U.S. CARSHARING & STATION CAR POLICY CONSIDERATIONS

MONITORING GROWTH, TRENDS & OVERALL IMPACTS

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ABSTRACT

Since the late-1990s, over 25 U.S. shared-use vehicle programs—including carsharing and station cars—have been launched. Given their presumed social and environmental benefits, the majority of these programs received some governmental support—primarily in the form of startup grants and subsidized parking. As of July 2003, there were a total of 15 shared-use vehicle programs, including 11 carsharing organizations, two carsharing research pilots, and two station car programs. Over the last five years, U.S. carsharing membership has experienced exponential growth.

Despite this expansion, the social and environmental impacts and long-term sustainability of these services remain unclear. As part of their U.S. shared-use vehicle survey (August 2002 to July 2003), the authors documented market growth/trends and limited, systematic evaluation of program impacts. While 80 percent of shared-use programs implement internal customer surveys (initial or follow-up), only a handful of independent studies have been conducted to date. Across organizations, participant use and program benefits are measured using a variety of study tools and metrics. Given current shared-use vehicle growth and the ongoing interest of policymakers and government agencies in this concept, the authors recommend a longitudinal monitoring approach to better understand market developments, social/environmental impacts, and targeted policy strategies. Furthermore, the authors conclude that coordinated, program-wide data collection (consistent survey instruments and performance measures) could enhance overall market awareness and the credibility of shared-use vehicle organizations in leveraging additional public support.

Key Words: Shared-Use Vehicles, Carsharing, Station Cars, Market Developments, Impacts, and Policy Monitoring

INTRODUCTION

Automobiles have profoundly influenced land use and travel in the U.S. by providing unprecedented flexibility, convenience, and speed. Despite the myriad benefits offered by private vehicles, there is an increasing recognition of the negative social and environmental impacts of car dependence *(1, 2)*. Costs include traffic-related deaths, congestion, air and water pollution, and suburban sprawl. To date, strategies to reduce auto use and dependency have largely focused on public transit. Shared-use vehicle programs represent an intermediate solution—situated between public transit and private vehicle ownership—to addressing several auto-related concerns. Furthermore, shared-use vehicles have the potential to complement existing transportation infrastructure (e.g., transit linkages and parking efficiencies) at significantly less cost than transit extensions, roadway expansions, and added parking structures.

Shared-use vehicles can be thought of as short-term auto rental in which members pay only for the time they use a car, with operators providing for vehicle maintenance, repair, and insurance. The expression “shared-use vehicle service” is an umbrella term encompassing both

carsharing and station car programs. One can imagine a continuum of shared-use vehicle services, ranging from carsharing on one end to station cars on the other *(3)*. Despite the ongoing linkage of these concepts, it is important to characterize differences between the carsharing and station car models.

Carsharing enables individuals to acquire the benefits of private-vehicle use at lower cost relative to vehicle ownership, taxis, or conventional rental. More specifically, through collective ownership, high fixed auto-ownership costs are spread across a group of individuals, making vehicle miles cheaper than if each member owned or leased a private vehicle. Rather than financing a personal auto, individuals pay to access a vehicle fleet on an as-needed basis. At present, almost all U.S. carsharing programs are deployed according to the neighborhood model in which vehicles are parked in designated spots throughout a region or locality, providing convenient access to a broad set of members living in an area.

In contrast to carsharing, station car programs primarily facilitate transit access. For many, transit use is inconvenient because station endpoints are often beyond walking distance of final destinations. This frequently necessitates private vehicle commuting. Station cars enable individuals to substitute transit for the middle portion of a journey, providing a critical link between transit and origins/destinations. Participants typically lease a station car to access transit. Due to the relatively short travel distances involved, station car programs often further enhance environmental benefits by deploying electric vehicles.

During the mid- to late-1990s, interest increased in U.S. shared-use vehicle services. As of July 2003, 15 shared-use vehicle organizations collectively claimed 25,727 members and 784 vehicles. Since 1998, carsharing organizations have experienced exponential membership growth. As demand for shared-use vehicle services continues to grow, decision makers and transit operators are increasingly interested in understanding program effects. Potential benefits include: 1) promoting alternative transportation modes by enhancing existing transit systems and facilitating reduced auto ownership; 2) enhancing mobility at substantial savings for those who do not drive daily and lower-income segments; 3) expanding compact growth incentives by reducing parking needs in new/existing developments and enhancing transit-oriented developments; 4) increasing energy and emission benefits by facilitating modal shifts to alternative transportation, as well as clean-car use in shared fleets; 5) reducing parking needs by alleviating pressures for publicly-funded parking structures; and 6) alleviating capacity expansion requirements by complementing existing public resources (transit, highways, and parking).

Due to presumed social and environmental benefits, many governmental agencies and private entities have provided startup grants and non-monetary support to promote shared-use vehicle services throughout the country. Several additional policy measures have also been proposed, including tax-exempt commuter benefits, emergency risk fund support (insurance), innovative pilot funding, and “transportation systems” credits that provide incentives to automakers to place clean vehicles into shared-use fleets in California. While many shared-use vehicle organizations demonstrate ongoing promise, long-term viability and program impacts remain uncertain. To date, only a few independent studies have been conducted on U.S. operational programs *(4, 5, 6)*. Nevertheless, most shared-use vehicle organizations currently implement questionnaires to assess program impacts. However, survey instruments and performance measures are largely inconsistent, and most data gathered are proprietary. Thus, more systematic data collection and monitoring are needed to assess collective benefits and corresponding policy measures.

