Small City and Rural Transportation: A Review

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ABSTRACT

The goals and objectives of providing public transportation services in small cities and rural areas are different from those of metropolitan regions. For the small cities and rural areas, the primary purpose is supplying transportation services to meet basic needs of people who do not have any convenient means of transportation. This group can be classified collectively as the carless. Carless simply implies that automobile transportation is not available. This group includes the poor, handicapped, elderly, and youth, as well as, members of households that do not own an automobile or do not have access to an automobile.

The mobility needs of the carless are examined in this review. The characteristics of the special mobility groups are studied. The emphasis of the review is on the planning process and operation of public transportation services in the small cities and rural areas. A summary of the characteristics of existing nonmetropolitan transportation services is also presented.

The state of the art in nonmetropolitan transportation planning is one of considerable disjointed effort. Although there has been careful planning related to the implementation of public transportation operations in the rural areas and small cities, little systematic development of goals, objectives, policies, and criteria could be found. The high per capita costs of providing transportation services to a small disadvantaged group require careful analyses with respect to the equity and efficiency of costs and benefits. In view of
increasing competition of various public and social services for very limited funds, there will be greater demand for careful accounting and justification of public transportation services in small cities and rural areas.
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SMALL CITY AND RURAL TRANSPORTATION PLANNING:
A REVIEW

INTRODUCTION

The 1970's have brought a renewed interest in rural America and the problems faced by its inhabitants. Concurrent with this interest, the issue of rural and small city transportation has attracted the attention of researchers and policymakers. The problem of providing mobility to all residents has become a major concern. Mobility needs in the rural and small communities have been satisfied largely by the private automobiles and to some extent by hundreds of small scale public transit systems. So far, there has been only minimal effort to derive a standard methodology for specifying and satisfying the public transportation needs of rural and small city residents.

Before the transportation problems in low density nonmetropolitan areas became apparent, the emphasis in transportation policies and resources at all levels of government has been on urban transportation. The Housing Act of 1961 contained the first federal commitment to the improvement on urban mass transportation. It was followed by the UMTA Act of 1964, which broadened and strengthened the federal role and institutionalized the principles that guided federal policy until the Federal Aid Highway Act of 1973. The 1964 Act limited aid to transportation systems in urban areas. Rural areas were excluded from federal transportation assistance efforts. Only in social welfare programs were federal dollars for transportation services
made available in rural areas. Not until the passage of the Federal Aid Highway Act of 1973, with Section 147, which authorized the Rural Highway Public Transportation Demonstration Program, were the public transportation needs of rural America officially recognized as being a legitimate concern of the nation's emerging transportation policy.

The concern over rural areas and rural transportation is an outgrowth of concerns in urban areas. The present concerns in urban areas that have given rise to recent public transportation projects have been congestion, immobility, poverty, disability, pollution, and energy consumption. These same concerns with varying degrees of applicability hold for rural areas also. It is in the mix and weighting of these concerns that rural and urban areas differ. For many urban areas the provision of public transportation services has become a necessity. The necessity of providing public transportation services in small city and rural areas is not universally recognized, however.

With the demise in recent years of bus and taxi services in rural areas, large portions of rural America have become increasingly dependent upon a single mode of local and intercity passenger travel - the automobile. If all persons living in rural areas had access to the automobile whenever they wished to travel this dependence might not cause problems. In fact, the low densities associated with rural areas makes them ideally suited to the automobile. However, the auto is not universally available in rural areas. Thus, as in urban areas, a portion of the rural population is in need of transportation assistance.
SPECIAL TRANSPORTATION NEEDS IN SMALL CITIES AND RURAL AREAS

Although certain circumstances in small cities and rural areas seem to indicate that private transportation solutions are often the most appropriate, the existence of groups with special transportation problems in these areas suggests a role for publically provided transportation services. However, little is actually known about how possible mobility constraints actually influence the activity patterns, and hence, the quality of life of special groups in nonmetropolitan areas. Consequently, knowledge of the situation of special groups in urban areas is useful in understanding the types of problems faced by their small city and rural counterparts. However, until research is done on the actual situation in nonmetropolitan areas, findings from larger areas can be viewed as suggestive, but not conclusive with respect to the smaller areas.

The Carless Population

The carless population is the most visible subset of those who are considered transportation handicapped. The carless are a diverse group including parts of the following groups: the young, elderly, poor, handicapped, those without drivers licenses or insurance, and those who choose not to drive (14). The percentage of rural households who are carless varies from about 10% to 27% between states. The percentage is about 11% in California (30). In the United States, 80% of all households own 1 or more cars. The 20% who don't represent more than 40 million people (21).
As the size of an urban area increases, the percentage of carless households also increases. In United States cities of greater than 3 million people, 47% of the households have no car. In cities of 250,000 or less, 20% are carless. For rural areas the average is 15% (21). One possible reason for this trend is that auto ownership is less necessary in larger cities because of the existence of public transportation facilities.

