transportation services, inadequate funding and high service costs, have both been remedied by the lottery program. Transportation services can be priced at the cost of service and still generate significant ridership because of the 75 percent lottery reimbursement for senior citizen riders.

3. The Section 406 and Section 203 programs have created rural transportation services available to the general public in many areas where no such services existed at all. Most rural service in Pennsylvania was formerly provided by social service agencies and was restricted to agency clientele. By law, program participants were required to open these services to the general public. Although the per trip cost is often quite high and general public riders are unsubsidized, the services now do exist and are available to everyone who needs them.

4. The programs have been of great benefit to private and public carriers who are eligible to participate. About half the program participants are taxi and paratransit companies and transit authorities, and they have collectively seen a substantial increase in their senior citizen ridership and total revenues.

The services provided under the Section 406 and 203 programs are still in a stage of rapid growth, and it is difficult to predict where that growth will level out. In 1982-1983 about 50 providers participated in the program for at least part of the year. In 1983-1984 that number has risen to nearly 70 and is expected to go still higher. Although some providers that have been in the program for several years have seen their ridership stabilize, the newer ones are still experiencing a lot of growth as news of the program penetrates their service areas.

The good news about this kind of growth is that it is not rising toward a financial ceiling that will eventually curb further growth or even cause reductions in service as service costs increase or funds are cut. As long as the state lottery fund continues to be healthy (and to date it has been very healthy, with a current surplus of well over $200 million) there will be no ceilings on the availability of funds for demand-responsive transportation in Pennsylvania.

Number and Status of Mobility-Handicapped Persons in the Federal Republic of Germany

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ABSTRACT

In December 1980 a joint study, "Number and Status of Disabled Persons by Target Groups," was commissioned by the Ministry of Youth, Family and Health (that had the main responsibility for the study), the Ministry for Employment and Social Order, and the Ministry of Transport of the Federal Republic of Germany. A multistage survey concept was developed for the empirical part of the study. An initial gross sample of 66,000 persons was used (in various sampling stages) to determine the number of officially recognized disabled persons, as well as the number of disabled persons not officially registered. For a subgroup of approximately 6,400 disabled persons (gross) and a control group of about 2,300 nondisabled persons, data on mobility were also collected by having the target persons fill out diaries for a sample day. One of the basic aims of the project was to identify the sociodemographic structure of mobility-handicapped persons with special reference to those who hold the free travel passes provided by the government. A comprehensive picture of the actual number of mobility-handicapped people in the Federal Republic of Germany and respective cross-tabulations are given. An outline of further evaluations of mobility and the underlying conceptual approach is also provided.

The empirical study of mobility-handicapped persons, which is the subject of this paper, incorporated not just one but several surveys. The research objectives, in fact, included surveys of mobility-handicapped people who needed nursing care and surveys of mobility-handicapped people who did not.

The research project began in 1978-1979 when a representative sample survey was carried out for the West German Federal Ministry of Youth, Family and Health to identify the number and status of persons who need nursing care and live at home. It was proposed that the data would make possible an estimate of the cost framework for the insurance and legal aspects of nursing care. The survey instrument used for this study collected all information necessary to differentiate between the healthy, the acutely ill, those in need of various levels of nursing care, and a threshold or borderline group made up of the "no longer healthy" who were at the same time "not yet in need of nursing care." One of the most

important indicators in this context was the radius of action of the target persons (1).

In addition to the data from this survey, more detailed activity data relating to a sample travel day were available from a previous survey of the same persons. These data had been collected as part of a special review financed by the Federal Ministry of Transport as part of the project, "The Mobility of Handicapped Travellers--A Pilot Study of Those Needing Nursing Care." By combining both data sets, it was possible to derive very detailed data about the mobility of all persons living at home who needed nursing care as well as about specific subgroups (2). People with very reduced or only a very basic level of mobility could, for example, be contrasted with nonhandicapped control persons. The whole exercise was done, therefore, at a comparatively low cost.

In interpreting these data it was, of course, necessary from a planning viewpoint to bear in mind that those persons needing nursing care represented only a proportion of all mobility-handicapped persons. During the Year of the Disabled, however, it was intended to carry out studies of disabled persons, including mobility-handicapped persons. The Federal Bureau of Statistics had already decided several years earlier that

> The disabled have been shown to be . . . a diverse group, which has become ever more inhomogeneous since the reduction of the number of persons with war disabilities; a group which can only be surveyed to a limited extent by methods such as household surveys (3, p. 493).

Socialdata was therefore commissioned to develop a conceptual framework for a major study, "The Number and Status of Disabled Persons by Target Group, with Special Reference to the Structure and Needs and the Function of Self-Help Organisations." The actual study was finally commissioned in December 1980 as a cooperative project between three federal ministries: the Ministry for Youth, Family and Health (project leaders); the Ministry for Employment and Social Order; and the Ministry of Transport.

