**Technical Background Document on the Impacts of Voluntary Travel Behavior Change Programs Based on a Review of the Empirical Literature**

Steven Spears and Marlon Boarnet, University of California, Irvine
Susan Handy, University of California, Davis

## Study Selection

Studies cited in the Voluntary Travel Behavior Change (VTBC) brief were chosen on the basis of both their methodological soundness and applicability to conditions in California. Wherever possible, the studies chosen for the brief used control groups to evaluate before-and-after effects. For reported projects in the USA (Socialdata America, 2007; Brög et al. 2009), studies incorporated a pre- and post-program control group to evaluate travel behavior changes in the participating households. Sloman et al. (2010) used household travel survey data from other cities of similar size, as well as local control groups to evaluate impacts in the three English cities in their study. Only three of the ten Japanese studies cited in Fujii and Taniguchi (2005) used control groups, so these results should be interpreted more cautiously. However, the results of programs that did not use control groups did not differ substantially from those that did.

The brief also includes results from a meta-analysis of projects conducted by Möser and Bamberg (2008). They evaluated a total of 141 projects, including 72 that could be classified as VTBC programs. These included personalized travel planning, travel awareness campaigns, and public transport marketing programs. The goal of their meta-analysis was to determine whether the available empirical evidence indicated that broad implementation of VTBC programs was a legitimate means of reducing car use.

Although none of the studies examined by Möser and Bamberg used control groups, the authors attempted to address some of their shortcomings using quantitative meta-analytical techniques. For instance, they examined the data for the presence of reporting biases and used the pool of available study data to test for statistically significant effects. Möser and Bamberg caution that meta-analytical techniques cannot overcome the shortcomings of the experimental design in the original studies. However, the fact that their meta-analysis generally agrees with the effect sizes of programs that used control groups adds to the level of confidence in the range of impacts given in the brief.

## Effect Size, Methodology and Applicability Issues

Although VTBC programs have been used more frequently over the past decade, only in the past five years or so has increased scrutiny been given to the techniques used to evaluate their impacts (Chatterjee and Bonsall, 2009). Some early programs used research methods that did not allow statistical inferences to be drawn from their results. In particular, many programs did not use control groups to evaluate travel behavior change. These studies relied solely on pre- and post-program reports of driving behavior from those who participated in the program (Möser and Bamberg, 2008; Fujii

et al. 2009). Experimental designs such as these cannot account for changes in travel behavior that may occur in the general population, for example due to changes in season, travel or fuel costs, public transportation service, or roadway construction.

As was stated in the Study Selection section this document, studies that used control groups were chosen for this brief where possible. All of the programs reported in the brief at U.S. sites (Socialdata America, 2007; Brög et al. 2009) did include control groups in their evaluations. In order to give a broad picture of effect sizes, some evaluations that did not use controls were included, and their results generally agree with those where control groups were included. In addition, the Möser and Bamberg (2008) meta-analysis of VTBC programs attempted to address some of the methodological shortcomings of earlier evaluations by examining pooled effect sizes. The results of these studies appear to indicate that household vehicle miles traveled (VMT) is generally reduced by an average of 5 to 8 percent among those who participate in VTBC programs. This was used as the basis for the effect size reported in the brief.

With the exception of the Sloman et al. (2010) study of English towns, the effect sizes given in the brief are for participant households only. Overall impact is therefore dependent on the number of households who participate in the program. One difficulty of evaluating the wider impact of VTBC programs is the potential problem of self-selection, which has been recognized by researchers who have examined VTBC program evaluations. Self-selection occurs when those who are most likely to participate in the program are those who already have positive attitudes toward sustainable modes of transportation and the environment. These participants are therefore more likely to reduce their car use than the general population (Bonsall, 2009).

Self-selection can lead to study populations that are not necessarily representative of the population as a whole. This can possibly result in an overstatement of impacts and limits on the generalizability of effect sizes from the VTBC programs. Results from the Sloman et al. (2010) evaluation and Möser and Bamberg (2008) meta-analysis appear to indicate that the VTBC program effects persist when self-selection is accounted for, though the size of the effects may be somewhat smaller. Both studies found driving trip reductions of 5 to 7 percent, which agrees with the effect size found in other studies.

A second factor that must be considered in generalizing VTBC program impacts is neighborhood form and transportation infrastructure. For example, Seethaler and Rose (2009) contend that many cities and neighborhoods that are targeted for VTBC programs are chosen because of their higher potential for mode switching. These areas may be especially receptive to such programs due to their land-use mix and/or strength of non-automotive alternatives. This seems likely to be the case, as local governments are most apt to fund projects in locations where the return on expenditures is likely to be greatest.

Programs initiated in areas that offer few alternatives to automobile use are likely to have smaller effect sizes than those reported in the brief. In areas where transit service

is limited or non-existent, and walking and bicycling are not feasible, any vehicle use reductions would likely result from the more efficient use of vehicles through increased occupancy or more efficient trip chaining. Very little research exists on VTBC programs whose main purpose is to reduce car use in rural or exurban areas, and more study would be required to determine if such programs could be effective.

Some researchers have cited the reliance on self-reported behavior as a source of measurement error in VTBC evaluations (Chatterjee, 2009). Most VTBC programs rely on travel diaries completed by respondents as an accurate source of before-and-after travel behavior. Although travel diaries are a standard tool in travel behavior research, under-reporting of trips and inaccurate data can present problems.

