# Demand for Intercity Bus by the Rural Elderly

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**What role could and should the intercity bus play in serving the growing elderly population in rural areas? Telephone and on-board surveys were conducted in a corridor in Northern California to learn who used intercity buses and who did not, and why. It was found that only a tiny number of elderly riders were "captive"; the remainder had similar demographic, socioeconomic, and auto accessibility characteristics to those who did not use intercity buses. This finding implies that the potential for expanding ridership may be significant, but also implies that the intercity bus does not provide an essential public service to elderly people. To understand and predict ridership, future studies of intercity bus demand should focus on the particular circumstances and lifestyles of individuals living in differing sociocultural environments, not on traditional demographic, socioeconomic, and auto accessibility indicators.**

The elderly population of the United States is large and expanding (people 55 and older are projected to increase from 20.8 percent to 28.4 percent of the U.S. population between 1980 and 2020); more than 40 percent of these elderly people live in rural areas and small cities outside metropolitan areas (*1*). These elderly people have special transportation needs: besides experiencing diminishing physical mobility, they often live in remote locations and, compared with their metropolitan counterparts, are poorer and have less access to social services (*2–4*). Thus, despite reduced access to the automobile-based transportation system, their need for health and other social services continues to grow. To government they are a special problem (*5, 6*); to intercity bus companies they are an opportunity (*7*). As this elderly population grows, the question arises as to what role the intercity bus should or could play in rural areas (*8*).

Elderly bus riders and a sample of elderly residents in a corridor in Northern California were interviewed to learn which of them used intercity bus service and which do not, and why. The study had two initial objectives: (1) to specify how elderly riders are different from the larger elderly population (in terms of income, sex, education, age distribution, access to autos, etc.), and (2) to explore the potential for expanding intercity bus ridership among the elderly. The study corridor included several cities at each extreme of the corridor and rural settlements between them.

Ridership by the elderly on intercity bus in the study corridor was very low—about 3.3 passengers per vehicle-service hour. We were aware beforehand of this low level of ridership and had observed the same low patronage patterns in numerous other rural corridors in California (D. Sperling, unpublished data). What was not known and what emerged as a surprising finding of this study was that only a tiny number of riders could be characterized as "captive"; most elderly people who used intercity buses could not be readily distinguished from the much larger elderly non-user population. In other words, non-users and users had similar demographic, socioeconomic, and auto accessibility characteristics.

This finding has two implications: on the one hand, since intercity bus riders were, for the most part, like other elderly people, there is reason to believe that potential demand by the rural elderly is very large; on the other hand, the absence of a significant transit-dependent population suggests that intercity bus does not provide an essential public service.

## DESCRIPTION OF THE STUDY CORRIDOR

This study of the demand for intercity bus by the elderly was conducted in a lightly populated area of Northern California (see Figure 1). At one end of the corridor is Eureka, a small city of 24,153 people on the Pacific Coast (all population figures are from the 1980 national census). At the other end of the study corridor, 150 miles to the east by road, is Redding, a somewhat larger city of 41,995 which is located on the upper edge of the rich agricultural valleys of the state. The area between Eureka and Redding is mountainous and heavily forested; the largest intermediate communities are Arcata (pop. 12,340, adjacent to Eureka), Weaverville (pop. 2787) and Blue Lake (pop. 1201). Eight other communities, all with populations less than 1000, also lie within the corridor. The total population in the corridor is about 90,000.

Redwood Empire Lines (REL) is a private bus company which has operated continuously since 1938; in recent years it has provided the only intercity bus service in the Redding-Eureka corridor. In 1985, when the surveys were conducted, REL provided twice-daily service with 14 scheduled stops between Eureka and Redding. REL's service provided access to many connecting transportation services. In Redding, transfers could be made to Amtrak, Greyhound, and Trailways buses, several airlines and a weekend-only intercity bus, as well as to the local transit services. In Eureka, transfers could be made to Greyhound, several local transit services, and a limited regional bus service (see Figure 1).