The goal of this study was to supply sufficiently disaggregated, target-group-oriented data on handicapped persons living in the Federal Republic of Germany. Until then, the only data that had been available had dealt with persons who had the official status of "handicapped." These data were insufficient to achieve the goals of the survey for a number of reasons:

1. The classification is achieved using standardized rating criteria that can establish the handicap according to various levels of reduction in earning capacity (REC). The intensity of the REC level is measured by the extent of the functional losses of the body or by the size of the functional impairment that is attributable to the impaired member or part of the body. On this basis it is impossible to deduce the percentage of the population with comparable handicaps that has not been given or has not sought official recognition as handicapped for whatever reason.
2. The official statistics include no data that are suited to describing the living conditions of the handicapped in such a way that it is possible to comment on the size and composition of the subpopulations whose needs are not being fulfilled.
3. The causes of severe handicaps are not very well disaggregated; more than three-quarters of all persons who are officially acknowledged as handicapped with an REC of at least 30 percent are lumped in the category "other causes or several causes" or "other illnesses (including those resulting from vaccinations)."
4. The official statistics are distorted by the facts that some deceased persons are included in the files and tens of thousands of persons whose documents are currently being processed are not included.

INITIAL SURVEY

To carry out the study, the survey design that was selected to fulfill the demanding statistical requirements was large scale, from a methodological viewpoint. The sampling frame consisted of 26,700 representatively selected private households (representing 66,000 persons) in the Federal Republic of Germany and West Berlin.

As part of a written mail survey, possible handicaps of all persons in the household other than those already officially recognized as disabled were also recorded. The indicators for these disabilities were (in addition to the disabilities and the functional impairments listed) any aids needed to travel outside the home, the need for any medical or other basic care, the need for assistance with the care of the household or with communication, and impairments of bodily, spiritual, or mental well-being as defined by the World Health Organization.

The sample was selected shortly before the survey using random routes and, when they were available, address lists because recourse to any official lists that could have been used as a weighting mechanism was not possible. There was, therefore, no person-related data available for any of the sample households.

The survey was completed with a final response rate of 71 percent of the valid gross sample. This was sufficient, in the light of the survey objectives, to

1. Classify handicapped persons on the basis of the nature of their disabilities (including a handicap in mobility) in conjunction with a medical diagnosis (i.e., filter questions);
2. Verify a suspected handicap; and
3. Provide descriptive data on sociodemography, income, living conditions, mobility, education, occupation, degree of information about disease or handicap, how the individual is cared for, how the disease or handicap is attended to, and recreational and social integration including any possible deficiencies.

The analysis of the broad range of data was necessarily manual to satisfactorily deal with the open-ended questions and the individual responses. Based on this close examination, it was possible to place the respondents in the following groups:

1. Officially recognized handicapped persons;
2. Persons who were not officially recognized as handicapped; however, in the light of all information gathered about them, it was highly probable that these persons could also be classified as handicapped (level 1 suspects); and
3. Persons not officially recognized as handicapped who responded to the prestudy in a way that indicated it was possible that they were handicapped (level 2 suspects).

MAIN SURVEY

Persons who received the next person-related ques-

tionnaire as part of the main survey were all persons from these three groups (i.e., a total of 9,700 "official" and "suspected" handicapped persons). It was expected that their tendency to respond or not to respond would depend on the form of their disability. Within each group two age groups were defined (18-24 years of age, and 65 years and older). This meant that the sample was divided into six sections and created the possibility of dealing with each of the individual "fields" with the necessary intensity by employing different questionnaires for each subgroup. After 2 weeks in the field, the response rate (based on the valid gross sample) was between 80.5 percent (level 1 suspects, 65 years and older) and 87.3 percent (officially handicapped, 65 years and older).

The survey instrument for interviewing these groups had to fulfill the following functions:

1. Verification of suspected handicaps;
2. Classification of those confirmed as handicapped with respect to the nature of their functional impairment or disability;
3. Preparation of descriptive data (e.g., sociodemographic data and data on living and income situation); and
4. Identification of needs or deficiencies in life-style or living conditions (e.g., mobility, education or occupation, medical care, household maintenance, organization of free time, communication, and social integration).

Six to 12 months were allowed to elapse between the initial inquiries made of the households and the main survey dealing with disabled individuals. This was done to ensure that temporary acute illnesses at the time of the initial study would not be classified incorrectly as statistically relevant handicaps.

