

Significance of Mobility for the Well-Being of the Elderly

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The goal of this paper is to integrate information about the mobility of older adults with that on their well-being and the quality of their lives. Toward that end, the literature on human adaptation and the gerontological literature on emotional and social well-being are reviewed, and a conceptual model is derived from knowledge about the meaning, determinants, and dynamics of well-being among the elderly. Then studies on their mobility are reviewed within the framework of the model. Social and emotional well-being is defined by the presence of such variables as positive self-esteem, feeling of usefulness, and happiness and the absence of loneliness, anxiety, and depression. Well-being depends on the individual's success in meeting his or her own needs, and this is largely determined by the degree of congruence, or fit, between needs and community resources. Mobility is discussed as a key element in the congruence term. Qualities of mobility that influence its effects on well-being are presented: feasibility, safety, and personal control. Studies of each major transportation mode are reviewed in terms of these qualities, and modes are compared on them. Other variables affect the qualities of mobility: the person's socioeconomic status, physical characteristics of the site, and transportation technology. These are discussed as moderators in the model. The final section comprises conclusions and recommendations for research.

Throughout the paper it is essential to keep in mind the heterogeneity of older Americans today and the future changes that will alter relationships of

age to other variables. Generalizations are presented, but this does not imply homogeneity. Older persons are more different from each other than are persons in any other age group. However defined, the old have a wide age range. For example, retired groups include parents and their children. With regard to any characteristic, diversity may be as great within as between age groups. Changes in older persons accompany alterations in the population's age structure.

Mobility as a major determinant of well-being among older persons has recently become a prominent issue. Several lines of evidence have attracted public attention, including perceptions by older persons, a closer look at housing for the elderly, and research showing decreases in both mobility and well-being with age.

Transportation was the "sleepers" issue at the 1971 White House Conference on Aging (1). Conference planners did not expect it to be a major issue, but delegates ranked transportation third in importance, preceded by income and health. Research confirms that, in general, older persons are not satisfied with their ability to get around in the community (2-5).

Housing for the elderly has been a focus of attention since the late 1950s, and its relevance to their well-being has been documented. "Housing for the elderly" is defined broadly to include the entire living environment. Thus, mobility plays a vital role in this domain by determining accessibility of community resources. Siting studies have shown that residents of retirement housing may sit home and look across an expressway at services and facilities accessible only to those with automobiles (6). In another study, some applicants who were offered apartments in a fine, new public housing facility for the elderly decided not to move in after a tour of inspection because, although the project offered a tremendous improvement in housing, it was surrounded by a slum (7). Most tenants considered the location undesirable, and ratings became more negative over the first 8 years of occupancy. Tenants complained about the scarcity of stores, churches, and eating places, and they feared going out on the street in that part of town to those that existed. The only "convenient" characteristics of the housing project were those that enabled them to meet their needs elsewhere: buses that stopped at the front door and being within walking distance (0.7 mile) from the central shopping district. "The quality of later life depends upon the quality of housing and environment, *made dynamic by transportation*" (7, p. 128).

Older persons make fewer and shorter trips than younger persons (4, 8). Reductions in rate and territorial range of mobility may reflect preferences. A third of all trips and about 40 percent of all vehicle mileage are related to work, and retirement may bring a welcome cessation of that travel (5). However, subtraction of work trips does not equalize travel totals between age groups. Moreover, reduced mobility among older persons is accompanied by

lower self-esteem, feelings of uselessness, loneliness, unhappiness, and depression (9). The fact that decreases occur simultaneously in mobility and well-being does not guarantee that one causes the other. However, such coincidence does suggest that the relationship merits investigation.

Thus, three lines of evidence point to the relevance of mobility to well-being in later life: the views of older people about its importance in their lives and their dissatisfaction with it, recognition that the quality of housing for the elderly depends in part on siting that provides safe access to services and facilities, and research showing diminutions in both mobility and well-being with age. In order to improve the effects of mobility on well-being, it is necessary to understand how these effects occur. The following section outlines a conceptual model of the determinants and dynamics of emotional and social well-being to provide the context for reviewing mobility studies.

A CONCEPTUAL MODEL

It has long been axiomatic that well-being depends on the individual's success in meeting her or his own needs (10–13). The Ecological Model of Aging (14) deals with the interaction between abilities of older people (with regard to health, sensory-motor functions, etc.) and environmental characteristics in the performance of tasks of daily living. Congruence models (15, 16) focus on the degree of fit between needs and environment. Each of these models is partial. The ecological model seems relevant primarily to the frail elderly, who are the minority, and to their maintenance of independent living, which is supportive of but not sufficient for well-being. The congruence models were developed to fit institutionalized groups and reflect their needs and special environments.