This paper examines the developing shared-use vehicle market, documented social and environmental benefits, and the role of policy instruments in promoting program growth and public benefits. It includes three main sections. First, the authors provide a shared-use vehicle overview, including organizational dynamics, current funding and parking support, and market trends. Second, the authors present a review of the social and environmental impacts literature, as well as a description of ongoing data collection activities. Finally, the authors conclude that systematic, longitudinal monitoring is needed to develop a deeper understanding of policy mechanisms aimed at supporting market expansion and social/environmental benefits.

U.S. CARSHARING & STATION CAR: CURRENT MARKET DEVELOPMENTS

In this section, the authors present results from their recent *U.S. Shared-Use Vehicle Survey* (completed in July 2003). This study entailed interviews and questionnaires in December 2002 and July 2003, with 15 operational and nine planned programs, as well as three defunct organizations. While all 27 operational, planned, and defunct organizations participated in this study, many were unable to provide detailed information on insurance rates/brokers and funding amounts by source due to proprietary issues.

There are four main parts to this discussion. First, the authors provide an overview of organizational dynamics, including program launches and closures. Second, membership and fleet totals for carsharing/station car programs from 1998 to July 2003 are reviewed. Next, the authors discuss current funding and parking benefits received by U.S. shared-use vehicle organizations. Finally, market trends are examined.

Organizational Dynamics

As of July 2003, there were 15 U.S. shared-use vehicle organizations, including eleven carsharing organizations, two carsharing pilots, and two station car programs. This analysis focuses on changes in the number of organizations by business model (carsharing and station car) between August 2002 and July 2003, and dynamics in total membership and fleet size since 1998.

Carsharing Organizations

Between August 2002 and July 2003, two carsharing organizations were launched, and one organization closed operations. The number of startups and program closures was less during this timeframe in contrast to the previous 12 months, which reflected four startups and three closures largely due to insurance rate hikes following 9/11. Recent dynamics may reflect some degree of market stabilization. Since 1998, a total of 20 carsharing programs have been deployed in the U.S., with 13 remaining. Seven programs have ceased operations. Two of the defunct programs were experimental and designed for limited durations; one merged with another existing organization; and another suspended operations for one year.

Station Car Programs

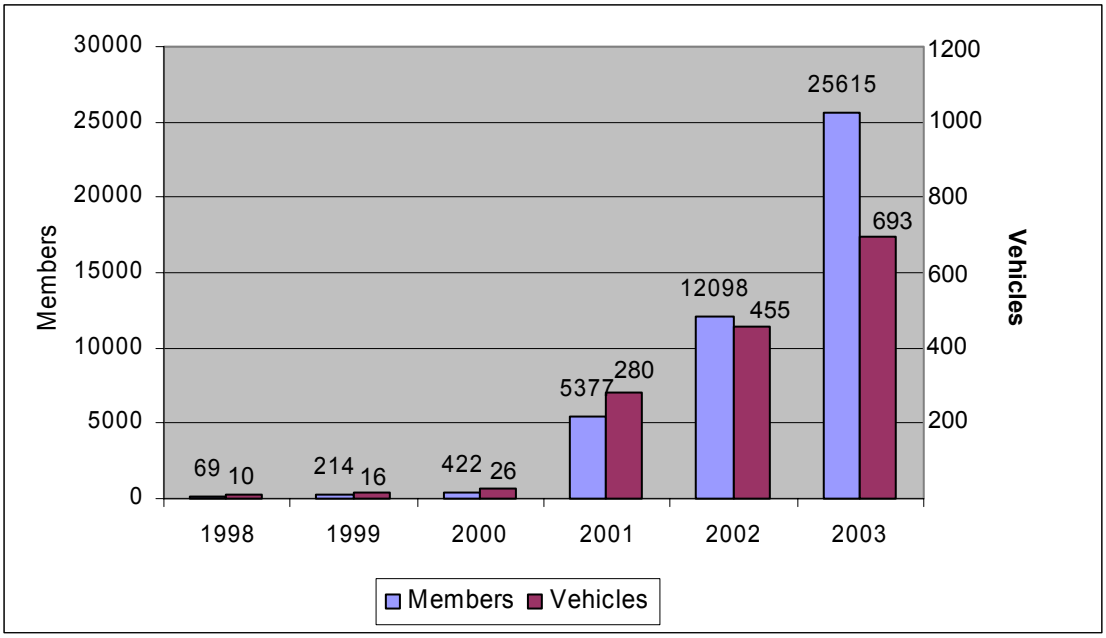
Since 1998, six U.S. station car programs, of which only two are operational today, were established. Interestingly, station car program closures were not recorded until 2002-2003, during which 60 percent of all programs ceased operations. Several underlying factors account

for this change, including insurance rate increases, reduced public funding (possibly a result of economic downturn), and decreased customer demand in one instance. The next section provides an overview of carsharing and station car program membership and fleet dynamics.

