Research Article

The Influence of the Transportation Environment on Driving Reduction and Cessation

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Abstract

Purpose of the Study: Driving is by far the most common mode of transportation in the United States, but driving ability is known to decline as people experience age-related functional declines. Some older adults respond to such declines by self-limiting their driving to situations with a low perceived risk of crashing, and many people eventually stop driving completely. Previous research has largely focused on individual and interpersonal predictors of driving reduction and cessation (DRC). The purpose of this study was to assess the influence of the transportation environment on DRC.

Design and Methods: Data were combined from the Health and Retirement Study, the Urban Mobility Scorecard, and StreetMap North America (GIS data). Longitudinal survival analysis techniques were used to analyze seven waves of data spanning a 12-year period.

Results: As roadway density and congestion increased in the environment, the odds of DRC also increased, even after controlling for individual and interpersonal predictors. Other predictors of DRC included demographics, relationship status, health, and household size.

Implications: The current study identified an association between the transportation environment and DRC. Future research is needed to determine whether a causal link can be established. If so, modifications to the physical environment (e.g., creating livable communities with goods and services in close proximity) could reduce driving distances in order to improve older drivers' ability to remain engaged in life. In addition, older individuals who wish to age in place should consider how their local transportation environment may affect their quality of life.

Keywords: Driving, Transportation, Reduction/cessation, Environment, Congestion

Driving is by far the most common mode of transportation in the United States. Personal automobiles account for 83.4% of all trips made and 88.4% of miles travelled (Santos, McGuckin, Nakamoto, Gray, & Liss, 2011). Personal mobility and independence are closely tied to the ability to drive, which is known to decline with age.

Data show that around age 75, exposure-adjusted motor vehicle crash risk increases (Insurance Institute for

Highway Safety, 2015). Older people are also more susceptible to injury, because of the increased frailty that often accompanies aging (Islam & Mannering, 2006; Liu, Utter, & Chen, 2007). When people begin to experience declines in their ability to safely drive, many self-limit their driving to situations and locations with a low perceived risk of crashing (Centers for Disease Control and Prevention, 2015; Molnar et al., 2013). Eventually, many people stop

driving completely, resulting in almost a decade of unmet mobility need (Foley, Heimovitz, Guralnik, & Brock, 2002).

It is vital to understand the factors that affect driving reduction and cessation (DRC) because sustained mobility plays such a key role in successful aging (Curl, Stowe, Cooney, & Proulx, 2014; Dickerson et al., 2007). Former drivers most commonly rely on family and friends to provide for their transportation needs (Choi & DiNitto, 2015; Coughlin, 2001), but often report that they do not want to be a burden or feel dependent on others (Kostyniuk, Connell, & Robling, 2009; Ritter, Straight, & Evans, 2002). Even initiating a conversation about driving cessation (DC) can be a difficult and emotional process (Connell, Harmon, Janevic, & Kostyniuk, 2012; Dobbs, Harper, & Wood, 2009).

DC can have serious consequences for older adults, including reduced social contact (Liddle, McKenna, & Broome, 2004) and a smaller social network (Mezuk & Rebok, 2008). More than 50% of older nondrivers stay at home on any given day (Bailey, 2004); nondrivers average only about half as many daily trips as current drivers (Mattson, 2012). Loss of personal identity and independence, decreased life satisfaction, and less productive engagement in life can result from DRC (Connell et al., 2012; Curl et al., 2014; Harrison & Ragland, 2003). Both driving reduction (DR) and DC are related to onset of depressive symptoms, even when controlling for other known factors (Choi & DiNitto, 2015; Fonda, Wallace, & Herzog, 2001; Ragland, Satariano, & MacLeod, 2005). DC is also known to be an independent risk factor for entry into a long-term care facility (Freeman, Gange, Muñoz, & West, 2006).

Because the ability to drive is so highly valued, some older adults continue to drive even when it is no longer safe. This places the older driver, as well as others in their vehicle or on the roadway, at risk of injury or death. The implications of continuing to drive or giving up driving illustrate the inherent conflict between safety and independence often faced by older adults and their families (Connell et al., 2012).

The social ecological model (SEM; illustrated in Figure 1) provides a useful framework to examine the process of DRC (see e.g., McLeroy, Bibeau, Steckler, & Glanz,

1988; Schulz & Northridge, 2004). Factors at the outermost levels of the model have the broadest reach, influence the process directly, and affect all other factors. Using this model, individual behavior is best understood in the context of the broader physical and social environment (Schulz & Northridge, 2004).