The model that provides the framework for this paper is based on general adaptation theory and includes the concepts of the ecological model and the congruence models. It incorporates the needs, abilities, and community environments of the majority of older persons (17, 18). The relationship between needs and environmental resources that determines how well needs will be met is that of congruence. Today, people must go into the community for almost everything they need. The existence of facilities and services is meaningless without access to them. Mobility is a key function in determining the degree of fit between need and resource for meeting it.

The qualities of mobility that facilitate the meeting of needs and thereby support well-being are (a) its feasibility for the person, which includes his or her abilities to perform the activities involved; (b) its safety; and (c) the sense of personal control it provides, that is, the degree to which it enables individuals to meet their needs independently. The feasibility, safety, and personal control of mobility are affected by (a) the socioeconomic status of the person (income may limit the type of transportation available); (b) physical characteristics of the site (severe weather or steep hills, or both, are barriers for older

drivers and pedestrians); and (c) transportation technology (power steering may compensate for loss of upper-body muscle strength; hand controls may allow paraplegics to drive their own automobiles). Figure 1 outlines the model. Its components are explained more fully below.

HUMAN NEEDS AND COMMUNITY RESOURCES

Well-being, as contrasted with mere existence, depends on satisfaction of two categories of needs: those whose satisfaction is requisite to independent living and those whose satisfaction is necessary to give life an acceptable and positive quality. Life-maintenance needs include nourishment, clothing, medical care, pharmaceuticals, and banking. Community resources for meeting them are food stores and other stores, physicians' offices, pharmacies, and banks. Unless, safely and through their own efforts, people are able to gain access to these resources, they cannot live independently. Institutionalization is strongly undesirable to older persons and negatively affects their well-being (9).

Other needs, sometimes labeled "higher-order," include those for social interaction, usefulness, recreation, and religious experience. There is a tendency to downplay this category. In one study (4) the most common trip purpose among older persons was "shopping/personal business"; few trips were work related, and other frequently mentioned trip purposes were "relaxation/enjoyment" and "religious activities." The investigators considered the latter trip purposes "unessential." Work (during employed years), shopping, getting medical care and medicines, and banking are requisite to independent living, but when well-being is at issue—that is, if life is to have an acceptable quality—higher-order needs such as those expressed in trips for relaxation and enjoyment and religious activities are also "essential."

The need for social interaction continues in later life. Although only 5.5 percent of the population under 65 lives in single-person households, this figure rises to 29.4 percent of those 65 and older (19). Older people are therefore more dependent on mobility to meet this common human need. The high incidence of loneliness among the elderly (9) suggests that, for many, affiliative needs are not met. Among two samples of older adults, loneliness (measured by a standard scale) was related to poor emotional and social well-being (20). Unlike the lonely young, the lonely old behaved in ways likely to inhibit restoration of social networks following a personal loss. They did not make plans or learn about available community health and social services. They tended to be anxious and depressed and to have low self-esteem.

During employed years, work not only provides opportunities to be with others, it also demonstrates usefulness. With retirement, customary bases for both aspects of well-being are lost. The prevalence of feelings of uselessness