Several studies focusing mainly on the mobility patterns of carless people in metropolitan areas have been conducted. Paaswell, et al. (22) gathered data on the socioeconomic and trip characteristics of persons in Buffalo, New York. The carless profile was one of low income, elderly, female, and unemployed. The largest segment of those carless lived in the most densely populated portions of the city. The carless shopped for groceries more often (by walking) and participated in neighborhood-oriented activities more than those with cars. Paid social activities were engaged in less frequently by the carless.

While most respondents were satisfied with their current level of trip frequency, more carless than noncarless responded they would like to travel more frequently than they now do. Their demand for increased public transit services was linked to a greater desire for leisure, recreation and visiting trips. Trips for shopping of groceries and other necessities were also linked to the public transportation demand by the carless. In general, public transit would provide greater access to services over a greater range.
The same data were also analyzed by Paaswell and Berechman (23). In addition to the qualitative differences in the type of trips made by the carless and noncarless, differences in the distance and travel time of trips were also noted. Specifically, carless people tend to have shorter distance but more time consuming trip patterns.

Using census data of areas with a high incidence of carlessness versus the other areas in Denver, Koutsopoulos and Surti (15) arrived at some conclusions similar to those of the Buffalo studies. That is, there was some difference in the frequency of various trip purposes and in the average distance of trips. However, the Denver study revealed that car owning neighborhoods tended to make more trips, whereas the Buffalo study did not indicate any significant differences between the carless and auto availability groups in the overall frequency of nonwork travel. Part of the difference in studies can be explained by the fact that the Buffalo study counted walking trips and the Denver study probably did not.

Kidder and Saltzman (11) have found that carlessness also affects work trips. This is especially true of the inner city carless. Public transit systems often emphasize the commuter run, connecting suburban origins to central business district destinations. Jobs in the central business district are most often white collar jobs while inner city residents are most often blue collar workers whose work sites are peripherically located. The use of public transit to reach peripheral locations is often complicated by long travel times, inconvenient scheduling, and need for transfers. Bus lines initiated for the cities may not serve peripheral locations outside the city
boundaries.

Based on these factors, the need for the restructuring of transit systems is seen as a solution to the problem. The importance of a transit solution depends upon the extent to which the inner city resident is transit oriented. While conclusions differ from city to city, indications are that carlessness does not necessarily imply transit orientation. Ridesharing is often the mode for work trips. Programs originated to increase the mobility of the inner city worker have failed to achieve expected ridership when competing with informal and formal ridesharing arrangements. Ridesharing arrangements previously disapproved of by employers has experienced a resurgence after the energy crisis.

In order to test the extent to which carless people are more transit oriented and have lower auto ownership aspirations than people with automobiles, a survey of low income carless residents in Greensboro was conducted (12). It was found that the respondents have a high degree of automobile orientation. Eighty-seven percent of the men and 43% of the women respondents have driven in the past. Twenty-five percent expressed the intention to purchase an auto within 3 years. The chief reason for not owning an automobile was the consideration of cost. Employment opportunities provided by public transit have raised income of inner city residents sufficiently to allow auto ownership causing users to abandon the system. Of the total sample in Greensboro who make regular journeys to work, 80% traveled by car.
A small group of transit riders are indeed "captive riders" and would suffer if bus service was curtailed. Indications are that this number may be dwindling. Minimum wage increases and the removal of discriminatory credit practices have improved opportunities for auto ownership. The numbers of elderly without drivers licenses or formal driver learning experience are diminishing. While it is true that most bus riders are poor, it is not true that the poor are mostly bus riders. In addition, the data in small cities indicate that the percentage of low income workers that use transit is between 16% and 30% lower than percentages in larger cities.

There are reasons for believing that mobility problems associated with carlessness will be greatly concentrated in nonmetropolitan areas. First, public transit generally does not exist. Where it does exist it may be provided only to certain designated groups, the elderly or the handicapped. Certainly these groups also suffer from carlessness to some degree, but the total problem of carlessness is not addressed in these systems. Second, the options available to city residents may not exist. Taxi services are not provided in all small cities or rural areas. Ridesharing arrangements are harder to make. Rural residents who do not have telephones may find difficulty in making ridesharing arrangements. Distances between rural residents are greater, therefore increasing the inconvenience to drivers who are willing to provide transportation. Third, the services conveniently available to inner city residents in their neighborhood are not within walking distances for rural residents. Fourth, a full range of services are often not clustered together in rural areas necessitating
longer and more varied trips by rural residents.

**Other Special Mobility Groups**

Also included among the potentially transit dependent are the elderly and the handicapped. Figures on the percentage of households that are transportation handicapped indicate a much greater need for public transportation in rural areas. The percentages vary from 52% in Colorado to 77% in Kentucky (30). In 28 states, over 66% of the rural county households are transportation handicapped and only 4 states show under 60%.