Much of the previous research on DRC has focused on individual and interpersonal predictors (e.g., medical conditions, family influence; Connell et al., 2012; Dickerson et al., 2007; Sukhawathanakul et al., 2015; Wong, Smith, Sullivan, & Allan, 2016). Far less is known about how factors on the higher levels of the SEM impact this process. The present research was conducted to fill this gap by using the SEM to better understand DRC with a particular focus on how the physical environment (community level) affects this process. Two hypotheses were tested in this research. The first suggested that people living in an area with less community mobility will be more likely to engage in DR than those who live in areas of higher community mobility. The second suggested that a similar, but stronger relationship will be observed for DC.

Design and Methods

Data

The data for this study came from three sources: the Health and Retirement Study (HRS, 2013), the Urban Mobility Scorecard (UMS; Schrank, Eisele, & Lomax, 2012), and Geographic Information Systems (GIS) data from StreetMap North America (ESRI Ltd., 2013). The HRS is sponsored by the National Institute on Aging (U01AG009740); data are collected every 2 years and comprise a nationally representative panel study of people older than 50 years in the United States (HRS, 2013). Seven waves of data were analyzed, spanning the 12 years from 1998 through 2010. Restricted HRS data with respondents' zip codes were obtained to combine HRS with data from the other sources. The most recent year for which the restricted data were available was 2010, so that was used as the final data point for all analyses.

The UMS contains regional transportation information at the Census Urban Area (UA) level and has been compiled by the Texas A&M Transportation Institute each year since 1982 (Schrank et al., 2012). The GIS-based variables were calculated using the StreetMap North America data set (ESRI Ltd., 2013). ArcGIS software (version 10.2) was used for all GIS calculations in this study.

Measures

Driving reduction was operationalized using the HRS question: "Do you limit your driving to nearby places, or do you also drive on longer trips?" The response choices reflected either limiting or not limiting. DC was operationalized using two HRS questions. The first question asked "Are you able to drive?" Although this question assesses

Figure 1. Social ecological model (see Schneider, 2011 for more details).

ability to drive rather than engagement in driving behavior, it serves as a reasonable proxy for DC and has been used as such in a number of previous studies (see e.g., Choi & Mezuk, 2013; Dugan & Lee, 2013; Fonda et al., 2001; Freund & Szinovacz, 2002). To increase the likelihood of assessing driving behavior rather than driving ability, a second question was also used: "Do you have a car available to use when you need one?" To be considered a driver, respondents needed to report that they were able to drive and had a car available.

To assess the transportation environment, two UMS measures were used. The Travel Time Index (TTI) is a ratio of congested travel to open travel in a given area (Schrank et al., 2012). The Roadway Congestion Index (RCI) is a measure of the density of traffic in a given region; values greater than or equal to 1.0 are considered of high traffic density and undesirable (Schrank et al., 2012).

The UMS variables are calculated at the Census UA level and were only available for 101 of the largest Census UAs in the United States. As such, data were available for about 51% of HRS respondents. To assess the transportation environment at a more nuanced level (and for all HRS respondents), a GIS-based variable (roadway density) was calculated by dividing the total miles of roadway in a given zip code by the number of square miles within that zip code.

Age, gender, race, education, health, relationship status, and social support variables were also included. Age was recoded into 5-year increments. Gender was identified in HRS as either male or female. Racial categories included White, African American, Hispanic, and Other. Education was defined as the highest level of education completed. Two different measures of health were assessed: an objective and a subjective measure. The objective measure represented comorbidity and was a sum of the following conditions: diabetes, cancer, lung diseases, heart problems, stroke, and arthritis. Many of these conditions are known to affect driving, and some have suggested that comorbidity may be the key factor that increases crash risk for older adults (Eberhard, 2008; Papa et al., 2014).

Subjective health was operationalized using the question: "Would you say your health is excellent, very good, good, fair, or poor?" Response options were coded from 1 to 5; higher scores represented worse health. The objective and subjective health variables were added to the models separately to avoid multicollinearity problems. Both were highly significant, but the subjective measure was retained in future models because it was a slightly stronger predictor. Vision was operationalized using a self-report item; response options included excellent, very good, good, fair, or poor. Scores range from 1 to 6, with higher scores representing worse vision; a score of 6 represented legal blindness. Relationship status was categorized as married/partnered, divorced, widowed, and never married. Social support was operationalized using three items: household size, if a friend lives in the respondent's neighborhood, and number of living children.