Eureka and Redding are both important regional centers. Eureka has two colleges, a major hospital, several shopping centers and various commercial businesses. Redding also provides major medical facilities, shopping centers, and commercial businesses. The nearest metropolitan centers are the

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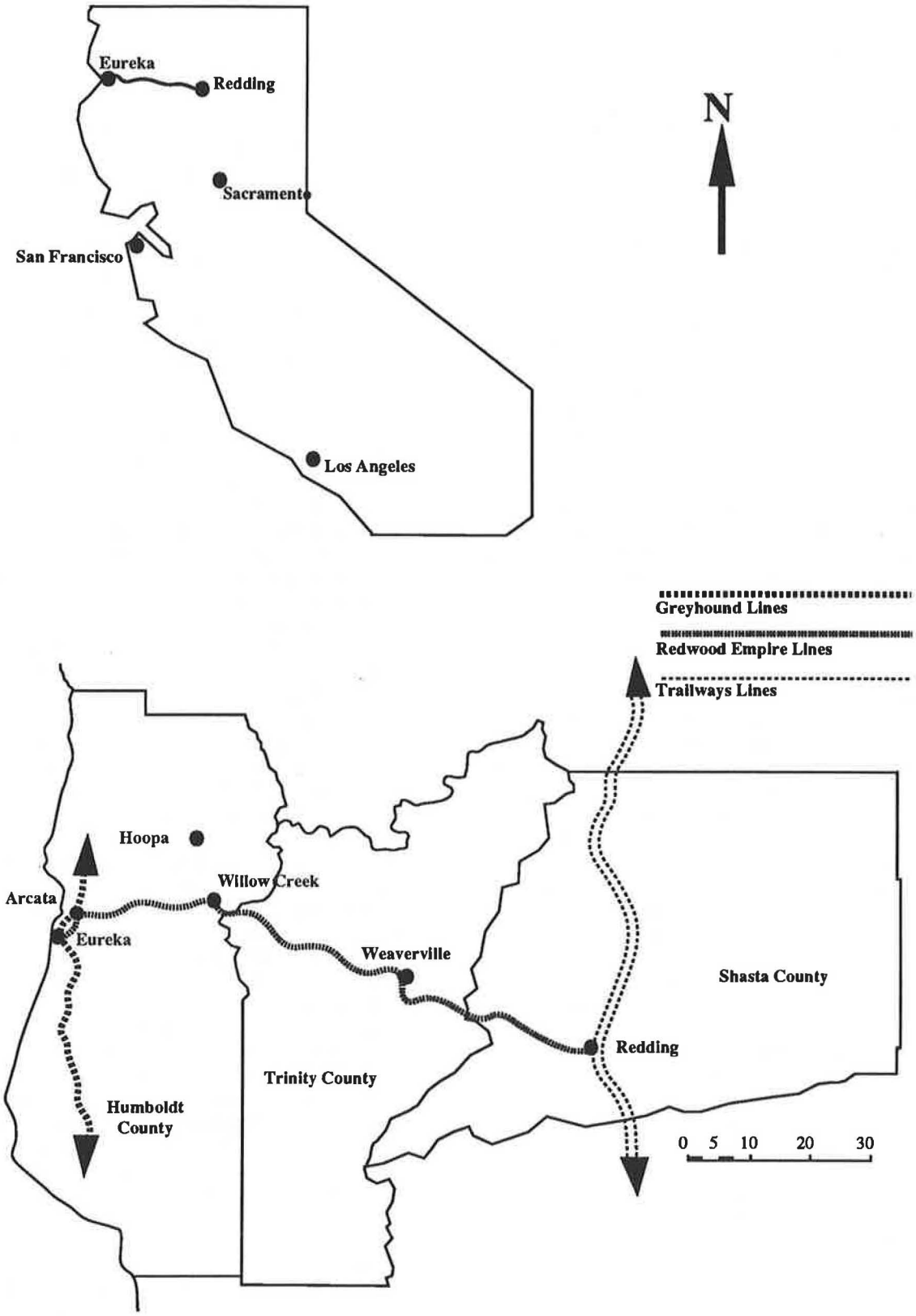


**FIGURE 1 Map of study corridor, Eureka-Redding.**

San Francisco Bay area, 250 miles south of Eureka, and Sacramento, 160 miles south of Redding.

## RESEARCH APPROACH

To find out which elderly people use intercity buses and why, we designed two surveys: a user survey administered on the buses and a survey of elderly residents conducted by telephone.

