DATA REQUIREMENTS IN TRANSPORTATION PLANNING FOR URBAN DISADVANTAGED

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The usual data sources for urban transportation planning studies are inadequate for either identification of urban disadvantaged persons or estimation of capital and operating requirements of systems that are needed to overcome their mobility disadvantages. Some nontypical data sources are required to identify disadvantaged persons and determine their travel needs. Several social welfare data bases are recommended that offer specific identification of physical, economic, or racial handicaps; describe special travel requirements by destination, mode, and cost; contain historical trend data; and provide high sample rates. An approach to a transportation planning process integrating needs analysis of transportation-disadvantaged persons is outlined. Prime elements are small-area identification of specific types of disadvantaged persons and investigation of trip-maker and locational constraints on employment access and nonwork travel needs. Development of new transit facilities and hardware modifications for the physically handicapped is made explicit. New operating strategies for existing or new systems are shown to benefit disadvantaged users.

•TRANSPORTATION planners and operators at various levels of government are seeing that, like every other facet of American life, transportation planning has been oriented predominantly to the highly mobile, middle-income trip-makers. They have been provided with highways for their cars and transit for their downtown journeys to work. Those who do not own a car have been expected to make use of the available public transportation while it lasts. In the same manner, the Nation's health system works well for upper-middle- to upper-income persons. The Nation's education system works well in some places for those students who are moderately bright and moderately motivated.

But poor people cannot get to the new suburban jobs. Welfare agencies must pay for taxis to medical centers and to job interviews. Handicapped persons cannot get on buses. Illiterate and blind persons cannot figure out bus routes or read destinations. There are locations in densely populated cities where a bus to downtown goes by every few minutes but no bus goes across to the hospital, which is much closer. These important travel desires are neither analyzed nor programmed for solution in many current studies. The problem is an example of a significant general public expenditure question: Whom does the public policy decision affect? It is not enough to show total benefit of a project; we need to show who benefits and who does not.

In the late sixties for a time, and again in 1972, significant federal and local interest has emerged in questions about the mobility needs of the large number of persons whose incomes, travel desires, and community impact wash out as "system noise" in transportation analyses.

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The problem is with us not only because transportation systems are designed to serve predominantly middle-income persons but also because few data with which to design systems to serve the disadvantaged are available.

This paper suggests specific considerations to be included in transportation studies of the needs of disadvantaged persons and alerts experienced analysts to additional sources of transportation needs data. If current transportation facilities limit opportunities for disadvantaged persons to get good-paying jobs and have access to other activities that broaden the quality of life, then data of the type discussed here are needed in transportation planning.

KEY ELEMENTS OF AN APPROACH TO NEEDS STUDIES OF DISADVANTAGED GROUPS

Disadvantaged Target Groups

The first step in determining these transportation needs is to filter out or isolate the disadvantaged persons. No longer can they be assumed to be covered by "transit ridership" or some other substitute. Each homogeneous disadvantaged target subgroup must be identified and located and its characteristics determined before subgroups are aggregated.

What is a disadvantaged person or group? Some concepts of what to look for in the data are needed. Classifications of persons and mobility levels to be evaluated can be developed. Figure 1 shows a simplified classification of disadvantaged persons. The classes are physical, economic, and racial; within each class several breakdowns can be further made, as shown in Figure 2.

Disadvantage can be measured as the number and the extent of goods and services neither personally provided nor received from others. Demand for services can be measured, at the risk of falling into pitfalls of demand economics, wherein desires must be related to marginal willingness to pay for and wait for a service and reasonable potential that the service can be economically supplied. Latent or unexpressed desires as well as any survey responses must be added, possibly by extrapolation beyond expressed needs or by using substitute services and goods sought (1).

What is meant by a person being transportation-disadvantaged? Each set of goods and services or jobs desired by a disadvantaged person implies a desired travel service to obtain them. A travel desire must be established. Existing or future transportation networks must be established to learn whether the trip desired can be fulfilled in a car or by reasonably convenient transit.

