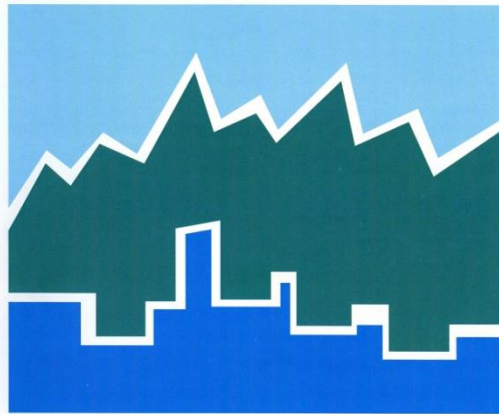


# NHTS



## **NATIONAL HOUSEHOLD TRAVEL SURVEY**

Compendium of Uses

January 2013 - December 2013

## Introduction

This compendium contains various uses and applications of the National Household Travel Survey (NHTS) data used in transportation planning and research from January 2013 to December 2013. Published journal articles and reports that cite the use of NHTS data were selected using the Transportation Research Board (TRB) Annual Meeting Online Portal <http://amonline.trb.org/> and Google Alerts, notification emails sent by Google when new search results matched predetermined search terms pertaining to NHTS data. The key word and search engine terms used in both online sources were the **National Household Travel Survey** and **NHTS**.

The research papers were grouped into 11 categories that were created based on the **Subject Areas** and index terms identified in each abstract as well as category titles used in previous NHTS compendium databases. The categories are as follows:

1. Bicycle and Pedestrian Studies
2. Demographic Trends
3. Energy Consumption
4. Environment
5. Policy and Mobility
6. Special Population Groups
7. Survey, Data Synthesis, and Other Applications
8. Traffic Safety
9. Transit Planning
10. Travel Behavior
11. Trend Analysis and Market Segmentation

A one-page description of each paper is provided which includes the **Title, Authors, Abstract, Subject Areas, and Availability**.

Research articles and reports in this document cover a diverse range of topics in the areas of transportation, health, safety, environment, and engineering and were published in various journals including, but not limited to, the American Journal of Public Health, the International Journal of Behavioral Nutrition and Physical Activity, and the National Center for Transit Research. Several papers were also submitted by researchers and graduate students for presentation and publication to the Transportation Research Board 92<sup>st</sup> Annual Meeting and can be found in the 2013 TRB Annual Meeting Compendium of Papers.

Please note that this 2013 compendium consists of approximately 282 research papers and articles. This document was updated on an on-going basis with newly published papers that cite NHTS data. For information about adding a research paper to the NHTS compendium, please contact Adella Santos at [adella.santos@dot.gov](mailto:adella.santos@dot.gov).

Search and documentation support was provided by Susan Liss. Jasmy Methipara (MacroSys) categorized and formatted the paper abstracts.

**Outline of reports from January 2013 through December 2013  
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# 1. BIKE AND PEDESTRIAN STUDIES

## **Closing the Bicycling Gender Gap: The Relationship Between Gender and Bicycling Infrastructure in the Nation's Largest Cities** *Allison Camp*

**Abstract:** The percentage of trips taken by bicycle and the number of bicyclists in the U.S. has steadily increased in the past decade. Accounting for this increase are men ages 25 to 64. Nationwide trends indicate women accounting for 25 percent of bicyclists and 24 percent of the nation's bicycle trips. Cities like Portland, Oregon with high cycling quantities also have higher female cycling numbers. Studies in Portland show that women respond positively to on-street bicycle facilities with a buffer from automobile traffic. Northern European cities with separated infrastructure see upwards of 50 percent female ridership. These cities have created an environment that is receptive to bicycling, and in turn have more bicyclists and ultimately more women bicyclists. Infrastructure creates a streetscape to accommodate more bicyclists, and the type of infrastructure can serve as an undeniable indicator to the quantity of women bicycling.

This research examines the relationship between adults who bike to work and the quantity of lanes, routes, and paths in the 51 largest U.S. cities using data from the Alliance for Biking & Walking's 2010 and 2012 U.S. Bicycling and Walking Benchmarking Project. This research finds a strong relationship between male ridership and bike routes, while female ridership shows a stronger relationship to bike paths. Women's data shows a positive correlation between change in infrastructure and change in ridership over time.

Gaining quantitative understanding of the infrastructure that leads to increased perceived safety among women can inform new safety and design standards that can accommodate all types of bicyclists. Statistically analyzing bicycle commuting data creates significant findings to support anecdotal research of women's bicycling perceptions to create a link between infrastructure and gender. These findings will begin to shrink the gender gap in bicycling.

**Subject Areas:** female; bike lane infrastructure; safety

**Availability:** Camp, Allison. "CLOSING THE BICYCLING GENDER GAP." (2013).  
<https://scholarsbank.uoregon.edu/xmlui/handle/1794/12935>

## **Bicycle! Bicycle! Conversion Factors Influencing Changes in Personal Transportation Choices** *Britta Barrett, Kristine M. Berg, Dominic Doneux, Ross Hattori, Meredith Slota*

**Abstract:** Transportation research for the past 30 years shows consistent commuter preference for individual commuting via private automobile, and the number of vehicles per household continues to rise. Transportation infrastructure capacity struggles to keep up, and many cities report increasing congestion and even gridlock. Urban planners cite alternative methods of transportation, such as walking, bicycling, and public transit, as a way of easing congestion while contributing to the overall health of residents and decreasing pollution from personal automobiles.

The City of Seattle published the Seattle Bicycle Master Plan in 2007, aiming to convert non-bicyclists into regular bicyclists by improving bicycle safety and trail access. They cite several barriers to potential bicyclists that non-bicyclists report prevent them from experimenting with bicycling as a regular method of transportation.

We aim to conduct an exploratory research project designed to examine the conversion factors reported by new bicyclists, to determine if and how they overcame the previously reported barriers. Additionally, we aim to examine non-bicyclists to both confirm previously reported perceived barriers as well as investigate any potential conversion factors they may be exploring. Our overall goal is to elucidate the rationale behind personal transportation choices and changes individuals make to better inform information outreach done by the City of Seattle.

**Subject Areas:** commute; congestion; health; pollution; conversion factors

**Availability:** BARRETT, BRITTA, et al. "Bicycle! Bicycle!." [http://re.vu/download/KristineMarieBerg/284759/work\\_example-kristine.m..berg-bicyclecommunityresearchproposaldoc.131072.1376623183.doc](http://re.vu/download/KristineMarieBerg/284759/work_example-kristine.m..berg-bicyclecommunityresearchproposaldoc.131072.1376623183.doc)

## **Perspectives on Seattle Women's Decisions to Bike for Transportation** *Anne Broache*

**Abstract:** A tangle of health, quality-of-life, environmental, and economic concerns has prompted Seattle and other major US cities to pursue strategies that encourage more trips by foot, bike, and transit. Yet increasing bicycling rates remains a distinct challenge, as evidenced by the extremely low share of Americans especially women who choose the two-wheeled mode for their everyday journeys. Even in Seattle, which has earned accolades for bike- friendliness, men compose more than 70 percent of bike commuters. An understudied research area lies in determining why these gender differences exist, to what extent they can be overcome, and, in general, how best to attract cycling skeptics. A better understanding of motives for bicycling among both genders and their nuanced subgroups is essential if planners hope to shift more trips away from motorized modes and reap the array of benefits associated with active transportation. This master's thesis contributes to the limited body of research on gender-related bicycling behavior and preferences by examining four major questions: (1) What are the major barriers associated with Seattle women's decisions to bicycle for transportation? (2) What are the key motives that may cause Seattle women to start or increase their cycling? (3) How do these barriers and motives differ among Seattle women who do or do not consider themselves daily riders? and (4) Based on these factors, what strategies might planners and other interested stakeholders employ to encourage more cycling among Seattle women? This research centers on a quantitative analysis of responses from a non-representative sample of 365 Seattle women, including 106 women who reported not riding for any of their everyday trips and 259 women who reported riding daily, collected through a survey by the Association of Pedestrian and Bicycle Professionals Women's Cycling Project in 2010. Through a quantitative comparison of these two ridership groups, I investigated how barriers and motives vary by self-reported experience levels. My analysis was informed by the ecological model, which suggests that individual, social-environment, and physical-environment factors all play roles in transportation behavior. Consistent with existing literature, safety in the presence of motorized traffic was the paramount concern for daily and non-daily riders alike. Weather, steep topography, distances between origins and destinations, route connectivity, and grooming and cargo issues also played important roles in the women's cycling decisions, especially for non-daily riders. By contrast, bike and equipment issues, presence of social supports in the community, and connectivity with transit appeared to be less relevant considerations. Based on these findings, I recommended that planners consider greater separation of bikes from motorized traffic, improve end-of-trip facilities, explore creative workarounds to steep topography, seek solutions to increase route connectivity, and enhance marketing activities that address cycling for transportation as a lifestyle.

**Subject Areas:** commute; bicycle; motives; gender

**Availability:** Broache, Anne. Perspectives on Seattle Women's Decisions to Bike for Transportation. Diss. University of Washington, 2012.

<https://digital.lib.washington.edu/xmlui/handle/1773/20790>

## **Effects of Bicycle Facility Provision on Mortality Prevention and GHG Reduction: Cost -Benefit Analyses within the BICY Project** *Meggs, J., Schweizer, J.*

**Abstract:** Cost-benefit analysis (CBA) has been conducted to examine the estimated effects of the provision of new bicycle infrastructure in a range of cities in Central Europe, based on results of the BICY Project. In particular, anticipated reductions in greenhouse gas (GHG) emissions, and all-cause mortality (as found with WHO Europe's HEAT tool) are presented here. The key finding: investing in bicycle infrastructure is strongly anticipated to return benefits valued at many times the initial investment, magnified by rapid action. A range of policy actions are considered.

**Subject Areas:** bicycling, infrastructure, cost-benefit analysis, CBA, HEAT, health impact assessment, HIA, active travel, bicycle transportation, transport economics, life expectancy, transport policy

**Availability:** Meggs, J., and J. Schweizer. "Effects of Bicycle Facility Provision on Mortality Prevention and GHG Reduction: Cost-Benefit Analyses within the BICY Project."  
<http://www.bicy.it/docs/129/HEAT-Scenario-CBA-FINAL-DRAFT-for-WHO.pdf>

## **Cycle Track Safety Remains Unproven** *Paul Schimek*

**Abstract:** n/a

**Subject Areas:** bicycle lanes; bicycle crash rate

**Availability:** Schimek, Paul. "Cycle track safety remains unproven." *American journal of public health* 103.10 (2013): e6-e7.

<http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.2013.301476>





**Examining the impact of urban morphology on bicycle mode choice** *Edwards, Greg Rybarczyk, & Changshan Wu*

**Abstract:** Nonmotorized transport modes such as bicycling are becoming important components to urban transportation systems in the United States, in particular with the recent emphases on sustainable urban development. Recent bicycle forecasting methods have included urban design elements to help explain bicycle behavior but most measures lack accountability of microscale built form attributes that address bicyclist perception. This study developed a discrete choice model to examine the impact of urban morphological factors on people's utilitarian bicycle mode choice decisions. In the model, traditional factors considered include personal, household, and environmental variables. Urban morphology variables from space syntax were also incorporated in the model to test for the marginal influence of microscale design and space characteristics in the decision to bicycle. Results indicate that microscale built form factors that enhance visibility and contain well connected street networks significantly affected bicycle mode choice decisions at the trip origin. The finding that built form variables by and large influence the probability that someone will commute via bicycle suggests that policies and planning efforts aimed at increasing bicycle mode share should include human-scaled built form metrics that address urban space and cognition.

**Subject Areas:** urban form, bicycling, GIS, visibility analysis, discrete choice model

**Availability:** Rybarczyk, Greg, and Changshan Wu. "Examining the impact of urban morphology on bicycle mode choice." *Environment and Planning B: Planning and Design* 40 (2013): 000-000. <http://www.envplan.com/epb/fulltext/bforth/b37133.pdf>

## **Spinning the Wheels and Rolling the Dice: Life-Cycle Costs and Benefits of Bicycle Commuting in the US** *Edwards, Ryan D., and Carl Mason*

**Abstract:** Objective. We assess average net longevity benefits of bicycle commuting in the U.S. Methods. We construct age-specific fatality rates per distance bicycled or driven using denominators from the 2009 National Household Travel Survey and numerators from official fatality statistics. We model the impact on the life table of switching from car to bicycle commuting. Results. Bicycling fatality rates in the U.S. are an order of magnitude higher than in Europe. These costs follow an age pattern that punishes both young and old, while the health benefits guard against causes of mortality that rise rapidly with age. Although the protective effects of bicycling appear significant, it may be optimal for individuals to wait until later ages to initiate regular bicycle commuting or avoid it in the current U.S. risk environment, especially if individuals discount future life years. Conclusions. The lifetime health benefits of bicycle commuting appear to outweigh the costs in the U.S., but individuals who sufficiently discount or disbelieve the health benefits may delay or avoid bicycling. Bicycling in middle age avoids much fatality risk while capturing health benefits. Significant cross-state variation in bicycling mortality risks suggest that safety improvements in the built environment might spur changes in transit mode.

**Subject Areas:** Aging, Expectations, Health, Mortality, Accidents, Life table, Life expectancy

**Availability:** Edwards, Ryan D., and Carl Mason. "Spinning the Wheels and Rolling the Dice: Life-Cycle Costs and Benefits of Bicycle Commuting in the US."

<http://qcpages.qc.edu/~redwards/Papers/edwards-mason-cycling06.pdf>

## **Measuring transportation at a human scale: An intercept survey approach to capture pedestrian activity** *Robert James Schneider*

**Abstract:** Pedestrian travel data are critical for measuring and analyzing sustainable transportation systems. However, traditional household travel surveys and analysis methods often ignore secondary modes, such as walking from a street parking space to a store entrance or walking from a bus stop to home. New data collection and analysis techniques are needed, especially in areas where walking is common. This paper describes an intercept survey methodology used to measure retail pharmacy customer travel to, from, and within 20 shopping districts in the San Francisco Bay Area. Of the 1003 respondents, 959 (96 percent) reported all modes of travel used from leaving home until returning home, including secondary modes. Walking was the primary travel mode on 21 percent of respondent tours, but an analysis of secondary modes found that 52 percent of tours included some walking. Pedestrian travel was particularly common within shopping districts, accounting for 65 percent of all trips within 804 meters (0.5 miles) of survey stores. Detailed walking path data from the survey showed that respondents in denser, more mixed-use shopping districts tended to walk along the main commercial street as well as other streets connecting to the core shopping area, while respondent pedestrian movements in automobile-oriented shopping districts tended to be contained within specific shopping complexes.

**Subject Areas:** pedestrian; secondary modes; intercept survey methodology

**Availability:** Schneider, Robert James. "Measuring transportation at a human scale: An intercept survey approach to capture pedestrian activity." *Journal of Transport and Land Use* 6.3 (2013): 43-59. <https://jtl.org/index.php/jtlu/article/view/311>

## **Walking and Biking in Pennsylvania: A Matter of National Security *Mission: Readiness***

**Abstract:** The retired admirals and generals of Mission: Readiness are concerned that 75 percent of young Americans are unable to join the military. About a quarter of all young Americans cannot join because they are overweight. Obesity rates among children have tripled within three decades, threatening not only the overall health of America, but also the future strength of our military. The Centers for Disease Control and Prevention, using a wider definition of who is overweight than the military uses, concluded that four out of ten young adults in Pennsylvania are either overweight or obese. Within roughly one generation, two trends have gone in opposite, and dangerous directions: A third as many children walk or bike to school, while Childhood obesity has tripled. Healthy lifestyles that include adequate physical activity are ultimately a matter of personal responsibility, however, elected officials can help individuals bear this responsibility better by creating environments where the healthy choice is also the easy choice. Investing wisely in infrastructure that promotes walking and biking can help more young Americans become fit again.

**Subject Areas:** youth; walk; bike

**Availability:** Are, Who We. "A MATTER OF NATIONAL SECURITY?."

<http://missionreadiness.s3.amazonaws.com/wp-content/uploads/PA-Transportation-Brief.pdf>.

## **Cycling in the Crescent City: An Exploration of the Spatial Variation in Bicycle Commuting in New Orleans** *Emilie S. Bahr*

**Abstract:** This thesis examines the spatial variation in bicycle commuting across New Orleans. It identifies where in the city bicycle commuting is most and least prevalent. It also explores factors that are promoting and discouraging utilitarian bicycling. A review of existing literature on variables found to influence transportation bicycling is conducted, and a survey is disseminated to residents across the city to determine some of the motivations for and obstacles to transportation bicycling locally. Additionally, case studies are compiled pertaining to two neighborhoods falling on opposite ends of the bike-commute spectrum. These include analysis of socio-economic and demographic data; an evaluation of the built environment using maps and field observation; and interviews to assess residents' attitudes about and experiences with transportation bicycling. In the end, this thesis should be helpful in pinpointing variables influencing bicycle commute rates and in determining the types of policies and investments that may be most effective in encouraging more bicycling in New Orleans and across the country.

**Subject Areas:** Bicycle commuting

**Availability:** Bahr, Emilie S. "Cycling in the Crescent City: An exploration of the spatial variation in bicycle commuting in New Orleans." (2013). <http://scholarworks.uno.edu/td/1607/>

## **How to Increase Bicycling for Daily Travel** *McNeil, Nathan*

**Abstract:** Research shows that infrastructure, programs, and policies that support bicycling can significantly increase levels of bicycling for daily travel. However, it is difficult to generalize about the effectiveness of specific strategies or particular kinds of bicycle infrastructure. Many studies only measure the impact of incremental expansions and do not capture the full impact of a completed bicycle system. Indeed, the most compelling evidence comes from communities that have implemented a fully integrated package of strategies to increase bicycling. The evidence reviewed in this brief suggests that a comprehensive approach produces a much greater impact on bicycling than individual measures that are not coordinated.

**Subject Areas:** Bicycling; health

**Availability:** McNeil, Nathan. "How to Increase Bicycling for Daily Travel." (2013).  
[http://activelivingresearch.org/files/ALR\\_Brief\\_DailyBikeTravel\\_May2013.pdf](http://activelivingresearch.org/files/ALR_Brief_DailyBikeTravel_May2013.pdf)

**Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public** *Bushell, Max A., Bryan W. Poole, Charles V. Zegeer, and Daniel A. Rodriguez*

**Abstract:** Costs for pedestrian and bicycle safety infrastructure often vary greatly from city to city and state to state. This document (and associated database) is intended to provide meaningful estimates of infrastructure costs by collecting up-to-date cost information for pedestrian and bicycle treatments from states and cities across the country. Using this information, researchers, engineers, planners, and the general public can better understand the cost of pedestrian and bicycle treatments in their communities and make informed decisions about which infrastructure enhancements are best suited for implementation. By collecting countrywide cost information, this database should contain useful information for any state or city, even if costs from that particular state or city are not included for a given treatment.