Participants

The DC ($n = 15,060$) sample included more respondents than did the DR ($n = 10,690$) sample, because only participants who reported the ability to drive were asked about DR. The interview status variable for each wave was used to ensure that only those who actually participated in the wave were included. Characteristics of the DC sample are reported first, followed by the DR sample.

Across the seven waves, 7,655 (50.5% weighted) participants were women and 7,405 (49.5% weighted) were men. The weighted mean age of the respondents was 70.0 years. The unweighted numbers of respondents by racial group were 12,253 White (86.9% weighted), 1,657 African American (6.9% weighted), 956 Hispanic (4.8% weighted), and 190 Other (1.4% weighted). The weighted average years of education completed was 12.6. Most of the respondents were married or partnered (68.3% weighted), 18.6% were widowed, 10.3% were separated or divorced, and 2.8% had never been married.

The mean weighted age among participants in the DR sample was 69.4 years and included 4,786 women (44.7% weighted) and 5,904 men (55.3% weighted). The other characteristics followed the same general trends as those noted in the DC sample (weighted: 89.0% White, 5.5% African American, 4.2% Hispanic, 1.3% Other; 13.0 years of education; 73.3% married, 14.6% widowed, 9.5% divorced, 2.6% never married).

Data Management

HRS data include complex sample survey design elements (stratification, clustering, and weights), so analyses accounted for those design features. Indicator variables were created to allow the data to be analyzed by subgroup (domains), as required when analyzing complex sample survey data (Heeringa, West, & Berglund, 2010). To account for missing data, multiple imputation procedures were used (fully conditional specification logistic, discriminant, and regression methods; five imputations). The UMS variables were only available for 51% of the data set, but because those areas were all urban/suburban, imputing the remaining sample (mostly rural and lower density suburban) would not have been appropriate. Of the HRS variables, there were no missing data for respondent age, gender, or household size. The variable with highest percentage of missing data required less than 2% imputed, so very little imputation was required overall.

Statistical Approach

Survival analyses were used to assess the extent to which the transportation environment affected DRC. The data were measured at 2-year intervals, so discrete-time data analytic procedures (logistic regression) were used. Separate models were fit for each of the outcomes of

interest in this study: DR and DC. Prior to fitting the models, the data were prepared to account for respondents who had censored data or exhibited these behaviors in multiple spells. Respondents who never reported having the ability to drive or reported that they were unable to drive (or restricted driving) the first time they were asked (left-censored data) were excluded from these analyses. The vast majority of people engage in these behaviors as a single spell event; once they begin to avoid difficult driving situations or give up driving altogether, they do not return to unlimited driving. When multiple spells of these events occurred in the data set, only the most recent cycle was retained to eliminate the bias that would result from including multiple occurrences with these procedures (Allison, 2010). Finally, a variable was created to represent the amount of time each person was at risk of DC (or DR). HRS respondents are not asked about their driving ability until they are 65 years old, so this variable represented the number of successive waves for which they remained in the sample until they left due to DR (or DC), death, or other attrition.

As described earlier, data from the UMS variables were only available for about half the sample, whereas GIS data were available for all respondents. Thus, separate models were fit that included the most statistically significant UMS predictor and the most significant GIS predictor for each outcome. The final models were built by adding groups of related variables and assessing changes in the parameter estimates. The GIS and UMS analyses included the full sample and a subsample, respectively, so the parameter estimates for the control variables were slightly different within each analysis, but the overall conclusions related to these variables largely remained the same. For the sake of parsimony, the parameter estimates for the control variables from only the GIS (full sample) analyses are included here, because the primary focus of this study was assessing the influence of the transportation environment variables. Version 9.4 of the SAS System for Windows (SAS Institute Inc., 2013) was used to conduct the statistical analyses in this study.

A conceptual model showing the relationships among the variables is illustrated in Figure 2. Although separate models were fit with the DC and DR variables as outcomes, they are displayed together for simplicity.