An example of the classification of disadvantaged persons is useful here. Social welfare agencies have categorized the disabled, and, by using this classification, one can extract information and statistical data for each class. Figure 2 shows that the disabled can be subdivided into physically disabled and mentally disabled. Subsequent breakdowns in hierarchy illustrate how one can start building opportunity boundaries related directly to transportation needs. The records available, for example, for the physically disabled provide information on the types of disability, household size, and requests made by the physically disabled for transportation and other services. This information contains details of the time that the request was made, the desired destination of the disabled, and, in many instances, the time required to arrive at the designation. The data also contain information as to how and under what circumstances the transportation need was met. In the category of "able to navigate," this service can be divided into licensed driver versus nondriver. The analyst would be particularly interested in the nondriver categories since these must be related to the availability of public transportation in an urbanized area.

We find that even the nondriver who is somewhat able to navigate has considerable difficulty in achieving life-style objectives. On the other end of the scale, the totally disabled are quickly put into the situation of not being able to use the private transportation unless there is a driving member of the family, a relative, or a friend available to provide private transportation to the desired destination. In most instances, we found that the totally disabled would have to depend on some form of public transportation.

For analysis purposes, 2 types of transportation disadvantage must be analyzed separately: trip-maker constraints and location constraints.

Trip-maker constraints are the inherent problems of the trip-maker in getting anywhere by an available mode of transportation. Examples include blindness, crippled legs, insufficient income to purchase a car, and inability to read or understand directions. These constraints are present no matter where the person lives or what public transportation is available nearby.

Location constraints are concerned with the transportation services available or known to a resident or employee where he is or wants to go and the distribution of destination needs and opportunities of that trip-maker—his realistic travel demand. Transportation services are provided by location, at locations.

The constraints of the transportation system as it appears to him are, of course, compounded by his trip-maker characteristics; he may be able to afford only public transportation, and it does not go to the new suburban industrial job concentrations. Inadequate public information services and publicity in certain areas of the city about not generally known routes cause location constraints. Infrequent bus service, multiple transfers, or lengthy travel times inhibit employment opportunities, as was demonstrated in Watts (2).

Trip-maker constraints will generally require special services, bus hardware, or fares, independent of location. Only to the extent that disadvantaged persons tend to concentrate in certain locations are they locationally constrained, for example, black persons who have low incomes and are constrained by housing discrimination and who need to get to suburban factories (3).

Location constraints are a problem to all persons in an area but particularly to disadvantaged persons. Changes in the total transportation network can do much to resolve these constraints if they respond to disadvantaged travel demand.

What are the data requirements for identification? For the state of Vermont, we have undertaken a comprehensive social services needs and delivery study, including a determination of the demand for social services and requests for funds to travel to essential service centers. The transportation analyst can evaluate these transportation needs in the context of total opportunities, desires, and capabilities of the disadvantaged population to achieve a definitive activity objective, related to available transportation services and prices. The propensity of each subgroup of the disadvantaged to desire a set of activities must be seen in its own opportunity surface and is not related solely to the availability of transportation.

Past efforts to shed light on these needs have depended too much on urban transportation study data aggregated by zones and supplemented occasionally by special survey data on employment travel (4).

Accessing automated welfare files as we have done in several metropolitan areas provides the following (5):

1. Source of information on broad needs or trip purposes other than just work trips;
2. Updated file of both person characteristics and requests for services;
3. Historical or longitudinal file indicating changing needs of disadvantaged persons over time;
4. Sample approaching 100 percent of the disadvantaged persons in an area because of financial incentives to register, although welfare agencies do not seek out new clients; and
5. Potential to sort data in several useful ways, including address or zone, income, types of handicaps, services needed, and requests for special travel payments.

Much has been written on census data (6); and in 1971 for the first time in many years, the fourth count is a useful recent data source, particularly on journey-to-work trips by tract. Not to be overlooked are special tabulations offered by the U.S. Bureau of the Census; these allow the analyst to request cross tabulations of disadvantage indicators.

Employment data from primarily state agencies can identify specific types of employment problems and programs (7).

