The objective of this seminar will be to present and discuss the current status of innovative utilization of geographic positioning devices to improve measurement of household travel. In 2009, Abt SRBI undertook pioneering work in the U.S. to utilize global positioning system (GPS) technology in household travel surveys to capture all trips digitally, thereby improving travel measurement. These devices use global satellites to capture and record all respondent travel information. They provide measured versus reported travel activities thereby eliminating a variety of problems including under-reporting and misreporting of travel. The Ohio Department of Transportation (ODOT), in cooperation with the Ohio-Kentucky-Indiana Regional Council of Governments (OKI), the MPO for Cincinnati, initiated this exclusively GPS Household Travel Survey (HTS). A subsample of follow-up prompted recall surveys was conducted to allow respondents to review their GPS interpreted travel information for verification and for imputation purposes, and to provide additional details not apparent from the GPS data. No paper diaries were used in the Ohio study. Mode was interpreted from speed and route data between trip ends. Trip purpose/activity was interpreted from household workplace, school, and most frequent shopping locations gathered as a part of the recruitment. In addition, land use information was used in a preliminary way to interpret trip purpose/activity for other locations.

Household Travel Surveys (HTS) provide vital information to transportation and urban planners about daily travel patterns, including trip purposes, time of day decisions, mode choices, trip lengths and distances, activity locations, and routes taken. State and local governments use the data to update, develop, and calibrate statewide and urban travel demand models. HTS are also used to determine project requirements and investment priorities, and for air quality conformity, alternatives analysis, and detour analysis. More recently, HTS are used in combination with more traditional health surveys to better understand obesity and activity behavior.
HTS typically use a proportional sample of recruited households within a study area, with each member of the household reporting travel and activities for a 24-hour weekday period in a diary provided. The households are recruited by Abt SRBI using an address-based sample. Address-matched households are recruited primarily by phone, while unmatched households are invited via mail correspondence. The household demographic information and, subsequently, the travel diary information are retrieved by Abt SRBI by computer-assisted telephone interview (CATI) methods, a web-based diary response format, or mailback and data entry of the self-administered diary. Advanced address-based methods are used to oversample hard-to-reach households (e.g., zero-vehicle households) in census tracts or block groups with high proportions of these households of interest. Responsive design interviewing techniques pioneered at the University of Michigan are utilized as the HTS fieldwork proceeds. Ultimately, the data are gathered into huge databases.

However, a well-known shortcoming of paper diaries is that respondents undercount by failing to report, misreporting, or forgetting to report all trips. In addition, paper-based diaries involve considerable respondent burden, which not only undermines data validity, but also cooperation rates. To counteract, Abt SRBI has been incorporating subsamples of GPS device tracking in large-scale HTS, as is being currently implemented in Minnesota and California, utilizing the paper-based diaries to determine trip purpose and mode for trips captured and matched to GPS recordings. While subsample comparison continues to confirm the underreporting inherent in dairy-based surveys, it has proven difficult to develop statistically valid approaches for weighting and expanding trip data from small GPS subsamples to a fully representative sample of the entire population.

Our seminar presentation will provide an overview of GPS device captured travel behavior, the challenges we face in both gaining respondent cooperation and in analyzing the huge volume of data, and the research issues still outstanding. Namely, can exclusively GPS HTS produce results sufficient to meet the data requirements of traditional diary-based HTS?

The design and implementation of HTS present important methodological questions and challenges, with and without GPS. More specifically, four issues arise:

1. The “completed household” bar is high for GPS based surveys since all members of a household over 12 years old are required to carry a personal GPS unit on a concurrent day. Thus while household and person cooperation rates for GPS may go down, trip rates go up. What is the value of the trade-off here?
2. What are best practices for sampling and responsive design interviewing techniques for GPS and large-scale HTS?
3. Should GPS data represent the "gold standard" to adjust diary-based responses?
4. There is an emerging split in the client transportation modeling community between traditional 4-step modelers who care most about identification of trip ends and trip chaining using only home, work, school, other purposes; and emerging activity-based modelers who are most concerned about how activities (purpose) drive trips and trip chaining? How can GPS utilization in HTS meet the needs of both camps?

We will present the pros and cons of alternative approaches--with documentation to substantiate. We will present our literature bibliography and be ready to pose additional outstanding issues and answer questions.