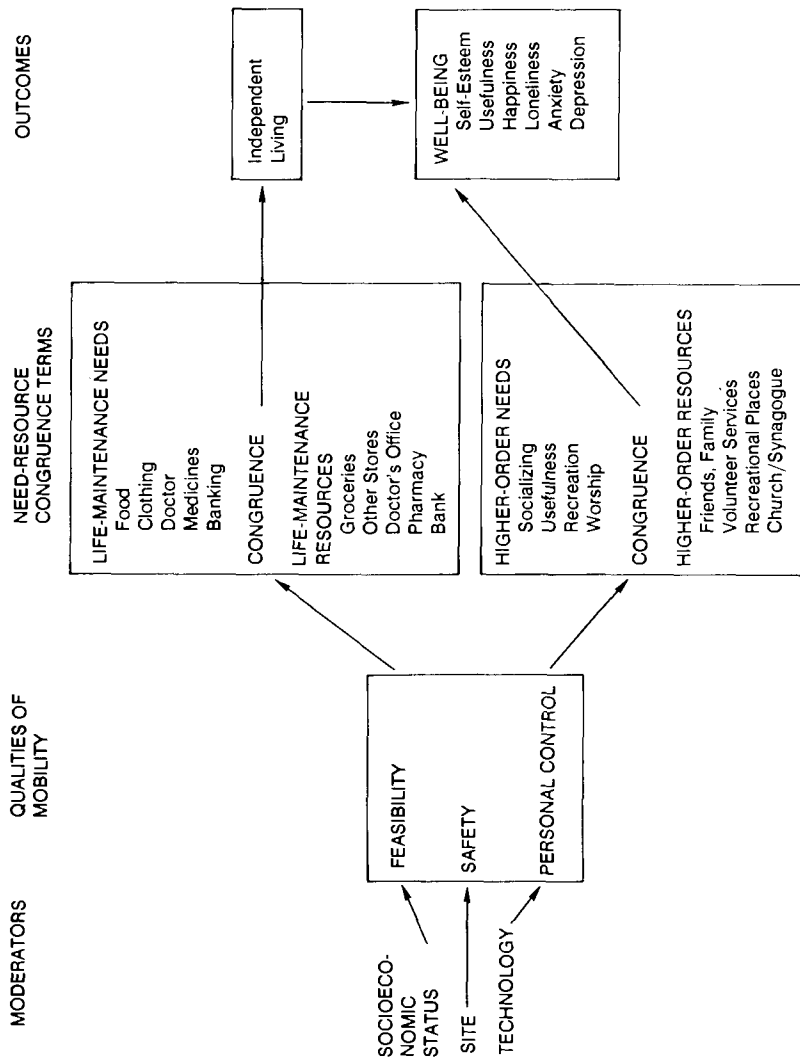


FIGURE 1 Conceptual model.

among older people (9) suggests that new bases are not found. Feeling useless is tied to lack of societally valued activities and is associated with diminutions in happiness and self-esteem (21).

QUALITIES OF MOBILITY

Satisfaction of both life-maintenance and higher-order needs requires going out into the community. Meeting basic needs depends not only on the presence of food stores and other stores, physicians' offices, pharmacies, and banks but also on the person's access to them. Resources for meeting higher-order needs are defined not only by the location of providers (e.g., churches and synagogues, places of entertainment, relatives and friends) but also by their accessibility.

Mobility is a key influence on the congruence term in the model. It largely determines the fit between a person's need and resources in the community by which it can be met. The qualities of mobility that influence its effects on social and emotional well-being include its feasibility, its safety, and the personal control experienced by the traveler. All three factors vary according to mode of transportation; thus, in the following sections each mode is discussed separately.

Feasibility for Meeting Needs

Other papers in this volume deal with specifics of age-related health problems, decrements in sensory-motor functions, and details of transportation design and management that may be problematic for persons with various impairments. Here, primary concern is with older people's perceptions of their limitations in traveling, and of travel conditions that create difficulties for them.

Automobile Driving

As Drivers People are aware of changes in their abilities and of driving situations that become more difficult as age advances. In one metropolitan area survey, problems for older drivers listed by the majority of respondents included visual problems (82 percent); slowing of motor response (75 percent); stiffness and crippling, especially by arthritis (62 percent); and difficulty adjusting to new situations (55 percent). Statistically significant proportions also mentioned decreased alertness and slowing of thinking (22). A survey in a different metropolitan area confirmed these results (23). In both, driving conditions perceived as especially problematic were speed, traffic congestion, complex and confusing signs, unfamiliar streets, and freeway interchanges.

Respondents generally considered speed an inevitable evil about which little could be done. Traffic congestion was thought to be controllable by improved street and highway design and more efficient traffic control. Respondents found no excuse for the proliferating and sometimes seemingly contradictory signs and signals at urban intersections, and most believed that they could deal with unfamiliar streets and freeway interchanges if these were more adequately marked. Street names are inconsistently located, often hidden by trees or other obstacles, and may be difficult to read. On unfamiliar freeways signs may not provide enough information for maneuvering into the proper lane to transfer to another freeway or exit.

Respondents perceived visual problems as the most serious. Losses in night vision were accommodated by reducing night driving to short trips in familiar territory or by eliminating it. Many believed that better printing, placement, and lighting of street signs would enable them to drive safely after dark without becoming lost. The temporary blinding effect of oncoming cars could be reduced by proper installation of headlights and drivers' switching them to low. The driver in a hurry to pass should not tailgate with lights turned up high in an attempt to force another driver to the right when it is impossible to change lanes safely.