A "Representative Survey in the Federal Republic of Germany to Determine the Mobility Behavior of the (Mobility)-Limited Who Live at Home and of Their Household Members" conducted for the Federal Ministry of Transport by Socialdata is a further part of the main survey. The initial survey had already identified the representative proportion of "mobility-limited" people living in private households in the Federal Republic of Germany (including sociodemographic descriptions; differentiation according to degree, type, and cause of the disability; necessary aids; and so forth). It was, therefore, the task of this survey, which was conducted as a postal survey on a random sampling day, to measure the out-of-house activities of the mobility-limited persons and their household members, as well as to show mobility relevant deficiencies in the way in which the persons were provided for.

CHARACTERISTICS OF MOBILITY-HANDICAPPED PERSONS

According to the definition selected, 11.9 percent of the German population (i.e., just about every 8th person) is mobility handicapped and living at home. Of these, however, only three-quarters fulfilled the definition of handicap in the main study. The remaining quarter, therefore, includes persons who, strictly speaking, have great difficulties with mobility but are not considered handicapped. For the purposes of this paper, the term mobility handicapped will be used in the collective sense for all persons previously described. In total, this collective group represents 5.29 million German persons over 18 years of age (excluding persons living in institutions). Just two-thirds (61 percent) of these are officially recognized as handicapped. This proportion is significantly lower than the proportion of all handicapped persons (76 percent) who are officially acknowledged. In contrast, only about three-fifths of all handicapped persons can be classified as mobility handicapped; consequently the total handicapped community has about 1.7 million more persons than the mobility-handicapped community. Not even half of all mobility-handicapped persons are entitled to free use of public transport. This proportion is actually less than that for all handicapped persons. This means that only two-thirds of those persons with free travel passes are mobility handicapped in the current sense; in contrast, more than 3 million mobility-handicapped persons are not entitled to free travel (Table 1).

Every twentieth person who is mobility handicapped is so limited in his or her ability to move

TABLE 1 Characteristics of Mobility-Handicapped Persons

	HANDICAPPED			MOBILITY HANDICAPPED		
	Proportion of the total Population %	Absolute (Rounded) Millions	Proportion of the Handicapped %	Proportion of the total Population %	Absolute (Rounded) Millions	Proportion of the Mobility Handicapped %
Handicapped						
- Yes	15,7	6,98	100	8,9	3,96	75
- No				3,0	1,33	25
Mobility Handicapped						
- Yes	8,9	3,96	57	11,9	5,29	100
- No	6,8	3,02	43			
As handicapped						
- officially acknowledged	11,9	5,29	76	7,2	3,83	61
- not officially acknowledged	3,8	1,69	24	4,7	2,46	39
Free Travel Pass						
- available	7,0	3,10	44	4,9	2,12	40
- not available	8,7	3,86	52	7,0	3,17	60

Note: Commas should be understood as decimal points.

that these people actually need to be categorized as immobile. This does not imply, however, that these people are constantly immobile. On the contrary, out-of-house mobility provides such basic necessities of life that, despite the utmost individual difficulties, it cannot, as a general rule, be totally suppressed. This specification is valid also for two further groups, those persons theoretically dependent on other people and mechanical aids (P+M) and those theoretically dependent only on other people (P). For these two groups, this means neither that this assistance is assured nor that out-of-house activities take place only when it is available. About one-third of the mobility-handicapped population uses various mechanical aids when they leave the house, and a good half of these can be mobile only with the assistance of another person. In absolute terms this results in about 2 million persons who use mechanical aids and about 1.3 million persons who actually need to be accompanied by another person. Although it can be assumed that the majority of those mobility-handicapped persons discussed so far also have problems with structural impediments, the last group (S) has problems only with structural impediments and needs neither mechanical aids nor the assistance of another person. This group of 2.38 million persons includes almost half of the mobility handicapped (Table 2).

Sixty-one percent of the mobility-handicapped persons are officially recognized; more than half of these (33 percent) have been recognized as having a reduction of earning capacity of at least 80 percent. Official recognition is particularly high among the P+M and M groups (theoretically, mechanical aids only are necessary), the handicapped for whom the formal criteria are most easily recognized. It is interesting that group P+M has the highest number of REC values of 80 percent and more and that most REC values for group M are between 50 and 75 percent. Obviously the bodily defects in the P+M group are, or have become, so great that they can no longer be adequately compensated for by the use of mechanical aids. Similar relations exist between groups P and S. It can be assumed here also that the mobility problems of group S--to the extent that they do not result in the use of mechanical aids--would lead to an increased reliance on the assistance of a second person in many cases. In contrast, it can be concluded from the rather lower level of official acknowledgment of group I (theoretically immobile) that this is a group of persons who are similar to those persons who live at home and require nursing--the group studied in the pilot survey of this project (Table 3).