Results

The parameter estimates, standard errors, odds ratios (ORs), and significance levels for the final models are shown in Table 1. Fit statistics were also calculated for the models on each of the replicate data sets (SAS v9.4 statistics). Generalized R^2 s ranged from .07 to .09, and max-rescaled generalized R^2 s were between .23 and .25. The c statistic (the area under the receiver operating characteristic curve) ranged from about .83 to .84, which suggested good predictive power for the models.

Figure 2. Conceptual model.

As expected, increasing age was an important predictor of DRC. For every 5-year increase in age, the odds of DR increased by 64% ($p < .001$), whereas the odds of DC almost doubled (89%; $p < .001$). Gender was also a key predictor of both, with male gender showing a protective effect. Higher education had a significant, but small effect (lower odds) for DR, but was not significantly related to DC. In terms of race, White respondents were much less likely to engage in DR compared with those in the other racial categories. Race also significantly predicted DC in the same direction, but had a smaller effect.

Being married/partnered was highly protective against both DR and DC. People who were divorced, widowed, or never married had much higher odds of reducing their driving (ORs = 1.40, 1.39, 1.69, respectively) and of DC (ORs = 1.45, 1.42, 1.75, respectively), compared with married/partnered respondents. Having a friend in one's neighborhood was significantly protective against DC, but did not predict reduction. Larger household size slightly increased the odds of DR, but was highly predictive of DC, with a fairly large influence (OR = 1.43, $p < .001$). The number of living children did not significantly predict either outcome. Worse health was a strong predictor of both DR (OR = 1.48, $p < .001$) and DC (OR = 1.66, $p < .001$), as was worse vision (ORs = 1.23, 1.47, respectively). Finally, more time at risk was significantly associated with an increase in the odds of DRC.

The TTI was identified as the strongest UMS predictor of DR, whereas roadway density was the strongest GIS predictor. These results indicate that as travel time in a given area increased due to congestion, the odds of DR also increased. Likewise, as roadway density increased, the odds of DR increased. For DC, the RCI was the strongest UMS predictor, whereas roadway density was the strongest GIS predictor. An increase in roadway congestion or roadway density was significantly associated with higher odds of DC, even after controlling for other variables in the model.

It should be noted that the ORs for the congestion and roadway density variables were quite different from

Table 1. Final Models

	Driving reduction					Driving cessation				
	Parameter estimate	SE	OR	OR 95% CI		Parameter estimate	SE	OR	OR 95% CI	
				Lower limit	Upper limit				Lower limit	Upper limit
Age (5 years)	0.49***	0.02	1.64	1.58	1.70	0.64***	0.02	1.89	1.82	1.98
Gender (ref = female)	-0.64***	0.04	0.53	0.49	0.58	-0.58***	0.05	0.56	0.50	0.62
Male										
Education	-0.07***	0.01	0.93	0.92	0.95	-0.02	0.01	0.98	0.96	1.00
Race (ref = White)										
Black/African American	0.32***	0.07	1.38	1.20	1.59	0.17*	0.08	1.19	1.02	1.39
Other	0.56**	0.18	1.75	1.23	2.50	0.21	0.20	1.24	0.83	1.85
Hispanic	0.30**	0.09	1.35	1.13	1.61	0.31**	0.11	1.36	1.09	1.69
Relationship status (ref = married/partnered)										
Divorced	0.34***	0.08	1.40	1.20	1.63	0.37***	0.09	1.45	1.21	1.75
Widowed	0.33***	0.06	1.39	1.24	1.55	0.35***	0.06	1.42	1.26	1.60
Never married	0.53**	0.16	1.69	1.23	2.34	0.56**	0.19	1.75	1.20	2.56
Friend in neighborhood	-0.05	0.04	0.95	0.86	1.03	-0.26***	0.05	0.77	0.69	0.85
Household size	0.07*	0.03	1.07	1.01	1.14	0.35***	0.03	1.43	1.34	1.52
Number of living children	0.01	0.01	1.01	0.99	1.03	0.02	0.01	1.02	1.00	1.04
Health	0.29***	0.02	1.48	1.42	1.55	0.51***	0.03	1.66	1.58	1.75
Vision	0.21***	0.02	1.23	1.17	1.29	0.38***	0.03	1.47	1.38	1.56
Time	0.08***	0.01	1.08	1.06	1.10	0.08***	0.01	1.09	1.06	1.11
Transportation environment										
Congestion	0.81*	0.36	2.26	1.10	4.65	0.54***	0.13	1.72	1.33	2.23
Roadway density	0.03**	0.01	1.03	1.01	1.04	0.03***	0.01	1.03	1.01	1.06

Notes: CI = confidence interval; OR = odds ratio; SE = standard error.