Older drivers are extremely apprehensive about losing their licenses (24). The loss would mean inability to go where they needed to go and therefore meet their needs independently. It would mean inability to provide rides to others and so to feel useful. It would make them "feel old," which is negatively related to social and emotional well-being (25). Ex-drivers reported much more difficulty in getting places they needed to go than did drivers, and even somewhat more than persons who had never driven (24). They felt ineffectual, dependent, and demeaned.

Driving is the only mode of transport whose feasibility is determined by official decree. Just as receipt of the first driver's license is an important rite of passage to adulthood and independence, license loss formally identifies one as "over the hill." Age is sometimes used in studies as a stand-in for mobility competence. This is convenient but not accurate. "Age-related" changes are statistically defined: at a given time, older groups tend to score lower on some mobility-related efficiencies. Scores are not uniform across persons in any age group. Correlations with age may change over time. Levels of efficiency relevant to driving, not age, should determine licensure.

Those older individuals whose driving is greater than average for their age, thus resembling that of younger drivers, have accident rates similar to those of other age groups with similar mileage (26). Deterioration of driving skills through disuse among less frequent drivers may affect group rates. Self-assessment inventories (27) and courses of instruction (28, 29) may help older drivers identify and deal more effectively with their problems. Medical advances are reducing the correlations between age and some driving abilities.

For example, improvements in cataract removal and lens implantation enable some persons in their eighties to have restrictions removed from their licenses.

As Passengers Those without automobiles who have physical problems using public transit and walking are most likely to depend on rides (30). Rides are important in providing access to places they need to go, which otherwise would be difficult or impossible to reach. The main problem in feasibility, that is, provision of mobility adequate for meeting one's needs, is insufficiency. Requesting additional rides is inhibited because the riders generally are unable to reciprocate and thereby maintain the give-and-take that is requisite to healthy interpersonal relationships. Consequently, the passenger not only feels dependent but also suffers loss of social equity and therefore self-esteem.

Public Transportation

A major dissatisfaction with public transit is that it frequently does not provide access to the places and at the times older people need to go (22, 31). Transit systems are designed primarily for work commuters, and routes and schedules often do not meet the travel needs of retired persons. Proximity to the stop for "the bus that takes me where I want to go" is critically important; location of "any other bus stop" is irrelevant (32).

The match of abilities with activities involved in using public transit varies with the type and design of transit and the physical condition of the individual. A study in Great Britain compared bus use between retired persons who had physical difficulties in walking and retired persons without such difficulties (33). Interestingly, "the 44 percent of the sample who had physical difficulties with walking, walked more and used buses less than those without such difficulty" (p. 3-23). The physical conditions identified with difficulty in walking obviously made transit use even more difficult than they made walking. The majority (56 percent) of those with walking difficulties and 39 percent of those without such difficulties reported problems in using a bus. Getting to the bus stop and waiting there were about equally problematic to those with and without walking difficulties. However, getting on and off the bus was difficult for more of the former (27 percent) than the latter (11 percent). The validity of the "walking difficulty" measure is questionable in view of the fact that those with difficulties walked more than those without. "Bus-use difficulty" measures should include valid items on walking and on additional factors such as mounting and dismounting steps.

In a bus-use study in this country that did not include walking, ability-activity incongruences were observed at each trip segment studied (34). The wait for the bus was tiring, a drain on the lower energy of older riders. Entering the vehicle was a problem because of the greater agility, strength, and speed of other passengers, which made it difficult to negotiate steps and

enter vehicles before the doors closed. The ride was tiring, especially if one had to stand. In walking to seats or standing in a moving bus, older users had trouble keeping their balance. In alighting they perceived their disadvantages relative to younger passengers—10 percent volunteered that they needed help.

The consensus in this study was that engineers should be able to design steps more easily negotiable by older persons that would not create problems for the young, and sensors that would detect persons in the entry or exit and prevent vehicle doors from closing or drivers from moving the vehicle. Transit aides could ease older persons' problems in entering and leaving vehicles, especially with packages, and would be looked on as extenders of older users' independence (34).

Walking

Older residents of San Antonio (35) and San Francisco (36) reported that too many of their destinations are too far away for them to walk. In describing the ideal situation, older women living alone in Oakland would have most of the 37 listed services and facilities "within walking distance" (37). A major source of dissatisfaction with their existing situations was that many of these resources were beyond walking range.