**Subject Areas:** Safe Routes to School; Walking; Bicycling; Evaluation; Survey; Elementary school children

**Availability:** Bushell, M.A., Poole, B.W., Zegeer, C.V., & Rodriguez, D.A. (2013). Costs for Pedestrian and Bicyclist Infrastructure Improvements: A Resource for Researchers, Engineers, Planners, and the General Public. Chapel Hill, NC: University of North Carolina, Chapel Hill, Highway Safety Research Center. <http://activelivingresearch.org/costs-pedestrian-and-bicyclist-infrastructure-improvements-resource-researchers-engineers-planners>

## **Evaluating safe routes to school events that designate days for walking and bicycling** *Aaron Buckley, Michael B. Lowry, Helen Brown, Benjamin Barton*

**Abstract:** This paper presents a case study evaluation of days designated for walking and bicycling as part of a Safe Routes to School program. The case study examines two elementary schools in Moscow, Idaho that annually participate in two designated days for walking and bicycling, "International Walk to School Day" in the fall and "Fill the Racks!" in the spring. Students walking or bicycling to school were counted before and after the events. For comparison, counts were also observed at a nearby school not involved with the Safe Routes to School program. Count data was collected for 8 days. Furthermore, 45 students and 17 parents were surveyed; and five parents and four community leaders were interviewed. The count data showed a significant increase in students using active modes of travel on the day of the event and a few weeks later. The interviews and surveys showed, among other things, there is strong support for the special events and most parents felt the designated days increased their child's motivation to walk to school. Many parents said the spring event prompted their child to return to walking to school after the cold winter months. Policy implications and other lessons learned are provided.

**Subject Areas:** Safe Routes to School; Walking; Bicycling; Evaluation; Survey; Elementary school children

**Availability:** Buckley, Aaron, et al. "Evaluating safe routes to school events that designate days for walking and bicycling." *Transport Policy* 30 (2013): 294-300.

<http://www.sciencedirect.com/science/article/pii/S0967070X13001546>



## **The paths from walk preference to walk behavior: Applying latent factors in structural equation modeling** *Matthew A. Coogan, Thomas Adler, Karla Karash*

**Abstract:** A structural regression model has been developed to explore the relationship among key factors in the explanation of utilitarian walking. The model examines the relationship between and among unobserved, or 'latent' factors that reflect 1) the values and preferences operant at the time of residential selection; 2) the urban form of the neighborhood; 3) the urban form of the residence; 4) the level of auto dependency; and 5) the extent to which the neighborhood is found satisfactory by the participant and those whose opinions he/she respects. The model allows the detailed examination of the paths from initial inclination towards a neighborhood with walkable destinations, through a series of mediating unobserved factors, each of which might either impede or facilitate the adoption of utilitarian walking. Variations on the model allow for the examination of the role of attitudes and preferences towards suburban house formats separately from the question of walkable destinations, reflecting the possibility of a value conflict situation. Analysis of the model results can shed some light on the relationship between attitudes and values brought to bear at the time of residential selection, and the need to deal with conditions and constraints to walking associated with the built environment closer to the time of the walking decision.

**Subject Areas:** walking; land use; attitudes; behavior

**Availability:** Coogan, Matthew A., Thomas Adler, and Karla Karash. "The paths from walk preference to walk behavior: Applying latent factors in structural equation modeling." *Journal of Transport and Land Use* 5.3 (2012). <https://jtl.org/index.php/jtlu/article/viewArticle/269>

## **Stretching the limits of walkability: comparing walk and bus trips in urban Seattle neighborhoods** *John Murphy*

**Abstract:** This study challenges traditional distance-based notions of walkability. The objective of this research was to determine whether it is feasible and realistic to replace relatively short bus trips with walking in urban Seattle, Washington neighborhoods. Through the collection of sixty data points, comparing walking and taking the bus from three origin points of varying distance (2.3, 1.5, and 0.9 miles) to the same location helped to determine that taking the bus is always fastest, less reliable, and less energy intensive than walking. However, the point at which walking becomes faster than taking the bus is a critical distance—0.9 miles—and is the upper limit at which the neighborhoods based in this study are deemed walkable. The comparability of travel time between walking and taking the bus at this distance shows that traditional distance-based definitions of walkability—usually 0.5 miles and less—may need to be extended under certain urban conditions.

**Subject Areas:** Adult; Walking; Area deprivation; Socioeconomic status; Active transportation; Policy

**Availability:** Murphy, John. *Stretching the limits of walkability: comparing walk and bus trips in urban Seattle neighborhoods*. Diss. University of Washington, 2012.  
<https://digital.lib.washington.edu/xmlui/handle/1773/21846>

**The relationship of area-level sociodemographic characteristics, household composition and individual-level socioeconomic status on walking behavior among adults** *Mary O. Hearsta, John R. Sirardb, Ann Forsythc, Emily D. Parkerd, Elizabeth G. Kleine, Christine G. Greenf, Leslie A. Lytle*

**Abstract:** Understanding the contextual factors associated with why adults walk is important for those interested in increasing walking as a mode of transportation and leisure. This paper investigates the relationships between neighborhood-level sociodemographic context, individual level sociodemographic characteristics and walking for leisure and transport. Data from two community-based studies of adults (n = 550) were used to determine the association between the Area Sociodemographic Environment (ASDE), calculated from U.S. Census variables, and individual-level SES as potential correlates of walking behavior. Descriptive statistics, mean comparisons and Pearson's correlations coefficients were used to assess bivariate relationships. Generalized estimating equations were used to model the relationship between ASDE, as quartiles, and walking behavior. Adjusted models suggest adults engage in more minutes of walking for transportation and less walking for leisure in the most disadvantaged compared to the least disadvantaged neighborhoods but adding individual level demographics and SES eliminated the significant results. However, when models were stratified for free or reduced cost lunch, of those with children who qualified for free or reduced lunch, those who lived in the wealthiest neighborhoods engaged in 10.7 min less of total walking per day compared to those living in the most challenged neighborhoods (p < 0.001). Strategies to increase walking for transportation or leisure need to take account of individual level socioeconomic factors in addition to area-level measures..

**Subject Areas:** Adult; Walking; Area deprivation; Socioeconomic status; Active transportation; Policy

**Availability:** Hearst, Mary O., et al. "The relationship of area-level sociodemographic characteristics, household composition and individual-level socioeconomic status on walking behavior among adults." *Transportation research part A: policy and practice* 50 (2013): 149-157. <http://www.sciencedirect.com/science/article/pii/S096585641300013X>

## **Investigating Behavior of Active Cyclists** *Katia Andrade & Seiichi Kagaya*

**Abstract:** The behavior of active cyclists in Japan and their motivations for cycling were investigated. In Japan, bicycles were often used either as the main transportation mode or as part of a multimodal journey. However, few Japanese transportation policies and strategies address cycling. The current investigation thus addressed the reasons why people cycled although the cycling system had yet to achieve high levels of service. Commuters' views on cycling were investigated in a behavioral analysis. In a statistical analysis, discrete choice models were estimated to assess the factors that had a strong influence on cycling. Results of the behavioral and statistical analyses are discussed with a focus on unimodal commuting trips. The findings of the models suggest that the single-person household type influences the choice of nonmotorized modes and that owning a car is not significant when people choose to cycle. Those who regularly cycle to perform other activities and those who regularly exercise are more likely to commute by bicycle. The possibility of sharing sidewalk space with pedestrians appears to have a strong positive impact on cycling. In addition, longer distances to public transport stations motivate the use of bicycle in multimodal journeys. The insight gained can be used by transport planners and government bodies in Japan and elsewhere in planning for more cycling-friendly cities.

**Subject Areas:** bicycle; behavior analysis; discrete choice; vehicle ownership; multimodal

**Availability:** Andrade, Katia, and Seiichi Kagaya. "Investigating behavior of active cyclists." Transportation Research Record: Journal of the Transportation Research Board 2314.1 (2012): 89-96. <http://trb.metapress.com/index/HT1L167L20886L02.pdf>

## **Temporal Stability and Transferability of Non-Motorized and Total Trip Generation Models** *Judith L. Mwakalonge, Juhann C. Waller, Judy A. Perkins*

**Abstract:** Transportation systems provide a means for moving people and the goods from which they are spatially separated. Of the two means of surface transportation, the motorized mode is used extensively for utilitarian travel in developed countries. The increasing reliance on motorized travel has contributed to increased traffic congestion, air pollution, and greenhouse emissions. Non-motorized travel has recently received significant attention as a means to reduce congestion and environmental problems and improve human health. However, non-motorized modeling is generally underdeveloped. This study investigated some changes in non-motorized and total travel and the characteristics of the traveling public in 1990, 1995, 2001, and 2009 using a national travel survey. The study also investigated the temporal transferability of linear-regression trip generation models for non-motorized and total travel under such changes. High-income households made fewer non-motorized trips in 1990 and 1995 compared to 2001 and 2009. Persons aged 50 and over showed an increased demand for non-motorized travel, whereas children aged 0 - 15 showed a decreasing preference for non-motorized travel over time. Regarding temporal stability, only the coefficient for single-adult households with no children was stable across all of the analysis years. For both non-motorized and total travel, most model parameter estimates were stable short term but not long term. In general, the total travel models transferred better than non-motorized models, both short term and long term. Despite not finding universal stability in model parameter estimates, the models were marginally able to replicate travel in 2009 relative to the locally estimated 2009 model.

**Subject Areas:** Non-Motorized; Transferability; Temporal; Total Travel

**Availability:** J. Mwakalonge, J. Waller and J. Perkins, "Temporal Stability and Transferability of Non-Motorized and Total Trip Generation Models," *Journal of Transportation Technologies*, Vol. 2 No. 4, 2012, pp. 285-296. doi: 10.4236/jtts.2012.24031.  
<http://www.scirp.org/journal/PaperInformation.aspx?paperID=23829&>

**Simple, Inexpensive Approach to Sampling for Pedestrian and Bicycle Surveys:  
Approach Developed in Pedestrian and Bicycling Survey** *Ann Forsyth, Asha  
Weinstein Agrawal, Kevin J. Krizek*

**Abstract:** Many transportation planners undertake local surveys for a better understanding of the levels of walking and cycling of residents in their city or town. This paper explores the challenges of designing a robust sampling strategy for such surveys. A review of existing surveys on nonmotorized transportation demonstrated that many existing surveys used less than ideal sampling approaches for communities that were aiming to collect population wide data on cycling and walking and thereby jeopardized the strength of their conclusions. Either surveys used approaches that were too expensive and complex for most communities to implement or surveys generated data that were not applicable to all residents in a community (i.e., data that were not generalizable to the full population). In response to that sampling problem, this paper presents a new method for collecting generalizable data: the sampling method developed in the Pedestrian and Bicycling Survey (PABS) project. PABS offers a rigorous, yet inexpensive, simple, and well-documented method to conduct surveys. The PABS mail-out-mail-back survey and probabilistic (generalizable) sampling approach can be performed in-house within municipal agencies. With the use of PABS, transportation professionals can obtain higher-quality data about their community as a whole than they would obtain with many of the other existing approaches. PABS is thus a useful complement to other sampling approaches such as intercept surveys (an important way to collect data on the use of specific facilities) or surveys distributed to e-mail lists (a cheap and useful way to collect qualitative data).

**Subject Areas:** bicycle; pedestrian; survey

**Availability:** Forsyth, Ann, Asha Weinstein Agrawal, and Kevin J. Krizek. "Simple, Inexpensive Approach to Sampling for Pedestrian and Bicycle Surveys." *Transportation Research Record: Journal of the Transportation Research Board* 2299.1 (2012): 22-30.  
<http://trb.metapress.com/content/m42748585505nn31/>

## **Bicycle and Pedestrian Studies Based on Data from National Household Travel Survey** *Stephen Edwards, Stephanie S. Ivey, Martin Lipinski, Mihalis M. Golias*

**Abstract:** Communities around the nation are addressing new federal regulations and an increased pressure by national and local advocacy groups to accommodate bicyclists and pedestrians in transportation projects. To meet these demands, state and local transportation planning agencies must often rely on data sets derived from small samples and with little previous application to develop user characteristics and travel demand models that estimate the effect an increase in bicycle and pedestrian infrastructure will have on the transportation network. One of the main sources for data on travel and transportation available to industry professionals is the National Household Travel Survey (NHTS), which FHWA conducts every 5 to 7 years and which provides data sets on daily travel for all transportation modes, including information on driver characteristics, travel time, trip purpose, time of day, and day of the week a trip took place. An add-on program with NHTS offers agencies an opportunity to obtain local data that may be used for bicycle and pedestrian studies. This paper presents the results of a literature review on the current methodology NHTS uses to gather bicycle and pedestrian data, the application of the data by transportation planning agencies and researchers, and lessons learned in the use of those data for bicycle-pedestrian studies.

**Subject Areas:** bicycle; pedestrian; NHTS

**Availability:** Edwards, Stephen, et al. "Bicycle and Pedestrian Studies Based on Data from National Household Travel Survey." *Transportation Research Record: Journal of the Transportation Research Board* 2299.1 (2012): 150-156.  
<http://trb.metapress.com/content/441309246r7825j9/>

**Bicycling and Walking for Transportation in Three Brazilian Cities** Reis, Rodrigo S., Adriano AF Hino, Diana C. Parra, Pedro C. Hallal, and Ross C. Brownson

**Abstract:** Background: Physical inactivity plays a role in the acquisition of heart disease, type 2 diabetes, and breast and colon cancer. The impact of such noncommunicable diseases on low- and middle-income countries is a major global health concern, but most studies in this area have focused on high-income countries. A better understanding of the factors that may influence physical activity in low- and middle-income countries is needed. Purpose: This study describes the prevalence of cycling and walking for transportation and their association with personal and environmental factors in adults from three state capitals in Brazil. Methods: In 2007–2009, a random-digit-dialing telephone survey was conducted with residents (aged  $\geq 18$  years) of Curitiba, Vitoria, and Recife, sampled through a clustered multistage sampling process. Walking and cycling for transportation, perception of the environment related to physical activity, and demographic and health characteristics were collected. Poisson regression was used to examine associations between cycling and walking for transportation with covariates stratified by cities. All analyses were conducted in 2011. Results: The prevalence of bicycling for transportation was 13.4%; higher in Recife (16.0%; 95% CI=13.7, 18.4) compared to Curitiba (9.6%; 95% CI=7.8, 11.4) and Vitoria (8.8%; 95% CI=7.34, 10.1); and 26.6% for walking regularly as a mode of transportation. The adjusted analysis showed that cycling is positively associated with being male (prevalence OR [pOR]=3.4; 95% CI=2.6, 18.4) and younger (pOR=2.9; 95% CI=1.8, 4.9) and inversely associated with having a college degree (pOR=0.3; 95% CI=0.2, 0.4). Walking for transportation is inversely associated with having a college degree (pOR=0.6; 95% CI=0.5, 0.8). No strong evidence of association was found of environmental indicators with walking or bicycling. Conclusions: The prevalence of active commuting was low and varied by city. Personal factors were more consistently associated with bicycling than with walking, whereas perceived environmental features were not related to active commuting.

**Subject Areas:** health; low-income country; bicycle; pedestrian; random-digit-dialing; Poisson regression; demographic trends

**Availability:** Reis, Rodrigo S., et al. "Bicycling and walking for transportation in three Brazilian cities." *American journal of preventive medicine* 44.2 (2013): e9-e17.  
<http://www.sciencedirect.com/science/article/pii/S0749379712007994>



**Walkable Communities and Adolescent Weight** Slater, Sandy J., Lisa Nicholson, Jamie Chriqui, Dianne C. Barker, Frank J. Chaloupka, and Lloyd D. Johnston

**Abstract:** Background: Neighborhood design features have been associated with health outcomes, including the prevalence of obesity. Purpose: This study examined the association between walkability and adolescent weight in a national sample of public secondary school students and the communities in which they live. Methods: Data were collected through student surveys and community observations between February and August 2010, and analyses were conducted in Spring 2012. The sample size was 154 communities and 11,041 students. A community walkability index and measures of the prevalence of adolescent overweight and obesity were constructed. Multivariable analyses from a cross-sectional survey of a nationally representative sample of 8th-, 10th- and 12th-grade public school students in the U.S. were run. Results: The odds of students being overweight (AOR 0.98, 95% CI=0.95, 0.99) or obese (AOR=0.97, 95% CI=0.95, 0.99) decreased if they lived in communities with higher walkability index scores. Conclusions: Results suggest that living in more-walkable communities is associated with reduced prevalence of adolescent overweight and obesity.

**Subject Areas:** health; walkability; student; obesity

**Availability:** Slater, Sandy J., Lisa Nicholson, Jamie Chriqui, Dianne C. Barker, Frank J. Chaloupka, and Lloyd D. Johnston. "Walkable Communities and Adolescent Weight." *American journal of preventive medicine* 44, no. 2 (2013): 164-168.

<http://www.sciencedirect.com/science/article/pii/S0749379712008008>

## **Social ecological influences on work-related active commuting among adults**

*Bopp, Melissa, Andrew T. Kaczynski, and Matthew E. Campbell*

**Abstract:** Objective: To examine influences on active commuting (AC) behavior using a social ecological framework. Methods: Participants (N = 1234) responded to an online survey about AC patterns and social ecological influences on AC. Multiple regression analysis determined the relative influence of individual, interpersonal, institutional, community, and environmental levels on AC. Results: Significant relationships were found between AC and individual, interpersonal, institutional, community, and environmental influences; 70% of the variance in AC was explained with the full model. Conclusions: The social ecological model provides a framework for understanding a range of influences on AC and should inform strategies to improve AC behavior.

**Subject Areas:** Active commuting; Social ecological; regression analysis

**Availability:** Bopp, Melissa, Andrew T. Kaczynski, and Matthew E. Campbell. "Social ecological influences on work-related active commuting among adults." *American Journal of Health Behavior* 37.4 (2013): 543-554.

<http://www.ingentaconnect.com/content/png/ajhb/2013/00000037/00000004/art00012>

**Walking Associated With Public Transit: Moving Toward Increased Physical Activity in the United States** Amy L. Freeland, Shailendra N. Banerjee, Andrew L. Dannenberg, and Arthur M. Wendel

**Abstract:** We assessed changes in transit-associated walking in the United States from 2001 to 2009 and documented their importance to public health. We examined transit walk times using the National Household Travel Survey, a telephone survey administered by the US Department of Transportation to examine travel behavior in the United States. People are more likely to transit walk if they are from lower income households, are non-White, and live in large urban areas with access to rail systems. Transit walkers in large urban areas with a rail system were 72% more likely to transit walk 30 minutes or more per day than were those without a rail system. From 2001 to 2009, the estimated number of transit walkers rose from 7.5 million to 9.6 million (a 28% increase); those whose transit-associated walking time was 30 minutes or more increased from approximately 2.6 million to 3.4 million (a 31% increase). Transit walking contributes to meeting physical activity recommendations. Study results may contribute to transportation-related health impact assessment studies evaluating the impact of proposed transit systems on physical activity, potentially influencing transportation planning decisions

**Subject Areas:** transit; walking; health; demographic trends

**Availability:** Amy L. Freeland, Shailendra N. Banerjee, Andrew L. Dannenberg, and Arthur M. Wendel. Walking Associated With Public Transit: Moving Toward Increased Physical Activity in the United States. *American Journal of Public Health*: March 2013, Vol. 103, No. 3, pp. 536-542. <http://ajph.aphapublications.org/doi/full/10.2105/AJPH.2012.300912>

## **Bicycle-Transit Integration in the United States, 2001–2009** Wang, Rui, and Chen Liu

**Abstract:** This paper analyzes the recent trend in bicycle-transit integration in the U.S. It reviews data from the National Household Travel Surveys (NHTS) to show the characteristics of bicycle-transit integrated trips, where the integrators were from, and to which population groups the integrators belonged. Bicycle-transit integration was increasingly observed in commuters and younger travelers, and became more imbalanced by gender. Results indicate the rise in socio-economic diversity of bicycle-transit integrators, despite a racial gap. There was a clear concentration of bicycle-transit integrators in large and high-density urban areas, where most transit users lived. Evidence does not support that rail attracts more bike access/egress trips than bus. More transit users used bicycles to access/egress in the Pacific, East North Central, and Mountain regions. Given the non-trivial role of bicycles compared to transit in the U.S., the focus on bicycle use and the marriage between bicycle and transit should be further emphasized.