Urban transportation survey data of the type collected by the authors for the Chicago Area Transportation Study in 1970 can provide breakdowns by race, income, and age, but only in certain zones and for certain disadvantages will the number of disadvantaged subgroup samples be adequate to do travel analyses. Since home interview surveys are designed to achieve minimum sample sizes of total trend, subgroups of disadvantaged travelers appear in less than representative numbers.

Some data sources not generally considered by transportation planners are shown in Figure 3. Table 1 gives a description of these sources.

Transportation Demand

The next step is to determine the actual and latent demand for transportation by the disadvantaged subgroup and to estimate future demand. The study of travel demand for disadvantaged persons requires understanding of recent sophisticated research in travel demand, modal choice, and transportation economic analysis (8, 9, 10). Considerations include the following:

1. Induced demand as a function of the attractiveness of transportation services existing and proposed (stereotyped images of public transportation services, i.e., ancient, dirty, slow, and unsafe, affect projection of modal-choice attitudes);
2. Latent demand for transportation services not now expressed but expected to occur when individuals perceive travel needs or the facilities available to transport them;
3. Effect of aggregating data on the reasonableness of demand estimates;
4. Changes in demand curves with excessive trip lengths and excessive waiting times required of disadvantaged persons [the Skokie Swift studies (7) long ago indicated that inner-city residents are unwilling to endure excessive waits for suburban feeder buses to factories after a long rapid transit ride, even though the reward may be a steady job, and that transportation facilities available may affect whether a trip is made at all either by the disadvantaged or by the advantaged];
5. Whether trip cost or perceived cost directly affects rates of low-income persons as expected (taxis paid by welfare agencies and the cultural attractiveness of expensive cars indicate areas for careful study); and
6. Whether many commonly used travel survey data bases are statistically invalid when disaggregated to specific disadvantaged groups in small areas because insufficient disadvantaged persons were sampled in a zone (in particular, the usual home interview survey sample size is quite low).

The extent of these problems indicates that a useful approach would be to use welfare files of various types to build up trip files from basic individual data on disadvantaged subgroups. Figure 4 shows this approach.

Among the characteristics of welfare files of particular benefit to current research in small-area disaggregated behavioral travel demand and modal-choice modeling are the following:

1. Almost 100 percent sample of disadvantaged families based on the incentive for the welfare recipient of continued payments and the incentive to the welfare agency to eliminate costly excess payments;
2. Heavy coverage of the nonwork trips that are essential to the recipient in requests for travel money and destination costs (e.g., doctor fees);
3. Longitudinal (historical) data on changing trip-making and income over time including relations between changing travel patterns and income (a link of successions of residential address changes for these highly mobile persons is possible); and
4. Behavioral data for cause and effect research (for example, Are people unemployed because they lack transportation? or Is lack of transportation to doctors common to high infant mortality areas?)

Some possible problems associated with transportation studies based on or supplemented by welfare data are

1. Possible extreme sensitivity to privacy issues in welfare agencies (some welfare

Figure 1. Classification of disadvantaged.

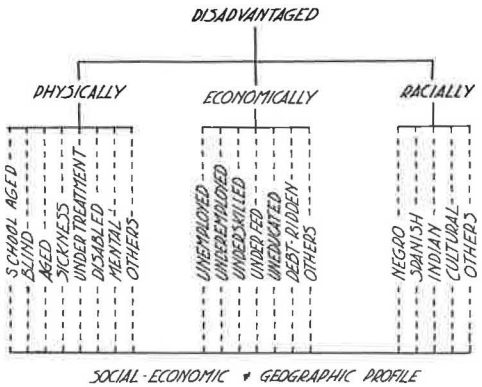

Figure 2. Subclasses of physically disadvantaged.