For example, comparisons of GPS and travel diary data of recent studies in Australia and the U.S. have indicated that between 20 and 30 percent of trips are typically not reported in travel diaries (Stopher, 2009). One potential solution to this problem is the use of GPS tracking, but this becomes expensive with large sample sizes, and data management can become a problem. According to Stopher (2009) and Seethaler and Rose (2009), one cost-effective alternative is the use of odometer readings. These have been used in some Australian Travel Blending programs. While odometer readings may provide more accurate information on car use, they cannot address reporting issues with non-automobile modes.

The majority of studies in this brief report behavior changes from short-term programs involving individual households. However, the recent study of the Smarter Choices program in England by Sloman et al. (2010) gives some insight into the potential for more comprehensive VTBC programs conducted at the citywide level. Smarter Choices was a five-year program that included personalized travel planning, travel awareness campaigns, public transport marketing, and the promotion of walking and cycling. Evaluations conducted through citywide travel surveys indicated a 9 percent reduction in car trips, and 5 to 7 percent reduction in VMT. The study also found a10 to 22 percent increase in bus use, a 26 to 30 percent increase in bicycle trips, and a 10 to 13 percent increase in walking trips in the three target cities.

The results of the Smarter Choices program appear to indicate the potential for comprehensive VTBC programs to encourage mode switching, in the absence of major changes in transportation infrastructure. The program also demonstrates the positive impact that such programs can have on transit ridership, which has been the primary goal of many VTBC programs (Jones and Sloman, 2006). An example is King County Metro Transit's In Motion program, which used a modified version of the IndiMark system to target households in four Seattle area neighborhoods (Cooper, 2007). Data collected from self-reports, bus-stop counts, and ridership data indicated a 20 to 50 percent increase in transit use during the program.

Data from the Smarter Choices program also indicated that the largest drop in vehicle use occurred among people who were at a “change in life” stage (i.e. recently changed jobs or retired) (Sloman et al., 2010). These findings, which agree with other research

on life-stage change and travel behavior (i.e. Verplanken et al., 2008), illustrate the potential for increasing the impact of VTBC programs by targeting those who are actively considering their travel choices.

**References**


Bonsall, Peter. 2009. Do we know whether personal travel planning really works? Transport Policy 16, no. 6: 306 - 314. doi: 10.1016/j.tranpol.2009.10.002.

Brög, W., E. Erl, I. Ker, J. Ryle, and R. Wall. 2009. Evaluation of voluntary travel behaviour change: Experiences from three continents. *Transport Policy.* 16 (6): 281-292.

Chatterjee, Kiron. 2009. A comparative evaluation of large-scale personal travel planning projects in England. *Transport Policy* 16, no. 6 (November): 293-305. doi:10.1016/j.tranpol.2009.10.004.

Chatterjee, Kiron, and Peter Bonsall. 2009. Special Issue on Evaluation of programmes promoting voluntary change in travel behavior. *Transport Policy* 16, no. 6: 279 – 280. doi:10.1016/j.tranpol.2009.10.001.

Cooper, Carol. 2007. Successfully changing individual travel behavior - Applying community-based social marketing to travel choice. *Transportation Research Record*, no. 2021: 89-99. doi:10.3141/2021-11.

Fujii, Satoshi, Bamberg, Sebastian, Friman, Margareta and Gärling, Tommy. 2009. Are effects of travel feedback programs correctly assessed?, *Transportmetrica*, 5: 1, 43 — 57.

Fujii, Satoshi and Ayako Taniguchi. 2006. Determinants of the effectiveness of travel feedback programs–a review of communicative mobility management measures for changing travel behaviour in Japan. *Transport Policy* 13, no. 5: 339 - 348. doi:10.1016/j.tranpol.2005.12.007.

Jones, Peter, and Sloman, Lynn. 2006. Encouraging behavioral change through marketing and management: What can be achieved? In: K. W. Axhausen, ed., *Moving through nets: The physical and social dimensions of travel*. Oxford: Elsevier, 221–243.

Moser, Guido, and Sebastian Bamberg. 2008. The effectiveness of soft transport policy measures: A critical assessment and meta-analysis of empirical evidence. *Journal of Environmental Psychology*, 28, 10–26.

Seethaler, Rita, and Geoff Rose. 2009. Using odometer readings to assess VKT changes associated with a voluntary travel behaviour change program. *Transport Policy* 16, no.6: 325 - 334. doi:10.1016/j.tranpol.2009.10.006.

Sloman, L., S. Cairns, C. Newson, J. Anable, A. Pridmore, and P.Goodwin 2010. *The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report*, Report to the Department for Transport, London, February.

Socialdata America. 2007. Individual Transportation Options Pilot Project. Final Report prepared for Oregon Department of Transportation. Accessed at July 14, 2010 at http://www.oregon.gov/ODOT/PT/PROGRAMS/TRANS_OPTIONS/TRAVEL_SMART/TravelSmartMar07Rpt.pdf.

Verplanken, B, I Walker, A Davis, and M Jurasek. 2008. Context change and travel mode choice: Combining the habit discontinuity and self-activation hypotheses. *Journal of Environmental Psychology* 28, no. 2 (June): 121-127. doi:10.1016/j.jenvp.2007.10.005.

## Acknowledgments

This document was produced through an interagency agreement with the California Air Resources Board with additional funding provided by the University of California Institute of Transportation Studies MultiCampus Research Program on Sustainable Transportation and the William and Flora Hewlett Foundation.