The elderly are not auto drivers for many reasons. Fear of driving is much more prevalent among the elderly than for other segments of the population. Many do not have drivers licenses or driving experience. Physical disabilities associated with aging often preclude auto usage. Lowered incomes often do not allow for auto expenditures. Testimony in 1971 Senate hearings indicated that incomes of older Americans are roughly half that of younger counterparts.

In providing public transit the special needs of the elderly are also of concern. Older persons suffer loss of peripheral vision, hearing difficulties, loss of reaction time, decrease in performance of motor tasks, and losses of orientation. The elderly also suffer from psychological barriers. These include fear of becoming lost, fear of embarassment, fear of crowded conditions, fear of physical attack, and fear of falling on other accidents. The elderly may also be unable to understand routing and scheduling pamphlets, unable to
endure long waits at bus stops, and unable to negotiate high steps and automatic doors associated with transit buses (25).

While the average person may own or drive a car, this option is not open to many handicapped persons. To the handicapped person the available options are taxi use, assistance from friends, or public transit use. Taxis are often too expensive, and the handicapped may not wish to continually seek assistance from friends so the only option is public transit usage. However, many handicapped persons have severe problems that restrict their use of public transit. These problems include ambulatory limitations, vision impairment, hearing loss, motor control loss, and mental limitations. To those handicapped restricted to "Canadian Walkers" or wheelchairs the problems are magnified. Temporary handicaps like broken bones or sprains requiring the use of canes or crutches also often restrict mobility and interfere with transit usage (25). While all these needs cannot be provided for on all buses, the purchase of some buses by a transit operator is a necessity especially where the elderly and handicapped are members of the target population. These buses should provide wider doors, fewer steps, possibly a bus chassis that can be raised and lowered, wheelchair lifts, chair tie down mechanisms, and most importantly a trained and sympathetic driver.

Meeting the Needs of Special Groups in Nonmetropolitan Areas

The information from larger areas on the carless and other special groups indicates that there are mobility problems. However, the extent to which improvements in conventional public transportation
would be the best solution to these problems seems to be questioned, especially by Kidder and Saltzman. It is certainly possible that the problems facing similar groups in nonmetropolitan areas might be qualitatively different. Similarly, appropriate transportation solutions could also be different in smaller areas.

It can be concluded that there is a need for more information about the mobility problems in nonmetropolitan areas. Such information would require new research similar to the surveys conducted in urban areas. In addition, it is useful to assess the success of current planning and operating efforts which provide transportation services in nonmetropolitan areas. Such an examination can indicate which solutions have proven more viable. In particular, it is useful to determine the role publically provided transportation plays in nonmetropolitan areas, both in terms of meeting the needs of special groups and in attaining other community goals.

NONMETROPOLITAN TRANSPORTATION PLANNING AND OPERATIONS

The probable existence of mobility problems in nonmetropolitan areas suggests the need for careful planning to solve these needs and attain other transportation goals. Such an approach would involve an analysis of the current situation and the design and evaluation of alternative mechanisms for alleviating possible transportation deficiencies. In its general outlines, a transportation planning process for nonmetropolitan areas would be similar to the standard urban transportation planning process.
The recent history of publically provided transportation in nonmetropolitan areas indicates that little systematic planning has been done. Instead, the types of systems which have been provided have tended to be ad hoc responses to some perceived need. Often the existence of a federal subsidy was the key ingredient in providing the service.

A typical case history of a small transportation system might take the following form. A small scale demonstration program was implemented consisting of a few vehicles operating in a small territory and serving a loosely defined clientele with funding from a social service agency. Often these programs were the result of a mandate to the social service agency to provide transportation to its clients. Usually little analytical work preceded the project implementation. A verification of the need for the project was limited except for a general description of potential clients and some specification of service needs. When sufficient funds were appropriated the project went into operation. When the funds expired the project folded.

The lack of prior planning and analysis in many of these efforts together with possible lack of coordination because of diverse funding sources indicates that attention should be paid to developing transportation planning processes for nonmetropolitan areas. In considering the planning requirements, the experience gained in actual operation can be very valuable. For example, data obtained from systems operation can be useful in demand analysis methodologies and in financing decisions. Therefore, in discussing possible planning
processes for nonmetropolitan areas, attention will first be focused on theoretical and methodological concerns. Next, some of the information obtained from existing operations will supplement the theoretical discussion.

Planning and Analysis

In its most general outlines, a planning process for nonmetropolitan areas would include the same components that any systematic planning process contains. That is, appropriate local, regional, or state agencies together with the impacted citizenry would systematically choose a course of action to meet their transportation needs. First, transportation and other community goals are established. These would certainly consider any mobility problems of special groups. Next, alternative transportation solutions are designed. These solutions are analyzed using techniques such as demand analysis methodologies and project evaluation methods to aid in the selection of an appropriate solution. This solution is implemented and monitored. Over time, adjustments might be necessary. In the observation of actual systems, information from previous efforts is valuable.