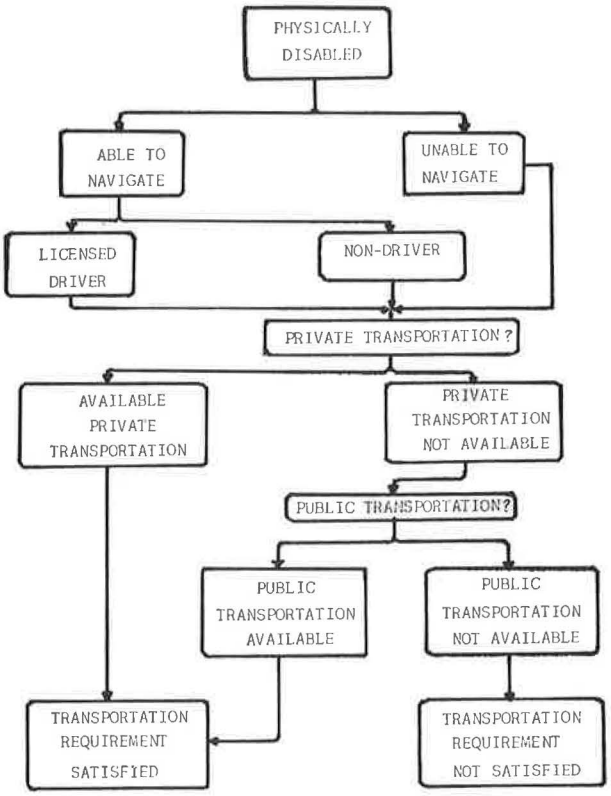

Figure 3. Data sources for transportation planning.

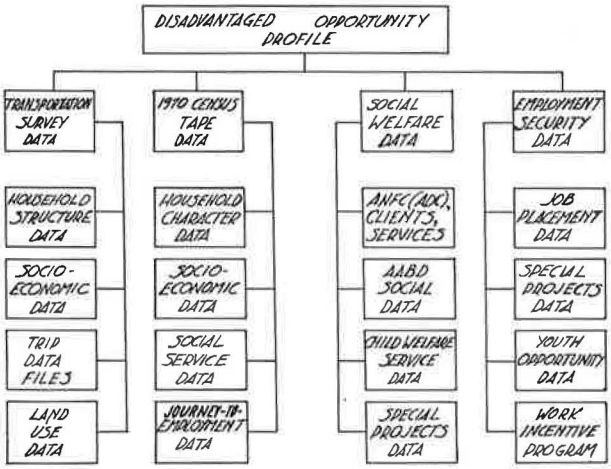

Table 1. Data base.