**Subject Areas:** bicycle; multimodal; transit; demographic trends

**Availability:** Wang, Rui, and Chen Liu. "Bicycle-Transit Integration in the United States, 2001–2009." *Journal of Public Transportation* 16.3 (2013).  
[http://www.nctr.usf.edu/wp-content/uploads/2013/10/16.3\\_wang.pdf](http://www.nctr.usf.edu/wp-content/uploads/2013/10/16.3_wang.pdf)

## **Measuring the Sustainability of U.S. Public Bicycle Systems** *Williamson, Max W.*

**Abstract:** As cities worldwide plan for increasing urbanization levels, new challenges in mobility will arise. Any approach taken to address these new issues will need to consider how to move more people with declining resources, thus the need for a sustainable solution arises. This thesis examines the growing trend of cities creating public bicycle systems as a means to add sustainability to a transportation system and identifies what are the criteria and indicators of a sustainable public bicycle. The criteria and indicators are used to examine data collection techniques of three Public Bicycle Systems in the United States: Capital Bikeshare in Washington, D.C., Nice Ride in Minneapolis, Minnesota and Denver B-Cycle in Denver, Colorado.

**Subject Area:** public bicycle system

**Availability:** Williamson, Max W. "Measuring the Sustainability of US Public Bicycle Systems." University of New Orleans Diss. (2012). <http://scholarworks.uno.edu/td/1574/>

## **Characterizing Walk Trips in communities by Using Data from 2009 National Household Travel Survey, American Community Survey, and Other Sources**

*Hwang, Ho-Ling; Reuscher, Tim; Wilson, Daniel W and Murakami, Elaine*

**Abstract:** Non-motorized travel (i.e. walking and bicycling) are of increasing interest to the transportation profession, especially in context with energy consumption, reducing vehicular congestion, urban development patterns, and promotion of healthier life styles. This research project aimed to identify factors impacting the amount of travel for both walk and bike trips at the Census block group or tract level, using several public and private data sources. The key survey of travel behavior is the 2009 National Household Travel Survey (NHTS) which had over 87,000 walk trips for persons 16 and over, and over 6000 bike trips for persons 16 and over. The NHTS, in conjunction with the Census Bureau's American Community Survey, street density measures using Census Bureau TIGER, WalkScore, Nielsen Claritas employment estimates, and several other sources were used for this study. Stepwise Logistic Regression modeling techniques as well as Discriminant Analysis were applied using the integrated data set. While the models performed reasonably well for walk trips, travel by bike was abandoned due to sparseness of data. This paper discusses data sources utilized and modeling processes conducted under this study. It also presents a summary of findings and addresses data challenges and lesson-learned from this research effort.

**Subject Areas:** Non-motorized Travel; NHTS; Travel Survey; Stepwise Logistic Regression; Discriminant Analysis

**Availability:** Hwang, Ho-Ling [ORNL] et al. "Characterizing Walk Trips In Communities By Using Data From 2009 National Household Travel Survey, American Community Survey, and Other Sources." *TRB 92nd Annual Meeting, Washington, DC, USA, 20130113, 20130117*. 2013. <http://www.osti.gov/scitech/biblio/1060848>

## **Sustainable and Healthy Travel Choices and the Built Environment Analyses of Green and Active Access to Rail Transit Stations Along Individual Corridors**

*Appleyard, Bruce*

**Abstract:** Until recently, data and technology have limited the ability of travel behavior research to uniquely capture details of the built environment that may influence a person's choice to walk or bicycle. Most previous studies have relied on aggregated zonal averages homogeneously attributed to unique individuals and have likely missed key subtleties of the built environment important to people traveling outside the protective enclosure of an automobile. Furthermore, most studies focus on the characteristics of the origin, not the critical components of the destination (such as parking, availability, and price). To understand better the choice of green and active modes, which is central to an understanding of how to achieve important environmental and health benefits, this paper presents methods to align detailed measures of the built environment (in sum, more finely disaggregated data of the built environment) more closely with the individual for disaggregated analyses of travel behavior. Through the use of a new, linear spatial unit of analysis—the individual access corridor—characteristics of the built environment are captured all the way from the origin to the destination for a group of individuals large enough to be statistically meaningful for policy and urban design guidance through the use of predictive, multinomial logit mode choice models. This study provides planning and design guidance on how to increase the likelihood that one will choose walking or bicycling over motorized modes and examines such elements as zoning, subdivision ordinances, and streetscape design as well as station policies for bicycle and auto parking.

**Subject Areas:** travel behavior; O-D; health; multinomial logit; zoning

**Availability:** Appleyard, Bruce. "Sustainable and healthy travel choices and the built environment." *Transportation Research Record: Journal of the Transportation Research Board* 2303.1 (2012): 38-45.

<http://trb.metapress.com/content/f6012n4q322w5172/fulltext.pdf>

## **Using Health Impact Assessments to Evaluate Bicycle and Pedestrian Plans**

*Wagner, Laura*

**Abstract:** Where we live, work, and play influences health, as well as how we travel to those places. Transportation agencies are responsible for ensuring safe access to travel options, including walking and bicycling, for people of all ages and abilities. For a number of reasons, including chronic disease rates and changing demographics, there is growing interest across the country to better explore the links between health and transportation. New approaches are emerging that can assist transportation agencies during the transportation planning process to make more informed decisions. One such approach involves the use of Health Impact Assessments (HIA), which can improve decision-making and protect and enhance health and health equity.

**Subject Areas:** health; bicycle; pedestrian; transportation planning

**Availability:** Wagner, Laura. "Using Health Impact Assessments to Evaluate Bicycle and Pedestrian Plans." University of North Carolina Highway Safety Research Center: Pedestrian and Bicycle Information Center White Paper Series (2013).  
[http://katana.hsrb.unc.edu/cms/downloads/WhitePaper\\_HIA\\_PBIC.pdf](http://katana.hsrb.unc.edu/cms/downloads/WhitePaper_HIA_PBIC.pdf)



## **Non-motorized Travel as a Sustainable Travel Option** *Bernardo, Christina, and Chandra Bhat*

**Abstract:** In many developed countries walking and bicycling are not extensively used as a means of transportation. Further, the share of these non-motorized travel modes (as a percentage of all trips) has been reducing over time. The increasingly low use of walk and bicycle modes of transportation, and the concomitant increasing use of motorized vehicles for transportation, may be associated with several factors, including land use and development patterns, traffic safety and personal security concerns, and perceptions of and attitudes towards non-motorized transport. These factors manifest themselves differently in developing and developed countries, but throughout the world the increasing reliance on motorized transport contributes to serious traffic congestion problems, air quality degradation, and greenhouse gas emission increases. In addition to transportation professionals, health agencies are also paying increased attention to non-motorized modes, or “active transport” as a route to improve public health. We discuss the many benefits of non-motorized travel, identify its facilitators and impediments, analyze its utilization in select developed and developing countries, review previous studies of the effectiveness of strategies to promote it, and recommend possible pathways to promote non-motorized travel as a sustainable travel option.

**Subject Areas:** bicycle; walking; sustainability

**Availability:** Bernardo, Christina, and Chandra Bhat. "Non-motorized Travel as a Sustainable Travel Option." *Handbook of Sustainable Travel*. Springer Netherlands, 2014. 277-291. [http://link.springer.com/chapter/10.1007/978-94-007-7034-8\\_18#](http://link.springer.com/chapter/10.1007/978-94-007-7034-8_18#)

## 2. DEMOGRAPHIC TRENDS

**Age-Related Shifts in Housing and Transportation Demand** *Margaret B. Neal, Ph.D.; Nancy Chapman, Ph.D.; Jennifer Dill, Ph.D.; Irina Sharkova, Ph.D.; Alan DeLaTorre; Kathleen Sullivan; Tomoko Kanai; & Sheila Martin, Ph.D.*

**Abstract:** Understanding where middle-aged and older adults live, where they are moving, how they get around, and the factors influencing these decisions is essential for planning for the future. To gain an understanding of the impact of age-related shifts on housing and transportation demand, Portland State University's College of Urban and Public Affairs, via its Institute on Aging, was contracted to conduct a review of the literature and to analyze existing key local and national data sources. A multidisciplinary team of faculty and graduate students was assembled and performed the work in the summer of 2006. The literature reviewed and the analyses presented here are intended to inform Metro's Regional Forecast and modeling assumptions and to stimulate policy discussions pertaining to managing the region's land supply and investing in transportation infrastructure.

**Subject Areas:** elderly travel behavior

**Availability:** Neal, Margaret B., et al. "Age-Related Shifts in Housing and Transportation Demand." (2006).

[https://www.pdx.edu/sites/www.pdx.edu.ioa/files/cupa\\_age\\_related\\_shifts.pdf](https://www.pdx.edu/sites/www.pdx.edu.ioa/files/cupa_age_related_shifts.pdf)

## **A Comparative Analysis of the Transit Needs of Men and Women Using a Transit Service in a Small-to-Mid-Sized United States Metropolitan Area: A Case Study for Tallahassee, Florida** *Danika Bellamy*

**Abstract:** Research has revealed notable differences between the travel behavior of men and women. Specifically, women's decisions and actions with regard to transportation remain greatly influenced by traditional gender roles existing within society. Although a great deal of research has focused on variances in transportation behavior between the sexes in terms of auto use, research on the unique transit needs and choices made by women has been limited. This investigation is important as attracting female passengers to transit can have long-term positive effects on the environment. Additionally, the retention of female riders currently captive to transit systems should be a continued goal of transit agencies.

This study sought to better understand the transit needs of women using StarMetro; a transit service provider in Tallahassee, Florida. In order to ascertain and examine their transit needs, a survey was administered to 150 bus riders, 75 men and 75 women, at major transfer points along the weekday route system. Information on specific needs such as accessibility, reliability of service, availability of information, frequency, cost, safety, as well as their relative importance to individual respondents was obtained and analyzed. Results revealed significant disparities in the transit needs of men versus women. Specifically, chi square tests showed that women were more likely to access transit for shopping and child related trips but less likely to have a car available to make trips or feel safe from crime while using StarMetro. The analysis revealed that women were more likely to feel unsafe from crime while waiting at bus stops during the night; walking to bus stops during the night; waiting at C.K. Steele Plaza during the night and while on buses. Women were also more likely than men to feel unsafe from accidents while waiting at a bus stop during daylight hours. Additionally, women were more likely to view safety from crime while using StarMetro as very important, whereas men were more likely to view the reliability of transit service as important. It is hoped that this research can be used as a catalyst by StarMetro to modify and improve their services to better facilitate the specific needs of women. For example, strategic improvements like increasing the number of well-lit bus stops could have a more positive impact on the travel experience of female users, which may result in their long-term retention as transit users.

**Subject Areas:** gender; transit

**Availability:** Bellamy, Danika. College of Social Sciences and Public Policy. Diss. The Florida State University, 2013.

[http://coss.fsu.edu/d6/durp/sites/coss.fsu.edu.durp/files/DIR\\_Bellamy2013.pdf](http://coss.fsu.edu/d6/durp/sites/coss.fsu.edu.durp/files/DIR_Bellamy2013.pdf)

**All Transit Is Not Created Equal** *Dr. Robert D. Bullard*

**Abstract:** n/a

**Subject Areas:** low-income; environmental justice, African American

**Availability:** Bullard, Robert D. "All transit is not created equal." race, poverty & the environment 12.1 (2005): 9-12. <http://www.jstor.org/stable/10.2307/41555221>

## **The Age-Adjusted Value of a Statistical Life: Evidence from Vehicle Choice** *James O'Brien*

**Abstract:** In this paper I estimate an age-adjusted value of statistical life (VSL) by examining consumer automobile purchases. Many public policies target the health and safety of older people, but most VSL estimates come from hedonic wage regressions with few older workers and no retirees. Although underrepresented in the labor force, senior citizens account for a sizeable share of vehicle acquisitions (around 12 percent). Using automobile purchase decisions I am able to extend the range of revealed preference evidence to include individuals up to 85 years old. Combining information on vehicle holdings and use, household attributes, used vehicle prices, and yearly fatal accidents for each make, model, and vintage automobile, I use a multinomial choice framework to model the vehicle purchase decision. For each age group I estimate a separate willingness to pay for reduced mortality by comparing the relative importance of fatality risk and annualized cost. I also employ a control function approach using vehicle crash test results to account for potential bias from individuals sorting into certain vehicle types. On average I find that seniors and non-seniors display similar VSLs, but that these averages mask a significant inverted-U-shaped VSL function that ranges from \$1.6 to \$17.1 million. Overall the results of this study corroborate the growing consensus on the shape and scale of the age-VSL relationship and highlight the importance of considering the specific age of affected individuals when evaluating the benefits of reduced mortality risk.

**Subject Areas:** Value of statistical life; senior discount; vehicle choice

**Availability:** O'Brien, James. "The Age-Adjusted Value of a Statistical Life: Evidence from Vehicle Choice." [http://www.stanford.edu/group/SITE/SITE\\_2013/2013\\_segment\\_6/2013-segment\\_6\\_papers/o\\_brien.pdf](http://www.stanford.edu/group/SITE/SITE_2013/2013_segment_6/2013-segment_6_papers/o_brien.pdf)

## **Travel-related behaviors, opinions, and concerns of U.S. adult drivers by race/ethnicity, 2010** *Geeta Bhat & Rebecca B. Naumann*

**Abstract:** The U.S. population is shifting to become both older and more racially and ethnically diverse. Our current understanding of U.S. drivers' travel-related needs and concerns by race/ethnicity is limited. The U.S. population is shifting to become both older and more racially and ethnically diverse. Our current understanding of U.S. drivers' travel-related needs and concerns by race/ethnicity is limited. Data from the 2010 HealthStyles survey, an annual, cross-sectional, national mail-panel survey of persons ages 18 years or older living in the United States, were used to calculate weighted percentages of travel-related behaviors, opinions, and concerns by race/ethnicity. Logistic regression was used to explore associations between race/ethnicity and specific travel-related concerns, while adjusting for other demographic characteristics. Adequate transportation alternatives to driving were reported by a greater percentage of persons in certain minority groups compared to whites (Hispanic: 34.7%; white: 23.4%). Concern for the availability of alternatives to driving in the future was greater among minority groups (black: 57.7%; Hispanic: 47.3%; other: 50.9%) compared to whites (37.5%). Additionally, among persons with a household income of \$25,000 +, minorities were generally more likely than whites to report concern about having alternative transportation options to driving, whereas concern was consistently high among all racial/ethnic groups for those earning less than \$25,000 annually. In each racial/ethnic group, more than 10% of persons reported not knowing how they would get around if they could no longer drive.

**Subject Areas:** Travel behaviors; Transportation; Race; Ethnicity

**Availability:** Bhat, Geeta, and Rebecca B. Naumann. "Travel-related behaviors, opinions, and concerns of US adult drivers by race/ethnicity, 2010." *Journal of safety research* 47 (2013): 93-97. <http://www.sciencedirect.com/science/article/pii/S0022437513001497>

## **Impact of fuel price on vehicle miles traveled (VMT): do the poor respond in the same way as the rich? *Tingting Wang; Cynthia Chen***

**Abstract:** The effects of fuel price on travel demand for different income groups reveal the choices and constraints they are faced with. The first purpose of this study is to understand these underlying choices and constraints by examining the variation of fuel price elasticity of vehicle miles travelled (VMT) across income groups. On the other hand, the rebound effect— increase in VMT as a result of improvement in fuel efficiency may offset the negative effect of fuel price on VMT. The second purpose of this study is to compare the relative magnitudes of the fuel price elasticity of VMT and the rebound effect. A system of structural equations with VMT and fuel efficiency (MPG, miles per gallon) as endogenous variables is estimated for households at different income levels from 2009 National Household Travel Survey. Higher income households show greater fuel price elasticity than lower income households. Fuel price elasticities are found to be  $-0.41$  and  $-0.35$  for the two highest income groups, while an elasticity of  $-0.24$  for the lowest income group is identified. The rebound effect is found to be only significant for the lowest income households as  $0.7$ . These findings suggest the potential ability of using fuel price as a tool to affect VMT. The study results also suggest possible negative consequences faced by lower income households given an increase in fuel price and call for more studies in this area.

**Subject Areas:** Vehicle miles travelled (VMT); Fuel efficiency; Fuel (gasoline) price; Income; Structural equations

**Availability:** Wang, Tingting, and Cynthia Chen. "Impact of fuel price on vehicle miles traveled (VMT): do the poor respond in the same way as the rich?." *Transportation* (2013): 1-15.  
<http://link.springer.com/article/10.1007/s11116-013-9478-1>

## **Nonwork Accessibility as a Social Equity Indicator** *Joe Grengsa*

**Abstract:** This study explains a method for deriving nonwork accessibility indicators and evaluates how nonwork accessibility varies among social groups in the Detroit metropolitan region. It finds that vulnerable social groups – including African Americans, Hispanics, low-income households, and households in poverty – experience an advantage in physical accessibility over more privileged groups for several trip purposes, including convenience stores, childcare facilities, religious organizations, and hospitals. However, vulnerable groups experience a distinct disadvantage in accessibility to shopping and supermarkets. These vulnerable social groups experience a substantially larger share of households with extremely low levels of accessibility, as a result of disproportionately low access to private vehicles.

**Subject Areas:** low income; poverty; nonwork accessibility

**Availability:** Grengs, Joe. "Nonwork Accessibility as a Social Equity Indicator." *International Journal of Sustainable Transportation* just-accepted (2013).  
<http://www.tandfonline.com/doi/abs/10.1080/15568318.2012.719582>



## **Convenience for the car-borne shopper: Are malls and shopping strips driving customers away? *Reimers, Vaughan***

**Abstract:** Global warming, increasing traffic congestion, diminishing resources and declining health levels have led to the introduction of several policies aimed at deterring car-usage. However many such policies have not only often failed to achieve their objective, they also risk jeopardising the retail sector. To help understand why, this study measures the importance shoppers assign to car convenience, their perceptions of shopping malls and shopping strips (also referred to as Main Street or the High Street) in relation to it, and then compares them in their actual provision of it. To achieve these objectives, the study utilised a consumer household survey and a retail audit. The results of the study indicate that consumers regard car convenience as an important determinant of where they choose to shop, and perceive malls as a superior source of it. Moreover, with the sole exception of being able to park close to desired stores, malls offer car-borne shoppers more convenient access and parking. The findings suggest that any strategy designed to deter car usage should be designed to impact equally on both mall shopping and strip shopping, or risk tipping the balance even further in favour of the mall.