Food is a basic need, and grocery shopping is an almost universal trip purpose among community-resident elderly. In San Antonio, food stores were beyond walking distance for most (35). In San Francisco, a high percentage walked to the grocery (36). In that hilly city, they could carry only light loads, which often necessitated an undesirably high frequency of trips for food. Moreover, adequacy of diet (on a food diary scored by a dietitian) was negatively related to the slope of the street on which the respondent lived. In neither city did walking provide satisfactory access to facilities for meeting basic nutritional and other needs. Ratings of walking were most favorable among persons who drove everywhere and least favorable among the most foot dependent.

Safety

Automobile

As Drivers There are two separate concerns associated with safety in driving: risk of accidents and danger from crime. Older persons rate the automobile high on "worry about accidents" and equally high on "feel protected from crime" (38).

In terms of rate per vehicle mile, the total elderly age group has more accidents than any other age group except the youngest (26, 29). When involved in accidents, older drivers are much more likely to suffer injury or

death (29). They are five times as likely to be killed in an accident involving another driver under the age of 20, and two and one-half times as likely to be killed when the other driver is aged 50 to 55 (26). Older drivers of small cars are more likely than are younger drivers to be killed when colliding with another small car or a larger one (26). These findings point to the greater physical vulnerability of older persons generally in the driving situation.

Awareness of danger may be a factor in the reduced driving of older drivers and their worry about accidents and may be reflected in reports of "nervousness" (75 percent in one sample and 80 percent in another) and "lack of confidence" (58 percent and 63 percent) (22, 23). However, the automobile insulates travelers against hazards of personal assault such as purse snatching to which walking and using public transit would expose them. Thus, persons who can drive prefer to do so, rather than riding as passengers, because they feel safer when they are in the driver's seat (24). Sitting at the controls of a powerful vehicle that can be locked from the inside seems the safest way to travel.

As Passengers The greatest drawback to feeling safe is distrust in the driver's skill (30). Fears must be suppressed because alternatives are not available. Showing nervousness might jeopardize future rides. Most who offer rides are relatives or friends, and the value of the personal relationship prohibits derogation of the driver's competence. Hence: "I close my eyes and hope for the best" or "I just pray." Fear for safety is prevalent among passengers and they must endure it in silence. The emotional cost may be high.

Public Transportation

Older persons fear being injured in falls or struck by doors when entering and leaving public transit vehicles, and falling by losing their balance during the ride (34). They do not worry about vehicular accidents in bus travel, but perceive the bus as leaving them extremely "unprotected from crime" (38).

Official records probably underestimate crime and fear of crime as deterrents to use of public transit by older persons. The Uniform Crime Reporting (UCR) system does not record the activity under way during commission of a crime or the location, and most police departments do not categorize crime by transit use. Transit providers are responsible for crimes committed on property under their jurisdiction, and this is reflected in their record keeping. Both police and transit systems depend on the public to report crimes. From the viewpoint of an older person considering use of a community resource that involves a trip via public transit, the trip also includes the walk to the vehicle stop and the wait there, plus the walk back home. Fear of criminal victimization during any segment of the trip may inhibit use of transit, and incentives

for reporting incidents experienced or witnessed may be weak. In Los Angeles, police officials considered bus crime to be a small fraction of total crime, but researchers found that 25 to 30 percent of crime reported in home interviews was related to bus travel (39). Interview-reported crime on buses and at or near bus stops was 20 to 30 times higher than that recorded by the transit agency. Over half the crimes reported in interviews occurred before victims entered or after they left the vehicle.

The elderly were more vulnerable to bus crime than any other age group; the more frequently they rode a bus the more likely they were to be victimized (40). More than one in four older people who took a bus daily were victimized between 1982 and early 1984. This is poignant in view of data from two different cities (22, 23): older people who drove automobiles rated public transit very favorably; those who rode the bus gave it low marks—the more frequently they took a bus, the lower the rating. Most victimization during bus use occurred at a few sites at certain hours. Intervention at those places and times should be effective and economical in reducing the overall victimization rate (39).

Is the fear that inhibits use of public transit rational? In the Los Angeles data, fear of transit crime was a function of the same variables as was actual crime. Direct assessment of the effects of fear on bus use was impossible, “primarily because so many of our respondents had no alternative” (40, p. 29).

Wachs (5) objects to stereotyping the elderly as “transit dependent” because only about a third do not have access to automobiles. However, research documents the hazards to older persons who use the bus as well as the fact that many have no option in attempting to meet their needs. It is inappropriate to label the entire elderly population with any tag; descriptors such as “transit dependent,” “poor,” or “frail” fit only some segments of that population. Nevertheless, the situations of those for whom the label is appropriate must not be ignored. Older persons who must rely on public transit are at risk of criminal victimization, regardless of whether they represent a majority of their age peers.