The c statistic ranged from about .83 to .84, generalized R^2 s ranged from .07 to .09, and max-rescaled generalized R^2 s were between .23 and .25.

* $p < .05$. ** $p < .01$. *** $p < .001$.

each other because of the range of their underlying scales. For example, the TTI had a relatively small range (values ranged from 1.03 to 1.42), whereas the range of the roadway density variable was quite large (0 to 26.80). Consequently, one-unit increases represented very different changes to the transportation environment. To allow for additional interpretation and comparison, these variables were standardized, and the models were refit. The variables were also divided into quartiles, and the models were refit once again. These results are shown in Table 2.

The standardization resulted in remarkably similar ORs for each of these variables. A 1 standard deviation increase in congestion or roadway density was associated with a 7%–8% increase in the odds of DR and an 11%–12% increase in the odds of DC. For the analyses of the quartile-divided variables, the first quartile (lowest congestion/density) was used as the reference. These results suggested that a relatively low threshold of congestion and density affects engagement in DR, but a higher threshold is needed to affect DC. Compared with low congestion/density (Quartile 1), the odds of DR were higher and generally significant for each of the other three quartiles. For DC,

Table 2. Recoded Transportation Environment Variables

Transportation environment	Driving reduction (OR)	Driving cessation (OR)
Standardized		
Congestion	1.07*	1.12***
Roadway density	1.08**	1.11***
Quartiles (ref = 1st)		
Congestion		
2nd	1.23*	1.13
3rd	1.06	1.12
4th	1.23*	1.27*
Roadway density		
2nd	1.17**	1.12
3rd	1.19**	1.14
4th	1.25***	1.27**

Notes. OR = odds ratio.

* $p < .05$. ** $p < .01$. *** $p < .001$.

however, Quartiles 1, 2, and 3 were not significantly different from each other. Only the quartile with high congestion/density was significantly associated with DC (OR = 1.27).

Discussion

Based on the SEM, the transportation environment was conceptualized as a community-level factor that influences DRC, after controlling for the effects of individual- and interpersonal-level factors. Assessing the influence of community-level factors expands what we know about DRC, and by extension, the role that such factors play in successful and productive aging.

Age, gender, education, race, relationship status, household size, health, and vision have all been identified in previous research as potentially important predictors of DRC (Braitman & Williams, 2011; Choi, Mezuk, Lohman, Edwards, & Rebok, 2012; Dugan & Lee, 2013; Rosenbloom, 2010; Siren & Meng, 2013). Many of those previous findings were replicated here (using a longitudinal nationally representative sample), with a few differences and additions. For example, previous research that has examined race has often compared only Whites with non-Whites (Choi et al., 2012; Dugan & Lee, 2013). Similarly, household size has typically been defined as living alone or not living alone (Donorfio, D'Ambrosio, Coughlin, & Mohyde, 2008). Having a friend in one's neighborhood was a very important predictor of DC, which had not been previously assessed.

In terms of the transportation environment, a more congested and roadway dense transportation environment was associated with an increase in the odds of DR and DC, providing support for both hypotheses. Also, as suggested by the second hypothesis, the transportation environment seemed to have a larger impact on DC compared with DR, based on the higher significance levels and larger ORs. This finding is important because DC has more serious consequences than simply reducing one's driving, particularly given that the DR variable used in this study only assessed limiting long trips.

There was remarkable consistency between the congestion and roadway density measures even though they represented the transportation environment in different ways. As noted earlier, the UMS variables were only available for the urban/suburban respondents (about half the sample) and assessed congestion (essentially, how we interact with the environment); the GIS measure focused exclusively on the transportation infrastructure and was available for all respondents. The similarity of the standardized parameter estimates, even given these measurement differences, suggests that the environment truly plays a role in this process.