**Subject Areas:** Shopping; Mall; Convenience; Car; Parking

**Availability:** Reimers, Vaughan. "Convenience for the car-borne shopper: Are malls and shopping strips driving customers away?." *Transportation Research Part A: Policy and Practice* 49 (2013): 35-47. <http://www.sciencedirect.com/science/article/pii/S0965856413000098>

## **The Impacts of LRT, Neighbourhood Characteristics, and Self-selection on Auto Ownership: Evidence from Minneapolis-St. Paul** *Cao, Jason, and Xiaoshu Cao*

**Abstract:** There is a growing interest in exploring the relationships between the built environment and auto ownership and a number of studies have investigated the impact of rail transit on travel behavior. However, few have disentangled the impact of rail transit on auto ownership from the influences of the built environment and residential self-selection. Using the light rail transit (LRT) in the Minneapolis-St. Paul metropolitan area, USA, this study applies the statistical control approach and quasi-longitudinal design to examine the effects of LRT, neighborhood design and self-selection on auto ownership. It is found that residential self-selection influences auto ownership; backyard size, off-street parking and business density marginally affect auto ownership; and the LRT does not have an independent impact on auto ownership beyond neighbourhood design and self-selection. The results point to the importance of neighbourhood design in rail transit development.

**Subject Area:** travel behavior; built environment; vehicle ownership

**Availability:** Cao, Jason, and Xiaoshu Cao. "The Impacts of LRT, Neighbourhood Characteristics, and Self-selection on Auto Ownership: Evidence from Minneapolis-St. Paul." *Urban Studies* (2013): 0042098013505887.

<http://usj.sagepub.com/content/early/2013/10/15/0042098013505887.abstract>

**Nonparametric Estimation of a Heterogeneous Demand Function under the Slutsky Inequality Restriction** *Blundell, Richard, Joel Horowitz, and Matthias Parey*

**Abstract:** Economic theory rarely provides a parametric specification for a model, but it often provides shape restrictions. We consider nonparametric estimation of the heterogeneous demand for gasoline in the U.S. subject to the Slutsky inequality restriction of consumer choice theory. We derive conditions under which the demand function can be estimated consistently by nonparametric quantile regression subject to the Slutsky restriction. The estimated function reveals systematic variation in price responsiveness across the income distribution. A new method for estimating quantile instrumental variables models is also developed to allow for the endogeneity of prices. In our application, shape-constrained quantile IV estimates show similar patterns of demand as shape-constrained estimates under exogeneity. The results illustrate the improvements in the finite-sample performance of a nonparametric estimator that can be achieved by imposing shape restrictions based on economic theory.

**Subject Areas:** Slutsky inequality restriction; gasoline demand

**Availability:** Blundell, Richard, Joel Horowitz, and Matthias Parey. "Nonparametric estimation of a heterogeneous demand function under the Slutsky inequality restriction." (2013). <http://www.cemmap.ac.uk/wps/cwp541313.pdf>

## **Spatial Analysis of Travel Demand and Accessibility in Vermont: Where will EVs work?** *Aultman-Hall, Lisa; Sears, Justine; Dowds, Jonathan; Hines, Paul*

**Abstract:** The suitability and charging requirements of electric vehicles (EVs) may differ in rural areas, where the electrical grid may be less robust and daily vehicle miles traveled (VMT) higher. Although other studies have examined issues of regional power requirements of EVs, none have done so in conjunction with the spatial considerations of travel demand and accessibility. The authors use three datasets to forecast the future spatial distribution of EVs, as well as to assess these vehicles' ability to meet current daily travel demand: the National Household Travel Survey (NHTS), geocoded Vermont vehicle fleet data, and an E911 geocoded dataset of every building statewide. The authors consider spatial patterns in existing daily travel and home-based tours to consider EV charging locations, as well as area-types that are unsuited for widespread electric vehicle adoption. The authors also consider how built environment attributes, including residential and commercial density and retail accessibility, affect travel demand and thus future EV energy requirements. The authors found that existing hybrid vehicles were more likely to be located near other hybrids than conventional vehicles were. This clustering of current hybrid vehicles, in both urban and rural areas, suggests that the distribution of future EVs may also be clustered. The analysis suggests that between 69 and 84% of the state's vehicles could be replaced by a 40-mile range EV, and 96-99% could be replaced by a 100-mile EV, depending on the availability of workplace charging. The authors did not find a strong relationship between land-use and travel demand, perhaps due to the low number of urban data points, the highly variable nature of rural travel, and the limitations of using a one-day travel log dataset. The results suggest EVs are a viable option to serve existing travel demand by rural residents but may require special consideration for power supply and vehicle charging infrastructure.

**Subject Areas:** Electric Vehicles; rural; electrical grid; hybrid

**Availability:** Aultman-Hall, Lisa, et al. *Spatial Analysis of Travel Demand and Accessibility in Vermont: Where will EVs work?*. No. TRC Report 12-007. 2012.

<http://trid.trb.org/view.aspx?id=1146641>

### 3. ENERGY CONSUMPTION

**Price-driven charging of Plug-in Electric Vehicles: Nash equilibrium, social optimality and best-response convergence** *Ghavami, A.; Kar, K.; Bhattacharya, S.; and Gupta, A.*

**Abstract:** As the number of charging Plugged-in Electric Vehicles (PEVs) increase, it is crucial to control the charging of PEVs in order to minimize energy generation and transmission costs, and ensure grid stability. In this work, we analyze the equilibrium properties of a natural price-driven charging control game in the distribution grid, between the utility (that sets the time-dependent energy usage price) and selfish PEVs (that choose their own charging schedules to minimize individual cost). We demonstrate through analysis and simulations that individual best-response strategies converge to socially optimal charging profiles (also equilibrium solutions) under fairly weak assumptions on the (asynchronous) charging profile update processes. We also discuss how the framework can be extended to consider the topology of the distribution tree and associated transmission line capacity constraints.

**Subject Areas:** battery powered vehicles; distribution networks; game theory; power grids

**Availability:** Ghavami, Abouzar, et al. "Price-driven charging of Plug-in Electric Vehicles: Nash equilibrium, social optimality and best-response convergence." Information Sciences and Systems (CISS), 2013 47th Annual Conference on. IEEE, 2013.  
[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6552326](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6552326)

**Coordinated EV Adoption: Double-Digit Reductions in Emissions and Fuel Use for \$40/Vehicle-Year** *Dong Gu Choi, Frank Kreikebaum, Valerie M. Thomas, and Deepak Divan*

**Abstract:** Adoption of electric vehicles (EVs) would affect the costs and sources of electricity and the United States efficiency requirements for conventional vehicles (CVs). We model EV adoption scenarios in each of six regions of the Eastern Interconnection, containing 70% of the United States population. We develop electricity system optimization models at the multidecade, day-ahead, and hour-ahead time scales, incorporating spatial wind energy modeling, endogenous modeling of CV efficiencies, projections for EV efficiencies, and projected CV and EV costs. We find two means to reduce total consumer expenditure (TCE): (i) controlling charge timing and (ii) unlinking the fuel economy regulations for CVs from EVs. Although EVs provide minimal direct GHG reductions, controlled charging provides load flexibility, lowering the cost of renewable electricity. Without EVs, a 33% renewable electricity standard (RES) would cost \$193/vehicle-year more than the reference case (10% RES). Combining a 33% RES, EVs with controlled charging and unlinking would reduce combined electric- and vehicle-sector CO<sub>2</sub> emissions by 27% and reduce gasoline consumption by 59% for \$40/vehicle-year more than the reference case. Coordinating EV adoption with adoption of controlled charging, unlinked fuel economy regulations, and renewable electricity standards would provide low-cost reductions in emissions and fuel usage.

**Subject Areas:** EV; GHG emissions; gasoline consumption

**Availability:** Choi, Dong Gu, et al. "Coordinated EV Adoption: Double-digit reductions in emissions and fuel use for \$40/vehicle-year." *Environmental science & technology* 47.18 (2013): 10703-10707. <http://pubs.acs.org/doi/abs/10.1021/es4016926>

## **Joint Optimization of Electric Vehicle and Home Energy Scheduling Considering User Comfort Preference** *Duong Tung Nguyen and Long Bao Le*

**Abstract:** In this paper, we investigate the joint optimization of electric vehicle (EV) and home energy scheduling. Our objective is to minimize the total electricity cost while considering user comfort preference. We take both household occupancy and EV travel patterns into account. The novel contributions of this paper lie in the exploitation of EVs as dynamic storage facility as well as detailed modeling of user comfort preference, thermal dynamics, EV travel and customer occupancy patterns in a concrete optimization framework. Extensive numerical results are presented to illustrate the efficacy of the proposed design. Specifically, we show that the proposed design can achieve significant saving in electricity cost, allow more flexibility in setting the tradeoff between cost and user comfort, and enable to reduce energy demand during peak hours. We also demonstrate the benefits of applying the proposed framework to a residential community compared to optimization of individual household separately.

**Subject Areas:** Electric vehicle, HVAC system, energy management, system, aggregator, day-ahead electricity price, occupancy, pattern, travel pattern, cost minimization, user comfort.

**Availability:** Nguyen, Duong Tung, and Long Bao Le. "Joint Optimization of Electric Vehicle and Home Energy Scheduling Considering User Comfort Preference." (2013): 1-12.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6596523](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6596523)

**Estimating the Efficiency of Transportation Energy Consumption based on Railway Infrastructure and Travel behavior Characteristics** *Hyunsu Choi, Dai Nakagawa, Ryoji Matsunaka, Tetsuharu Oba and Jongjin Yoon.*

**Abstract:** In recent years, energy consumption in the transportation sector by expanding motorization continues to increase in almost every country in the world. Moreover, the growth rate of the transportation energy consumption is significantly higher than those of the civilian and industrial sectors. Therefore, every country strives to reduce its dependence on private transport, which is the main contributor to the transportation energy consumption. In many countries, concepts such as Transit Oriented Development (TOD) or New Urbanism, which controls road traffic by increasing the proportion of the public transportation significantly, have been implemented to encourage a modal shift to public transport. However, the level of change required for eliminating environmental problems is a challenging task. Minimizing transportation energy consumption by controlling the increase of the traffic demand and maintaining the level of urban mobility simultaneously is a pressing dilemma for each city. Grasping the impact of the diversity of the urban transport and infrastructure is very important to improve transportation energy efficiency. However, the potential for reducing urban transportation energy consumption has often been ineffectively demonstrated by the diversity of cities. Therefore, the accuracy of evaluating the current efficiency rate of the urban energy consumption is necessary. Nevertheless, quantitative analyses related to the efficiency of transportation energy consumption are scarce, and the research on the current condition of consumption efficiency based on international quantitative analysis is almost nonexistent. On the basis of this background problem definitions, this research first built a database of the transportation energy consumption of private modes in 119 cities, with an attempt to reflect individual travel behaviors calculated by Person Trip data. Subsequently, Data Envelopment Analysis (DEA) was used as an assessment method to evaluate the efficiency of transportation energy consumption by considering the diversity of the urban traffic features in the world cities. Finally, we clarified the current condition of consumption efficiency by attempting to propose a target values for improving transportation energy consumption.

**Subject Areas:** Efficiency of transportation energy consumption, Global cities database, Railway infrastructure, Travel behavior, Data Envelopment Analysis (DEA), Person trip data (PT data)

**Availability:** Choi, Hyunsu, et al. "Estimating the Efficiency of Transportation Energy Consumption based on Railway Infrastructure and Travel behavior Characteristics." *International Journal of Railway* 6.2 (2013): 33-44.  
[http://www.ijr.or.kr/On\\_line/admin/files/\(33-44\)-13-005.pdf](http://www.ijr.or.kr/On_line/admin/files/(33-44)-13-005.pdf)



**Integrated V2G, G2V, and Renewable Energy Sources Coordination Over a Converged Fiber-Wireless Broadband Access Network** *Da Qian Xu ; McGill Univ., Montréal, QC, Canada ; Joos, G. ; Levesque, M. ; Maier, M.*

**Abstract:** In this paper, an integrated vehicle-to-grid, grid-to-vehicle, and renewable energy sources (IntVGR) coordination algorithm is proposed. The focus of this work is to provide a multidisciplinary study on implementing the proposed IntVGR scheme over a broadband fiber-wireless communications infrastructure by co-simulating both power and communications perspectives. For the power systems perspective, results show that the scheme is able to achieve a 21% reduction in peak demand compared to uncontrolled charging, and a better performance in flattening the overall demand profile and maintaining network constraints in comparison to a benchmark scenario. The scheme has also been demonstrated to successfully coordinate PEVs to take maximum utilization of local renewable energy. For the communications perspective, the measured upstream traffic for executing the proposed IntVGR scheme on a residential area of 342 households is found to be 1-2 Mbps with an end-to-end latency level of 1 ms. The scheme has also been validated from both perspectives in a sensitivity analysis with a higher PEV adoption rate.

**Subject Areas:** Co-simulation; demand side management; plug-in electric vehicles; smart grid communications

**Availability:** Maier, Martin. "Integrated V2G, G2V, and Renewable Energy Sources Coordination Over a Converged Fiber-Wireless Broadband Access Network." (2013).  
<http://ieeexplore.ieee.org/iel7/5165411/5446437/06519340.pdf?arnumber=6519340>

## **Stochastic Modeling and Optimization Scheduling for Electric Vehicle Charging**

*Jian Wang, Kuihua Wu, Zhizhen Liu,————— Kuizhong Wu, & Zhihui Li*

**Abstract:** This paper commences with the investigation of the charging power of electric bus, and the charging profile is fitted by using Least Square Method. Then the charging modeling of private electric vehicles is established by way of statistical techniques and Monte Carlo simulation algorithm. According to the negative impact on planning and operation of the power system, as is brought by the popularity of electric vehicles (EVs), especially when implemented without control, an optimal control concept is put forward by combining a centralized optimal scheduling and a distributed scheduling scheme, and a coordinated scheduling model is also established. The centralized optimal scheduling scheme takes the network load variance minimization as the optimization objective. The optimization goal of distributed scheduling scheme is to minimize the deviation between charging load demand and the centralized optimization results, within each dynamic sliding window, considering the actual battery constraints and EV owners' benefits. Therefore, the dynamic control for EV charging and discharging is fulfilled. Take the planning data of Shandong for example, we analyze the impact of EV charging on the distribution network under different scenarios. Results are presented to verify the validity and feasibility of charging model and control algorithm.

**Subject Areas:** Electric Vehicle; Load Curve; Load Characteristic; Modeling; Coordinated Charging

**Availability:** Wanga, Jian, et al. "Stochastic Modeling and Optimization Scheduling for Electric Vehicle Charging." [http://www.joics.com/publishedpapers/2013\\_10\\_11\\_3411\\_3420.pdf](http://www.joics.com/publishedpapers/2013_10_11_3411_3420.pdf)

## **Probabilistic Analysis of Plug-In Electric Vehicles Impact on Electrical Grid Through Homes and Parking Lots** *Rezaee, S.; Farjah, E.; & Khorramdel, B.*

**Abstract:** Plug-in electric vehicles in the future will possibly emerge widely in city areas. Fleets of such vehicles in large numbers could be regarded as considerable stochastic loads in view of the electrical grid. Moreover, they are not stabled in unique positions to define their impact on the grid. Municipal parking lots could be considered as important aggregators letting these vehicles interact with the utility grid in certain positions. A bidirectional power interface in a parking lot could link electric vehicles with the utility grid or any storage and dispersed generation. Such vehicles, depending on their need, could transact power with parking lots. Considering parking lots equipped with power interfaces, in more general terms, parking-to-vehicle and vehicle-to-parking are propose here instead of conventional grid-to-vehicle and vehicle-to-grid concepts. Based on statistical data and adopting general regulations on vehicles (dis)charging, a novel stochastic methodology is presented to estimate total daily impact of vehicles aggregated in parking lots on the grid. Different scenarios of plug-in vehicles' penetration are suggested in this paper and finally, the scenarios are simulated on standard grids that include several parking lots. The results show acceptable penetration level margins in terms of bus voltages and grid power loss.

**Subject Areas:** Electric vehicles; Power grids; Probability density function

**Availability:** Rezaee, Saeed, Ebrahim Farjah, and Benyamin Khorramdel. "Probabilistic Analysis of Plug-In Electric Vehicles Impact on Electrical Grid Through Homes and Parking Lots." (2013): 1-10. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6545377](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6545377)

## **Power System Reliability Assessment With Electric Vehicle Integration Using Battery Exchange Mode** *Lin Cheng; Yao Chang; Jin Lin; & Singh, C.*

**Abstract:** The demand for reducing fossil fuel consumption and carbon emissions has stimulated the development and deployment of electric vehicles (EVs). The reliability of power systems will be significantly influenced by the increasing penetration of EVs. Currently, there are mainly two potential modes for EVs charging: 1) plug-in mode and 2) battery exchange (BE) mode. There have been many papers studying the impact of EVs using plug-in mode. However, research on BE mode is still only limited. This paper aims at estimating the reliability impact caused by EVs using BE mode. First, the behavior of EV users under BE mode are extracted from two reliable databases. The behavior extraction method is developed specifically for BE mode, which is modified based on a method originally designed for plug-in mode. Afterwards, power system reliability is studied from the viewpoint of both the power system and the EV users by introducing a new reliability index named User Demand Not Satisfied (UDNS). The algorithm for reliability assessment is developed based on an algorithm designed for energy storage system (ESS) integration. The numerical results demonstrate the integration of EVs using BE mode can greatly benefit the reliability performances of power systems.

**Subject Areas:** Consumer behavior; Electric vehicles; Power system reliability

**Availability:** Cheng, Lin, et al. "Power System Reliability Assessment With Electric Vehicle Integration Using Battery Exchange Mode." (2013): 1-9.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6547709](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6547709)

## Power Forecasting for Plug-in Electric Vehicles with Statistic Simulations

*Guangbin Li*

**Abstract:** The report introduces the power forecasting model for plug-in electric vehicles with statistic simulations, based on some survey data and driving habits of citizens. Initial state of charge, starting time of charging and other important parameters are simulated from driven distance distributions and arrival time distributions for vehicles. Bass diffusion model is used for calculating the future amount of electric vehicles; and Monte Carlo simulation is applied to forecast the influence the plug-in electric vehicles bring to the grid. Results with different amounts in different seasons are simulated and analyzed. The conclusion is that free-charged electric vehicles may raise the peak of load curves, and increase the peak-valley differences, which is not good to be popularized; a kind of smart charging, ordered-charging, can help fill the valley. First-arrive-first-charged case and SOC-ordered charging cases are simulated, with decreasing the peak-valley differences instead of raising the peak as a result. Smart charging can make use of electricity energies in the valley period, realize the load shifting, and improve the efficiency of electricity usage.