The on-board user survey was administered during a two-week period (7–20 December 1985) to all passengers 55 or older. Since almost all trips began at or near the two ends of the route, a schedule was devised so that the interviewer could cover both of REL's runs in the same day. In doing so, the interviewer did not ride the entire route and as a result, some passengers riding to and from the intermediate rural communities may have been eliminated from the sample. These missed riders are few. A total of 69 passengers were identified; 14 refused to participate, one was sleeping, and one did not speak English, leaving 53 usable interviews. The questionnaire elicited socioeconomic and demographic data as well as information on accessibility of individuals to motor vehicles. Trip data obtained included origin and destination, other transportation modes used for the trip, travel time, trip purpose, and frequency of use of REL intercity bus service. Riders were asked to assess the quality of the transit service, and to state how or where they learned of the service.

A telephone survey of residents in the bus corridor was conducted during the same period as the user survey. The telephone-administered questionnaire was designed to resemble the on-board survey so they could be compared. The sample was drawn from telephone directories for the 14 "cities" lying along the bus route in Shasta, Trinity, and Humboldt counties (including the directory for the independent telephone company in Weaverville). Some bias was created by using telephone directories since some people, especially low-income people, do not have telephones, and others have unlisted numbers. Elderly people in convalescent hospitals and retirement homes are also missing from directories: however, the number of these missing households and individuals is estimated to be small. Altogether, 237 elderly persons were interviewed by telephone.

This sample was obtained by dialing every 20th non-business listing in each of the telephone directories comprising the study corridor. Only elderly residents (55 or older), present in about 40 percent of telephoned households, were interviewed. Call-back and replacement procedures were followed for unanswered and refused calls. The refusal rate was 18.9 percent. A lower sampling rate was used in Eureka, Arcata, and Blue Lake, with the result that residents in those areas were somewhat under-represented in the survey. Sensitivity tests indicate that our findings were not affected by the lower sampling rate in the three under-represented communities.

## PREDICTORS OF DEMAND

Why do some elderly people use intercity bus service, while others do not? While an investigation of behavioral motivations was beyond the scope of this study, it was possible to identify those attributes associated with people more likely to use intercity bus service. We hypothesized that lower-income, less educated people and people without access to an automobile (i.e., those without a license and motor vehicle) would be the most likely users of intercity buses. We also tested other attributes: length of residence in domicile community, education, physical disabilities, age, sex, state of employment, and household size.

Our two surveys generated three study groups: bus riders interviewed on board the bus, bus users interviewed at home by telephone, and non-users interviewed by telephone.

A chi-square analysis was conducted to identify statistically significant differences between user and non-user populations (from the telephone survey). As shown in Table 1, we found two significant differences (at a 5 percent level of significance): non-user households were more likely to have access to a motor vehicle and to have (or have had) a driver's license. Only 3.8 percent of the non-user households did not own an automobile or truck, in contrast to 13.9 percent of the user households, and 11 percent of the non-user population did not have a current driver's license, compared to 24.1 percent of the user population. The findings were consistent with those of the on-board survey: 12.9 percent of user households did not own a vehicle (comparable to the 13.9 percent figure for telephoned users) and 22.6 percent of the on-board users did not have a driver's license (like the 24.1 percent of telephoned users). These relationships were expected; for example, an intercity bus survey in Texas found that 76 percent of riders 65 years or older owned a car, and a survey in Michigan found that 62.4 percent of "retired" riders owned at least one motor vehicle (*9, 10*). What was surprising is that these differences in accessibility to motor vehicles, measured in terms of driver's licenses and vehicle ownership, were not greater between users and non-users.

Even more surprising was the lack of differentiation with respect to other attributes. Intercity bus users were similar to non-users in age distribution, income, sex, household size, length of residence in current community, and physical disabilities (Table 1). Differences were not statistically significant at a 5 percent level of significance for any of these attributes. Of the elderly bus riders, most were under 70 years of age (61.9 percent of telephoned users and 70 percent of on-board users), but this was similar to the age distribution of elderly non-users (63.4 percent under 70). Likewise, the male-female ratio was similar for users and non-users in the telephone survey (44.3/55.7 vs. 46.2/53.8). Income was not distributed equivalently for the different groups, but there was no discernible pattern. Indeed, if anything, the users tended to be somewhat more affluent than non-users (30.6 percent of telephoned users and 14.3 percent of on-board users earned $30,000 or more compared with 12.7 percent of non-users).