Carsharing & Station Car Organizations: Membership & Fleet Size

Since the first U.S. carsharing organization was established in 1998, the carsharing industry has experienced exponential membership growth. As of July 2003, 13 U.S. carsharing organizations were deployed. Another nine programs were planned. Collectively, existing carsharing organizations served 25,615 members employing 693 vehicles (see Figure 1 below). From August 2002 to July 2003, membership in carsharing programs grew by 112 percent; the number of vehicles increased by 52 percent.

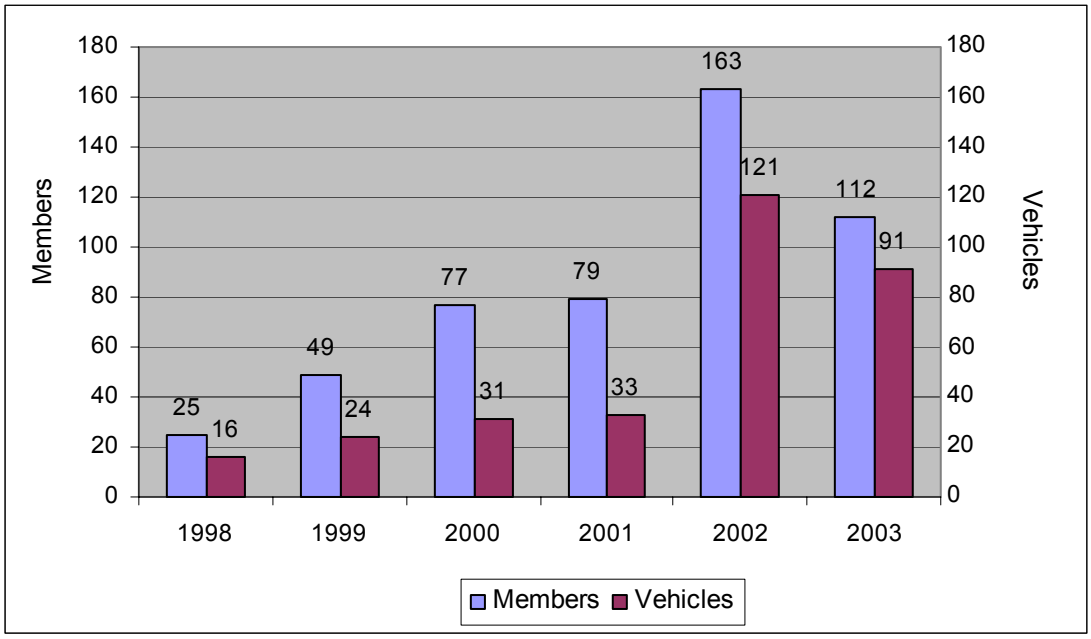
FIGURE 1: U.S. Carsharing Vehicle Membership & Fleet Size



Increased household demand and business customer developments account for the majority of this growth. The three largest carsharing organizations, Flexcar and Zipcar—both for-profit businesses—and City Carshare, a non-profit organization, accounted for 94 percent of U.S. membership and 79 percent of the total fleet.

In contrast, station car programs showed negative growth over the last year, with three of the five remaining programs (as of August 2002) ceasing operations. Funding non-renewal was a key driver in closures. Total station car membership dropped from 163 to 112 participants (see Figure 2 below). Similarly, the total fleet decreased from 121 to 91 vehicles. This corresponds to a decline of 31 and 25 percent, respectively. At present, no new station car programs are planned.

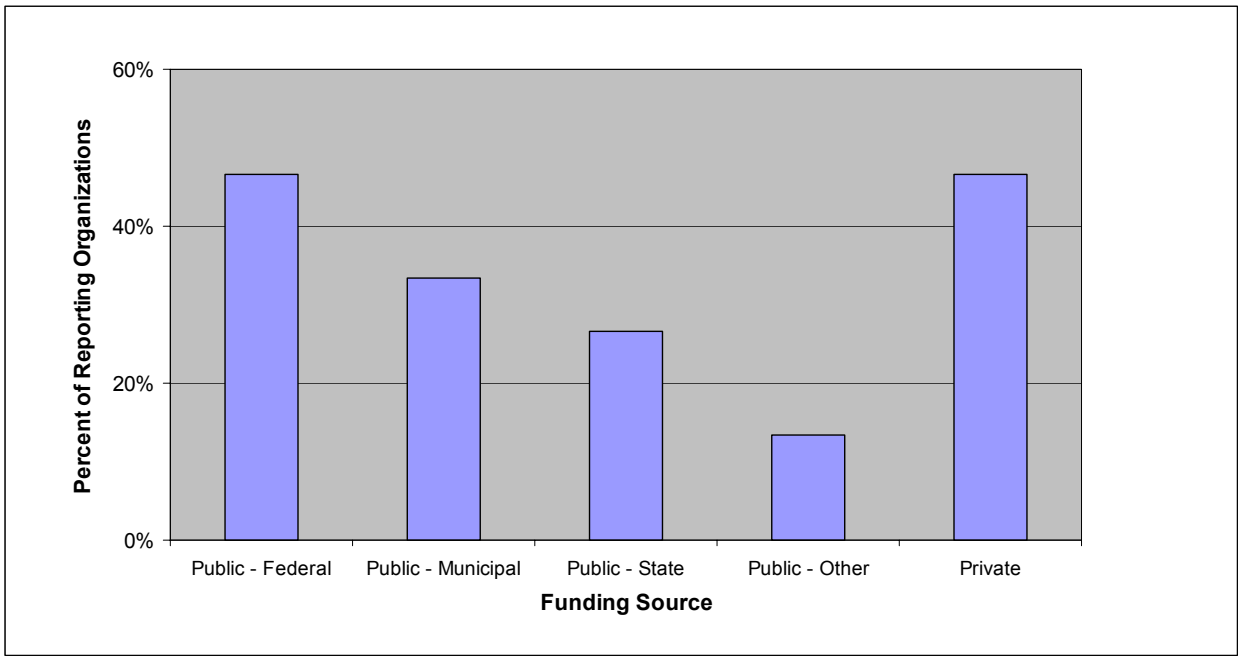
FIGURE 2: U.S. Station Car Membership & Fleet Size