**Subject Areas:** PEVs; smart charging; load shifting, electricity usage

**Availability:** Li, Guangbin. "Power Forecasting for Plug-in Electric Vehicles with Statistic Simulations." [http://www.ee.columbia.edu/~lavaei/Projects/Guangbin\\_Li\\_Advanced.pdf](http://www.ee.columbia.edu/~lavaei/Projects/Guangbin_Li_Advanced.pdf)

**Analysis of electric vehicle impacts in new Mexico urban utility distribution infrastructure** *Arellano, B.; Sena, S.; Abdollahy, S.; Lavrova, O.; Stratton, S.; & Hawkins, J.*

**Abstract:** Modeling is going to play a crucial role for utilities as Electric Vehicle (EV) ownership percentage increases. Utilities anticipate new demand peaks due to EV charging loads, particularly at high penetration levels. Several efforts in the utility industry have been using a demographic approach to find potentially worst overloaded distribution infrastructure and use these locations as test beds. This paper will demonstrate the methodology used in the demographics study to identify areas of interest for urban New Mexico feeders. Using existing infrastructure with real utility GIS data, several leading modeling tools were used to identify possible long-term and short-term outcomes. Using the demographic results, system- and component-specific analysis, an impact study will identify potential impacts and mitigation opportunities. The impact analysis methodology described in this paper will identify short term and long term impacts on voltage issues, protection, Power Quality, Loading, and Control. Through modeling results, data integrity gaps, generic to other utilities can also be identified. Other methods of modeling described in this paper will use Synergee (modeling tool developed by GL Group) as a baseline to simulate the EV penetration and correlate that with other Distributed Energy Resources such as PV. General conclusions will be made based on the results of the impact study. The conclusions will be used to identify business-case opportunities such as DR, TOU and possibly V2G. The modeling efforts will also support and identify gaps in modeling software in the utility and data integrity to have real time data for distribution planning for short term and long term impacts of all DERs.

**Subject Areas:** Data models; Electric vehicles; Load management; Load modeling; Loading; Substations

**Availability:** Arellano, B., et al. "Analysis of electric vehicle impacts in new Mexico urban utility distribution infrastructure." Transportation Electrification Conference and Expo (ITEC), 2013 IEEE. IEEE, 2013. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6573495](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6573495)

## **A decentralized access control algorithm for PHEV charging in smart grid** *Kan Zhou, & Lin Cai*

**Abstract:** Plug-in hybrid electric vehicle (PHEV), in addition to its environment-friendliness, brings both challenges (due to its high demand) and opportunities (thanks to the elasticity of its demand) to future smart grid. How to control users' elastic demand to reduce demand peaks and effectively use renewable energy are key objectives for smart grid, which also spark numerous research efforts. Existing solutions are either centralized, or decentralized based on real time pricing (RTP). In this paper, we introduce a new distributed random access approach for controlling PHEV charging, which does not need centralized control and can be executed in real time. Different from the existing work, we use the history information rather than RTP to coordinate all the distributed smart agents which schedule the PHEV charging. Simulation results show that the proposed decentralized access algorithm is efficient and effective in reducing peaks caused by uncoordinated PHEV charging, and can provide automatic demand response to make the demand follow the change of renewable energy supply. The proposed algorithm is simple and scalable to implement.

**Subject Areas:** PHEV charging; Demand response; Load control; Smart grid

**Availability:** Zhou, Kan, and Lin Cai. "A decentralized access control algorithm for PHEV charging in smart grid." *Energy Systems* (2013): 1-20. <http://link.springer.com/article/10.1007/s12667-013-0092-2>

## **Feasibility Study on the Applications of Residential Electric Vehicles to the Smooth and Efficient Operation of Power Grid** *Ming-Jang Jan*

**Abstract:** The main purpose of this thesis is to investigate the feasibility of the study on the applications of residential electric vehicles for smooth and efficient power grid operation. First of all, based on the National Household Travel Survey (NHTS), the probability model of EV arrival and initial state of charge (SOC) are built in the thesis. The focus of this thesis is to investigate the lithium-ion battery cycle life and to analyze the cost for each charge/discharge by considering the cost of battery degradation. Secondly, MATLAB simulation software is used, based on real-time electrovalence and goal of the minimal user's cost, to determine the best residential electric vehicle charge and discharge schedule. In addition, the load survey data are taken in the thesis to make the feasibility study on the applications of residential electric vehicles to the smooth and efficient operation of power grid. The simulation and analytical methods is valuable to research the impact of residential EV on smoothing the daily load curve in several charge/discharge cost and several time of use rate scenarios. The results may provide a valuable reference for electric power operators when electric vehicles become popular in the future.

**Subject Areas:** EV; power grid; V2G

**Availability:** Jan, Ming-Jang. "Feasibility Study on the Applications of Residential Electric Vehicles to the Smooth and Efficient Operation of Power Grid." (2013).

[http://pc01.lib.ntust.edu.tw/ETD-db/ETD-search/view\\_etd?URN=etd-0729113-190811](http://pc01.lib.ntust.edu.tw/ETD-db/ETD-search/view_etd?URN=etd-0729113-190811)



## **Coordinated Trading of Solar and Thermal Energy Including V2G Services**

*Muhammad W. Khalid and Ali T. Al-Awami*

**Abstract:** The minimum up/down time constraints of the thermal units expose them to the risk of operating at low benefits or even at loss at some periods. Also participants with renewable energy sources (RES) are at risk due to their uncertain resources. Energy trading in day-ahead energy market is already risky due to undecided energy and imbalance prices and load demand, whereas participation of RES makes it more risky. Coordinated trading of thermal with RES can mitigate this risk. Moreover, responsive demand can also be used for this purpose. In this paper, the case of a utility that have solar and thermal generators and use electric vehicles (EVs) as responsive demand is investigated. A bidding strategy is proposed for solar-thermal coordination while providing charging EVs through unidirectional vehicle-to-grid (V2G) services. The objective is to maximize the total expected profits of the utility while controlling its risk. The problem is devised as a stochastic mixed integer linear programming (MILP) with four random/stochastic parameters. A realistic case is developed for comparing uncoordinated with coordinated solar-thermal trading utilizing V2G services. Results show that coordination gives rise to higher expected profits and lower risk.

**Subject Areas:** Coordinated bidding strategies, Mixed integer linear programming, Profit maximization, Renewable energy sources, Vehicle to grid services

**Availability:** Khalid, Muhammad W., and Ali T. Al-Awami. "Coordinated Trading of Solar and Thermal Energy Including V2G Services."

<http://www.actapress.com/PaperInfo.aspx?PaperID=455663&reason=500>

## **All Options on the Table: Energy Systems Integration on the Island of Maui**

*Corbus, D.; Kuss, M.; Piwko, D.; Hinkle, G.; Matsuura, M.; McNeff, M.; Roose, L.; & Brooks, A.*

**Abstract:** PEV (Plug-in Electric Vehicle) charging control is important due to the fact that the unregulated charging can have a great impact on current power grid system. This paper concerns the PEV charging control for a case study of a shopping center parking lot. A queuing model is used to predict the temporal evolution of the number of PEVs in the parking lot. The charging control considers the loss of life of a dedicated distribution transformer for the facility. The objective of the control algorithm is to balance the minimization of the transformer loss of life and the maximization of charging service quality. The queuing theory is also used to estimate the waiting time under different number of chargers. The simulation results of the proposed smart charging strategy show the effectiveness of the methodology.

**Subject Areas:** Data models; Energy efficiency; Energy management; Hawaii; Load modeling; Predictive models; Renewable energy resources; Wind power generation

**Availability:** Corbus, Dave, et al. "All Options on the Table: Energy Systems Integration on the Island of Maui." *Power and Energy Magazine*, IEEE 11.5 (2013): 65-74.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6582019](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6582019)

**PEV charging control for a parking lot based on queuing theory** *Gong, Q.; Midlam-Mohler, S.; Serra, E.; Marano, V. & Rizzoni, G.*

**Abstract:** PEV (Plug-in Electric Vehicle) charging control is important due to the fact that the unregulated charging can have a great impact on current power grid system. This paper concerns the PEV charging control for a case study of a shopping center parking lot. A queuing model is used to predict the temporal evolution of the number of PEVs in the parking lot. The charging control considers the loss of life of a dedicated distribution transformer for the facility. The objective of the control algorithm is to balance the minimization of the transformer loss of life and the maximization of charging service quality. The queuing theory is also used to estimate the waiting time under different number of chargers. The simulation results of the proposed smart charging strategy show the effectiveness of the methodology.

**Subject Areas:** Aging; Load modeling; Power transformer insulation; Queueing analysis; Simulation; System-on-chip

**Availability:** Gong, Q., et al. "PEV charging control for a parking lot based on queuing theory." American Control Conference (ACC), 2013. IEEE, 2013.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6579987&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D6579987](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6579987&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D6579987)

## **Planning for the Long Haul: Investment Strategies for National Energy and Transportation Infrastructures** *McCalley, J.; Krishnan, V.; Gkritza, K.; Brown, R.; & Mejia-Giraldo, D.*

**Abstract:** Anthropogenic carbon dioxide (CO<sub>2</sub>) emissions and the resulting influence on global climate change have motivated nations throughout the world to reconsider how we obtain, move, and utilize energy. Use of the Sankey diagrams produced annually by Lawrence Livermore National Labs (see <https://flowcharts.llnl.gov>) indicates that in 2011, energy harvested in the United States was converted to electricity (40%), used for transportation (28%), or used for heating and industrial processes (32%). Similarly, in 2010, energy-related CO<sub>2</sub> emissions were due to electric conversion (40%), transportation (33%), and heating and industrial processes (27%). (Including non-CO<sub>2</sub> greenhouse-gas emissions does not significantly change these percentages.) Because energy-related CO<sub>2</sub> emissions come from the combustion of fossil fuels (coal, petroleum, and natural gas), there has been much emphasis on reducing reliance on these fuels or shifting some use of coal or petroleum to the use of cleaner-burning natural gas, along with reducing energy consumption via efficiency improvements and conservation.

**Subject Areas:** Carbon dioxide emissions; Coal; Electricity supply industry; Energy efficiency; Energy management; Global warming; Greenhouse effect; Investments; Natural gas

**Availability:** McCalley, James, et al. "Planning for the Long Haul: Investment Strategies for National Energy and Transportation Infrastructures." *Power and Energy Magazine*, IEEE 11.5 (2013): 24-35.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6581983&url=http%3A%2F%2Fieeexplore.ieee.org%2Fexpls%2Fabs\\_all.jsp%3Farnumber%3D6581983](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6581983&url=http%3A%2F%2Fieeexplore.ieee.org%2Fexpls%2Fabs_all.jsp%3Farnumber%3D6581983)

## **Optimizing demand response of plug-in hybrid electric vehicles using quadratic programming** *Bashash, S. & Fathy, H.K.*

**Abstract:** This paper develops a convex quadratic programming (QP) formulation for the demand response (DR) optimization of plug-in hybrid electric vehicles (PHEVs) under time-varying electricity price signals. The work is motivated by the need for a computationally-efficient PHEV DR model that accounts for the ohmic energy losses in PHEV batteries, and is scalable to large-scale vehicle-to-grid (V2G) optimization and control applications. We use a previously-developed power-split PHEV model with an optimal power management strategy to compute the average distance-based PHEV energy consumption characteristics. Moreover, we use an equivalent circuit battery model for the PHEV's charge and discharge process. We then derive the PHEV's total fuel and electric energy cost as a quadratic function of battery state-of-charge (SOC), and show that the cost function is convex. Finally, we use a standard QP solver to optimize the PHEV's demand response for a few sample trips obtained from the U.S. National Household Travel Survey (NHTS) dataset. The achieved optimization time for a 24-hour time window with 5 min. resolution is less than 0.1 s (using a single quad-core computer). The method can hence be easily scaled for large-scale smart grid optimization and control studies.

**Subject Areas:** Batteries; Electricity; Fuels; Integrated circuit modeling; Optimization; System-on-chip; Trajectory

**Availability:** Bashash, Saeid, and Hosam K. Fathy. "Optimizing demand response of plug-in hybrid electric vehicles using quadratic programming." American Control Conference (ACC), 2013. IEEE, 2013.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6579920&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D6579920](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6579920&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D6579920)

## **Decentralized Charging of Plug-In Electric Vehicles with Distribution Feeder Overload Control** *Abouzar Ghavami, Koushik Kar and Aparna Gupta*

**Abstract:** As the number of charging Plug-in Electric Vehicles (PEVs) increase, due to the limited power capacity of the distribution feeders and the sensitivity of the mid-way distribution transformers to the excessive load, it is crucial to control the amount of power through each specific distribution feeder to avoid system overloads that may lead to breakdowns. In this paper we develop, analyze and evaluate charging algorithms for PEVs with feeder overload constraints in the distribution grid. The algorithms we propose jointly minimize the variance of the aggregate load and prevent overloading of the distribution feeders.

**Subject Areas:** PEV; power capacity; distribution grid

**Availability:** Ghavami, Abouzar, Koushik Kar, and Aparna Gupta. "Decentralized Charging of Plug-In Electric Vehicles with Distribution Feeder Overload Control." arXiv preprint arXiv:1308.4316 (2013). <http://arxiv.org/pdf/1308.4316.pdf>

## **Effects of urbanisation on energy consumption in China** *Qiang Wang*

**Abstract:** As a key issue in China's economic development, urbanisation creates increasing pressure on energy supply and the natural environment. Thus, a better understanding of the relationship between urbanisation and energy consumption is necessary for Chinese decision makers at various levels to address energy security and sustainable economic and social development. This paper empirically investigates the effects of China's urbanisation on residential energy consumption (REC) and production energy consumption (PEC) through a time-series analysis. The results show that compared with rural areas, urbanisation slows per capita REC growth because of the economy of scale and technological advantages associated with urbanisation but has greater promotional effects on the growth of REC and the improvement of REC structure. The economic growth caused by urbanisation most significantly contributes to an increase in PEC, whereas technological advancement was found to reduce the scale of PEC (except from 2001 to 2005). Finally, the structural effect of the energy supply increased rather than decreased China's PEC, and the effect of industrial structure adjustment on PEC was found to be insignificant.

**Subject Areas:** Energy consumption; Effects of urbanisation; China

**Availability:** Wang, Qiang. "Effects of urbanisation on energy consumption in China." *Energy Policy* (2013). <http://www.sciencedirect.com/science/article/pii/S0301421513010239>

## **An Activity-Based Energy Demand Modeling Framework for Buildings: A Bottom-Up Approach** *Rajesh Subbiah*

**Abstract:** Energy consumption by buildings, due to various factors such as temperature regulation, lighting, poses a threat to our environment and energy resources. In the United States, statistics reveal that commercial and residential buildings combined contribute about 40 percent of the overall energy consumption, and this figure is expected to increase. In order to manage the growing demand for energy, there is a need for energy system optimization, which would require a realistic, high-resolution energy-demand model. In this work, we investigate and model the energy consumption of buildings by taking into account physical, structural, economic, and social factors that influence energy use. We propose a novel activity based modeling framework that generates an energy demand profile on a regular basis for a given nominal day. We use this information to generate a building-level energy demand profile at highly disaggregated level. We then investigate the different possible uses of generated demand profiles in different What-if scenarios like urban-area planning, demand-side management, demand sensitive pricing, etc. We also provide a novel way to resolve correlational and consistency problems in the generation of individual-level and building-level shared activities which occur due to individuals' interactions.

**Subject Areas:** energy consumption; building; energy demand profile;

**Availability:** Subbiah, Rajesh. An Activity-Based Energy Demand Modeling Framework for Buildings: A Bottom-Up Approach. Diss. Virginia Polytechnic Institute and State University, 2013. [http://vtechworks.lib.vt.edu/bitstream/handle/10919/23084/Subbiah\\_R\\_T\\_2013.pdf?sequence=1](http://vtechworks.lib.vt.edu/bitstream/handle/10919/23084/Subbiah_R_T_2013.pdf?sequence=1)



## **Life-Cycle Energy Implications of Different Residential Settings: Recognizing Buildings, Travel, and Public Infrastructure** *Brice Nichols and Kara Kockelman*

**Abstract:** The built environment can be used to influence travel demand, but very few studies consider the relative energy savings of such policies in context of a complex urban system. This analysis quantifies the day-to-day and embodied energy consumption of four different neighborhoods in Austin, Texas, to examine how built environment variations influence various sources of urban energy consumption. A microsimulation combines models for petroleum use (from driving) and residential and commercial power and natural gas use with rigorously measured building stock and infrastructure materials quantities (to arrive at embodied energy). Results indicate that the more suburban neighborhoods, with mostly detached single-family homes, consume up to 320% more embodied energy, 150% more operational energy, and about 160% more total life-cycle energy (per capita) than a densely developed neighborhood with mostly low-rise-apartments and duplexes. Across all neighborhoods, operational energy use comprised 83 to 92% of total energy use, and transportation sources (including personal vehicles and transit, plus street, parking structure, and sidewalk infrastructure) made up 44 to 47% of the life-cycle energy demands tallied. Energy elasticity calculations across the neighborhoods suggest that increased population density and reduced residential unit size offer greatest life-cycle energy savings per capita, by reducing both operational demands from driving and home energy use, and from less embodied energy from construction. The results support the notion that transportation and the built environment are strongly linked, and improving urban energy efficiency must come from policies and designs targeting embodied sources, not just a household's travel and daily energy consumption.

**Subject Areas:** Life-cycle Energy Use, Urban Systems, Neighborhood Design, Built Environment, Vehicle-Miles Traveled, Land Use Patterns, Sustainability Levers, Smart Growth

**Availability:** Nichols, Brice, and Kara Kockelman. Life-cycle Energy Implications of Different Residential Settings: Recognizing Buildings, Travel, and Public Infrastructure. No.

SWUTC/13/600451-00067-1. 2013.

<http://d2dtl5nnlpfr0r.cloudfront.net/swutc.tamu.edu/publications/technicalreports/600451-00067-1.pdf>

**Transportation Energy Data Book: Edition 31** *Davis, Stacy C.; Diegel, Susan; Boundy, Robert G.*

**Abstract:** The Transportation Energy Data Book: Edition 31 is a statistical compendium prepared and published by Oak Ridge National Laboratory (ORNL) under contract with the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Vehicle Technologies Program. Designed for use as a desk-top reference, the Data Book represents an assembly and display of statistics and information that characterize transportation activity, and presents data on other factors that influence transportation energy use. The purpose of this document is to present relevant statistical data in the form of tables and graphs. The latest edition of the Data Book is available to a larger audience via the Internet ([cta.ornl.gov/data](http://cta.ornl.gov/data)). This edition of the Data Book has 12 chapters which focus on various aspects of the transportation industry. Chapter 1 focuses on petroleum; Chapter 2 energy; Chapter 3 highway vehicles; Chapter 4 light vehicles; Chapter 5 heavy vehicles; Chapter 6 alternative fuel vehicles; Chapter 7 fleet vehicles; Chapter 8 household vehicles; Chapter 9 nonhighway modes; Chapter 10 transportation and the economy; Chapter 11 greenhouse gas emissions; and Chapter 12 criteria pollutant emissions. The sources used represent the latest available data. There are also three appendices which include detailed source information for some tables, more »measures of conversion, and the definition of Census divisions and regions. A glossary of terms and a title index are also included for the reader s convenience

**Subject Areas:** transportation energy use

**Availability:** Davis, Stacy C., Susan W. Diegel, and Robert G. Boundy. Transportation energy data book: Edition 31. No. ORNL 6987. United States. Department of Energy, 2012.

<http://info.ornl.gov/sites/publications/files/Pub37730.pdf>

## **Urban Transport Energy Consumption Explored Through 3D Arc Maps** *Stephanie Schweitzer; Ariane Middel; Wenwen Zhang*

**Abstract:** We present a visualization tool for the analysis of the transport energy budget of a city, including the life-cycle energy embedded in the built infrastructure and the energy consumption by transportation. In our application, cumulative total energy is displayed as stacked, color-coded cylinders on a land use map. Transport energy consumption from traffic between inner-city travel zones is visualized as directed 3D B´ezier curves. Our tool will support urban planners in assessing how urban form and infrastructure impact energy consumption and related greenhouse gas (GHG) emissions.