In considering the organizational structure for planning and providing for transportation services, several factors are important. Miller and Goodnight (18) believe that local control over the decision process and local participation in the data collection and analysis are essential. If local planning expertise is available it should be utilized. The community judgement regarding needs and goals of the population is essential to sound analysis of transit alternatives.
Local manpower resources as well as financial resources are invaluable as community involvement and support can ensure a successful system.

Local participation may be from the mayor's office, with participation extending down through his staff to other city government officials and to other agencies and consultants. Planning and implementation times are often cut down when high local government officials align themselves with and work for a transit system.

The other extreme is the formation of a transit committee. This approach, often the outgrowth of concerns expressed by interested citizens, can grow into strong community action necessitating a local governmental commitment to the project. These committees should represent everyone who is interested in a transit system. The views of all concerned citizens are expressed in community meetings and outlines are drawn up. This "grass root" approach is often more time consuming but will result in a strong test of community support for the project.

The state agency with transit planning responsibility provides a vital pool of experience, expertise and data essential to transit planning and operation for small cities (18). These functions are essential not only for initial planning and implementation but also for continued operation and maintenance.

The state transportation and planning agency maintains considerable transportation and other data files. This data is often expensive and time consuming to collect. From this point of view the state is a rich data source for rural areas and small cities. Most rural areas and small cities do not have the resources available to house a
planning staff with the requisite expertise. However, a state planning agency or commission does have personnel available for these functions. Other options available for the planning of a transportation system include rural cooperatives, private enterprise, transportation districts, or community action agencies. All these organizations offer knowledge and experience in the needs of rural areas and the needs of rural residents. A broad base of support and action is desirable and all these options should be investigated.

The established organizational structure in a given area would then be in a position to begin a systematic planning process. Before a transportation system is designed goals must be established. Although the goals may vary somewhat according to the characteristics of the area, Mix and Dickey (20) suggest that most rural transportation systems should accomplish these basic goals.

1) Improve the mobility of those who cannot provide their own transportation.

2) Increase the income of the poor by offering low-cost transportation.

3) Provide a means for the rural poor, elderly, handicapped, and young to take advantage and receive the benefits of existing resources and opportunities, such as mental and health care, welfare programs, employment, job training, and other educational facilities, religious facilities, recreational and cultural activities, and shopping areas.

4) Promote community interaction.
There are many options available for providing public transportation in rural and small urban areas. The choice of the desirable option should be based on the characteristics of the service area and the target population. These characteristics include the size and shape of the community, population of the area to be served, the demand density, and the location and size of major attractors such as the downtown shopping centers, schools, and large employers (29).

Fixed route systems follow fixed routes and schedules. This service is best for service between communities or in communities where origins and destinations lie along major corridors of travel. This type of system utilizes large buses that travel between fixed stops where passengers wait for pickup. Service patrons must be responsive to the characteristics of the system. If a system is not specifically aimed at those with limited mobility and if travel appears to be related to a few activity centers, then a fixed route system will perform very efficiently.

A demand responsive system, commonly referred to as dial-a-ride, involves no fixed schedules or routes. The vehicles, usually small buses or vans, are scheduled in response to telephone requests along routes which most efficiently serve the greatest number of requests. The user makes a phone request for service, waits for pickup at home, and is transported to his destination while other passengers are picked up and delivered along the way. A hybrid of the DAR system has been developed in Merrill, Wisconsin. In this concept, referred to as point deviation, the vehicle must stop at fixed checkpoints, but vehicles are not required to follow fixed routes between
checkpoints. Deviations occur to pick up patrons at their homes. Users can hail the vehicle, board at checkpoints, or call for service at home. Different rates are charged for all these services. The advantage of this system is that it provides greater coverage than fixed route service and increased capacity over demand responsive service.

There are many arguments in favor of demand responsive systems. The first is based on costs. The assumption is that vehicle utilization would be greater in low density rural regions and costs per passenger lowered if vehicles didn't have to travel at times or in places where few people want to go. A direct comparison of fixed route and demand responsive systems indicates the demand responsive systems can be more expensive. This is due to increased travel distances between origins and destinations and lower passenger usage rates. The operating costs per passenger of demand responsive systems examined by UMTA ranged from 75 cents to $1.75, while for fixed route services costs ranged from 35 cents to $1.25 per passenger (29).

Second, a demand responsive system offers better service by providing more flexibility in choosing destinations and departure times. Third, demand responsive systems, by providing door-to-door service, eliminate both walk times and transferring. DAR systems allow the patron to wait for service at his home instead of at bus stops.

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 additional cost. For elderly persons, the task of walking to a bus stop and waiting for the bus to arrive
can be difficult if not impossible. It seems evident that transit usage by elderly residents is increased by the door-to-door nature of demand responsive service. El Cajon had low elderly usage on its existing fixed route system but on the shared ride taxi system approximately 2/3 of its riders are elderly (29).

The mode of service does not completely determine the level of service. In addition to a choice between fixed route or demand responsive service the provider must decide such questions as the days of service, hours of service, headways, and number of back-up vehicles. If a demand responsive service is chosen, decisions must be made about number of vehicles to be in service at each time of the day, and whether service modifications are necessary in accordance with demand levels at different times of the day. This would include switching to fixed route or subscription service during peak periods. Decisions about routes, frequencies, and transfering are necessary with fixed route service.