TABLE 2 Categories of Mobility-Handicapped Persons

MOBILITY HANDICAPPED IN THE CATEGORY:		Total %	Absolute (Rounded) Millions
I	(Theoretically Immobile)	5,2	0,28
P+M	(Theoretically dependent on Other People and Mechanical Aids)	11,6	0,61
P	(Theoretically "only" dependent on Other People)	24,8	1,31
M	(Theoretically "only" dependent on Mechanical Aids)	13,5	0,71
S	("Only" difficulties with Structural Impediments)	44,9	2,38
TOTAL		100,0	5,29

Note: Commas should be understood as decimal points.

TABLE 3 Persons Officially Acknowledged as Handicapped

OFFICIALLY ACKNOWLEDGED	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Officially acknowledged as handicapped	61	45	70	58	80	55
- with an REC+) of less than 30%	1	3	-	0	1	1
- with an REC+) of 30 - 45%	4	2	1	3	4	6
- with an REC+) of 50 - 75%	23	8	16	12	38	28
- with an REC+) of 80% and more	33	32	53	43	37	20
Handicapped - not officially acknowledged	39	55	30	42	20	45
TOTAL	100	100	100	100	100	100

+) REC=Reduction in earning capacity

SOCIODEMOGRAPHY OF MOBILITY-HANDICAPPED PERSONS

Females represent two of three mobility-handicapped persons, and in each of the mobility-handicapped groups the proportions are approximately similar. The only exception is group M. The reason is possibly a higher proportion of war invalids and, more particularly, a more concerted effort by men to retain the ability to work and thereby their out-of-house mobility (Table 4).

Average age increases constantly from group S to group I. To oversimplify, it can be said that every second person in group S is less than 65 years old, that just over every second person in group M is between 50 and 75 years old, that every second person in group P is between 65 and 80 years old, that almost every second person in the P+M group is over 75 years old, and that nearly every second person in group I is more than 80 years old (Table 5). From this it can be surmised--again in simplified terms--that with increasing age many of the members of group S will move to group P, from group M to the P+M group, and from group P to group I.

The household size of each group varies significantly. The relatively large households of group I can be explained rather well by the special situation of the persons affected; the nursing and care needed generally require a large family unit. In contrast, the size of families in which the groups P+M and P are found is alarmingly small; the high proportion of single-person households (51 percent and 47 percent) has to be viewed against the need for an accompanying person. Only in group S does the household size still lie well above the overall average; the number of mobility-handicapped people in the household, however, rises proportionally (Table 6).

This household structure corresponds very closely with the marital status of those persons affected; a large proportion of widows and widowers contribute to the small household sizes in the groups P+M and P. In contrast, in group I it is readily recognizable that the existence of multigeneration households has created the conditions for avoiding the move to an institution (Table 7).

In support of the conclusions about age and sex, the share of full- or part-time workers is largest in group S. In groups I, P+M, and P, pensioners represent almost two-thirds and housewives about one-fifth of those persons affected. Nevertheless, 7 percent of persons in group I are employed at least part time, generally in light craft activities. In sum, about every eighth mobility-handicapped person is formally classified as unfit for work (Table 8).

TABLE 4 Sociodemography of Mobility-Handicapped Persons, by Sex

Sociodemography	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Sex						
- Male	36	32	30	34	53	35
- Female	64	68	70	66	47	65
TOTAL	100	100	100	100	100	100

TABLE 5 Sociodemography of Mobility-Handicapped Persons, by Age

SOCIODEMOGRAPHY	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Age Group						
- 18 to 50 years	13	10	8	11	14	16
- 51 to 65 years	26	11	18	15	31	33
- 66 to 75 years	29	22	28	29	26	32
- 76 to 80 years	16	14	22	21	18	11
- 81 years or more	16	43	24	24	11	8
TOTAL	100	100	100	100	100	100

TABLE 6 Household Size of Mobility-Handicapped Persons

HOUSEHOLD SIZE	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Household Size						
- One Person Household	40	28	51	47	44	33
- Two Person household	35	34	36	32	28	40
- Three and more Person Household	25	38	13	21	28	27
TOTAL	100	100	100	100	100	100
Household Composition						
- Average Household Size (All Persons)	2,01	3,18	1,68	1,85	1,97	2,08
- Average Number of Mobility Handicapped (18+ years)	1,12	1,07	1,11	1,08	1,06	1,17
- Proportion of Mobility Handicapped in % (18+ years)	56 %	34 %	66 %	58 %	54 %	56 %

Note: Commas should be understood as decimal points.