Study or Source File	Specific File Identification	Data Content and Data Items Used	Purpose for Disadvantaged
Transportation			
Home interview	B-1, C-1, and D summaries	Household structure, socioeconomic data, employment classification, occupation, trip data, trip purpose, time of trip, mode of travel, land use, cost, geographic location of trip and household, length of trip; dominated by middle-income travel, by travel zone, or by sample	Determine activity pattern for homogeneous groups particularly those selected as urban disadvantaged; obtain profile related to transportation network
Land use	Land use summary LU-116; land use field listing file	Detail description of urban land uses in urban area, usually by 99 categories located by block in built-up areas and by land classification in suburban areas	Relate existing land uses, e.g., industrial, commercial, institutional, to residential location
Facilities	Network inventory on various card and tape; link-mode file for highway and transit; public transit frequency file	Description of transportation-retrieval in urban areas for highway and transit; transit availability by time of day	Relate service facilities to areas reviewed
Welfare			
Aid to needy families with dependent children	FS201, 2015, FS211, DWS106	A complete socioeconomic profile with detailed information on all aid to needy families with dependent children—household size, location, income and service requests, including transportation; continuous time series data on changing patterns not available in any other data base	Trace mobility patterns of classes of disadvantaged persons in a zone
Aid to the aged, blind, and disabled	FS201, FS211, FS214	Detailed description of aged, disabled, and blind; federal support requirements; profile of urban disadvantaged subgroup case history and summary statistics on each individual description of transportation service needs, trips, time of day, mode of travel, and disabling factors mitigating travel	Relate impact on the aged of stricter driver licensing
Case and Administrative Services System (CASS) operating in a number of states	CASS file for related areas	Detailed case and administrative system of client objectives, services needed (transportation), trips or visits made, household data, income, time series data; universal profile of all opportunities available as part of urban disadvantaged group; national computer-based system	Relate need for services to actual consumption of services, such as transportation
Child welfare services	CWS301, service request; CWS 314 family	Detailed description of family structure and service needs for all children up to age 21 not picked up on other surveys	Separate serve-passenger trips, for which no occupation industry codes exist in home interview surveys, into trip purposes of children subgroup served, including trips to care centers, foster homes, and juvenile courts
Employment			
Work incentive program (WIN)	Work incentive case file (similar to DSW FS201)	Complete profile on client participation in WIN; particular emphasis on employment training and employability for specific subgroups; data on household and family characteristics, income, employment, training and related service needs	Develop detailed profile on disadvantaged subgroup, e.g., unemployed fathers; relate to specific training and job opportunities and transportation services
U.S. Census			
1970 Census of Population and Housing, selection of summary tapes for specific geographic areas	1970 summary tape 4 (13,000 tabulations by tract) and tape 3 (400 tabulations by block, without travel and income data)	Summary of population and household statistics by various geographic configurations; journey to work, mode choice, income, time lost from work, age, race	Use as universal control for all subgroups; relate location of disadvantaged groups to employment locations and mode of travel to work, to employed-unemployed, and to socioeconomic and household characteristics
Census of Transportation	Geographic summaries	Census of transportation, particularly location, mode, and length of travel by various categories	Relate overall profile of transportation use to facilities of mode; use as control for specific modal choices influencing locational decision related to industry
1970 Census of Population and Housing, special tabulations of data not in summary tapes	1970 special tabulations and cross tabulations of A against B	Income by age groups, time lost from work, race; smaller than tract level	Determine coincidence of multiple disadvantages

agencies, however, spend considerable funds on special transportation services or taxi fares, which a transportation study could attempt to reduce);

2. Predominantly unautomated data bases, or partial automation, with certain useful types of data in handwritten or typed form; and

3. Uneven accuracy of recorded data, depending on the welfare recipient, the caseworker, the availability of information on welfare services, and the keypuncher (a high sample size can reduce these problems).

A final transportation demand problem is that of estimating future demand. A couple of approaches are possible. The historical data in welfare files might be extrapolated. Land use characteristics might be broken down to determine any consistencies in trip generation by disadvantaged subgroups traveling there. The uncertainties of national economic prosperity, discriminatory attitudes, and medical research for the handicapped make forecasts particularly hazardous. At any rate, the immediate problems are serious enough to make current data in themselves quite valuable.

Transportation System Requirements of Each Group

Recommendations should be made for public transportation service system requirements of each disadvantaged group. This is the phase in which data on expressed and implied transportation needs of the disadvantaged are analyzed and expressed as requirements for a transportation system to serve those needs. The functions to be performed by the system are spelled out, and operating requirements are "optimized." Implied in any quasi-optimizing analysis is a demand and modal-choice analysis responsive to a system's proposed characteristics.

A wide range of hardware characteristics and operational strategies can be proposed. Specially designed buses, rail networks, or helicopter emergency systems have been developed. Demand-responsive operating strategies are being offered for specialized needs. Their characteristics can be evaluated by a first-stage, manual-analysis, filtering process without recourse to sophisticated mathematical analysis. Graphical analysis may be used to identify the few most promising functional systems.

The 2 or 3 most promising solutions can be tested by detailed transportation modeling to estimate demand, including demand by disadvantaged persons, benefits-disbenefits, and responsiveness to other criteria for evaluation of transportation plans.

The plan that serves the most disadvantaged trips may not be the most cost-effective for the general welfare of the total population in a study area. Although it should not be the transportation planner's role to absorb such high-level policy decisions in the preliminary evaluation process, he should now be prepared to answer some questions about who is served well by the system and who is not, what operating strategies are feasible, what pricing options are available, and what personal or welfare agency transportation expenditures are reduced.