Demand responsive systems seem to be superior in terms of comfort, convenience, and flexibility. However, demand responsive transportation shows no advantages in overall trip times and can be inferior to fixed route systems in reliability. The traveler cannot be confident as to the response time or travel time as both depend on the demands on the system. Fixed route systems are generally very reliable once routes and schedules are understood by users.

To communities or agencies not wishing to become involved in the operation of a public transit system contracting is possible if a system is already in existence. The method of operation is for a
group to contract with a private transportation firm for transportation on a regular basis at designated times to designated destinations. This type of operation can provide service to patrons needing visits to medical, agency, or commercial facilities on a regular basis.

Transportation may also be provided by community action agencies. These services are provided to the clients of the agency. Transportation is provided as an adjunct to regular agency duties with transportation available when funds permit and withdrawn when funds become tight. In many small urban or rural areas without other transit facilities, these agency services are the only means available for increasing client mobility. In a single area, many agencies may be providing services without consolidation of effort. These institutional difficulties arise out of funding constraints. Funds are available to agencies from specific sources who have control over how these funds are spent. The result is duplication of energies and inefficiencies.

A system outlined by Yukubousky would utilize the automobile. The central idea of the "MOBILITY CLUB" concept is to structure ridesharing in private autos so as to achieve a greater scope than is inherent in informal ridesharing agreements. In rural and small city areas the effects of the automobile are less constraining. This factor, along with the flexibility of the auto, make this concept the most realistic means of transportation provision (31). Major constraints to this system are liability laws, cost allocations, scheduling, and cooperation and trust among ride providers and sharers.
Taxi service has often been a paratransit solution which is overlooked by most transportation planners. However, taxi systems may be extremely important in solving nonmetropolitan transportation problems. In many areas, taxis are currently the only form of transit available (6). In addition, using conventional and innovative operating mechanisms, taxi systems can be an important ingredient in new demand-responsive systems in nonmetropolitan areas.

The various alternative solutions for a particular area should be assessed in terms of their community impacts. Demand analysis techniques can be useful in this regard. A survey of the literature indicates that there are opposing poles of thought upon the use of analytic techniques in demand estimation. The concern arises as to the applicability of analytic techniques in rural areas or small towns wherein the data may not be stable enough for concrete estimates to be drawn.

Miller and Goodnight (18) suggest a qualitative approach to the analysis of transit demands and testing of alternatives through implementation and continuous surveillance rather than through detailed analysis of demands and revenues. This stand is based upon four reasons, 1) analytic techniques, no matter how sophisticated or detailed, do not provide completely accurate estimates of transit patronage. This is especially true for small communities that do not have transit services. 2) For many of the smaller communities the set of feasible alternatives is limited and the cost of testing the most promising alternatives by actually implementing the service is not great. 3) For a small system, the cost of error is not great.
Change in routes and addition of buses can be achieved at little cost addition. 4) Factors entering into the decisions pertinent to implementation include social, political, economic and technical considerations. The transportation related estimates should be balanced in accordance with the roles each of these considerations play.

One approach to using analytical techniques is to apply the results from areas where transit systems are in operation to similar areas considering new systems. A method developed by Hartgen and Keck (8) assumes the rate of usage of a particular type of service is similar for special population groupings independent of their geographical location.

The rate of usage is presumed to be dependent upon factors such as age, sex, service attributes rather than characteristics of the community under consideration. Estimation of the demand is based upon a small home interview in the area of interest. The survey is compared with the results of another survey of similar users in another community. Results indicated that the method gives reasonable estimates of demand and demand sensitivity to policy variables such as fare or gasoline price.

Bell (1) assumed that basic services should be provided to all possible persons and that public transportation would be provided only for essential needs. Those communities that were supplying the basic services were considered as "service centers". Existing travel characteristics from rural areas to service centers were obtained from origin-destination surveys. Trip rates and demand were
calculated. Routes were laid out and costs were determined for each area. It was determined that persons residing in rural and small urban areas travel approximately half as frequently as their urban counterparts to reach essential services.

Mix and Dickey (20), using Madison County, Virginia as the study area, first defined travel demand, latent demand, travel "wants" and diverted travel. Five techniques were analyzed for making demand and need forecasts (attitude survey, accessibility, gap analysis, committee estimates and demonstration projects). It was concluded that full scale O-D surveys were too expensive and that a combination of committee estimates and demonstration projects would be the most feasible forecasting method.

Briggs (2) outlined four strategies for demand estimation. The strategy used in the Capitol Area Planning Commission, Texas, consisted of 3 steps: the determination of the target population within each graphical subdivision, the estimation of trip frequency per time period per person, and the assignment of each trip to the nearest service center. Upper and lower bounds were also determined in the demand estimations. These boundaries were then applied to the trip frequencies to estimate demand.

