Chapel Hill transit service has eliminated the need to build additional parking facilities at the University of North Carolina which were planned.

Increased Retail Sales and Use of Community Facilities.

Increased retail sales downtown have been reported in two sites, Eugene and Westport. Westport has also reported increased use of community facilities.

Reduced Auto Ownership. At only one site, Westport, has a reduction in auto ownership been noted. Twenty percent of the commuters on that service, i.e., those who used it to get to and from the railroad station, have reported that they eliminated one of the family cars as a result of the service. In Xenia, it was reported that the transit service has enabled many residents whose autos were destroyed by the tornado to defer purchases of new autos.

Negative Community Impacts

Financial Burden on the Community. The financial burden on the community has been an issue in some of the case study sites. This, coupled with low ridership, was primarily responsible for the demise of the Sudbury service. The cost of the Xenia service has been a constant issue in that community. Both El Cajon and Evansville have not actively attempted to attract more riders, because increased ridership would mean higher costs which these communities have been reluctant to absorb.

Loss of Revenue for Local Taxi Operator. In three communities, Ann Arbor, Merced, and Westport, the transit service has allegedly cost the taxi operator some of his business. The taxi operator sued the Ann Arbor Transportation Authority and lost. A suit by the taxi operator in Merced is still pending. In Westport, the threat of a lawsuit forestalled the introduction of a demand-responsive service in the off-peak morning hours, as originally planned. However, Westport is currently negotiating a shared-taxi service agreement with the local taxi operator(s).

Increased Vandalism. An increase in the incidence of vandalism near areas being served by transit is generally a phenomenon in larger cities only. However, in two of our communities, Westport and Sudbury, downtown merchants have complained of increased theft and vandalism, apparently as a result of greater access by teenagers to the downtown.

Summary

The community impacts discussed above and the operating data presented earlier indicate that the small community systems have filled a local need for public transportation. Further, they illustrate that a variety of transit service options are feasible in small communities and that the form

of service selected can be tailored to meet local transportation requirements and goals.

In general, these transit systems have enjoyed community support with existing sources of funding. Transit in these communities is being viewed as a public service, requiring financial support to meet expenses. In these transit systems, operating deficits are currently ranging between \$0.07 and \$1.20 per ride. In some of the localities where temporary funding has terminated, the citizens agreed to assume the costs of continuing operations. In other communities where state and federal funding is temporary, the taxpayers will likewise be asked to weigh the community benefits of public transit against an increased financial responsibility.