Design and Operation of System

A detailed engineering design and operation plan of the recommended system hardware and software are the next elements. In a study emphasizing the transportation needs of a subset of the population new hardware or operational strategies or both are quite likely. Seattle, Atlanta, Baltimore, Detroit, and Honolulu and numerous large and medium-sized foreign cities have recently selected capital-intensive rapid transit systems. Thus, more is required than in refined freeway location and design studies.

Hardware engineering studies are necessary even when no heavy new capital investment is anticipated. Buses, rail cars, and stations generally need to be modified to admit physically handicapped persons (1, 11).

An increasingly integral part of detailed design is the computer program requirements for transit or highway command and control systems. On-time performance is essential to job stability for low-income persons. Our recent research experience in a police crime and traffic study indicates that automated analysis of transit or highway on-time performance with software that reports exceptional system behavior in a meaningful way is necessary to achieve original performance specifications regularly.

Meaningful exception reporting requires that bad weather or a one-point bottleneck not merely be reported as "all cars late." The software should simulate what is normal behavior in such exceptional situations so that additional bottlenecks can be recognized and corrected while the abnormal (e.g., bad weather) conditions continue.

The detailed operations plan can carry out strategies selected to maximize transportation service to disadvantaged persons. Demand-responsive feeder systems, shuttle systems, or parking facilities could be developed here. Neighborhood or public welfare agencies can be organized to provide for volunteer-driven feeder or short-haul needs.

Implementation of New Transportation Systems

A pilot test is recommended for implementing innovative systems. If a small-scale test is economically feasible, it can provide realistic prototype evaluation data and will avoid disrupting an existing smooth operation. In some cases, such as some demand-responsive systems, a manual test can be misleading. The computer software required for the pilot will be the same as is required anyway for full development.

The new system must be given an opportunity (1 to 2 years) to develop new ridership and travel habits. As old, dirty, slow, unsafe, and noisy subways and buses give way as images of American transit, new levels of transit ridership can be reached.

Evaluation of Transportation Plans and Programs

The impact of programs aimed at the disadvantaged needs to be determined. Will jobs be obtained by disadvantaged people because of the project? Will trips to medical clinics increase? A range of social indicators influenced by improved transportation services is needed and can be accessed from nontransportation data bases. No attempt is made in this paper to show that special transportation services aimed at disadvantaged persons are needed, though a number of such studies have been made (2).

SOURCES OF DATA REQUIRED FOR VARIOUS GOVERNMENTAL UNITS

Transportation Planning Data

Interest in transportation planning for disadvantaged person needs has produced some specialized surveys and research analyses on the scope and depth of needs. Some have resulted in successful new services. Frequently, however, researchers have identified needs that were never implemented by the transit operator, or special demonstrations have been launched with insufficient planning. New routes were merely slight modifications of older ones, advertising was ineffective, or an evaluation criterion such as profitability may have replaced the original purpose, which was to open up job or leisure opportunities.

Better integration of transportation planning for disadvantaged persons in the regular data collection, analysis, and programming functions of established governmental planning agencies is needed.

Metropolitan Transportation Planning—As urban transportation planning programs develop major reappraisal planning update programs and recognize that new data collection and modeling improvements are needed, the opportunity arises to seek data on transportation-disadvantaged persons and incorporate them in the planning process.

The welfare payment agencies and social services referral centers are beginning to automate case records and statistical analysis. Even noncomputerized records may be well worth a cooperative automation effort.

Home interview data of the type collected by the authors in the fall of 1970 for the Chicago Area Transportation Study are most useful for the subgroups. Even for these groups—low-income persons, elderly persons, teen-agers and nondrivers—some zones will have insufficient interviews to estimate realistic proportions of disadvantaged persons in the population. Some useful sorts of the data are shown in Figure 5.

Land use projections benefit disadvantaged persons only if high densities are concentrated near transit facilities that have high levels of service and go where such

persons need to go. Demand-responsive and modal-choice models are necessary so that densities and incomes near transit facilities can be specified. Employment data files can be used to link high-unemployment neighborhoods and suburban job centers for low-skilled positions. Of course, actual demand and benefit to unemployed persons depend on national economic health.