Shared-Use Vehicle Support: Startup Funding & Parking Benefits

The majority of shared-use vehicle programs have received startup and/or parking subsidies due to their presumed social and environmental benefits. At present, funding (public and private) and parking benefits are the most common measures employed to support shared-use vehicle organizations. Funding is a particularly powerful means to aid startups. Eighty percent of organizations receive some form of financial support from a variety of public (ranging from federal to municipal) and private sources (see Figure 3 below). Public-federal and private resources are the predominant funding sources tapped by organizations.

FIGURE 3: Percent of Organizations Receiving Funding, By Source



Parking benefits represent another significant measure to foster market development (i.e., reduced program operating costs), as these subsidies can be quite significant, particularly in congested areas. Seventy-three percent of shared-use vehicle programs reported receiving parking subsidies: 60 percent obtained parking from public entities, 33 percent from private entities, and 20 percent received support from both public and private sources. Private parking subsidies are linked largely to residential complexes; commercial sites (activity centers, such as groceries stores); and business partners that directly benefit from shared-use vehicle access. Other, less universal forms of non-monetary support include donated vehicles, in-kind support services (e.g., staff time and consulting), and joint marketing efforts.

Shared-Use Vehicle Trends & Developments

This section includes an overview of several shared-use vehicle trends and developments identified by the authors in their recent survey. Key discussions include: barriers to entry, organizational evolution, member/vehicle ratios, business customer market, carsharing support services, insurance, and low-emission vehicles.

Barriers to Entry

As noted earlier, the exponential growth observed in carsharing membership is largely attributable to expansion by the three largest organizations, which collectively account for 94 percent of total membership and 95 percent of total growth between August 2002 and July 2003. This concentration reflects the aggressive growth orientation of these operators coupled with entry barriers. These barriers can be divided into two categories: first-to-market advantages and economies-of-scale.

First-to-market advantages—particularly financial support to offset start-up costs and the establishment of strong relationships with local governments and other organizations to secure critical infrastructure (e.g., parking and preferred marketing locations)—may play a key role in determining the competitive environment. Not surprisingly, incumbent organizations have an inherent advantage if their local relationships enable them to operate at lower cost and more competitively (e.g., from better lot locations) than later entrants to the same region.

Similarly, economies-of-scale can reduce costs across virtually all aspects of an operator's business. Although there might be slight diseconomies associated with expansion across interstate boundaries due to variation in insurance requirements, these additional expenditures (e.g., opportunity costs of identifying a new carrier) are likely to be insignificant relative to the overall benefits that scale confers. Table 1, below, provides a summary of potential scaling benefits that the largest carsharing organizations likely benefit from. When applicable, the authors also draw from interviews with shared-use vehicle organizations.

TABLE 1: Potential Benefits Resulting from Economies-of-Scale

Feature	Description
Service Usability	Program usability increases as a function of fleet size and lot location. The greater number of vehicles and locations an organization can support, the more accessible the service becomes to new and existing customers. In addition, multiple vehicles enable an organization to diversify their fleet, allowing customers to select a vehicle model that optimally addresses their trip needs.
Marketing	Several U.S. shared-use vehicle programs reported that word-of-mouth marketing and decaled vehicles play an important role in customer acquisition. Indeed, one program reported approximately 20 percent of members became aware of their service after spotting a carsharing vehicle in use, while another 30 percent were referred by other users. Such ad hoc marketing would logically increase as the number of vehicles and membership grows.
Technology	Larger organizations can invest in more sophisticated technologies that improve program management and customer service via improved vehicle access, reservations, and billing methods.
Organizational Specialization	As an organization's staff expand and management costs decline per unit of business, employee roles and business activities tend to specialize as firms create departments and hire individuals with specific expertise in areas such as marketing, business development, operations, human resources, and management.
Insurance	As noted in *7*, insurance remains a problematic area for shared-use vehicle organizations. Identifying a carrier that will provide coverage at reasonable rates continues to confound many surveyed organizations. Among those that disclosed insurance costs, rates remained high. Larger organizations appear to be at an advantage with respect to their size and operational history with insurers. Furthermore, larger organizations can budget to implement technological solutions (e.g., vehicle tracking technologies) that further reduce insurance risks.
Purchasing Discounts	Larger organizations can negotiate more advantageous pricing when leasing or purchasing multiple vehicles, maintenance contracts, insurance, etc.