Similarly, users tended to be more educated (50.7 percent of telephoned users and 39.3 percent of on-board users had completed one or more years of college vs. only 31 percent of non-users), but the relationship was not statistically significant.

Based on the telephone survey, the proportion of users who lived alone was almost identical to that of non-users (22.8 percent vs. 21 percent), although the proportion of single-person households was much greater in the on-board survey (48.4 percent).

The self-reported data on physical disabilities indicates that a somewhat smaller proportion of the telephoned users had

TABLE 1 CHI-SQUARE TESTS OF DIFFERENCES BETWEEN USERS AND NON-USERS—TELEPHONE SURVEY

| Characteristic | n | D.F. | Total Chi Square | Probability | Are Differences Statistically Significance ($\alpha$ = 0.05%) |
|---|---|---|---|---|---|
| Income | 205 | 3 | 6.64 | .05<p<.10 | no |
| Education | 290 | 2 | 5.77 | .05<p<.10 | no |
| Age | 303 | 6 | 8.28 | .20<p<.30 | no |
| Sex | 307 | 1 | 0.48 | .80<p<.90 | no |
| Disability | 308 | 1 | 1.39 | .20<p<.30 | no |
| Retirement | 307 | 1 | 1.09 | .20<p<.30 | no |
| Ever Have Driver's License? | 306 | 1 | 5.83 | .01<p<.02 | yes |
| Have Current Driver's License? | 309 | 1 | 5.31 | .02<p<.05 | yes |
| Household Size | 304 | 1 | 0.07 | .07<p<.80 | no |
| Number of Cars | 301 | 1 | 7.12 | .001<p<.01 | yes |
| Length of Residence | 305 | 3 | 1.80 | .70<p<.80 | no |

disabilities that prevented them from driving an automobile than non-users (5.1 percent vs. 11.2 percent) The responses regarding transportation handicaps are consistent with those reported by T. Au and D.M.B. Baumann in a 1981 report from the Transportation Systems Center (*11*). The proportion for users surveyed on board was 12.5 percent.

The length of time a person had lived in the same community also was not a good predictor of whether a person would use intercity bus services. Users in the telephone survey tended to have lived in the same community for a somewhat longer period than non-users, but the difference was small: 25.3 percent of telephoned users (and 20.5 percent of on-board users) had lived in the community less than 10 years community vs. 20.5 percent of non-users.

## OTHER SALIENT CHARACTERISTICS OF ELDERLY USERS

As in other studies of intercity bus demand (*12–14*), we found that most elderly passengers were visiting friends and relatives; 59.8 percent of on-board passengers stated this as the primary purpose of the trip. The next most common trip purposes were "recreation or entertainment" (8.8 percent), "visit doctor or dentist" (8.8 percent), personal errands (5.9 percent), shopping (2.9 percent) and work-related (2.9 percent).

Closer examination of trip patterns of on-board users provides some important insights on trip-making behavior. A large proportion of the passengers (36 percent) were traveling to or from locations outside the corridor, and had made at least one transfer to a different bus route or different mode during their trip. This non-resident user cohort contained a much higher proportion of women than did the cohort of users who resided in the corridor (15 out of 17 vs. 20 out of 33). A disproportionate number of non-corridor users also tended to be in one-person households (13 out of 16 vs. 15 out of 31). Other differences between the resident and non-resident groups (e.g., car ownership, age) were not statistically significant (see Table 2). Thus, a principal market for intercity buses appears to be trips of intermediate length—which are too long perhaps for the person to ask a friend or relative for a ride, but not long enough to justify the time and expense of traveling to out-of-the-way airports at the origin and destination ends of the trip.