**Subject Areas:** Multidimensional Data; Geographic/Geospatial Visualization; Geometry-based Techniques

**Availability:** Schweitzer, Stephanie, Ariane Middel, and Wenwen Zhang. "Urban Transport Energy Consumption Explored Through 3D Arc Maps."

<http://users.soe.ucsc.edu/~pang/visweek/2013/scivis/posters/schweitz.pdf>

## **Private household demand for vehicles on alternative fuels and drive trains: a review** *Laurence Turcksin, Olivier Mairesse, Cathy Macharis*

**Abstract:** Any attempt of the government to encourage the purchase of vehicles on alternative fuels and drive trains will depend on the acceptance of the end-users on the demand side. This paper offers an in-depth understanding of the consumers' attitudes and preferences towards AFVs which can guide the government to establish effective policy measures. A comprehensive review of research is performed under different conceptual frameworks and research methodologies: attitudinal, experimental, preference valuation studies and others. Research findings are reported with the general objective to (1) uncover the attitudes and preferences towards AFVs and (2) examine whether the environmental benefits of AFVs play a role in the car purchase decision. Overall, there exists a strong environmental concern, and positive attitudes towards AFVs. However, environmental benefits are of little importance in the car purchase decision, which is principally driven by price characteristics, performance and convenience attributes. Limited knowledge levels also seem to prevent building up awareness of AFVs, which is the key to their adoption. The adoption of AFVs is likely to be limited without significant governmental incentives and regulations. Based on the key findings, it can be recommended that a combination of educational campaigns (e.g., information tools), pricing measures (e.g., differentiated vehicle taxation), supply-sided measures and large-scale demonstrations is required to support the adoption of AFVs.

**Subject Areas:** Consumer preferences; Alternative fuels; drive trains; Private households

**Availability:** Turcksin, Laurence, Olivier Mairesse, and Cathy Macharis. "Private household demand for vehicles on alternative fuels and drive trains: a review." *European Transport Research Review* (2013): 1-16. <http://link.springer.com/article/10.1007/s12544-013-0095-z#>

Fuel Use and Optimality of Assignments in Multivehicle Households: Trends from 2001 to 2009  
*Bolon, Kevin; Keoleian, Greg; Kostyniuk, Lidia*

**Abstract:** Multi-vehicle household fleets are often composed of vehicles with a wide range of attributes, including passenger and cargo capacities, towing capability, and fuel consumption. Decisions for how these vehicles are assigned to trips can have a significant impact on a household's total fuel use. In this paper, actual vehicle assignments from the 2001 and 2009 NHTS data are compared to the fuel use-minimizing decisions using CTRAM — a model which determines optimal vehicle-to-trip assignments considering constraints on vehicle availability and capability. Results show that the average potential reduction in fuel use through optimal assignment for multi-vehicle households was 10.9% in 2001 and 10.2% in 2009. However, the increase in assignment optimality that is seen in this period does not appear to be the result of a greater prevalence of active, short-term vehicle assignment decisions, such as a driver's voluntary use of a non-preferred vehicle, or switching vehicles mid-day. This finding provides evidence that the higher level of assignment optimality in 2009 was influenced by other, possibly longer-term decisions, such as considering fuel consumption in purchase decisions according to the primary driver's expected usage of the vehicle (e.g. a small, efficient vehicle for long-distance work commuting). The significance of this conclusion is reinforced by the finding that increases in assignment optimality are smaller in lower income households, possibly due to the lack of efficient vehicles in the secondary market in the years preceding the 2009 survey.

**Subject Areas:** Automobile ownership; Fuel consumption; Households; Low income groups; Optimization; Household travel surveys; Multiple vehicles; Trip assignments

**Availability:** Bolon, Kevin M., Greg A. Keoleian, and Lidia P. Kostyniuk. "Fuel Use and Optimality of Assignments in Multivehicle Households: Trends from 2001 to 2009." Transportation Research Board 92nd Annual Meeting. No. 13-3159. 2013.  
<http://trid.trb.org/view.aspx?id=1241869>

## **Packetized Plug-in Electric Vehicle Charge Management** *Pooya Rezaei, Jeff Frolik, and Paul Hines*

**Abstract:** Plug-in electric vehicle (PEV) charging could cause significant strain on residential distribution systems, unless technologies and incentives are created to mitigate charging during times of peak residential consumption. This paper describes and evaluates a decentralized and 'packetized' approach to PEV charge management, in which PEV charging is requested and approved for time-limited periods. This method, which is adapted from approaches for bandwidth sharing in communication networks, simultaneously ensures that constraints in the distribution network are satisfied, that communication bandwidth requirements are relatively small, and that each vehicle has fair access to the available power capacity. This paper compares the performance of the packetized approach to an optimization method and a first-come, first-served (FCFS) charging scheme in a test case with a constrained 500 kVA distribution feeder and time-of-use residential electricity pricing. The results show substantial advantages for the packetized approach. The algorithm provides all vehicles with equal access to constrained resources and attains near optimal travel cost performance, with low complexity and communication requirements. The proposed method does not require that vehicles report or record driving patterns, and thus provides benefits over optimization approaches by preserving privacy and reducing computation and bandwidth requirements.

**Subject Areas:** Communication systems, plug-in electric vehicles, smart charging

**Availability:** Rezaei, Pooya, Jeff Frolik, and Paul Hines. "Packetized Plug-in Electric Vehicle Charge Management." [http://www.uvm.edu/~phines/publications/2014/rezaei\\_2014.pdf](http://www.uvm.edu/~phines/publications/2014/rezaei_2014.pdf)

## **Modeling light-duty plug-in electric vehicles for national energy and transportation planning** *Di Wu, & Dionysios C. Aliprantis*

**Abstract:** This paper sets forth a family of models of light-duty plug-in electric vehicle (PEV) fleets, appropriate for conducting long-term national-level planning studies of the energy and transportation sectors in an integrated manner. Using one of the proposed models, three case studies on the evolution of the U.S. energy and transportation infrastructures are performed, where portfolios of optimum investments over a 40-year horizon are identified, and interdependencies between the two sectors are highlighted. The results indicate that with a gradual but aggressive introduction of PEVs coupled with investments in renewable energy, the total cost from the energy and transportation systems can be reduced by 5%, and that overall emissions from electricity generation and light-duty vehicle (LDV) tailpipes can be reduced by 10% over the 40-year horizon. The annual gasoline consumption from LDVs can be reduced by 66% by the end of the planning horizon, but an additional 800 TWh of annual electricity demand will be introduced. In addition, various scenarios of greenhouse gas (GHG) emissions reductions are investigated. It is found that GHG emissions can be significantly reduced with only a marginal cost increment, by shifting electricity generation from coal to renewable sources.

**Subject Areas:** Energy planning; infrastructure; Plug-in electric vehicles

**Availability:** Wu, Di, and Dionysios C. Aliprantis. "Modeling light-duty plug-in electric vehicles for national energy and transportation planning." *Energy Policy* 63 (2013): 419-432.  
<http://www.sciencedirect.com/science/article/pii/S030142151300832X>

## **Investigating the Impacts of Plug-in Hybrid Electric Vehicles on Distribution Congestion** *Shafiee, Soroush, Fotuhi-Firuzabad, Mahmud, & Rastegar, Mohammad*

**Abstract:** Smart grids are envisioned to support large penetrations of electrical vehicles driven by economical and environmental signals. Nevertheless, distribution system operators are becoming concerned about distribution congestion that may occur in the network with multiple domestic plug-in hybrid electric vehicles (PHEVs) charging. Therefore, investigating the impacts of high PHEV penetration levels on the performance of distribution networks seems to be essential for system operators and planners. Doing so, in this paper, PHEV characteristics are precisely extracted from valid published reports and surveys. Accordingly, a comprehensive model for investigating the impacts of different PHEV penetration levels on distribution systems for a single year and upcoming years is developed. The proposed model is applied to the IEEE 34-node test feeder, and PHEV impacts on the distribution network characteristics are reported. The results show distribution congestion occurrence for more than 11% PHEV penetration level.

**Subject Areas:** smart grid, electrical vehicle, PHEV

**Availability:** Shafiee, Soroush, Mahmud Fotuhi-Firuzabad, and Mohammad Rastegar.

"Investigating the impacts of plug-in hybrid electric vehicles on distribution congestion."

Electricity Distribution (CIRED 2013), 22nd International Conference and Exhibition on. IET.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6683199](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6683199)



## **Electrical consumption of two-, three- and four-wheel light-duty electric vehicles in India** *Samveg Saxena, Anand Gopal, Amol Phadke*

**Abstract:** The Government of India has recently announced the National Electric Mobility Mission Plan, which sets ambitious targets for electric vehicle deployment in India. One important barrier to substantial market penetration of EVs in India is the impact that large numbers of EVs will have on an already strained electricity grid. Properly predicting the impact of EVs on the Indian grid will allow better planning of new generation and distribution infrastructure as the EV mission is rolled out. Properly predicting the grid impacts from EVs requires information about the electrical energy consumption of different types of EVs in Indian driving conditions. This study uses detailed vehicle powertrain models to estimate per kilometer electrical consumption for electric scooters, 3-wheelers and different types of 4-wheelers in India. The powertrain modeling methodology is validated against experimental measurements of electrical consumption for a Nissan Leaf. The model is then used to predict electrical consumption for several types of vehicles in different driving conditions. The results show that in city driving conditions, the average electrical consumption is: 33 Wh/km for the scooter, 61 Wh/km for the 3-wheeler, 84 Wh/km for the low power 4-wheeler, and 123 Wh/km for the high power 4-wheeler. For highway driving conditions, the average electrical consumption is: 133 Wh/km for the low power 4-wheeler, and 165 Wh/km for the high power 4-wheeler. The impact of variations in several parameters are modeled, including the impact of different driving conditions, different levels of loading by air conditions and other ancillary components, different total vehicle masses, and different levels of motor operating efficiency.

**Subject Areas:** Electric vehicles; Powertrain; Transportation; Vehicle to grid; India

**Availability:** Saxena, Samveg, Anand Gopal, and Amol Phadke. "Electrical consumption of two-, three- and four-wheel light-duty electric vehicles in India." *Applied Energy* (2013). <http://www.sciencedirect.com/science/article/pii/S0306261913008738>

## **Online Monitoring and integrated Analysis System for EV Charging Station**

*Xiaoyong Nie, Jieyi Liu, Liang Xuan, Huan Liang, Songlin Pu, Qianggang Wang, Niancheng Zhou*

**Abstract:** An online monitoring, analysis, and evaluation system of electric vehicle (EV) charging station is designed and developed. The system structure is based on PCI bus with multi-DSP design, and its hardware consists of multi-DSP acquisition terminal, vehicular terminal, Industrial PC (IPC), FPGA and PCI interface. The voltage and current of the point of common coupling (PCC) of charging station and chargers are collected on real time, and the power quality is calculated based on these data. All monitoring data, which is gathered by PCI bus, is used to analyze the operation characteristic of the transformer and chargers as well as the harmonics and inter-harmonics in the charging station. The start charging time, initial charging state and daily mileage of EVs are statistical on basis of operation and charging information, which are sent to the system via GPRS.

**Subject Areas:** electric vehicle, charging station, monitoring, start charging time, SOC, power quality

**Availability:** Nie, Xiaoyong, et al. "Online Monitoring and integrated Analysis System for EV Charging Station." <http://appeec2013.ic.polyu.edu.hk/paper/0149.pdf>

## **Modeling and Optimization of Electric Vehicle Charging Load in a Parking Lot**

*Lidan Chen, C. Y. Chung, Yongquan Nie and Rongrong Yu*

**Abstract:** Electric vehicle (EV) offers one of the most promising approaches towards reducing urban pollution. With EVs' integration into power grid for charging batteries, they can potentially have a significant impact on the distribution grid. This paper discusses the modeling of a charging station for analysis of charging load demand in a residential parking lot with the assumption that EV arrivals follow Poisson distribution. Then, a simulation framework to generate the charging load profiles is proposed. Furthermore, Particle swarm optimization (PSO) algorithm is employed to obtain the stochastic feature parameter of charging start time, and an optimal charging strategy based on the model is developed to reduce the power fluctuation level caused by EV charging. Compared with results of the uncontrolled case, simulation results indicate that the proposed charging start time optimal algorithm not only slightly meets EV owners' charging demand but also significantly reduces peak and filling valley, mitigating the impact of EV charging on the distribution network.

**Subject Areas:** Electric Vehicle; vehicle ownership; electricity use

**Availability:** Hydro, B. C., et al. "The Canadian Plug-in Electric Vehicle Survey (CPEVS 2013): Anticipating Purchase, Use, and Grid Interactions in British Columbia." (2013). [http://remain.rem.sfu.ca/papers/jaxsen/CPEVS-2013\\_BC\\_Preliminary\\_Report\\_Oct-31-13.pdf](http://remain.rem.sfu.ca/papers/jaxsen/CPEVS-2013_BC_Preliminary_Report_Oct-31-13.pdf)

## **The Canadian Plug-in Electric Vehicle Survey (CPEVS 2013): Anticipating Purchase, Use, and Grid Interactions in British Columbia** *Jonn Axsen, Harry Joe Bailey, & George Kamiya*

**Abstract:** This report investigates consumer interest in plug-in electric vehicles (PEVs), summarizing preliminary results from the Canadian PEV Survey (CPEVS 2013). Between April and October 2013, 1,754 new vehicle buying Canadian households completed this survey, including 538 residents of British Columbia (BC). This three-part survey collected in-depth information from each respondent, including: background information such as vehicle ownership, electricity use, familiarity with PEV technology, and personal values and lifestyle; vehicle travel behaviour; access to vehicle charging at home and elsewhere; interest in purchasing a PEV under different conditions; interest in green electricity; and openness to enrolling in a utility controlled charging (UCC) program to increase the uptake of intermittent renewable energy sources. This report summarizes several preliminary results for the BC sample:

1. Many BC new-vehicle buyers have recharge access at home.
2. Most BC new-vehicle buyers have little awareness of PEVs.
3. BC new-vehicle buyers are much more likely to want a plug-in hybrid (PHEV) than a “pure” electric vehicle (EV).
4. The potential “early mainstream” PEV buyers in BC are unique in terms of home recharge access, age, household size and lifestyle
5. There are three different lifestyle segments of potential “early mainstream” PEV buyers in BC (differing by engagement in environment- and technology-oriented lifestyles).
6. Without incentives or policy to control recharge behaviour, PEV electricity demand will likely peak at around 6pm each day.
7. Potential “early mainstream” PEV buyers are generally open to the idea of “utility controlled charging” to support renewables—despite some privacy concerns.

**Subject Areas:** Electric Vehicle; vehicle ownership; electricity use

**Availability:** Hydro, B. C., et al. "The Canadian Plug-in Electric Vehicle Survey (CPEVS 2013): Anticipating Purchase, Use, and Grid Interactions in British Columbia." (2013). [http://remain.rem.sfu.ca/papers/jaxsen/CPEVS-2013\\_BC\\_Preliminary\\_Report\\_Oct-31-13.pdf](http://remain.rem.sfu.ca/papers/jaxsen/CPEVS-2013_BC_Preliminary_Report_Oct-31-13.pdf)

## **Demonstrating Demand Management: How Intelligent EV Charging Can Benefit Everyone** *Julian de Hoog, Kristian Handberg, Raman Jegatheesan*

**Abstract:** This paper establishes the case for Electric Vehicle (EV) charging demand management through in-field demonstration, electricity network modelling and financial assessment. As part of the Victorian Government Electric Vehicle Trial, DiUS Computing demonstrated EV charging demand management using United Energy's Smart Grid. Modelling of the United Energy network by the University of Melbourne found that uncontrolled charging would require network augmentation once EVs are adopted by 10% of households. In contrast, managed charging would allow the network to support in excess of 50% uptake using existing capacity and infrastructure. Furthermore, the end-to-end EV charging demand management solution demonstrated by DiUS could be implemented for one tenth the cost of the network augmentation. Although success factors were identified during the demonstration that may serve as an input for demand management program design, electricity market arrangements may be the strongest determinant of adoption generally.

**Subject Areas:** Demand Response, Load Control, Grid Impacts, Smart Charging

**Availability:** de Hoog, Julian, Kristian Handberg, and Raman Jegatheesan. "Demonstrating Demand Management: How Intelligent EV Charging Can Benefit Everyone."

[http://percepacion.com/wp-content/uploads/sites/3/2013/11/Demonstrating-Demand-Management\\_EVS27.pdf](http://percepacion.com/wp-content/uploads/sites/3/2013/11/Demonstrating-Demand-Management_EVS27.pdf)

## **Alternating Direction Method of Multipliers for Decentralized Electric Vehicle Charging Control** *Jose Rivera, Philipp Wolfrum, Sandra Hirche, Christoph Goebel, and Hans-Arno Jacobsen*

**Abstract:** The integration of Electric Vehicles (EVs) into the power grid is a challenging task. From the control perspective, one of the main challenges is the definition of a comprehensive control structure that is scalable to large EV numbers. This paper makes two key contributions: (i) It defines the EV ADMM framework for decentralized EV charging control. (ii) It evaluates EV ADMM using actual data and various EV fleet control problems. EV ADMM is a decentralized optimization algorithm based on the Alternating Direction Method of Multipliers (ADMM). It separates the centralized optimal fleet charging problem into individual optimization problems for the EVs plus one aggregator problem that optimizes fleet goals. Since the individual problems are coupled, they are solved consistently by passing incentive signals between them. The framework can be parameterized to trade-off the importance of fleet goals versus individual EV goals, such that aspects like battery lifetime can be considered. We show how EV ADMM can be applied to control an EV fleet to achieve goals such as demand valley filling and minimal-cost charging. Due to its flexibility and scalability, EV ADMM offers a practicable solution for optimal EV fleet control.

**Subject Areas:** electric vehicle; power grid; battery

**Availability:** Rivera, Jose, et al. "Alternating direction method of multipliers for decentralized electric vehicle charging control." Proceedings of the IEEE CDC (in press, 2013).  
<http://mediatum.ub.tum.de/doc/1187583/1187583.pdf>

Impact of plug in electric vehicle battery charging on a distribution system based on real-time digital simulator *Abdulelah Yousef Alharbi*

**Abstract:** This study investigates the impact of the electric vehicles (EVs') battery charging on the distribution system in terms of maximum voltage deviation, voltage unbalance at various locations, transformers overloading, and introducing new peaks into the system. In this research, a 12.47 kV real distribution network has been modeled using real time digital simulator, using real data from a power distributor. The study presents four different scenarios of uncoordinated EVs integration for two different charging times (evening and night) and two different charging rates (level I and level II) at different penetration levels ranging from 10% to 100%. Voltage unbalance at different locations is determined and transformer overloading is analyzed. The influence of EVs charging on the daily load curve is shown. It is noted that actual system data of voltage and current at all intellirupters of the utility distribution system were close to the data of the simulated system.