Walking

Fear for their safety while walking was expressed by about two-thirds of older persons in two metropolitan areas (35, 36). They were afraid of being attacked by people or dogs, being hit by a car, and falling. These fears are not unfounded. Elderly pedestrians are about twice as likely as younger walkers to be involved in accidents (41). Those involved in accidents are more likely than younger persons to be injured, and their injuries are more serious (42). Elderly pedestrians suffer five to seven times as many fatalities as do younger persons on foot (43).

In the view of older persons, "pedestrian territory" should be safe from invasion by vehicles (6). Where it is necessary for pedestrians and vehicles to share space, rights-of-way should be clearly indicated and enforced. Signs should be visible and unambiguous. Signals, especially when time intervals are involved, should allow for the rights of pedestrians as well as drivers.

Personal Control

The sense of mastery is basic to well-being. Experiencing loss of control over events leads to feelings of helplessness, dependence, incompetence, and depression (44-46), all of which are widespread in the older population (9). Among older persons, perceived control is negatively related to psychological distress (47) and positively related to emotional and social well-being (48).

Gonda (49) reviewed the literature showing that absence of driving one's own car and consequent dependence on public transit are associated with lower life satisfaction, poorer adjustment, loneliness, and lower activity levels, whereas driving, as compared to depending on others for rides, is linked to higher levels of satisfaction. She concluded that transportation modes affect well-being differentially through the degree of personal control they provide. She attributes the greater well-being among drivers to the fact that driving one's own car supports one's sense of personal control at a stage of life when other supports have been lost. "Driving may be one of the few areas in an older person's life where they can still 'call their own shots'" (p. 65). In a direct comparison of the automobile and public transit on the degree to which travel "makes one feel free and independent," older people rated the automobile much more favorably (38). Gonda did not include pedestrian studies in her review, and walking was not included in the comparison study. However, "independence" was perceived as an advantage of walking by 85 percent of a sample of persons 65 and older (36).

Summary of Mobility Qualities

A century ago, people could walk to work, shops, others' homes, religious services, and most other destinations. In this century "the city has been transformed by transportation technology" (5). Few destinations lie within walking distance for any person, and physical deficits that accompany aging may shorten distances traversable on foot. Walking is perceived to be, and is, unsafe. The walker may be said to have control over where and when to go, but this independence is seriously curtailed by problems with feasibility and safety. Walking earns low marks as a means of meeting one's needs—the more foot-dependent the person the less favorable the rating. The good of both old and young may lie in improving pedestrian conditions. In a study of

considerations that would be important in a prospective change of residence, San Francisco Bay Area residents 18 and older (to 98) rated 15 items (37). Although there was disagreement among age groups on the importance of automobile access to freeways and location of bus stops, "good walking conditions in the area" were "very important" to the majority of all ages.

Automobiles provide access to widely distributed services and facilities, and safety and independence, for those who can drive them. Drivers are the only elderly group satisfied with their ability to get around. Age may bring personal limitations on driving ability. Loss of license is a serious fear among drivers, a threat to their autonomy, usefulness, and self-esteem. Ex-drivers are the least able to meet their own needs. Relatively frail elderly find the supply of rides inadequate, have little control over when and where they are taken, and fear for their safety on many trips. Accepting rides reinforces loss of independence, and the necessity to suppress fears about safety is emotionally costly. Public transit routes and schedules often do not accommodate the needs of retired persons; physical deficits associated with aging make its use more difficult; it is realistically perceived as unsafe; and it does not engender a feeling of personal control. The more dependent the older person on public transit, the lower her or his ratings of that mode of travel.

The literature supports feasibility, safety, and personal control as qualities that influence the effects of mobility on well-being.

MODERATORS

Socioeconomic Status

The type of transportation available to a person—and therefore its feasibility, safety, and personal control—is influenced by factors such as income, education, ethnicity, sex, household composition, location of residence, and automobile ownership. Wachs' (50) "life-style," defined by clusters of such items, affects mobility. A "deprivation index" of such variables devised by Carp and Carp (48) accounts for significant variance in the well-being of older persons.

Automobile ownership has been identified in many studies as the most powerful correlate of mobility and satisfaction (4, 33, 50, 51). It varies according to income, sex, household composition, ethnicity, and location of residence, all of which are also related to mobility and satisfaction with one's ability to get about in order to meet one's needs (4, 33, 50, 51).