TABLE 7 Sociodemography of Mobility-Handicapped Persons, Marital Status

SOCIODEMOGRAPHY	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Marital Status						
- Single	10	7	10	11	11	7
- Married	54	44	47	47	57	62
- Widowed	33	48	41	39	29	28
- Divorced	3	1	2	3	3	3
TOTAL	100	100	100	100	100	100

LIVING SITUATION OF MOBILITY-HANDICAPPED PERSONS

The most apparent bodily defects of mobility-handicapped people are functional impairments of the legs. Almost every second person suffers either impairment of both legs or has already had part or total amputation of one or both legs. This proportion rises to about three-quarters for the P+M group, and for group S it is over two-thirds. Comparable impairments of the arms are apparent primarily in groups I and P+M. In the P+M group problems with the hands or feet occur more frequently than average. Every third mobility-handicapped person also has a serious increase in difficulties with the spine and the bodily functions associated with it; every fifth person has balance difficulties; and 29 percent have mobility-related disorders that are related to rheumatism. Every 20th mobility-handicapped person is almost blind in one or both eyes or has greatly reduced vision in both eyes; every ninth person is almost deaf or has a high level of hearing impairment. For each of the mobility-handicapped groups there are correlations that can be directly related to the differing age structures (Table 9).

Mobility handicaps do not cease at the front door of the home; they have a general effect on the ability to move within the home as well. Admittedly the need for assistance drops by one-third from group I to group S, but, as is the case for the statements about movement and mobility, this does not imply

TABLE 8 Sociodemography of Mobility-Handicapped Persons, Employment Status

SOCIODEMOGRAPHY	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Employment Status						
- Full-time or part time emp employed	15	7	5	6	20	17
- Currently unemployed	1	-	-	1	2	2
- Pensioner	52	64	63	62	52	48
- Housewife	19	21	16	19	13	21
- Student/Apprentice	1	-	0 *)	1	1	1
- Unable to work	12	8	16	12	12	11
TOTAL	100	100	100	100	100	100
*) Less than 0.5%						

TABLE 9 Bodily Defects of the Mobility Handicapped Population

BODILY DEFECTS	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Functional Impairment/ Amputation						
Arms	19	24	32	18	17	15
Hands	13	14	24	12	12	9
Legs	47	57	73	37	68	36
Feet	18	19	30	17	17	14
Problems with						
Spine	33	25	33	28	36	36
Balance	21	34	30	25	15	17
Rheumatism	29	20	32	27	26	32
Recognition						
(Almost) blind/ very visually handicapped	5	7	4	8	4	3
(Almost) deaf/ very aurally handicapped	11	13	17	15	8	7

anything about the hardships related to movement. In addition, in several cases, the assistance of mechanical aids is also necessary within the home. This is also true for group S and more particularly for group P persons who do not need these aids outside the house (Table 10).

Every fourth mobility-handicapped person stays home frequently because of insecurities associated with the handicap. This proportion increases markedly from group S (one in eight) to group P+M (almost one in two). Associated with limited freedom to move are feelings of loneliness. The greater the handicap, the more frequently such feelings occur. An even clearer correlation with the degree of mobility handicap occurs with the frequency with which holidays were taken in the previous year. Only 17

TABLE 10 Movement Within the Home

MOVEMENT WITHIN THE HOME	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Assistance needed						
to move around	4	24	12	6	0	1
to push, carry	1	6	6	1	1	0
because bedridden	1	20	-	-	-	-
Aids within the Home						
Stick	16	25	43	16	29	3
Crutches	4	6	19	1	9	-
Wheel Chair	2	8	11	1	1	-

percent of group I compared with 57 percent of group S were able to do this. Holiday travel frequency of mobility-handicapped persons is about one-quarter less than the comparable value for the total population (Table 11).

CONDITIONS UNDER WHICH OUT-OF-HOUSE ACTIVITIES OCCUR

Mobility-handicapped people have several specific difficulties when moving outside of the home. The frequency of these difficulties correlates with the indirectly expressed ranking of the individual handicapped groups according to the degree of mobility handicap. Particular problems occur for long walking trips; almost two-thirds (60 percent) of mobility-handicapped people have difficulties. This aspect is of particular importance because walking is the travel mode most frequently used by all handicapped groups outside the home. Approximately one in four (28 percent) mobility-handicapped persons has problems crossing streets or feels handicapped because of general weakness (25 percent); related to this, every fifth (21 percent) person finds frequent stumbling a particular hindrance. In contrast, problems with orientation, reported in every seventh case (14 percent), suggest that mobility handicaps are not related only to weaknesses of the body or functional impairments. In addition, mobility-handicapped persons have difficulty, which is often significant, with structural impediments. Flights of stairs (escalators, slopes) are the biggest problem by far. The greatest proportion of these problems is experienced by group S (compared with groups M and P), suggesting that it is precisely these people for whom the introduction of mechanical or personal assistance can be very effective, as long as the handicap is not too advanced, as is the case for group P+M. In contrast, curbs, doorsteps, and other smaller steps are much more minor impedances that produce an above average barrier effect only for the P+M group. Finally, the greater mention of opening and shutting doors by the P+M group can be related to the frequency of functional impairments of the arms or hands in this group (Table 12).