To understand better who uses intercity buses, and to what extent elderly people rely on intercity bus transit, we compared frequent and infrequent riders. Frequent riders were defined as those using the REL service at least twice in two weeks (the current trip plus one previous trip). Frequent and infrequent users were similar in terms of income, sex, age, household size, and length of residence in the community. But in other important ways, the more frequent users among the elderly differed greatly from the less frequent users (see Table 3). One-fourth of the more frequent users lived in a household without a car, one-fourth had a disability that prevented them from driving, and almost one-half (43.8 percent) did not have a current driver's license. In contrast, every person in the "infrequent" group had a driver's license, lived in a household that owned a car, and were free of physical disability. The frequent elderly users also differed significantly in terms of retirement and place of residence. The frequent elderly passengers were much more likely to be retired (82 percent vs. 44 percent) and to live in outlying rural communities (44 percent vs. 0 percent) than the infrequent elderly riders. The survey therefore provides compelling evidence

TABLE 2 CHI-SQUARE TESTS OF DIFFERENCES BETWEEN PASSENGERS RESIDING IN THE CORRIDOR AND THOSE RESIDING ELSEWHERE—ON-BOARD SURVEY

| Characteristic | n | D.F. | Total Chi Square | Probability | Are Differences Statistically Significant ($\alpha$ = 0.05%) |
|---|---|---|---|---|---|
| Income | 35 | 3 | 0.54 | .90<p<.95 | no |
| Education | 42 | 2 | 0.23 | .80<p<.90 | no |
| Age | 45 | 4 | 0.38 | p<.95 | no |
| Sex | 52 | 1 | 4.90 | .02<p<.05 | yes |
| Disability | 49 | 1 | .01 | .90<p<.95 | no |
| Retirement | 46 | 1 | .05 | .80<p<.90 | no |
| Ever Have Driver's License? | 48 | 1 | .14 | .70<p<.80 | no |
| Have Current Driver's License? | 47 | 1 | .69 | .30<p<.50 | no |
| Household Size | 47 | 1 | 4.73 | .02<p<.05 | yes |
| Number of Cars | 47 | 1 | 1.09 | .20<p<.30 | no |
| Car Availability | 40 | 1 | 0.15 | .50<p<.70 | no |

that indeed a captive population exists, but that those persons are captive not because they lack the means to afford a car, but because they have a disability and or lack a driver's license, or both. That is, they are captive because they are physically incapable of driving or lack the confidence to do so, and because they either live alone or in a household with others who also do not drive.

## HOW LARGE IS THE TRANSIT-DEPENDENT ELDERLY POPULATION?

The number of elderly people in the corridor who rely on intercity transit is very small. Our on-board survey, which covered all bus trips during a full two-week period, found only about 10 people who lived in a household without a motor vehicle, and who used the intercity bus service.

Results from the telephone survey are, at first glance, at odds with those of the on-board survey. We found from the telephone survey that 5.2 percent of the elderly population in the corridor (representing about 1000 people) belonged to a household that did not own a motor vehicle. Several reasons explain why these 1000 people are not patrons of the REL service. First, most of these elderly people lived in the cities lying at the extreme ends of the corridor; most of these people do not travel in the corridor in large part because each end of the corridor lies in the hinterland of a different and much larger city—San Francisco in the case of Eureka/Arcata, and Sacramento in the case of Redding. In our telephone survey, the 14 percent of respondents who lived outside the three cities represented 46 percent of the REL users. Second, four percent of the telephone respondents indicated that in addition to not owning a car, they also had a physical disability which prevented them from using buses. Indeed, many people with disabilities find it easier or are more comfortable using a car than a bus. These two explanations narrow the list of 1000 potential captive riders in the corridor to perhaps 300 or so. Of these 300, a large proportion rely on neighbors, friends, and relatives for transportation. Our telephone survey found that of 43 respondents who were either auto-handicapped, without a driver's license, or without a vehicle, and who remembered the last trip they took in the corridor, fully 27 had relied on a friend or relative for transport on that trip. Only two had used a bus.

We cannot precisely specify the size of the captive population that travels in the corridor, but evidence from the surveys suggest that it is minuscule—less than one percent. The lesson seems to be that the automobile truly is ubiquitous; ownership is no longer a question of income. Almost all elderly people either have access to a car or have close friends and relatives that are willing to provide transportation.

These findings suggest that intercity bus may not provide an essential public service to the rural elderly; that is to say, there is no large disadvantaged elderly population in rural areas that depends on intercity bus service for transportation.