Organizational Evolution

During the period of the authors' study (August 2002 to July 2003), several U.S. carsharing organizations experienced a leadership shift. To some extent, this reflects a new stage in U.S. carsharing organizational growth and market development *(8)*. A management change can also provide credibility in securing further capital and reassuring existing investors/board members. The new carsharing directors appear to be focusing on several critical issues: market expansion, cost reduction, increased revenue, and improved service quality.

Increase in Member/Vehicle Ratios

Since August 2002, member/vehicle ratios across carsharing organizations have increased dramatically. On average, member/vehicle ratios increased from approximately 27:1 to 37:1, representing a 39 percent increase. Since the three largest organizations represent 94 percent of total membership, this increase presumably reflects a change in operational strategy. This shift likely suggests a combination of factors. First, vehicle use may be slowing on average (e.g., new members subscribe to carsharing as a form of "mobility insurance"), allowing fewer vehicles to serve a larger customer base. Second, a new market segment—supporting time-of-use rentals that are complementary to neighborhood carsharing—is emerging (i.e., business customers).

Business Customer Market Focus

An interesting development observed in the author's 2002-2003 *U.S. Shared-Use Vehicle Survey* is the aggressive expansion of carsharing services to business customers by several organizations. This trend could have significant implications for carsharing economics by matching the workday segment to the vehicle demands of neighborhood carsharing. Although evidence is inconclusive, some empirical data support the notion that household carsharing demand is more concentrated on weekends *(6, 9)*. Furthermore, several surveyed organizations reported that business clients could increase utilization during the workweek when the demand of household users is lower. This development explains, in part, the sizable increase in member/vehicle ratios observed since August 2002. To the extent that business vehicle requests are predictable and non-overlapping with household demand, business customers could be added without unduly straining existing capacity.

For business customers, carsharing's main attraction is reduced cost in contrast to the expense of a traditional corporate fleet. Rather than purchase exclusive vehicle access, a carsharing business customer only pays for actual vehicle use. Further savings are realized in terms of fleet oversight and management, responsibilities that the carsharing organization assumes. In addition to providing traditional time/mileage pricing, a carsharing organization might offer various levels of exclusivity (e.g., dedicated vehicle placement at the corporate site) to better align their service with a company's needs. Carsharing, unlike conventional corporate fleets, offers businesses more flexibility based on specific vehicle demands.

Carsharing Support Services

The largest U.S. carsharing organizations are also well positioned to pursue another market opportunity: carsharing support services. At present, this includes two key areas: 1) licensing of carsharing technologies, software, or hardware to other shared-use vehicle service providers or

government/corporate fleets; and 2) contracting of back-office management support (e.g., reservations and billing). Many U.S. shared-use vehicle organizations (planned or operational) do not have sufficient capital to independently develop fleet management technologies. Rather than develop their own systems, programs can instead deploy existing carsharing technologies developed by others—either through licensing arrangements or direct purchase. Several U.S. shared-use vehicle organizations currently do this. In addition to the growing carsharing market, shared-use technologies could be readily adapted to serve the vehicle reservation and management needs of corporate fleets. This represents a sizable market opportunity. At present, there are over 640,000 commercial fleets operating in the U.S., representing approximately nine million vehicles *(10)*. Furthermore, the U.S. market for fleet management systems is anticipated to grow to $1.8 billion by 2008 ($6.5 billion worldwide), up from an estimated $.7 billion in 2002 *(11)*.

Insurance

In 2002, insurance was identified as the most important challenge of U.S. shared-use vehicle organizations *(7)*. Although insurance premiums remain high and search costs are significant, just two organizations surveyed—between August 2002 and July 2003—identified insurance as a "critical challenge." It is unclear why the majority of U.S. shared-use vehicle organizations did not explicitly identify insurance as a key issue, given continued high costs. Several surveyed organizations expressed confidence that premiums would decline as insurers become familiar with the shared-use concept and more extensive claims histories can be used to develop more realistic risk factors. (For more information on insurance, see *7*).

To that end, over 70 percent of U.S. shared-use vehicle organizations expressed interest in pooling claims and usage data—contingent on certain confidentiality considerations—to facilitate risk rating factor development. Although several surveyed organizations did not disclose their insurance rates, larger organizations generally reported satisfaction with their current premiums. Given the high opportunity costs associated with identifying an insurer and the ongoing difficulties of securing reasonable rates, lower insurance costs represent an important strategic advantage. This implies that some organizations, to the extent that they have relatively lower rates, may be reluctant to assist in industry-wide efforts to reduce premiums. Neither of the two remaining U.S. station car programs identified insurance as an important factor. This is largely due to differences between the carsharing and station car models. Today, U.S. station car programs do not assume insurance liability for their vehicles, as the end users lease their cars and insure them under their own policies.