According to the definition, mobility-handicapped individuals in groups P and P+M include all those persons who, theoretically, need to be accompanied outside the home. This assistance can be provided in two of three cases by another person; for longer trips, particularly by the P+M group, a driver service of some kind is necessary. That this type of

TABLE 11 Social Contacts

SOCIAL CONTACTS	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Frequently at home because insecure	24	*)	47	42	17	12
Sometimes lonely	28	35	37	35	26	22
Holiday within the last year	47	17	33	37	52	57

*) Not applicable

TABLE 12 Difficulties Outside the Home

DIFFICULTIES OUTSIDE THE HOME	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I *)	P+M	P	M	S
	%	%	%	%	%	%
Problems with						
Curbs, Doorsteps	30		49	30	29	21
Stairs	46		57	42	39	53
Doors	9		28	8	6	5
Difficulties						
With longer walks	60		81	63	62	52
Crossing the Street	28		57	40	20	15
Because of General Weakness	25		37	35	18	20
Because of Frequent Stumbling	21		36	28	18	17
With Orientation	14		26	22	7	7

*) Not applicable

assistance is not always available and that, in spite of this, certain trips must be made has already been discussed in a similar context and must be recognized as a specific feature of the analysis of the handicapped. Mobility-handicapped persons who must use mechanical aids for their out-of-house mobility fall into two groups (P+M and M). Crutches or arm supports (54 and 50 percent) are most frequently used by both groups. The walking stick, walking frame, or wheelchair is used with similar frequency, although fewer handicapped persons (group M) use a walking stick more often (42 percent compared with 25 percent), and the most handicapped individuals (group P+M) need a walking frame or wheelchair most often (35 percent compared with 12 percent). The resulting 7 percent of the mobility-handicapped population who use either a walking frame or a wheelchair is divided approximately 1/4:3/4 between these two aids. This constitutes an absolute number of about 320,000 citizens over 18 years of age who use a wheelchair and live at home (Table 13).

The limited mobility caused by handicaps is reflected directly in a limited number of out-of-house activities. Trips to the cinema, theater, and con-

TABLE 13 Mobility Aids

MOBILITY AIDS	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I *)	P+M	P	M	S
	%	%	%	%	%	%
Mechanical Aids						
Walking Stick	9		25	-	42	-
Crutches	14		54	-	50	-
Walking Frame, Wheel Chair	7		35	-	12	-
Assistance of Others						
Attendant	27		62	68	-	-
Driver service (for longer trips)	21		70	52	-	-

*) Not applicable

certs are particularly affected; for every fourth mobility-handicapped person they are almost always impossible. Next in line are trips on official business, which in every fifth case are almost impossible. Almost all other trips are equally difficult. There are clear differences between the individual groups of handicapped people. Expressed somewhat simply, it can be said, with specific exceptions which have been mentioned, that out-of-house activities are almost always impossible in every second case for the P+M group, in every third case for group P, in every twelfth case for group M, and in every twentieth case for groups S.

It must be noted that this simplified classification relates to such elementary activities as the purchase of groceries and, more important, visits to doctors and thereby illustrates the daily problems of mobility-handicapped individuals. Knowledge of the possibility of being able to carry out activities outside the house, nevertheless, gives only limited information about the general radius of action of the handicapped. For this reason the results discussed previously will be compressed as follows:

1. At least three of the activities reported as almost always impossible involve a very strictly limited radius of action,
2. At least three of the activities were reported as frequently impossible and involved a limited radius of action,
3. At least three of the activities were reported as sometimes not possible and involved a less limited radius of action.

According to these categories, just less than a sixth of the mobility-handicapped population has a very strictly limited radius of action. There are very clear graduations from the P+M group to group S although, even in group S, almost every tenth person has a very strictly limited radius of action and every sixth person is limited to some extent (Table 14).

Public transit becomes particularly important for the mobility-handicapped population because of the limited opportunities to use a car and the difficulties experienced when walking. Nevertheless, one-third of the mobility-handicapped population cannot use public transit or can only use it with difficulty or with the assistance of someone else. This proportion rises to half for group P and to almost two-thirds for the P+M group; and 29 percent of the most lightly affected group (S) are affected. All modes of public transit are equally difficult for mobility-handicapped individuals to use; only taxis present fewer problems. Although the degree of difficulty decreases constantly from the P+M group to the S group, there are two significant differences: When compared with the fixed-track modes, bus use is more difficult only for groups M and S; in contrast, the use of buses for groups P and P+M seems to be somewhat easier. Rail-type modes, both above and below ground, present more difficulties to the latter groups (Table 15).