## MARKET POTENTIAL

We have suggested that the captive ridership for intercity bus service is very small. Intercity bus companies cannot expect

TABLE 3 CHI-SQUARE TESTS OF DIFFERENCES BETWEEN FREQUENT AND INFREQUENT USERS—ON-BOARD SURVEY

| Characteristic | n | D.F. | Total Chi Square | Probability | Are Differences Statistically Significant ($\alpha$ = 0.05%) |
|---|---|---|---|---|---|
| Income | 21 | 3 | 2.18 | .50<p<.70 | no |
| Education | 28 | 2 | 0.42 | .80<p<.90 | no |
| Sex | 33 | 1 | 0.008 | p>.99 | no |
| Age | 30 | 6 | 4.98 | .50<p<.70 | no |
| Disability | 32 | 1 | 4.03 | .02<p<.05 | yes |
| Retirement | 34 | 1 | 4.86 | .02<p<.05 | yes |
| Have Current Driver's License | 36 | 1 | 10.86 | p<.001 | yes |
| Household Size | 31 | 1 | 2.64 | .10<p<.20 | no |
| Number of Cars | 31 | 1 | 4.31 | .02<p<.05 | yes |
| Length of Residence | 47 | 1 | 3.82 | .05<p.<.10 | no |

to draw ridership principally from the rural poor or the rural elderly. Today's market for intercity buses is not determined by socioeconomic or demographic attributes, or even auto accessibility. In today's automobile-saturated society, the market for intercity buses is largely based on circumstances: that is, the potential market for intercity buses depends on providing convenience, comfort, and competitive fares. Clearly, intercity bus companies are not competitive with the automobile across the entire population, but buses can be attractive to certain people in certain situations: those living near a bus stop or with a destination near a bus route and who do not place a high value on time. Many people might fit these criteria, especially elderly, retired people.

## FUTURE RESEARCH

In view of these findings, why is ridership on intercity buses in the Redding-Eureka corridor (and in the United States in general) so low? Part of the explanation is that the elderly travel less than younger people, and that access to buses is low in rural areas because of the low population density. A more comprehensive answer, we believe, stems from on a combination of individual and social, or sociocultural factors. Most people in the United States, especially those in rural areas, have little or no experience with modes of transportation other than automobiles and light trucks. We therefore hypothesize that some rural people are actively or passively resistant to major changes in their travel behavior, and perhaps intimidated by the unknowns of intercjty bus travel.

Some evidence supporting this hypothesis is provided by our surveys. We asked riders and telephone respondents how they learned of REL's bus service. The differences between users and non-users is revealing. Telephone respondents who had never used the REL service, but were aware of it, mostly learned of it via newspaper (21 percent) or by seeing the bus or bus stops (about 50 percent). Fewer than one-fourth of the respondents learned of the service from friends or relatives. In contrast, of telephone respondents who had used the bus, more than 70 percent learned of it from friends and relatives (and, in most cases from other sources as well). The on-board bus users were also introduced to the bus primarily by friends and relatives (78 percent). While this is not definitive evidence, it does suggest that elderly people (and possibly others) in rural areas and small cities are reluctant to use a bus unless introduced to it by someone they know (*15, 16*).

Other evidence that the use of intercity buses is an unfamiliar and intimidating experience is provided by the income and educational levels of the bus users. As reported earlier, there was a tendency (not statistically significant) for the users to be better educated and more affluent than the general population. This unexpected relationship can perhaps be explained by the likelihood that better educated and more affluent people explore the various options available and attempt new experiences in resolving a particular problem or situation.

Unfortunately, we did not design the questionnaire to accommodate exploring market potential from this perspective of culture and individual life experiences. We followed the conventional practice of travel demand analysis studies in attempting to identify personal characteristics of elderly people that would be good predictors of demand. That approach is not fruitful. Future investigations of intercity bus demand should investigate individual circumstances and lifestyles of elderly people living in differing sociocultural environments and should rely at least in part on less structured survey formats such as focus group interviews.

## ACKNOWLEDGMENTS

This research was funded by a grant from the Intercity Bus Branch, California Department of Transportation. The authors would like to thank Redwood Empire Lines for their cooperation, Don Dean for his interest in and support of this project and Martin Wachs, Robert Kuehne, Steve Zimrick, and Don Dean for their insightful reviews of the paper.

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*Publication of this paper sponsored by Committee on Intercity Bus Transportation*