Low-Emission Vehicles

The prevalence of gasoline-electric hybrid vehicles among U.S. shared-use vehicle providers is also a notable trend. Approximately 30 percent of U.S. carsharing fleets are comprised of gasoline-electric hybrid and alternative fuel vehicles, including electric vehicles. One hundred percent of the vehicles deployed in U.S. station car programs are electric vehicles. Approximately fifty percent of U.S. carsharing organizations (excluding the two carsharing research pilots that already employ alternative fuel vehicles) reported that they plan to increase the proportion of hybrid vehicles in their fleets, citing organizational philosophy as a primary motivator. An additional catalyst to the further adoption of gasoline-electric hybrid vehicles is the California Zero Emission Vehicle (ZEV) Mandate—which requires automakers to sell a

certain number of zero emission vehicles (ZEVs), advanced technology-partial zero emission vehicles (AT-PZEVs), or PZEVS as a percent of total auto sales, starting in 2005. In addition to receiving ZEV sales credits, automakers can receive additional credits for placing vehicles in a "transportation systems" (i.e., programs that demonstrate technology-enabled vehicle sharing, linked to transit, or both). While the "transportation systems" credit application process is being developed, there are indications that several automakers are positioning to capitalize on the additional credits by partnering with shared-use vehicle organizations (e.g., offering vehicle discounts, financial support, or both). For more information on the ZEV mandate as it relates to shared-use vehicle services, see *12*. In the next section, the authors discuss the social and environmental impacts associated with U.S. shared-use vehicle programs.

SOCIAL & ENVIRONMENTAL IMPACTS

The vast majority of public funding and support is provided to shared-use programs in the interest of mitigating transportation-related problems, including air pollution, traffic congestion, and parking shortages. To a lesser degree, carsharing funding has been provided in the interest of expanding the mobility options available to the poor. Despite the intuitive appeal of shared-use vehicle services, comprehensive and objective evidence to support perceived benefits is limited.

While 80 percent of U.S. shared-use vehicle organizations administer some form of survey during the course of customer membership, relatively few (33 percent) conduct both pre- and post-membership surveys tracking behavioral and attitudinal changes. Among those that do collect before and after data, methods and measures are often inconsistent. These inconsistencies are present across and within organizations. This further complicates systematic aggregate analysis. For example, only 13 percent of shared-use vehicle organizations systematically collect data on socio-demographics, vehicle ownership, and transportation use, arguably the key variables to assess market developments and social/environmental impacts.

To date, a number of U.S. shared-use vehicle studies have been conducted to quantify various social and environmental impacts. While a variety of measures have been tracked (e.g., vehicle miles traveled (VMT), auto ownership, modal shift), study methods are largely inconsistent. A majority of the information regarding shared-use impacts comes from European experience *(9, 13, 14, 15)*. Most European studies document impressive VMT reductions, with annual vehicle mileage declining from 30 to 70 percent as a result of carsharing. Vehicle ownership impacts are also notable, ranging from 10 to 60 percent of members selling a vehicle after joining a carsharing program. Although some VMT reductions result from foregone trips, a significant amount of this change is attributed to modal shifts (i.e., members substituting private car use with public transit and non-motorized options).

While European carsharing results are encouraging, the methodologies employed also vary among studies. First, several rely on data collected only after an individual used carsharing, requiring members to reflect back on prior modal use (versus documenting mode split prior to membership). Not surprisingly, the accuracy of these data is unknown. Second, control groups are seldom used to provide a comparison of behavioral changes for members and non-members over the same time period, controlling for outside factors (e.g., economic downturn). Third, many studies document early adopter behavior only. Thus, results may not reflect travel patterns after an individual has fully adjusted to carsharing, as well as evolving market impacts (e.g., new target segments and attrition). Contextually, there are also numerous issues. For example, European public transit networks are far denser, fuel prices are substantially higher, and car

ownership rates are lower. Thus, the degree to which European results can be generalized to the U.S. is questionable.

Several systematic studies have been conducted on U.S. shared-use vehicle research demonstrations and just a few on existing programs. These include Purdue University's Mobility Enterprise shared-car experiment of the early-1980s *(16)*, and an evaluation of the Short Term Auto Rental Service in San Francisco *(17)* around the same time. More recent studies include the San Francisco Bay Area Station Car Program *(18)*; CarLink—a commuter-based carsharing system—deployed in the San Francisco Bay Area *(19, 20)*; and Intellishare's campus car study *(21)*. Among operating programs, two-year evaluations of CarSharing Portland and City CarShare have been completed *(5, 6)*.

To date, station car evaluations universally support the notion that increased transit connectivity can dramatically reduce VMT. This is not surprising as many of these programs specifically recruit individuals who would otherwise drive to work rather than commute via public transit. CarLink I—a carsharing field test with a station-car component—yielded a net VMT reduction of approximately 18.5 miles per day. CarLink also resulted in 20 *new* daily Bay Area Rapid Transit (BART) trips among CarLink commuters (among a limited sample of 20 individuals). Several participants stated that if CarLink became a permanent service, they would sell one of their personal cars, which could greatly reduce their transportation costs *(19)*. Findings from the San Francisco Bay Area station car demonstration also revealed substantial reductions in commute-related VMT. These findings indicate that personal vehicle mileage declined from 45 percent of total VMT to three percent, with drivers substituting a combination of rail and electric vehicles *(18)*.