**Subject Areas:** Electric Vehicles; battery; distribution system

**Availability:** Alharbi, Abdulelah Yousef. "Impact of plug in electric vehicle battery charging on a distribution system based on real-time digital simulator." [http://www.opal-rt.com/sites/default/files/technical\\_papers/Impact%20of%20plug%20in%20electric%20vehicle%20battery%20charging%20on%20a%20distribu.pdf](http://www.opal-rt.com/sites/default/files/technical_papers/Impact%20of%20plug%20in%20electric%20vehicle%20battery%20charging%20on%20a%20distribu.pdf)

## **Estimating the potential of controlled plug-in hybrid electric vehicle charging to reduce operational and capacity expansion costs for electric power systems with high wind penetration** *Allison Weis, Paulina Jaramillo, & Jeremy Michalek*

**Abstract:** Electric power systems with substantial wind capacity require additional flexibility to react to rapid changes in wind farm output and mismatches in the timing of generation and demand. Controlled variable-rate charging of plug-in electric vehicles allows demand to be rapidly modulated, providing an alternative to using fast-responding natural gas plants for balancing supply with demand and potentially reducing costs of operation and new plant construction. We investigate the cost savings from controlled charging of electric vehicles, the extent to which these benefits increase in high wind penetration scenarios, and the trade-off between establishing a controlled charging program vs. increasing the capacity of generators in the power system. We construct a mixed integer linear programming model for capacity expansion, plant dispatch, and plug-in hybrid electric vehicle (PHEV) charging based on the NYISO system. We find that controlled charging cuts the cost of integrating PHEVs in half. The magnitude of these savings is ~5% to 15% higher in a system with 20% wind penetration compared to a system with no wind power, and the savings are 50–60% higher in a system that requires capacity expansion.

**Subject Areas:** Dispatch; Capacity expansion; Plug-in hybrid electric vehicles; Controlled charging; Wind power integration

**Availability:** Weis, Allison, Paulina Jaramillo, and Jeremy Michalek. "Estimating the potential of controlled plug-in hybrid electric vehicle charging to reduce operational and capacity expansion costs for electric power systems with high wind penetration." *Applied Energy* 115 (2014): 190-204. <http://www.sciencedirect.com/science/article/pii/S0306261913008374>



## **Randomized PHEV Charging Under Distribution Grid Constraints** *Kan Zhou and Lin Cai*

**Abstract:** Plug-in Hybrid Electrical Vehicles (PHEV) are promising to improve energy efficiency and environment friendliness. However, without proper control, their charging will cause harmful impact on the power distribution grid, including load congestion and voltage drop. Instead of using centralized optimization which may need accurate predictions on key parameters, in this paper, a new decentralized random access framework is introduced to schedule the PHEV charging. The proposed distributed solution does not need accurate predictions and can be executed online. Simulation on a semi-urban residential medium voltage grid shows that our algorithm can effectively provide demand response to protect the distribution grid from bus congestion and voltage drop, and also improve its efficiency. Most importantly, this algorithm is simple to deploy.

**Subject Areas:** Decentralized/Randomized PHEV charging, Demand Response, Distribution Grid, Smart Grid

**Availability:** Zhou, Kan, and Lin Cai. "Randomized PHEV charging under distribution grid constraints." IEEE Trans. Smart Grid (submitted). <http://www.ece.uvic.ca/~cai/disgrid.pdf>

## **Life Cycle Cost and Environmental Implications of U.S. Electric Vehicle and Charging Infrastructure Scenarios** *Elizabeth J Traut*

**Abstract:** This thesis examines life cycle cost, greenhouse gas (GHG) emissions, petroleum use, and policy implications of scenarios for electrified vehicles and charging infrastructure in the U.S., addressing several questions: What mix of vehicles minimizes life cycle cost? GHG emissions? What are the implications of workplace charging in addition to home charging? How much current and potential U.S. residential charging exists? What are the costs and GHG emissions of fast-charging and battery swapping service stations? How sensitive are these results to uncertain parameters? What factors are most critical? and What are the policy implications? Results indicate that without sufficiently clean electricity, plug-in vehicles (PEVs) with home and workplace charging do not offer substantial reductions in GHG emissions compared to hybrid electric vehicles (HEVs). Benefits improve with low-emission electricity generation. High gas prices (\$6/gal) cause PEVs to appear in minimum cost solutions and combined with low vehicle and battery costs (DOE 2030 targets) cause PEVs to dominate. Currently 79% of households but only 56% of vehicles have home parking where charging could be installed. Excluding renters, who face additional barriers, less than half of U.S. vehicles have reliable access to off-street parking where charging could be installed. This places a major limit on potential penetration of PEVs for the foreseeable future.

Battery swapping stations cost 40% more per vehicle served than fast charging stations without the cost of waiting time during service, but 50% less when it is included. Battery swapping's cost advantage requires vehicle and battery standardization. Several policy implications are identified. Gas prices and vehicle and battery prices are identified as price levers to encourage adoption and reduce petroleum consumption, but clean electricity is also needed for GHG emissions reductions. Lack of residential charging could curb adoption and needs attention since parking infrastructure turns over more slowly than the vehicle fleet. With clean electricity, dedicated workplace charging further reduces GHGs. Battery electric vehicle (BEV) adoption is restricted by limited range. Rapid BEV refueling options include fast charging, which incurs costly waiting times during service, or battery swapping, which is faster and potentially less costly but requires vehicle and battery standardization.

**Subject Areas:** GHGs; residential charging; Battery Electric Vehicle

**Availability:** Traut, Elizabeth J. Life Cycle Cost and Environmental Implications of US Electric Vehicle and Charging Infrastructure Scenarios. Diss. Carnegie Mellon University, 2013.  
<http://repository.cmu.edu/dissertations/239/>.

## **Development and Evaluation of Smart Grid Simulation System with Power Stabilization by EV** *Keiko Karaishi and Masato Oguchi*

**Abstract:** Recently, attention has been focused on whether the Smart Grid could work efficiently in an energy network. The subject of our study is the electric vehicle (EV), which has been proposed as a potential chargeable/dischargeable part of the power grid infrastructure. As energy is transferred between an EV and the power grid, it is possible to regulate energy on the entire grid via charging and discharging the EV battery. In the future, it may also be possible to stabilize energy within the system, using information technology control embedded in the network of the Smart Grid. This research is to construct the Smart Grid simulation system to evaluate power flow on such an environment. As a result of the evaluation, the proposed and developed system works to provide us means of a useful evaluation for various cases of the Smart Grid.

**Subject Areas:** energy network, EV, simulation system, Smart Grid, Vehicle-to-Grid (V2G)

**Availability:** Karaishi, Keiko, and Masato Oguchi. "Evaluation of Smart Grid Simulation System with Power Stabilization by EV." *Network Protocols and Algorithms* 5.1 (2013): 71-89.  
<http://macrothink.org/journal/index.php/npa/article/view/3261>

**PHEVs centralized/decentralized charging control mechanisms: Requirements and impacts** *Moeini-Aghaie, Moein; Abbaspour, Ali; Fotuhi-Firuzabad, Mahmud; Dehghanian, Payman*

**Abstract:** This paper investigates the main features of the PHEV centralized and decentralized charging control mechanisms, their requirements and also impacts on distribution system performance. A home-based charging control scenario as well as a coordinated charging control algorithm for the charging management of PHEVs is devised in this paper. Both the owner preferences and system operator concerns are taken into consideration in an optimization-based framework. The total network losses and charging costs are set as the constraints to the proposed optimization approach. Various aspects of the two mechanisms are discussed and comprehensively compared by their application on the IEEE 34-bus test system. The obtained results and discussions offered demonstrate the efficiency and applicability of the proposed approach in real world.

**Subject Areas:** PHEV; charging control mechanisms; Batteries; Electric vehicles; Electricity; Optimization; Pricing

**Availability:** Moeini-Aghaie, Moein, et al. "PHEVs centralized/decentralized charging control mechanisms: Requirements and impacts." North American Power Symposium (NAPS), 2013. IEEE, 2013. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6666904](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6666904)

## **A Comprehensive Study of the Impacts of PHEVs on Residential Distribution Networks** *ElNozahy, Mohamed S., and Magdy MA Salama.*

**Abstract:** This paper presents the development of a probabilistic benchmark for assessing the impacts of the uncontrolled charging of plug-in hybrid electric vehicles (PHEVs) on residential distribution networks. Unlike the previous research, which adopted several assumptions and approximations, this paper analyzes the available load and transportation data to extract probability distribution functions describing different uncertainties characterizing the charging process. Monte Carlo simulation is utilized to handle these uncertainties and to predict the anticipated impacts of PHEVs on a representative test network. Finally, conclusions are drawn to assist utilities in integrating PHEVs into their networks.

**Subject Areas:** Distribution systems; Monte Carlo (MC) simulation; plug-in hybrid electric vehicles (PHEVs)

**Availability:** ElNozahy, Mohamed S., and Magdy MA Salama. "A Comprehensive Study of the Impacts of PHEVs on Residential Distribution Networks." 1-1.  
[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6674071](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6674071)

**An Event-Based Simulation Framework to Examine the Response of Power Grid to the Charging Demand of Plug-In Hybrid Electric Vehicles (PHEVs)** *Darabi, Z.; Ferdowsi, M.*

**Abstract:** This paper describes the development of a discrete event simulation framework that emulates the interactions between the power grid and plug-in hybrid electric vehicles, and examines whether the capacity of the existing power system can meet the PHEV load demand. The probability distribution functions for the arrival time and energy demand of each vehicle are extracted from real-world statistical transportation data. The power grid's limited generation and transmission capacities are considered to be the major constraints. Therefore, vehicles may have to wait to receive any charge. The proposed simulation framework is justified and described in some detail in applying it to two real cases in the United States to determine certain regions' grid potential to support PHEVs.

**Subject Areas:** Charging event; Load profile; Plug-in hybrid electric vehicle; Power grid; Transportation electrification

**Availability:** Darabi, Zahra, and Mehdi Ferdowsi. "An Event-Based Simulation Framework to Examine the Response of Power Grid to the Charging Demand of Plug-In Hybrid Electric Vehicles (PHEVs)." (2013): 1-1. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6513311](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6513311)

Ant-Based Swarm Algorithm for Charging Coordination of Electric Vehicles *Shaolun Xu, Donghan Feng, Zheng Yan, Liang Zhang, Naihu Li, Lei Jing, and Jianhui Wang*

**Abstract:** Uncontrolled charging of large-scale electric vehicles (EVs) can affect the safe and economic operation of power systems, especially at the distribution level. The centralized EVs charging optimization methods require complete information of physical appliances and using habits, which will cause problems of high dimensionality and communication block. Given this, an ant-based swarm algorithm (ASA) is proposed to realize the EVs charging coordination at the transformer level, which can overcome the drawbacks of centralized control method. First, the EV charging load model is developed, and the charging management structure based on swarm intelligence is presented. Second, basic data of the EV using habit is sampled by the Monte Carlo method, and the ASA is applied to realize the load valley filling. The load fluctuation and the transformer capacity are also considered in the algorithm. Finally, the charging coordination of 500 EVs under a 12.47KV transformer is simulated to demonstrate the validity of the proposed method.

**Subject Areas:** Electric Vehicle charging; Monte Carlo

**Availability:** Xu, Shaolun, et al. "Ant-Based Swarm Algorithm for Charging Coordination of Electric Vehicles." *International Journal of Distributed Sensor Networks* 2013 (2013).  
<http://www.hindawi.com/journals/ijdsn/2013/268942/abs/>

## **Evaluation of charging infrastructure requirements and operating costs for plug-in electric vehicles** *Zhang, Li, Tim Brown, and Scott Samuelsen*

**Abstract:** Plug-in electric vehicles (PEVs), including plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), have the potential to improve the energy and environmental landscape of personal transportation, but face a hurdle of access to charging infrastructure. Additionally, the types, locations, and quantities of electric vehicle supply equipment (EVSE) that will be required are not well established. This study investigates the charging infrastructure requirements from the perspective of PEV operating cost and BEV feasibility. California was selected as the research region and PEV parameters were selected based on the early deployed vehicles available in the emerging commercial market. To minimize operating cost, an optimal charging strategy based on 24 h travel patterns is proposed. Results indicate that charging time strategy is the most important factor in reducing PEV operating cost while greater numbers of charging locations provide diminishing benefits for PHEVs. Higher charging power capability, combined with an acceptable charging time strategy offer only slight benefits for PHEVs, but charging power is an important factor in increasing BEV functionality and decreasing public charging requirements. The approximation of the electric vehicle supply equipment (EVSE) needed at different types of locations (e.g., home, work place, shopping) is proposed based on an optimal charging strategy.

**Subject Areas:** Plug-in electric vehicles; Charging infrastructure; Optimal charging; Operating cost; BEV feasibility; EVSE allocation

**Availability:** Zhang, Li, Tim Brown, and Scott Samuelsen. "Evaluation of charging infrastructure requirements and operating costs for plug-in electric vehicles." *Journal of Power Sources* (2013). "Evaluation of charging infrastructure requirements and operating costs for plug-in electric vehicles." *Journal of Power Sources* (2013).

<http://www.sciencedirect.com/science/article/pii/S0378775313006460>



## **Investigating the Impacts of Plug-in Hybrid Electric Vehicles on Power Distribution Systems** *Shafiee, Soroush, Mahmud Fotuhi-Firuzabad, and Mohammad Rastegar*

**Abstract:** Despite the economic and environmental advantages of plug-in hybrid electric vehicles (PHEVs), the increased utilization of PHEVs brings up new concerns for power distribution system decision makers. Impacts of PHEVs on distribution networks, although have been proven to be noticeable, have not been thoroughly investigated for future years. In this paper, a comprehensive model is proposed to study the PHEV impacts on residential distribution systems. In so doing, PHEV fundamental characteristics, i.e., PHEV battery capacity, PHEV state of charge (SOC), and PHEV energy consumption in daily trips, are accurately modeled. As some of these effective characteristics depend on vehicle owner's behavior, their behavior and interests are considered in the proposed model. Also, to get a more practical model of PHEVs, the number of vehicles in a residential distribution network, the PHEV penetration level for upcoming years, distribution of PHEVs in the network, and estimation of household load growth for upcoming years are extracted from related published reports. The proposed model is applied to the IEEE 34-node test feeder, and PHEV impacts on residential distribution network are studied in different time horizons. A sensitivity analysis is also performed to demonstrate the effects of PHEV operation modes on the network load profile.

**Subject Areas:** battery powered vehicles; hybrid electric vehicles; load distribution; power distribution economics

**Availability:** Shafiee, Soroush, Mahmud Fotuhi-Firuzabad, and Mohammad Rastegar.

"Investigating the Impacts of Plug-in Hybrid Electric Vehicles on Power Distribution Systems." 1-10.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6497672&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D6497672](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6497672&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D6497672)

**Environmental assessment of plug-in hybrid electric vehicles using naturalistic drive cycles and vehicle travel patterns: A Michigan case study." Marshall, Brandon M.; Jarod C. Kelly; Tae-Kyung Lee; Gregory A. Keoleian; & Zoran Filipi**

**Abstract:** Plug-in hybrid electric vehicles (PHEVs) use grid electricity as well as on-board gasoline for motive force. These multiple energy sources make prediction of PHEV energy consumption challenging and also complicate evaluation of their environmental impacts. This paper introduces a novel PHEV energy consumption modeling approach and compares it to a second approach from the literature, each using actual trip patterns from the 2009 National Household Travel Survey (NHTS). The first approach applies distance-dependent fuel efficiency and on-road electricity consumption rates based on naturalistic or real world, driving information to determine gasoline and electricity consumption. The second uses consumption rates derived in accordance with government certification testing. Both approaches are applied in the context of a location-specific case study that focuses on the state of Michigan. The two PHEV models show agreement in electricity demand due to vehicle charging, gasoline consumption, and life cycle environmental impacts for this case study. The naturalistic drive cycle approach is explored as a means of extending location-specific driving data to supplement existing PHEV impact assessments methods.

**Subject Areas:** PHEV; Naturalistic drive cycle; Travel survey

**Availability:** Marshall, Brandon M., et al. "Environmental assessment of plug-in hybrid electric vehicles using naturalistic drive cycles and vehicle travel patterns: A Michigan case study." Energy Policy (2013). <http://www.sciencedirect.com/science/article/pii/S0301421513002115>

**Highly-resolved modeling of personal transportation energy consumption in the United States** *Matteo Muratori, Michael J. Morana, Emmanuele Serrab, & Giorgio Rizzoni*

**Abstract:** This paper centers on the estimation of the total primary energy consumption for personal transportation in the United States, to include gasoline and/or electricity consumption, depending on vehicle type. The bottom-up sector-based estimation method introduced here contributes to a computational tool under development at The Ohio State University for assisting decision making in energy policy, pricing, and investment. In order to simulate highly-resolved consumption profiles three main modeling steps are needed: modeling the behavior of drivers, generating realistic driving profiles, and simulating energy consumption of different kinds of vehicles. The modeling proposed allows for evaluating the impact of plug-in electric vehicles on the electric grid – especially at the distribution level. It can serve as a tool to compare different vehicle types and assist policy-makers in estimating their impact on primary energy consumption and the role transportation can play to reduce oil dependency.

**Subject Areas:** gasoline/electricity consumption; electric grid

**Availability:** Muratori, Matteo, et al. "Highly-resolved modeling of personal transportation energy consumption in the United States." *Energy* (2013).

<http://www.sciencedirect.com/science/article/pii/S0360544213001692>

**Electric storage in California's commercial buildings** *M. Stadlera; M. Kloessa; M. Groissböcka; G. Cardosod; R. Sharmae; M.C. Bozchaluie; C. Marnaya; Ernest Orlando*

**Abstract:** Most recent improvements in battery and electric vehicle (EV) technologies, combined with some favorable off-peak charging rates and an enormous PV potential, make California a prime market for electric vehicle as well as stationary storage adoption. However, EVs or plug-in hybrids, which can be seen as a mobile energy storage, connected to different buildings throughout the day, constitute distributed energy resources (DER) markets and can compete with stationary storage, onsite energy production (e.g. fuel cells, PV) at different building sites. Sometimes mobile storage is seen linked to renewable energy generation (e.g. PV) or as resource for the wider macro-grid by providing ancillary services for grid-stabilization. In contrast, this work takes a fundamentally different approach and considers buildings as the main hub for EVs/plug-in hybrids and considers them as additional resources for a building energy management system (EMS) to enable demand response or any other building strategy (e.g. carbon dioxide reduction). To examine the effect of, especially, electric storage technologies on building energy costs and carbon dioxide (CO<sub>2</sub>) emissions, a distributed-energy resources adoption problem is formulated as a mixed-integer linear program with minimization of annual building energy costs or CO<sub>2</sub> emissions. The mixed-integer linear program is applied to a set of 139 different commercial building types in California, and the aggregated economic and environmental benefits are reported. To show the robustness of the results, different scenarios for battery performance parameters are analyzed. The results show that the number of EVs connected to the California commercial buildings depend mostly on the optimization strategy (cost versus CO<sub>2</sub>) of the building EMS and not on the battery performance parameters. The complexity of the DER interactions at buildings also show that a reduction in stationary battery costs increases the local PV adoption, but can also increase the fossil based onsite electricity generation, making an holistic optimization approach necessary for this kind of analyses.