Although this study found an association between a congested and dense transportation environment and older adults' DRC behaviors, the potential reasons for these differences remain unknown, but would likely have very different policy and practical implications. For example, increased congestion and roadway density in the environment may tax the declining driving abilities of older adults to the point that they reduce or stop their driving. There is evidence that older drivers are more likely than younger people to crash in complex driving situations (Staplin,

Lococo, Martell, & Stutts, 2012). Navigating an intersection is probably the most complicated driving situation and is one that older people often try to avoid (Braitman, Kirley, Ferguson, & Chaudhary, 2007; Broberg & Willstrand, 2014). Living in an area that requires interaction with more of these difficult scenarios may lead to a crash, or to lower driving self-efficacy, and precipitate DRC. These decisions may be fueled by safety concerns, either from the older driver or from their family and friends.

An alternative explanation also exists, however. Locations with dense or congested transportation infrastructure may be difficult to navigate, but they may also provide easier and more readily available alternatives to driving. People in these areas may have a geographically closer social network, which could provide easier access to more people to provide rides. More congested areas may also require shorter travel distances. If these explanations account for this difference, older adults may be more willing to reduce or stop driving because they have more viable alternatives available, rather than feeling overwhelmed by driving in a daunting environment.

Implications

This study represents an initial assessment of the relationship between the built environment and DRC. Although causal connections cannot yet be established given the study design, the use of nationally representative data and the consistency of the relationships across different environmental variables (and within both the full and subsample) suggest that the role of the environment in DRC is an important area for future research. If a causal relationship between congestion and roadway density can be established, several policy implications can be considered. For example, some might suggest that funding and city design policies should be adjusted in order to reduce roadway congestion; in effect, build more roads with more lanes of travel. Although this design strategy may reduce congestion, it misses an important point. The vast majority of trips are taken for a specific purpose, rather than just driving enjoyment (Santos et al., 2011). People need access to certain things, people, or places in order to maintain quality of life. Increased adoption of mixed-use zoning policies, which allow neighborhoods to have retail and commercial businesses in close proximity to denser residential areas (American Planning Association, 2013), provide a viable solution by reducing the need to travel. Indeed, reducing the need to travel is consistent with the concepts of livable and walkable communities, as well as utilizing transit-oriented development policies for city design (Bishop, 2015; Dittmar & Ohland, 2004; Wheeler, 2013).

These results also have potential implications for how older individuals plan their future, particularly because many prefer to age in place (Benefeld & Holtzclaw, 2014). The built environment should be an important consideration for people with this preference. A congested driving

environment could result in giving up driving earlier and may unnecessarily hasten a loss of independence. On the other hand, if older people have better access to alternative forms of transportation—whether that means rides from nearby friends and family, public transportation, or para-transit—their location may be well suited to aging in place.

Limitations and Strengths

There are some limitations to this research that must be acknowledged. The variables used to assess DRC were not ideal. In particular, measures of DR that assess additional avoidance behaviors like driving during rush hour, at night, and in inclement weather would be helpful. Future research should assess whether the environment influences these behaviors, and if so, if the effect is consistent across these behaviors. A more robust measure of DC would ask specifically about driving behavior. Driving history and crash involvement as predictors of DRC would have also made important additions to the present study. In addition, recent research suggests that understanding an area's "accessibility" rather than simply its mobility (as studied here) is important (Grengs, 2015; Grengs, Levine, Shen, & Shen, 2010). The accessibility of an area focuses on the ease of reaching valued places, which includes mobility, but also considers proximity and connectivity (Grengs et al., 2010). For example, if an area consists of highly congested roadways, mobility may be considered poor. If there are many nearby places for residents to meet their needs (e.g., stores, banks, doctor's offices), however, the close proximity of those locations would mitigate the lack of mobility in the area. Future research should consider studying the effect of the environment on DRC using measures of accessibility.

A key strength of this study is that it examined the role played by the environment in DRC, and is the first to specifically assess congestion and the transportation infrastructure in this research context. This study also used an established theory—the social ecological model—to inform the hypotheses and predict relationships. Applying ecological theory to DRC helped identify community-level factors as important in this process, and should continue to be used to spur additional research. The nationally representative data and longitudinal survival analysis techniques used in this study are also key strengths of this work. Longitudinal data allowed for respondents to be followed prospectively for a 12-year period, to account for when they moved and for changes in congestion over time. Finally, the results can be generalized to much larger populations (congestion: urban/suburban areas, GIS: entire United States), so findings from this study are applicable to areas throughout the United States.

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