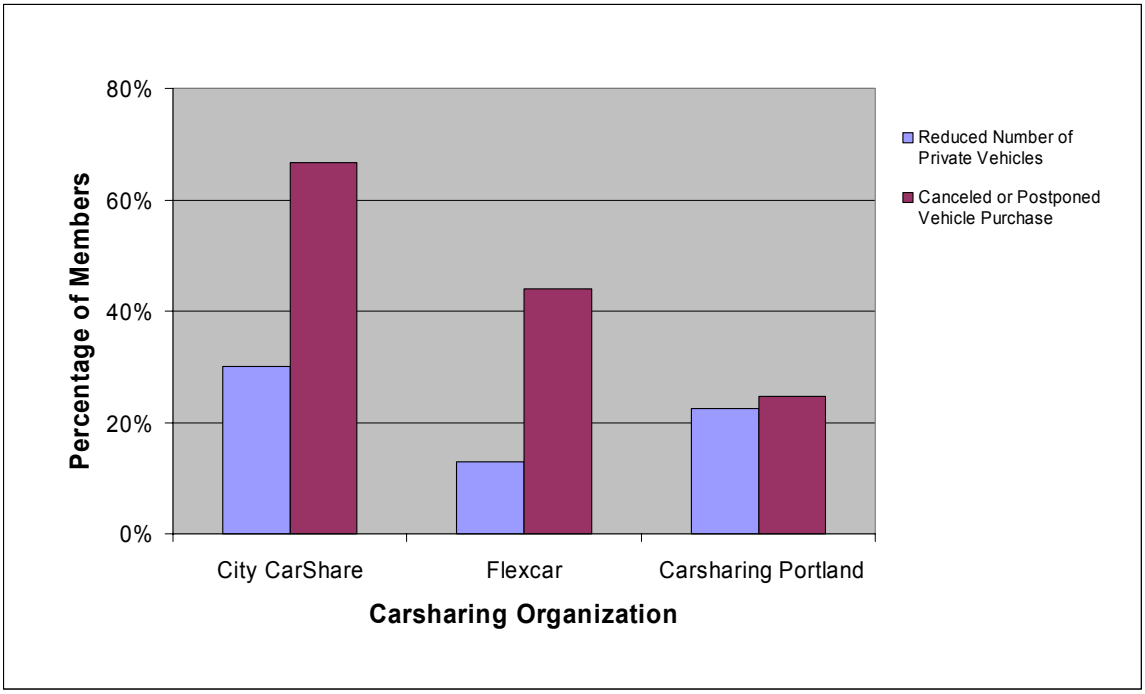
Results are less clear in the case of neighborhood carsharing largely due to limited samples, length of time studied, modest behavioral changes, or a combination of factors. A study of CarSharing Portland membership behavior after two years of operation indicates that aggregate VMT decreased among members by 7.6 percent. This reduction was largely driven by members who previously owned/leased a car prior to carsharing. For these individuals, VMT decreased by 25 percent, implying that carsharing may impact vehicle ownership decisions. For members without household vehicle access, VMT increased by 19 percent *(5)*. A similar outcome was observed in a two-year evaluation of City CarShare in San Francisco, which revealed a two percent VMT reduction among members *(6)*. Although modest, it is important to note that this particular measure may underestimate carsharing VMT impacts. Among a comparable group of non-members (a control group), VMT increased by 49 percent over the same period, suggesting that carsharing may have reduced total VMT beyond the modest two percent reduction reported. The authors hypothesize that the influence of carsharing membership on vehicle ownership is likely reflected in reduced VMT among households that either sold or forfeited a car purchase.

Relatively few studies effectively evaluate the modal shift impacts of shared-use vehicle programs across a full range of motorized and non-motorized modes. Early program studies support differing conclusions. For example, CarSharing Portland's two-year study indicates a slight increase in transit use and walking/cycling, while the City CarShare year-two study reports a decline in walking, cycling, and transit usage. In the case of City CarShare, carsharing appears to have largely displaced these travel modes among members *(5, 6)*.

Neighborhood carsharing appears to have a more tangible effect on vehicle ownership. Most U.S. carsharing studies demonstrate that shared-use vehicles have a mitigating influence on vehicle ownership, motivating members to either sell or avoid a vehicle purchase. For instance, CarSharing Portland's two-year study reported that 23 percent of members sold a personal

vehicle, and 25 percent were able to avoid purchasing one *(5)*. Results of three programs are presented in Figure 4 below.

FIGURE 4: Impact of Carsharing Membership on Vehicle Ownership



While initial vehicle ownership results are directionally favorable (ranging from 25 to 67 percent of members postponing a vehicle purchase, and 12 to 30 percent selling a personal vehicle), methodological dissimilarities and limited sample size confound systematic comparisons. Most studies are based on limited samples and do not employ experimental or statistical controls, making it difficult to attribute behavioral changes to carsharing versus exogenous variables.

Although shared-use systems have the potential to enhance the mobility options of the poor, and several programs offer this as an organizational objective, existing data do not support this. Studies report the majority of members are highly educated, professionally employed, and white *(5, 6)*. Low adoption rates among the poor are likely the result of several factors, including limited service availability and program awareness, limited credit history, membership deposits, and application processing fees. Nevertheless, some public funding is supporting the expansion of carsharing services into low-income areas. Most likely, notable adoption rates among the poor will take a few years to develop. Despite carsharing's enhanced mobility and cost-saving benefits, real or perceived risks associated with serving this segment suggest that this market may not be addressed without governmental support.

To summarize, the efforts of shared-use vehicle organizations to evaluate membership impacts on travel behavior are currently inadequate to characterize long-term effects (particularly across market segments and models). More systematic, longitudinal analysis of U.S. shared-use vehicle developments, program effects (e.g., by target market and model), and policy impacts (e.g., ZEV Mandate "transportation systems" credits) is needed. Decision makers, funding agencies, private-sector investors, and shared-use vehicle operators would each benefit from a

more systematic understanding of the evolving shared-use vehicle market/demand and resulting impacts. Independently, most U.S. organizations do not have sufficient resources to conduct ongoing studies—implying that collective action may be required.