Location of residence is related to income, education, and ethnicity and affects the quality of transportation available (3, 50). The rural elderly have special problems in getting to where their needs can be met. Facilities and services are so far from home that walking is impossible; roads may be narrow and poorly paved, and public transit tends to be poor or absent (2). Most of the elderly live in urban areas. However, their numbers in the suburbs are

increasing because of both "aging in place" (52) and migration (53). Income is relatively high among suburbanites, which supports automobile ownership and driving safely and independently. Because of the distribution of community resources and the design of public transit for those who commute to work, older residents remain drivers for as long as possible (2). For the same reasons, when they become ex-drivers, their ability to meet their own needs is restricted (23). Central-city elderly were reported to make fewer trips than residents of other areas, in a study that did not include walking (50). However, in New York City (54) and in San Antonio and San Francisco (55), studies that included walking found high rates of trip taking by inner-city elderly as compared with others.

The effect of socioeconomic status on mobility is accentuated by the poor match between the transportation services and the socioeconomic status of residents in an area (50). On the basis of a 1979 study, those in Hispanic neighborhoods had very low incomes, and few had automobiles or licenses; yet bus service in those areas was poor, and taxi costs were high. Although residents of older suburbs had much greater access to automobiles, bus service was better in their areas and taxi rates were lower.

The socioeconomic status of older persons tends to be inferior to that of other age groups. Automobile ownership is lower (56). Financial resources are diminished (2). Women outnumber men; they are more likely to live alone, and older women living alone are the group with the lowest income (57). Older women are also less likely to drive automobiles (58).

Site

Differences in mobility between Houston and Miami (4) and between Ontario and Orange County (59) suggest the influence of characteristics of the data-collection site. The issue of site effects was addressed directly by testing hypotheses derived from differences between two additional areas, San Francisco and San Antonio (23). Total population size and socioeconomic status of respondents were the same between the two sites, thus removing the effects of these variables. San Antonio sprawls over the Texas plain. San Francisco is compacted into a small area, much of it hilly; residential lots are smaller and thus homes are closer together. Neighborhood groceries, other shops, and recreational facilities are more plentiful in San Francisco than in San Antonio, where stores and recreational services are clustered in major malls. San Francisco provides more complete transit coverage of residential areas and routing among them. In San Antonio public transit corridors radiate from the center, which necessitates transferring and involves greater distances and longer trip times than reaching the same destination by car. A lower rate of automobile use was predicted for San Francisco because of the deterrent effect of hills for older drivers. Walking was predicted to be more common because

of the proximity of homes to each other and to other facilities. It was expected that San Franciscans made greater use of public transit because of its proximity to their homes. The study data supported all three predictions.

Predictions on differences in frequency of trip types and mode of transportation used for them also were confirmed. San Franciscans made more trips to shop for food and other goods, to visit friends and neighbors, and to use places of recreation. Over two-thirds of San Franciscans but only one-fourth of San Antonians fetched groceries on foot. Many San Antonians (41 percent) but few San Franciscans (16 percent) did "other shopping" by automobile; transit was used for this purpose by three times as many San Franciscans (54 versus 18 percent).

The most impressive difference was in trips for recreation. Most San Franciscans (55 percent) went out for entertainment and recreation (to a club, play, movie, etc.) at least once a week, whereas only 3 percent of San Antonians went out that often. The distribution of transit was crucial. Over one-third (38 percent) of such trips in San Francisco, but only 2 percent of them in San Antonio, were by transit. The influence of neighborhood facilities is also obvious. Three times as many San Franciscans walked between home and the place of entertainment or recreation, despite the hills.

Evaluative perceptions were consistent with behavior. In San Francisco automobile driving received poorest marks (87 percent said it did not meet their needs "at all"), transit received the most favorable ratings (57 percent said it met their needs at least "fairly well"), and walking and riding as a passenger in a private car held the middle ground. In San Antonio all transportation modes received lower ratings in meeting respondents' needs. Transit and walking were given the poorest marks; driving and riding were rated relatively well.

Transportation Technology

In addition to the distribution of transportation facilities, technology moderates the fit between a person's abilities and the physical environment of travel. Studies demonstrate that age differences in performance attributed to "age-related" declines in abilities may disappear after certain technological alterations. For example, older drivers had to drive one-third to one-fourth the distance closer to a standard sign than did younger subjects to make a correct identification (60), but there was no age difference if the symbol appeared on a background having high luminescence contrast (61). For all transportation modes, such technological issues as readability of signs and timing of signals affect the feasibility, safety, and personal control of travel.