Census data for 1970 will be heavily used in transportation studies for sample control and geographic file linkage. The linkages can extend to welfare and employment files that are based on street addresses.

City Transportation Planning—Sources of data of particular interest to city planners include 1970 census tapes, state employment data, and welfare data. Special surveys of Model Cities neighborhoods and planning areas offer an opportunity to identify transportation-disadvantaged persons and areas.

With or without a mid-decade U.S. population and housing census, any data base heavily dependent on census data should include an active growth-monitoring program for a city or metropolitan area. Much talk about urban data base updating has been followed by little continuing financial support since April 1970. A good generalized data base management software package such as the authors have designed and installed should contain the necessary multifile update and cross-tabulation retrieval software. Regular or continuing update data sources and procedures for the multiple-file data base discussed previously require more than a single update source. Operating data from city departments, such as building permits, assessment records, and water service changes, can update name lists of owners and residents but do not usually provide information on income and physical or mental handicaps. Depending on local availability, welfare, credit agency, or utility (possibly with income) ties can be established by housing unit and aggregated to small areas to protect confidentiality.

Small Town and Suburban Transportation Planning—In recent years some smaller towns and suburban villages have bravely sought to subsidize transit service for residents and employees. Some recognized that attracting an industrial tax base would require not only water, sewers, and good schools but also transit service for "low-cost labor" from commuter rail stations to industrial parks. Others seek relief from traffic congestion and parking problems and convenience for shoppers. Demand-responsive, subscription, and pulse-scheduled minibus systems have met considerable success, including some revenue success. Generally, these completely new systems have provided mobility to previously stranded disadvantaged persons.

Special surveys can be inexpensive in these areas, but they should be designed to identify latent travel demands and divertible automobile trips by implying new potential destinations and high-quality service (12). Factory-organized bus services can be absorbed if identified.

Statewide or Intercity Transportation Planning—High intercity travel cost excludes all but the most essential trips for disadvantaged persons, and physical barriers to the handicapped are formidable. Illinois, New York, and several other states are now considering or implementing high-speed ground transportation projects that may help these persons.

Some major modeling efforts in statewide transportation planning have been made by New York, Pennsylvania, and California, where our firm conducted the earliest study (13, 14). Most of these efforts involved adaptation of gravity model theory to urbanized areas as trip-generating point sources. As with intracity transportation studies, these models aggregate the data such that modal choice is based on income-automobile ownership rather than on more specific behavioral characteristics.

Additional research into latent demand and modal-choice determinants, such as door-to-door travel time, convenience of not having to drive, and mobility requirements at destination city, is needed; data bases on which to run such models are also needed. Economic application of Northeast Corridor research is needed. Treatment of demand as in recreation planning models should be explored. Use of urban areas as point-trip sources will not be successful unless characteristics of access to some high-speed service terminal from all parts of that urban area are taken into account in disaggregated fashion.

Figure 4. Opportunity-demand profile.

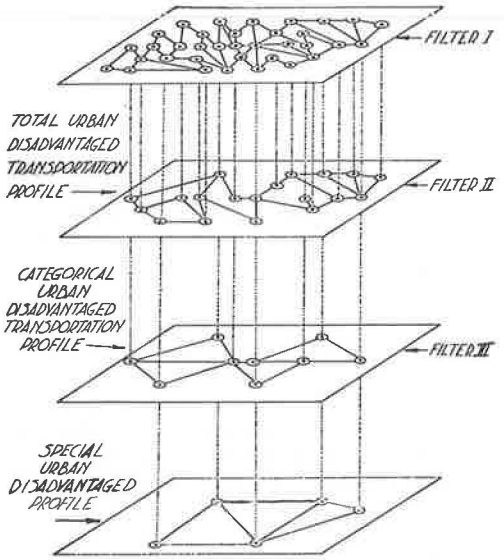

Figure 6. Distribution of travel by time of day.