CONCLUSION & RECOMMENDATIONS

Since 1998, U.S. carsharing organizations have experienced exponential membership growth. As a result of this expansion, aggregate carsharing member/vehicle ratios have also increased, particularly among the largest providers. This change can be attributed to two factors: 1) aggressive market diversification to include business customers, and 2) an increased proportion of users employing carsharing as "mobility insurance." In contrast to carsharing, station car programs experienced declines in membership/fleet size and program numbers—just two east coast initiatives remain. This is largely a result of reduced public funding and insurance rate increases. Furthermore, characteristics separating the station car and carsharing concepts continue to blur, as numerous U.S. carsharing programs nurture transit partnerships.

Given presumed social/environmental benefits and economic potential, 100 percent of shared-use vehicle organizations have attracted start-up funding (public and private), non-monetary benefits (e.g., subsidized parking), or both. While station car programs demonstrate public benefits, their economic viability is less promising at present. The largest remaining station car program, however, has recently developed a five-year business plan. This new approach towards station car viability should be monitored.

To date, limited shared-use vehicle data have been systematically collected and analyzed to assess program impacts on enhanced mobility, congestion, land use, and air quality. While early studies provide indications of positive shared-use vehicle impacts, there is inconsistency among methodological approaches and findings, confounding aggregate-level analyses. To evaluate program-wide effects, more systematic data collection and analysis approaches are needed.

Although several U.S. organizations have experienced rapid growth, future carsharing dynamics are uncertain, with just a few organizations reporting or approaching profitability. Through supportive public-private partnerships, program sustainability could be expedited and enhanced through a range of measures. Furthermore, funding and support should be carefully monitored to ensure that market developments and impacts achieve objectives.

At present, two support mechanisms have been widely employed among U.S. shared-use vehicle organizations: start-up funding and parking benefits. Additional policy mechanisms have been discussed. These can be categorized as demand side, supply side, or combined policies; they can be implemented system-wide or targeted at particular organizations or market segments. Public start-up grants represent one important supply-side strategy. Employed to aid shared-use vehicle programs overcome high initial costs, start-up grants typically lower market-entry barriers. Insurance subsidies (such as a national emergency risk fund supported by the government) are another proposed supply-side mechanism. California's ZEV Mandate—which links clean-fuel vehicle credits to "transportation systems" (or shared-use vehicle services) in 2005—is another supply-side strategy, which could attract automakers as stakeholders to carsharing and station car initiatives on a larger scale.

At present, non-monetary public support predominantly consists of joint marketing efforts and parking benefits, the latter combines supply- and demand-side incentives. Other policy instruments, with a demand-side focus, include pre-tax credits and high occupancy vehicle (HOV) lane access. Pre-tax credits could be aimed at commuters and low-income households.

Finally, HOV lane access for clean fuel, shared-use vehicles could serve as another incentive to shared-use program participation. After reviewing the U.S. shared-use vehicle literature and existing data collection methods, the authors conclude that aggregate and systematic monitoring is needed to inform shared-use vehicle market developments, assess program impacts, and guide policy support. Such a monitoring framework should be developed among key stakeholders (e.g., organizations, funding agents, local governments, etc.). A first step toward formulating such a framework might include identifying appropriate study measures corresponding to program objectives. Social and environmental goals—including enhanced mobility for low-income households, reduced congestion and emissions, increased transit ridership, and better land use—are the primary motives for public support (funding and policy measures). For each of these goals, specific measures should be identified (see Figure 5 below). Identifying efficient measures is critical (i.e., those with the greatest explanatory power at least cost). Once performance measures are determined, a methodological approach can then be developed.

FIGURE 5: Potential Shared-Use Vehicle Monitoring Measures

Low-Income Household Mobility	Air Quality	Traffic Congestion	Land Use
- VMT - Transportation Expenditures - Time Spent by Trip Purpose - Distance Traveled to Employment Site - Socio-Demographics of Membership	- VMT - Vehicle Ownership - Vehicle Type - Modal Shift - Number of Trips (e.g., Cold Starts)	- VMT - Modal Shift - Time of Trip - Trip Assignment - Trip Generation - Vehicle Occupancy	- Users Served by Space - Vehicle Ownership - Modal Shift - Spaces Displaced (e.g., New Residential Development)

An effective monitoring strategy would: 1) provide a consistent set of measures across organizations; 2) establish standardized data collection techniques (e.g., before and after surveys, question wording, etc.); 3) identify a sampling framework sufficient to generate statistically significant results; 4) ensure data confidentiality; 5) determine appropriate monitoring duration to assess program/policy impacts over time; and 6) balance organizational data collection costs (e.g., staff time). If data collection efforts are burdensome, however, shared-use programs are unlikely to participate, even if the potential long-term benefits are substantial. Thus, cost-effective data collection tools are needed. To that end, internet-based surveys and online data submission methods should be considered. A web-based monitoring approach could enable national aggregate data collection, enhancing prospects for data consistency and statistically significant results. Furthermore, the availability of a consistent shared-use vehicle data set could also lead to a more powerful understanding of market dynamics, program impacts, and future potential among various stakeholders.

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