Milliken, et al. (19) have developed a technique to assess transit needs in small cities in California. Transit needs are determined by a) average community income, b) percentage of youth and elderly, and c) percentage of trips that are satisfied by existing systems. The procedure for determining the transit need in a particular candidate community utilizes relationships developed from
ten test communities. That is, the relationship between transit need and the three independent variables is developed separately for each test community. The candidate community is matched with one of the test communities and the appropriate relationship is then used to determine transit need.

In addition to demand, several other community impacts are possible. These include improved mobility for special groups, impacts on community interaction, financial considerations, competition with existing services, impacts on retail sales, and impacts on automobile travel. Many of these impacts will be related to demand and the nature of the selected alternative. Information from existing services, which is discussed in the next section, is useful in assessing potential community aspects.

CHARACTERISTICS OF EXISTING NONMETROPOLITAN TRANSPORTATION SERVICES

Experience gained in operating small city and rural transportation systems can be important in considering new systems in different areas and in developing data bases and analytical tools for planning. Various case studies in diverse parts of the United States offer information on systems characteristics, ridership data, costs of operation, financing (fare structures and funding sources), and community impacts.

Ridership rates of systems in operation vary according to the service provided, the target population, number of vehicles, and hours of service. Demand responsive systems operating in urban areas and oriented toward the whole community appear to generate between
.10 and .50 trips per month per person in the target area (28).
Results from projects in operation reported by the Urban Mass
Transportation Administration show a close correlation to the lower
bound estimates by Briggs. Bremerton, Washington averaged 1.19 rides
per month per person (29). This was a subscription bus service to an
industrialized area causing it to have a high ridership average.
El Cajon, California shared ride taxi service averaged .22 rides per
month per person (29). Merrill, Wisconsin, a point deviation demand
responsive service, averaged .54 rides per month per person (29).
Xenia, Ohio averaged .79 rides per month as a fixed route service and
.44 rides per month per person as a jitney operation (29).

Gilbert (6) conducted an on board survey of taxi users in
several small and medium-sized North Carolina cities in order to test
several hypotheses about taxi ridership. The data revealed that taxi
users in these cities tend to be of lower income than their
counterparts in larger cities. In addition, it was found that taxi
users during the first week of a month are older and poorer than users
in the last week of the month. This fact is related to the payment of
benefit checks. Taxi users, in general, tend to be poorer and have
less access to an automobile than the general population in these
cities. Finally, taxi users in sampled cities with public transit
service tend to have higher incomes and different trip purposes than
users in cities without public transit. However, public transit and
taxi appear to serve distinct markets in sample cities with both
services.
The costs of a rural public transportation vary depending upon the size and characteristics of the system. A 1974 United States Department of Transportation report (3) estimated that the cost per vehicle mile varies from 33 cents to 60 cents for systems with professional drivers providing full time transit service. It is estimated that smaller systems employing volunteer drivers will experience much lower costs: in the range of 15 cents to 32 cents per vehicle mile. Estimates include administrative overhead (3). Chen found costs to range from 58 cents to 92 cents per vehicle mile (5). The average annual operating costs per passenger per trip ranged from $3.86 to $10.51 (5). Kidder estimates that costs run to about 7 cents per passenger mile (10).

Chen (5) broke the 10 systems studied into 4 categories by seating capacity (< 100 seats, 100-200, 200-300, > 300), with the average size of the buses being 14 passenger vans. Based upon this classification operating costs for the different capacity systems were determined. It was found that total cost per vehicle first decreased with system capacity and then increased again after a certain size system was reached. Total costs per vehicle by seating capacity ranged from $13,000 for the under 100 seating capacity system to $17,000 for the 300 seat system. Average annual operating costs ranged from $65,000 for the under 100 seat system to $764,000 for the greater than 300 system.

Kidder, et al. (13) analyzed cost data for several transit systems serving the elderly and handicapped in small areas in an attempt to develop an analytical relationship between the scale of
operation and unit costs of service. The economic theory of the firm suggests that unit costs should decrease with increasing scale up to a point, and then increase. The result is a U-shaped cost curve. To test this concept with respect to transit services for the elderly and handicapped, data from 16 transportation services for the elderly and handicapped located in various parts of the United States were collected. Using cost per passenger mile as the output or unit cost indicator and total passenger miles as the measure of the scale of operations, the analysis indicated that there were decreasing unit costs over the scales of operation represented in the data. This finding suggests that considerable economies in unit costs can be realized by operating transportation services for the elderly and handicapped at scales of operation considerably larger than most of those existing under contemporary assistance programs.

Of the total costs for all systems, salaries consume the major part of the transportation dollar for systems employing full time drivers. Salaries generally used about 60% of the program budget (10). These salaries include administrative salaries and driver compensation. If drivers can be hired at minimum wages or on a part time basis, costs can be cut considerably. Equipment and maintenance costs are significant but variable. Savings accrued on capital acquisition by purchasing older buses are often offset by greater expenditures on maintenance. If capital funds are from a grant, new equipment should be purchased, if not, an economic analysis should be done on long run capital versus maintenance costs. Vehicles down for repairs other than regular maintenance, which can be scheduled, cost money in
maintenance costs and revenues lost. Also attracting ridership is made more difficult if vehicles are perceived as being unreliable by service patrons.