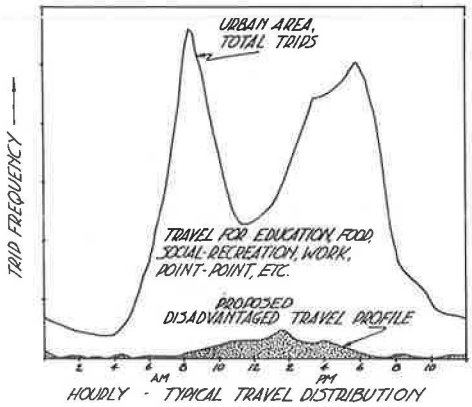

Figure 5. Home interview survey tabulation.

S ZONE		AUTO OWNERSHIP				DRIVER STATUS		TRIPMAKING ON TRAVEL DAY								
	TOTAL AUTOS	OCCUPIED NO AUTOS	DWELLING ONE AUTO	PLACES TWO AUTOS	OWNING THREE+ AUTOS	LICENSED DRIVER	NON DRIVER	BY PERS AGE 5 + OLDER	TOTAL PERSON TRIPS	AUTO DRIVER TRIPS	AUTO PASS TRIPS	COMM BUS TRIPS	SCHOOL BUS TRIPS	TAXI + INT TRUCK PASS	WALK+ OTHER	ZNE
001	192	96		96		192	96	192	927	735	192					001
002	96	96	96			192	96	192	384	192		192				002
003	96	96	96			96	96	192								003
005																005
006																006
007																007
009	192		192			384	96	288	627	435	192				192	009
010	96		96			96		96	243					243		010
011	192		192			192	192	384	1611	1317	294				243	011
012																012
013	96		96			96	96	192	972	633	339					013
014	96		96			96	96	96	441	441						014
015		192					480	192	294		294				96	015
	1056	480	864	96		1344	1248	1824	5499	3753	1311	192		243	531	
	1056	480	864	96		1344	1248	1824	5499	3753	1311	192		243	531	
016	110		110			220	330	440	2632	944	1688				110	016
017	220		220			330	770	220	834	834						017
018		220					220	110	278		278					018
019	220	220	220			220	550	330	1112	834	278					019
020	220	220	220			550	660	990	7436	3162	4274					020
021	110		110			220		110	776	776						021
022	110		110			110		110	495	495						022
	990	660	990			1650	2530	2310	13766	7048	6718				110	
023	212	106	212			318	212	530	3266	2038	960	268				023
024	318	106	106	106		636	636	848	7928	4450	3478					024

Operating Transit Agencies

Transit agencies need not wait for revisions of urban transportation planning models to assess their responsiveness to travel needs of urban disadvantaged persons. In the high-density areas of major cities with frequent, heavily used service to downtown, there are many disadvantaged persons who need to go across town or to a nearby hospital and persons who physically cannot mount a bus step. Semiliterate, low-income residents often cannot sort out a maze of bus routes and signs and do not know where to turn for help. Some disadvantaged persons can travel in the off-peak periods (Fig. 6) when marginal operating cost is low. These trips are not usually made to work but for other purposes, and the destinations are more dispersed over space and time. A demand-responsive, door-to-door service should be demonstrated for off-peak periods.

Welfare agencies are good initial sources of information, as are some Model Cities staffs, which often bring specific problems to transit operators.

Home interview survey analysis of automobile and taxi trips taken by persons who are also transit users can be explored. We have found employers to be responsive to letter surveys of company-sponsored bus services.

SUMMARY

Some approaches to considering the transportation needs of urban disadvantaged persons have been explored. The paper has pointed out the inadequacy of conventional transportation data collection processes that frequently miss trips made or needed by disadvantaged persons. The authors have identified and have utilized complementary sources to estimate travel needs of the disadvantaged. Several types of welfare files from national programs have been described and related to transportation planning requirements.

We suggest that analysts either incorporate these files in the transportation planning process or develop new techniques to collect disadvantaged time series data in urban area transportation planning studies. We are not effectively evaluating total transportation demand, and we must extend the scope of data collected.

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