ELIGIBILITY FOR FREE TRAVEL ON PUBLIC TRANSIT

A fundamental policy for the support of mobility-handicapped people in the Federal Republic of Germany is the entitlement, under certain circumstances, to unlimited travel on public transit. These circumstances are of a fairly formal nature (generally an REC of at least 80 percent) and therefore correspond to the definition of official recognition--one of the major reasons that only 40 percent of the mobility-handicapped population has this entitlement. In addition, until now, little has been known about the actual effect of this sociopolitical policy. For this reason, in this section the mobility-handicapped population has been divided accord-

TABLE 14 Out-of-House Activities

OUT-OF-HOUSE ACTIVITIES	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I *)	P+M	P	M	S
	%	%	%	%	%	%
Range of Action						
Very severely limited	16		34	27	18	9
Limited	15		35	23	18	16
Less severely limited	70		31	50	64	75
TOTAL	100		100	100	100	100
(Almost) Always Impossible						
Grocery Shopping	16		48	31	8	4
Doctor's visits	15		45	29	5	4
Official errands	19		54	40	8	5
Liesure walks	14		44	24	7	4
Visits to Friends, Relatives	15		45	29	6	3
Visits to Cinema, Theatre, Concerts	26		62	47	16	10

*) Not applicable

TABLE 15 Problems with Public Transit

PROBLEMS with PUBLIC TRANSPORT	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I *)	P+M	P	M	S
	%	%	%	%	%	%
Use of Public Transport						
- not possible or only with assistance	18		37	37	16	7
- possible with difficulty	17		25	15	23	22
- basically possible	65		38	48	61	71
TOTAL	100		100	100	100	100
Degree of Difficulty (Index**)						
- Bus	1,9		2,9	2,4	1,8	1,5
- Tram	1,9		3,0	2,5	1,7	1,4
- U-Bahn	1,9		3,1	2,7	1,6	1,4
- Train	1,9		3,1	2,6	1,7	1,4
- Taxi	1,6		2,4	2,0	1,5	1,3

*) Not applicable

**) 1,00 = No difficulties
4,00 = Use impossible

Note: Commas should be understood as decimal points.

ing to eligibility for free travel. The corresponding behavioral data, therefore, can be better interpreted against this background.

In general, it can be shown that, using the formal definition, those persons who receive free travel have characteristics similar to those of the handicapped population overall, and those who do not receive free travel are more similar to those who are mobility handicapped. The proportion of men entitled to free travel (50 percent) is, for example, notably higher than that of men with no free travel (30 percent). In the age structure there are also clear differences: almost half the free travelers are less than 65 years old, and fewer than one-quarter are more than 75 years old (Table 16).

As a consequence of the different age and sex distribution, the personal availability of a car to the free travelers is much higher. This is evident

TABLE 16 Sex and Age of Mobility-Handicapped Persons Entitled to Free Travel

SEX and AGE	Total	Mobility Handicapped with Free Travel Pass *)	Mobility Handicapped without Free Travel Pass *)
	%	%	%
Sex			
- Male	36	50	30
- Female	64	50	70
TOTAL	100	100	100
Age Groups			
- 18 to 50 years	13	13	12
- 51 to 65 years	26	34	24
- 66 to 75 years	29	30	24
- 76 to 80 years	16	12	17
- 81 years or more	16	11	23
TOTAL	100	100	100

*) The two groups do not always equal the total since persons who did not respond were excluded from the analysis.

both from car ownership (27 to 17 percent) and from license holding (36 to 26 percent) (Table 17).

Because they are generally younger, persons entitled to free travel are not only better able to use public transit but, because of greater car availability, are also better able to use motorized individual transport. Because use of nonmotorized modes would also be easier for the younger persons eligible for free travel, it can be concluded that the execution of out-of-house activities is generally much easier for these people. In other words, free travel entitlement is more likely to apply to mobility-handicapped persons who have the least severe mobility limitations.

DIRECTIONS FOR THE ANALYSIS OF MOBILITY

The work presented here leads to the following conclusions:

An important characteristic of handicapped persons is the fact that they are not able to carry out their day-to-day activities without limitations. Some of these activities can or must be engaged in outside the home. These activities--the so-called out-of-house activities--can be relatively reliably measured. Because there are mutual dependencies between the ability to do out-of-house activities and those within the home, certain conclusions about the life situation of handicapped persons in general may be drawn from their program of out-of-house activities.