The pricing of public transportation is often a policy measure. The justification for public funds support by the government is based on the provision of transport services to meet the needs of the transit dependent. These persons are the least likely to afford the full costs of a transportation service. Fares are charged for many reasons: to avoid the stigma attached to free fare systems as poor people or "welfare buses", 2) to generate revenue in order to minimize subsidies, 3) to allocate a scarce resource (seating capacity) among potential users, and 4) to attach a cost to the benefits perceivable to the users of the system.

The costs of a transit system are paid with revenues generated from fares and subsidy funds. The level of revenues is dependent upon the fare level and the number of passengers. Free fares provide large levels of usage but no revenue. High fares can produce high revenue but if the target population is the transit dependent high usage levels are not likely. The high fare will tend to price the target population out of the system.

Free fares will encourage overutilization. The level of usage will exceed the actual level of need. In a system of scarce resources overutilization by some means underutilization by others, resulting in unmet transportation needs for the target population. If overcrowding occurs transit usage will diminish. Forced away from the system will be members of the target population. Those least likely
to respond favorably to overcrowding are the elderly and handicapped. McKelvey (17) has found that over one-third of the elderly are unable to maintain their balance if required to stand while riding. Of the total elderly sampled more than one-fifth dislike functioning in crowded conditions. More than one-fourth of the handicapped find impatience of other riders and fear of embarrassment a concern. One-fourth of the handicapped dislike having to function in crowded conditions. To eliminate these anxieties the elderly and handicapped will often abandon the system.

The fare structure becomes a transit allocation device, and as such is a policy decision and not a technical one. Fares must encourage the structuring of transit needs into reasonable travel demands, but must not price target group members from the system. Differential fares may be charged which seek to reaffirm through the pricing mechanism the advantages of public transit usage to certain subgroups of the target population.

Upper and lower bounds of the fare structure can be determined by two means. An assessment should first be made of the cost of potential alternatives, whether they are existing commercial taxis, a bus service, or informal arrangements with neighbors. A comparison of service quality would also seem appropriate. To compete with a higher priced service a lower quality service must be priced lower. If higher quality service is going to be provided a higher fare may be possible. A general observation regarding fares is that it is better to set original fares too high and reduce them than have to restructure fares upward later. The level of subsidy and its
likelihood of continuance are also of prime importance. If subsidies are low or hard to maintain, fares should be higher as an insurance against service disruption if funding sources become scarce. Revenues generated in excess of expenses due to high fares can be put into banks as hedges against service disruptions.

The United States Department of Transportation has determined that most fares charged range from 2-5 cents per passenger mile (10). Investigated fares ranged from free fare to $4.50 per trip. Most fares averaged from 25 cents to $1.00 per passenger per trip. With a fare range of a maximum of 5 cents per passenger mile and operating costs of 7 cents per passenger mile the occurrence of a deficit is predictable.

This deficit occurs with each passenger carried by the system. It is the differences between revenue generated per passenger mile and the cost of service per passenger mile. The amount of the deficit depends upon the cost of operation and fare revenue generated. The amount of subsidy necessary is often considerable. The amount can range from 30 to 60% of total costs.

Subsidies generally appear in one of two forms. Provider subsidies consist of allocated monies to the provider of the transit system based upon the difference between operating costs and revenues. Under this approach the transit user pays a fare amounting to less than the cost of the service he is receiving, the difference being made up from funds exogenous to the system. User subsidies consist of funds allocated to the user of a transit system based upon his usage. The transit provider provides a transit service at a price
equal to or above the average cost of a unit of service, depending upon the profit motive. Each time a patron uses the system the differences between the price paid by the user and the actual price of the system is paid by some outside funding source. This mechanism is achieved by tickets or coupons dispensed to patrons for a charge less than the face value of the coupon received. In either case the deficit is avoided but the user does not pay the full cost of the service provided.

Subsidies are disapproved of in principle on two general reasons. In a free market the presence of a subsidy does not allow for a full accounting of benefits and costs. Benefits accruing are not fully compensated for by costs to the recipient. The system is not at equilibrium and inefficiencies may develop. This is the second reason subsidies are disapproved of. A subsidy hides the problems and hinders the elimination of these inefficiencies.

The opposing view is that public transportation should be viewed as a public utility, subsidized for the external economies it brings as measured by economic development, freedom of choice to the individual, or some other nonmonetary advantage. The benefits of these systems comes from their serving persons who have been isolated from activity solely because they do not have access to private transportation. Subsidies are a useful social investment that permits the increased mobility of the transportation disadvantaged to needed social services, medical care, and community contacts.

