Chapter 18
GPS Travel Diaries in Rural Transportation Research: A Focus on Older Drivers

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ABSTRACT

Global Positioning System (GPS)-based travel diaries have emerged as valuable tools for urban transportation planning but have had little uptake in rural transportation planning. This chapter describes the methodology and effectiveness of employing vehicle-instrumented passive GPS units and participant-prompted recall with Geographic Information Systems (GIS) in a rural travel diary study focused on understanding older driver travel behaviour. A convenience sample of 60 rural older drivers in New Brunswick, Canada participated for an average of 5.3 days. The GPS devices recorded 1649 “stops” of 1 minute or more, with 8% of all “stops” due to stoplights or traffic delay. Remaining “stops” were organized into 1494 trips (one origin with one destination), with participants supplying travel purposes and driver and passenger details for 99.1% of trips. An external battery for the GPS unit minimized satellite acquisition delay but was exhausted in 10% of cases. Results from the study permitted an exploratory analysis of the impact of select license restrictions on older drivers, the potential for rural older drivers to meet their needs without a car, and exposure analysis by road class.

INTRODUCTION

Global Positioning System (GPS)-based travel diaries have emerged as valuable tools for optimizing urban transportation systems and congestion management. These tools have had little uptake for use in rural transportation planning, which has historically focused on meeting infrastructure needs for safe and efficient movement of the private automobile. The data from GPS-based travel diaries have the potential to help rural jurisdictions answer licensing and policy questions, assess the feasibility of rural transit, or better understand driver performance on roadway infrastructure.

This chapter describes the methodology and effectiveness of a GPS travel diary study in the
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rural context, with a particular focus on understanding older driver travel behaviour. The study employed passive GPS data collection and Geographic Information System (GIS) complemented by participant prompted recall on a convenience sample of 60 rural older drivers (29 men, 31 women, average age of 69.6 years) in the Province of New Brunswick, Canada. New Brunswick is located on Canada’s Atlantic coast north of Nova Scotia with approximately 50% of the population living in rural areas. Data were collected from volunteers in rural areas of four counties between 2008 and 2009, with the study complete in 2010.

RATIONALE

GPS travel data for rural planning purposes may not appear relevant for the management of a rural highway network by transportation authorities since one market for the data is travel demand modelling, an activity not generally seen as applicable in rural areas (Hanson, 2009b). Jurisdictions may undertake traffic forecasting exercises, but these can be based on permanent or temporary traffic counters and may only involve straight line extrapolation to project future volumes for infrastructure management purposes. GPS travel data has the potential to offer a more comprehensive and sophisticated exploration of vehicle and driver behaviour on roadway infrastructure and can provide local content to complement nationally available travel datasets. These data need to be matched with information, such as demographic and stated preference information, in order to provide context to the travel, increasing the usefulness and applicability of the data. GPS travel diaries can be valuable tools for rural jurisdictions in situations where there is a need to understand and evaluate the potential impacts of changes to driver’s licensing policies, evaluate the potential for rural transportation alternatives or understand speed behaviour and driver tolerances on differing roadway geometries.

GPS TRAVEL DIARIES VS. PEN AND PAPER DIARIES

Pen and paper travel diaries were standard approaches for travel data collection prior to the advent of computerized approaches. They were traditionally one day in length, with the occasional two day survey (Stopher & Greaves, 2007). Some believed this timeframe was too short to understand travel behavior and its variability (Axhausen, et al., 2007), but an extended survey length increased respondent burden and the potential for under-reported trips and inaccurate recording. These concerns have largely been addressed through the development and use of electronic travel diaries in the early 2000’s facilitated by commercial access to GPS (Murakami et al., 1997; Draijer et al., 2000; Doherty & Miller, 2000; Bachu et al., 2001; Wolf et al., 2001). What continues to pose a challenge for researchers is the adding of contextual information to the travel data such as trip purpose and demographic information, which could permit policy analysis, alternative development and other research possibilities. Methods of adding contextual data have included interacting with a Personal Digital Assistant (PDA) to enter trip purpose, passenger numbers, etc. (Murakami et al., 1997), associating trip purpose with adjacent land use (Wolf et al., 2001) and prompted recall of participants to fill in the data gaps (Bachu et al., 2001). Recent advances in mobile computing have seen a shift from PDAs to GPS-enabled consumer “smartphone” devices which function as communication and data platforms and can facilitate individual travel data among different modes of transportation. Efforts are underway to see smartphone devices play a larger role in travel data collection for transportation planning purposes (Yu et al., 2012), though some devices have been found to be less accurate than dedicated GPS devices for travel data collection (Bierlaire et al., 2013).
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