An analysis restricted to handicapped persons and based on these considerations does not give a satisfactory conclusion about the nature and range of activities that can no longer be fully or partially engaged in as a result of a handicap. In addition, because the sociodemographic structure of the handicapped population generally differs substantially from that of the population at large, and because this sociodemographic structure at the same time significantly influences the pattern of out-of-house activities, such comparisons are not sufficient to determine relevant mobility deficits. This problem can be solved, however, if a group of control persons is constructed. These comparable persons need to be selected so that they represent as exactly as possible the sociodemographic structure of the relevant handicapped group. For this it would be necessary to carry out a comprehensive survey of the mobility behavior of the total population. A survey such as this also makes it possible to view the relevant variables of the nonmobility-handicapped population against the mobility data of the handicapped and their control persons. From the comparison of the out-of-house mobility of the mobility handicapped with the selected control person, the mobility deficiencies of the mobility handicapped can be estimated.

An analysis based on these principles allows the basic needs associated with out-of-house activities to be presented using relevant qualitative characteristics. These characteristics are based primarily on the ability to leave the house at all (out-of-house proportion), the daily frequency of leaving home (number of trips), the activity program of the mobile persons (trips, out-of-house activities, travel mode used), and the time spent at the individual out-of-house activities and the time needed to reach them. The most important results of this analysis will be presented in future publications.

TABLE 17 Car and License Possession

CAR and LICENCE OWNERSHIP	MOBILITY HANDICAPPED IN THE CATEGORY: TOTAL	I	P+M	P	M	S
	%	%	%	%	%	%
Target Person owns a car						
- Yes	20	12	16	9	34	25
- No	80	88	84	91	66	75
TOTAL	100	100	100	100	100	100
Target Person has						
- a licence to drive a car	30	16	20	15	43	38
- an other licence	1	-	2	0	2	2
- no licence	69	84	78	85	55	60
TOTAL	100	100	100	100	100	100

REFERENCES

1. B.M. Meibom. Mobility and Handicapped Persons. In ECMT Round Table 51: Social Service Transport--Transport for Elderly and Handicapped Persons, European Conference of Ministers of Transport, 1980.
2. W. Brög, G.-F. Häberle, and K. Ribbeck. The Mobility of Persons Needing Nursing Who Live at Home. In Transportation Research Record 830, TRB, National Research Council, Washington, D.C., 1981, pp. 1-7.
3. Wirtschaft und Statistik. Heft 8. Statistisches Bundesamt, Bonn, Federal Republic of Germany, 1978.

Effect of Size and Type of Organization on Quality of Special Transportation Services

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ABSTRACT

An index of quality of service for special transportation services for elderly and handicapped persons was developed and used to analyze the relationships of quality to the size of the provider and to the type of organization of the provider. For a sample of 42 special services it was found that quality increases with size of ridership and that private organizations provide greater quality of service than do public organizations.

To efficiently deliver special transportation for the elderly and handicapped it is necessary to choose an appropriate method of providing service. This involves an analysis of a variety of issues including the size of the provider and whether the provider should be public or private. Researchers have studied these questions from the point of view of cost efficiency (1); however, the quality of the service that is provided should also be considered. The relationships between type of provider (i.e., its size and public or private nature) and the quality of transportation service are analyzed. To depict these relationships, a measure of quality was developed. The measure was applied to a sample of special transportation services for the elderly and handicapped, and the relationships between the quality of service and other characteristics (primarily size and type) were statistically analyzed.

In the first two sections of this paper the development and application of the index are discussed. The third and fourth sections cover the relationship between quality and size and type of organization. In the next two sections the interrelation of size and type of organization is discussed and the relation of quality to productivity and to the provision of wheelchair service is introduced. A summary of the conclusions of the analysis is presented in the final section.

INDEX OF QUALITY

The measure of quality of service that was developed is a hierarchic index. It is composed of eight general aspects of a special transportation service:

1. Reliability and on-time performance,
2. Comfort,
3. Convenience of making reservations,
4. Extent of service,
5. Vehicle access,
6. Safety,
7. Driver characteristics, and
8. Responsiveness to user.

Each aspect is composed of specific attributes or general measurable characteristics. For instance, under the general aspect reliability is the attribute, "delays while on the vehicle." This attribute can be measured in expected minutes of delay per year.

The different aspects are of different relative importance to quality of service. Thus each aspect was assigned a weight that is proportional to its relative importance. The weights are designed so that they sum to 10. Similarly, each attribute has a different importance to its relevant aspect. Therefore, the attributes also were assigned weights. The weights of all the attributes that contribute to one aspect also add to 10.

The weights were developed from a survey of elderly and handicapped users and potential users of special transportation services. A questionnaire was sent to a sample of 659 elderly or handicapped people. In the questionnaire, the respondents ranked the attributes according to their importance to the