Subsidy funding must be reliable and should originate from sources as close to the operation as possible. Sources closest to
the operation will have the greatest commitment to the continuation of the project. The loss of public funds often signal the demise of an operation. If funds are sought from local agencies or jurisdictions continued strong public support for the project must be solicited and maintained. Federal government support is available for capital acquisition and may soon be available for operations. These sources are overwhelmingly generous but lack strong commitment. The stronger the funding commitment the better chances are that the project will survive the demonstration period.

In practice, a wide variety of funding sources have been used to subsidize small city and rural transportation operations. At the federal level, it has already been mentioned that funds from the 1973 Federal Aid Highway Act are available. In addition, UMTA demonstration and capital grants have been used and the recently suggested revisions of the UMTA Act will make available general capital and operating subsidies to areas of under 50,000 population for the first time. Also at the federal level are the diverse sources for social service transportation. Included among these are funds under the Older Americans Act, Social Security Act, UMTA Act, and other HEW sources. A compendium of the sources of funds has been compiled (3).

At the state level, the primary source is the Transportation Development Act. These funds are earmarked for transit expenditures to the point at which there are no unmet transit needs. Of potential importance for nonmetropolitan areas is the recent revision which sets aside five percent of these funds for paratransit purposes.
At the local level are general fund revenues and revenue sharing monies. These sources have been used in both metropolitan and nonmetropolitan areas for conventional transit systems as well as special service systems.

The provision of public transportation will have both positive and negative impacts upon a community. Services will differ from project to project and region to region, but some general impacts upon a region have been identified (29).

The financial burden upon a community has become an issue in some communities. This coupled with low ridership was responsible for the end of service in Sudbury, Massachusetts. In Xenia, Ohio this has been a constant concern. The service in Xenia has been operated up to now on UMTA demonstration funds. Both Evansville, Indiana and El Cajon, California have not attempted to increase ridership on their systems. Increased ridership would increase the cost of service provision beyond the capabilities of financial sources.

Increases in vandalism have been noted in Westport, Connecticut and Sudbury, Massachusetts. While this has not been detrimental to the image of the services it is of concern to local merchants. Increased access to the downtown by teenagers is apparently the cause.

In communities where transit services existed prior to the new service revenue losses have been reported by the old operations. In the communities of Ann Arbor, Merced, and Westport the local taxi operation has reported lost revenues. The Ann Arbor operator sued and lost, Merced's suit is still pending, and Westport is now negotiating a shared ride transit operation with the local taxi
operator.

Increased mobility is available to those who previously had to depend on friends or other informal arrangements to make their trips. This includes all members of the transit dependent and families who use transit when the family car is unavailable. Elderly citizens have indicated an increased ability to travel and a realization of the increased independence available through public transportation.

Increased community interaction has been noted. The provision of transportation has eased the problems of immobility and allowed freer access to community services. Shopping and visiting trips have both increased in areas where transit is provided. Increases in community action and participation rates among those formerly immobile have been noted.

Some increase in retail sales and community facilities uses have been shown. Increased sales were noted in Eugene, Oregon and Westport, Connecticut after a transit system was instituted. This impact can be used to elicit support from community merchants for an innovative transit system.

Reduced auto usage and parking problems have also been noted. Xenia, Ohio and Chapel Hill, North Carolina both report this. Chapel Hill's project provides transportation mostly to students of the University of North Carolina. This service has eliminated the need for increasing the parking facilities in the town. While parking space reductions and decreased auto usage are not the prime motivators in rural and small city transit provision they are still beneficial community impacts. They are impacts that may soon become important
even to small city and rural areas.

The major impact seems to be that public transit can work. Public transit systems are not panaceas for all community problems. The ability of a service to solve a problem depends on its ability to deal with the problem. Federal demonstration projects have proven the flexibility of transit operations to varying needs and situations. Specification of community needs and desires in detail is the prime ingredient. Public transportation is a service not a commodity. There are many public transportation options available. The key to success is tailoring the service characteristics of varying modes to serve the needs of the community as a whole. Public transportation is not always the answer. But a well planned, well managed system can provide far reaching benefits to a community.

SUMMARY AND CONCLUSION

The state of the art in nonmetropolitan transportation planning is one in which there has been considerable disjointed effort in providing services, but little systematic development of policies, planning theories and methods. The knowledge and experience gained from providing service is definitely valuable input into more systematic planning processes. Such information has been used to develop cost relationships and would also be valuable in demand analysis.

The area of analysis that would require the most effort is probably the specification of the travel behavior and needs of
nonmetropolitan subpopulations. Such an analysis would be useful in establishing transportation deficiency criteria, and therefore, transportation mobility goals, and in improving demand analysis capability. Previous experience has many times emphasized the financing and operations of particular systems without much consideration given to the purposes served by the systems. Therefore, careful analysis of nonmetropolitan travel behavior seems to be a necessary first step in the development of more systematic planning processes. In addition, the specification of transportation markets and their travel patterns is important in understanding the nature of nonmetropolitan environments.
References