CONCLUSIONS AND SUGGESTED RESEARCH

Studies on the mobility of older persons fit well into a conceptual model based on general adaptation theory and gerontological literature on social and emotional well-being. In summary, well-being depends on success in meeting life-maintenance and higher-order needs. Satisfaction of any need depends on congruence between the need and the resources for meeting it. Mobility is a key factor in determining the degree of congruence, because community facilities and services are irrelevant if they are inaccessible. Characteristics of mobility that affect its contribution to well-being are feasibility, safety, and personal control. These properties are influenced by the socioeconomic status of the individual and characteristics of the broader environment in which she or he lives, including transportation technology.

This is a first-generation model that requires more explication and refinement. However, viewing the mobility literature within the model's framework suggests benefits from integrating what generally have been two separate lines of investigation. Understanding social and emotional well-being in the elderly may be furthered by inclusion of the mobility factor in theoretical models and study designs. Policymakers and planners may be better assisted by research that includes well-being as an outcome.

With regard to feasibility, distance to the needed destination lies within the province of urban planners and transportation providers, and research is needed to clarify the specifics of the fit between abilities of older persons and activities involved in use of each transportation mode. This requires identification of which of the many age-related changes in persons are relevant to each activity; then identification of how, in each case, feasibility of use can be improved by (a) compensations for personal deficits (e.g., cataract removal), (b) changes in transportation distribution and design (e.g., luminescence contrast of signs), and (c) education and training to enable the older person to recognize and deal more effectively with problematic situations (e.g., turning the head or using mirrors to see behind if peripheral vision is constricted).

With regard to safety, older people's fears seem realistic in view of accident and fatality rates. Efficiency and economy of attempts to improve travel safety can be improved by research. A few sites and times were identified as contributing disproportionately to bus crime in one city. Similar studies should be carried out at various sites and with all transportation modes; interventions should be evaluated. The sense of personal control experienced by the traveler needs further investigation. Such investigations should consider travelers' perceptions, which may not be obvious to planners. For example, although rides from family or friends threaten autonomy, transit aides are seen as supportive of independence.

Socioeconomic variables often are used as controls to eliminate their effects on study results. It may be preferable to interpret them as moderators and

assess their power relative to other variables. Attention should be paid to subgroups deprived on many socioeconomic variables (e.g., residents of minority-ethnic neighborhoods, older women living alone). Failure to consider site characteristics may produce discrepant results among studies and delay understanding of the role of mobility in well-being. Some site characteristics have been shown to affect mobility. Others probably should be included (e.g., climate). Site differences in transportation technology merit special consideration because they affect all qualities of mobility that underlie its effects on well-being. Research in transportation technology can dramatically improve the well-being of the elderly by increasing the congruence between abilities and activities.

In all areas of research certain considerations are important. One is the quality of the data for the study purpose. Official records are convenient and often valuable sources of data. However, care must be taken to ensure that the purpose and design of the records are consistent with those of the research. The UCR system was implemented to provide consistency of crime records throughout the nation. It was not intended to be a measure of resident experience and fear of victimization and is therefore of questionable value in drawing conclusions about the latter. In attempts to understand the roles of crime and fear of crime as deterrents to use of public transit by older persons, transit system records only give part of the story. Transit providers are no more responsible for criminal victimization during walks to and from a bus stop than are proprietors of grocery stores or providers of any other community facility or service. Transit crime records are designed for transit system needs, not to provide a full view of exposure to criminal victimization during the entire trip for the community involved.

The quality of data is affected also by the validity of instruments developed by researchers. The validity of a measure of "walking difficulty" that predicts more walking among those with difficulties is questionable. In understanding person-environment fit in bus use, an ability measure should include items relevant to performance of tasks in each segment of the trip. The same is true, of course, for other modes.

In all studies the central variable or variables of interest should be clearly identified and defined, and the appropriateness of the data should be assessed for relevance to study outcomes. For example, conclusions about overall mobility rates for residents of central cities contrasted with those of other urban areas differ between studies that do and do not include walking. Use of age as a stand-in for competence violates the basic assumption that competence-activity congruence underlies well-being. At any age, persons vary widely in mobility-related abilities; and the greater the age, the wider the variability. Correlations between age and abilities observed today may be reduced or eliminated by future changes in many areas, including medicine, socioeconomic conditions, and transportation technology.

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