**Subject Areas:** California; CO<sub>2</sub> emissions; Distributed energy resource optimization; Electric storage; Electric vehicles; Energy costs

**Availability:** Stadler, Michael, et al. "Electric storage in California's commercial buildings." *Applied Energy* 104 (2013): 711-722.  
<http://www.sciencedirect.com/science/article/pii/S0306261912008264>

**Impact of plug-in hybrid electric vehicles on the power grid in a smart environment** *Ferdowsi, Mehdi; Darabi, Zahra; Chowdhury, Badrul H.; Kimball, Jonathan W.; Grasman, Scott E. (Scott Erwin); Crow, Mariesa*

**Abstract:** This dissertation focuses on the interactions between plug-in hybrid electric vehicles (PHEVs) and the power grid. This study has used the data available through the national household travel survey (NHTS) to obtain realistic information such as the arrival time of vehicles, miles driven, and vehicles types. After data manipulation, the aggregated PHEV charging load profiles (PCLP) have been developed. The results show that the peak of PCLP overlaps with the domestic load peak. In order to alleviate this issue, several charging policies have been developed and their impacts on PCLP have been investigated. As a next contribution, the data obtained from NHTS has been used to extract probability distribution functions (PDF) for the arrival time and the energy required to fully charge PHEVs. These functions have been used to propose an event-based simulation framework which emulates the interactions between the power grid and PHEVs and examines how a power grid with limited capacity responds to PHEV charging demand. For instance, for a particular region in the United States and for a specific penetration level, it is possible to obtain the wait time of vehicles, the number of vehicles receiving service, and the number of vehicles that give up. In a smart environment, it becomes necessary to define and schedule optimum policies for smart charging of PHEVs. Finally, this work proposes an optimization problem to find an optimal charging rate schedule for PHEVs. This rate which is variable by time tries to maximize the energy delivered to vehicles while considering the constraints of the grid as well as the wait time of the vehicles.

**Subject Areas:** Charging level; Plug-in hybrid electric vehicle; Smart charging; Transportation electrification

**Availability:** Darabi, Zahra. "Impact of plug-in hybrid electric vehicles on the power grid in a smart environment." Missouri University of Science and Technology Diss. (2012). <https://mospace.umsystem.edu/xmlui/handle/10355/33056>

## **Deploying Plug-in Electric Cars Which are Used for Work: Compatibility of Varying Daily Patterns of Use with Four Electric Powertrain Architectures** *Santini, Danilo; Zhou, Yan; Kim, Namdoo; Gallagher, Kevin; Vyas, Anant D.*

**Abstract:** Vehicles with electrified powertrains such as hybrid electric vehicles (HEVs), plug-in HEV (PHEVs) and AEVs (all-electric vehicles using grid supplied battery energy exclusively) are potentially marketable because of low operating costs, but each come with a significant initial cost penalty in comparison to a conventional vehicle (CV) powered by an internal combustion engine (ICE). This paper selects a subset of three car PHEVs and an AEV from a larger set of simulations. Daily travel of vehicles traveling to and from work is isolated from other vehicle travel in the National Household Travel (NHTS) survey; five different daily distance categories are investigated. Three driving cycle runs are used here – the LA92 cycle, World cycle (WLTC), and a selected Kansas City real driving record. Probable patterns of charging for each PHEV and the AEV are investigated for each daily distance category. The possibility of two charges at work, before and after a lunch trip, is considered, as is the possibility of a charge before and after work. The degree of importance of spending a given pool of money on residential vs. workplace charge point upgrades is discussed. Two indicators of effectiveness of battery pack utilization, (1) a charge depleting (CD) effectiveness factor and (2) grid kWh used per day per dollar of incremental vehicle expense, are developed and target markets for cars used for work for each powertrain type are suggested.

**Subject Areas:** Energy; Environment; Finance; Highways; Vehicles and Equipment; Environment; Vehicle Design and Safety; Vehicle Operating Costs; Electric Vehicles; Plug-in Electric Vehicles; All-Electric Vehicles

**Availability:** Santini, Danilo, et al. "Deploying Plug-in Electric Cars Which are Used for Work: Compatibility of Varying Daily Patterns of Use with Four Electric Powertrain Architectures." Transportation Research Board 92nd Annual Meeting. No. 13-4925. 2013.  
<http://trid.trb.org/view.aspx?id=1242883>

**Modeling the impact of electric vehicle charging on heat transfer around underground cables** *Jeffrey S. Marshall, Paul D. Hines, Jiarui D. Zhang, Francesca Minervini, and Simtha Rinjitham*

**Abstract:** While increased use of plug-in electric vehicles (PEVs) has environmental and economic benefits, the increased load is expected to strain components of the power delivery infrastructure. Within electric distribution systems, overloading of transformers and underground cables and associated thermal degradation is of particular concern. The current paper estimates the effect of different levels and types of PEV charging on transient heating of underground cables. Transportation survey data is used to estimate travel miles and arrival/departure times for a typical residential neighborhood, which is subsequently used to estimate the electric load curve with different levels of PEV penetration. The estimated load curves are used to perform transient heat transfer computations for a system of three buried cables using an overset grid finite-difference approach, the results of which are used to estimate acceleration of cable thermal degradation. Vehicle charging, even for a modest 30% PEV penetration, is found to nearly double peak temperature rise above ambient at the cable surface, increase the daily variance in cable temperatures, and significantly decrease the estimated time to failure for cables with thermally sensitive insulation.

**Subject Areas:** Underground cables; Cable heat transfer; Plug-in electric vehicles; Thermal engineering; Overset grid method; Cable life span; electric distribution system

**Availability:** Marshall, Jeffrey S., et al. "Modeling the impact of electric vehicle charging on heat transfer around underground cables." *Electric Power Systems Research* 97 (2013): 76-83. <http://www.sciencedirect.com/science/article/pii/S0378779612003586>

## **Demand Dispatch of Smart Charging for Plug-In Electric Vehicles** *Wu, Ting, Gang Wu, Zhejing Bao, Qiang Yang, and Wenjun Yan*

**Abstract:** Random charging for a large number of Plug-in Electric Vehicles (PEVs) can have a negative impact on the power network operation with peak load and imposes technical and economical challenges to the electric power utilities. In this paper, we address this issue by applying and proposing three smart PEV charging modes, i.e. the valley-searching, the interruptible and the variable-rate charging patterns. The suggested approaches are studied through numerical simulation experiments for a range of scenarios by using the random charging as the comparison benchmark for a residential area. The result shows that the demand dispatch of PEVs based on smart charging has many significant advantages over the random charging in terms of graceful load profile (peak shaving and valley filling) as well as the improvement of the user satisfaction.

**Subject Area:** Plug-in Electric Vehicle (PEVs); smart charging; power operation

**Availability:** Wu, Ting, et al. "Demand Dispatch of Smart Charging for Plug-In Electric Vehicles." Control Engineering and Communication Technology (ICCECT), 2012 International Conference on. IEEE, 2012. [http://www.pnnl.gov/main/publications/external/technical\\_reports/PNNL-22064.pdf](http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22064.pdf)



## **Utilizing Electric Vehicles to Assist Integration of Large Penetrations of Distributed Photovoltaic Generation** *Tuffner, F. K., M. C. W. Kintner-Meyer, F. S. Chassin, and K. Gowri*

**Abstract:** This analysis provides detailed distribution-level insights into the leveraging potential of distributed rooftop photovoltaic (PV) technologies and electric vehicle (EV) charging. Either of the two technologies by themselves – at some high penetrations – may cause some voltage control challenges or overloading problems, respectively. But when combined, there could be synergistic effects, at least intuitively, whereby one technology mitigates the negative impacts of the other. High penetration of EV charging may overload existing distribution system components, most prominently the secondary transformer. If PV technology is installed at residential premises or anywhere downstream of the secondary transformer, it will provide another electricity source, thus relieving the loading on the transformers. Another synergetic or mitigating effect could be envisioned when high PV penetration reverses the power flow upward in the distribution system (from the homes upstream into the distribution system). Protection schemes may then no longer function as designed and voltage violations (exceeding the voltage upper limit of the American National Standards Institute (ANSI) voltage range) may occur. In this particular situation, EV charging could consume the generated energy from the PV, such that the reversal of power flow can be reduced or alleviated. Given these potential mutual synergistic behaviors of PV and EV technologies, this project attempted to quantify the benefits of combining the two technologies. Furthermore, of interest was how advanced EV control strategies may influence the outcome of the synergy between EV charging and distributed PV installations. Particularly, California utility companies with high penetration of distributed PV technology, who have experienced voltage control problems, are interested in how intelligent EV charging could support or affect the voltage control challenges.

**Subject Areas:** photovoltaic (PV); electric vehicle (EV); electric distribution system

**Availability:** Tuffner, F. K., et al. "Utilizing Electric Vehicles to Assist Integration of Large Penetrations of Distributed Photovoltaic Generation." Pacific Northwest National Laboratory (2012). [http://www.pnnl.gov/main/publications/external/technical\\_reports/PNNL-22064.pdf](http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22064.pdf)

## **Influence of Electric Vehicles Connected to the Grid** *Li, Guangbin*

**Abstract:** Plug-in electric vehicles (PEVs) have great potential of being the alternative for the next-generation of transportation. Uncoordinated PEV charging, however, may put a significant pressure on the distribution grid. In this paper, on a modified IEEE-13 Node distribution network of 342 residential customers, we propose a converged fiber-wireless infrastructure based on EPON, WiMAX, wireless mesh network and sensor technologies to support coordinated charging of PEVs. To measure the performance of both the communications and power system perspectives of proactive scheduling algorithms and proposed reactive control protocols, our recently developed hybrid co-simulator based on OMNeT++ and OpenDSS is used. Co-simulation results show that the proposed low-cost communications infrastructure enables to efficiently schedule PEV chargings and quickly stabilize the voltage in a stress scenario.

**Subject Areas:** Plug-in electric vehicle (PEVs); electric distribution system

**Availability:** Li, Guangbin. "Influence of Electric Vehicles Connected to the Grid." Columbia University <http://www.ee.columbia.edu/~lavaei/Fall2012/GL.pdf>

## **Co-Simulation of PEV coordination schemes over a FiWi Smart Grid communications infrastructure**

*Levesque, Martin, Da Qian Xu, Geza Joos, and Martin Maier*

**Abstract:** Plug-in electric vehicles (PEVs) have great potential of being the alternative for the next-generation of transportation. Uncoordinated PEV charging, however, may put a significant pressure on the distribution grid. In this paper, on a modified IEEE-13 Node distribution network of 342 residential customers, we propose a converged fiber-wireless infrastructure based on EPON, WiMAX, wireless mesh network and sensor technologies to support coordinated charging of PEVs. To measure the performance of both the communications and power system perspectives of proactive scheduling algorithms and proposed reactive control protocols, our recently developed hybrid co-simulator based on OMNeT++ and OpenDSS is used. Co-simulation results show that the proposed low-cost communications infrastructure enables to efficiently schedule PEV chargings and quickly stabilize the voltage in a stress scenario.

**Subject Areas:** Plug-in electric vehicles (PEVs); electric distribution grid

**Availability:** Levesque, Martin, et al. "Co-Simulation of PEV coordination schemes over a FiWi Smart Grid communications infrastructure." IECON 2012-38th Annual Conference on IEEE Industrial Electronics Society. IEEE, 2012.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6389434](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6389434)

**Comparison of Energy consumption and costs of different HEVs and PHEVs in European and American context** *Rousseau, A., M. Badin, N. Redelbach, A. Kim, D. Da Costa, D. Santini, A. Vyas, F. Le Berr, and H. Friedrich*

**Abstract:** This paper will analyse on the one hand the potential of Plug in Hybrid Electric Vehicles (PHEVs) to significantly reduce fuel consumption and displace it toward various primary energies thanks to the electricity sector. On the other hand the total cost of ownership (TCO) of two different PHEV architectures will be compared to a conventional vehicle and a HEV without external charging. The vehicles energy consumptions have been calculated using simulation softwares at Argonne National Lab and IFP Energies nouvelles. The TCO analysis carried out by DLR and Argonne National Lab includes the vehicle initial price together with the maintenance, energy consumptions and other costs during their life. The impact of driving behaviour variations between Europe and the US will be addressed in the paper through its influence on component sizing and fuel consumption benefits

**Subject Areas:** Plug-in Hybrid Electric Vehicles (PHEVs); fuel consumption;

**Availability:** Rousseau, A., et al. "Comparison of Energy Consumption and Costs of Different HEVs and PHEVs in European and American Context." European Electric Vehicle Congress, Brussels. 2012. [http://elib.dlr.de/80776/1/2012\\_EEVC\\_-\\_Comparison\\_of\\_Energy\\_consumption\\_and\\_costs\\_of\\_different\\_HEVs\\_and\\_PHEVs\\_in\\_European\\_and\\_American\\_context.pdf](http://elib.dlr.de/80776/1/2012_EEVC_-_Comparison_of_Energy_consumption_and_costs_of_different_HEVs_and_PHEVs_in_European_and_American_context.pdf)

## **Exploration of Intra-household Motorized Vehicle Allocation Using the 2009 National Household Travel Survey** *Nam, Richard H., Brian HY Lee, Lisa Aultman-Hall, and Justine Sears*

**Abstract:** This study examines intra-household vehicle allocation to drivers and trips using data from the 2009 National Household Travel Survey and is motivated by the fact that reallocating household vehicles is a reasonable short-term action to reduce fuel and associated emissions. Models are developed for households in the national sample and for segmentations by population and Census regions. Binomial logistic regression is used to model whether a household fleet is optimal and whether a household is a high potential saver (HPS). Of households with two or more vehicles, 31% are classified as HPS. Linear regression is used to model the number of gallons of fuel a household can potentially save per year with vehicle reallocation. About 59% of households can reduce fuel consumption by an estimated 5.2%, or approximately five billion gallons of fuel nationally, if they reallocate their fleet. Household size and lifecycle, travel behavior, and fleet composition are related to intra-household vehicle allocation. Similar variables are significant predictors of potential gallons of savings and whether a household is an HPS. Models are consistent across regions with minor exceptions. Rural areas had differences from more urban areas. This study has demonstrated that appreciable savings in fuel consumption and associated emissions is plausible through vehicle reallocation and the ability to pursue this countermeasure in the short-term motivates further research to more fully understand causal mechanisms and target households for intervention.

**Subject Areas:** vehicle allocation; fuel consumption

**Availability:** Nam, Richard H., et al. "Exploration of Intra-household Motorized Vehicle Allocation Using the 2009 National Household Travel Survey." *Transportation Research Board 92nd Annual Meeting*. No. 13-3089. 2013. <http://trid.trb.org/view.aspx?id=1241822>

## 4. ENVIRONMENT

### **Cleaner Gasoline and Vehicle Standards are urgently needed** *American Lung Association Fighting for Air*

**Abstract:** The American Lung Association submits these expanded comments in support of the U.S. Environmental Protection Agency's proposed Tier 3 Motor Vehicle Emission and Fuel Standards Program. These standards are urgently needed and will help protect the health of millions of Americans who continue to breathe unsafe air. The American Lung Association urges EPA to adopt both the 10 parts per million low-sulfur gasoline standards and strong tailpipe emissions standards. Both are needed to achieve the greatest air quality benefits from existing and new vehicle technology. The comments below demonstrate the compelling case for EPA to adopt strong final Tier 3 Motor Vehicle Emission and Fuel Standards by December 31, 2013.

**Subject Areas:** Fuel Standards; EPA; emissions standards; air quality

**Availability:** Expanded Comments from the American Lung Association to EPA-HQ-OAR-0135-2011, Tier 3 Motor Vehicle Emission and Fuel Standards Program; July 1, 2013

<http://www.lung.org/get-involved/advocate/advocacy-documents/tier-3-cleaner-gasoline-and.pdf>

## **Reducing Light Duty Vehicle Fuel Consumption and Greenhouse Gas Emissions: The Combined Potential of Hybrid Technology and Behavioral Adaptation** *Danilo Santini and Andrew Burnham*

**Abstract:** When comparing the potential of advanced versus conventional powertrains, a traditional approach is to hold glider design constant and simulate “comparable performance” to a conventional vehicle (CV). However, manufacturers have developed hybrid electric vehicle (HEV), plug-in hybrid electric vehicle (PHEV), and all-electric vehicle (EV) powertrains in gliders designed to synergistically enhance fuel saving benefits of such powertrains by further reducing road load and engine output power (or continuous power for the EV) where no conventional powertrain option is provided. In the U.S. marketplace, there are now several examples of both hybrid and plug-in hybrid electric vehicles using gliders common to top selling CVs and a few using low load gliders to further reduce fuel consumption. We use fuel consumption estimates from FuelEconomy.gov for a number of plausible CV versus HEV, PHEV, and EV comparisons to estimate the potential additional annual fuel savings and greenhouse gas (GHG) emission benefits, using Argonne National Laboratory’s GREET model, obtainable when consumers make the behavioral choice to purchase various electrified powertrains in low road load gliders. When electric generation comes from natural gas, PHEVs and EVs in low load gliders can provide about the same GHG benefits as low load HEVs, with less gasoline use. If renewables are used in conjunction with natural gas, the GHG benefits increase. In comparison to HEVs in standard gliders, there will be even greater benefits.

**Subject Areas:** conventional vehicle; PHEV; renewables

**Availability:** Santini, Danilo, and Andrew Burnham. "Reducing Light Duty Vehicle Fuel Consumption and Greenhouse Gas Emissions: The Combined Potential of Hybrid Technology and Behavioral Adaptation." SAE International Journal of Alternative Powertrains 2.2 (2013): 314-324. <http://intl-saealtpow.saejournals.org/content/2/2/314.abstract>

## **Stochastic and Optimal Aggregation of Electric Vehicles in Smart Distribution Grids** *Zheyuan Hu*

**Abstract:** The background concerned about wind power and EVs is presented along with the motivation of this project. The EVs can achieve zero CO<sub>2</sub> emission to be environment friendly. They have potentials to reduce the cost of the transportation systems [1]. The development of the EVs is on an accelerated pace [2]. As new loads in the distribution grid, charging EVs could influence the operation of the distribution grid. The base cases are set to investigate the capacity of the grid to support EVs. Four representative days have been chosen: summer weekday, summer weekend, winter weekday and winter weekend. Issues of high wind power penetration in Danish power system are demonstrated. With a whole picture of electricity market in Denmark, the architecture of this project is presented. To make the outcome more realistic, the stochastic data is used in this project. The stochastic data is generated by certain driving patterns using Monte Carlo Method. The stochastic data include driving distance, arriving time and leaving time of 75 EVs. A plan of dumb charging is made based on these data. EVs start to charge as soon as they arrive home and stop charge until the batteries are fully charged. Because of the fluctuation of electricity price and the wind power production, it is wise to charge EVs during off-peak time of the consumption of electricity. The optimal charging plans are made to reduce the charging cost. The smart charging plans could benefit the grid aggregators and the EV owners.

**Subject Areas:** wind power; EV; CO<sub>2</sub> emission; Monte Carlo

**Availability:** Hu, Zheyuan. "Stochastic and Optimal Aggregation of Electric Vehicles in Smart Distribution Grids." (2013). <http://projekter.aau.dk/projekter/files/76896072/MasterThesis.pdf>



## **Greenhouse Gas Implications of Fleet Electrification Based on Big Data-Informed Individual Travel Patterns** *Hua Cai and Ming Xu*

**Abstract:** Environmental implications of fleet electrification highly depend on the adoption and utilization of electric vehicles at the individual level. Past research has been constrained by using aggregated data to assume all vehicles with the same travel pattern as the aggregated average. This neglects the inherent heterogeneity of individual travel behaviors and may lead to unrealistic estimation of environmental impacts of fleet electrification. Using “big data” mining techniques, this research examines real-time vehicle trajectory data for 10,375 taxis in Beijing in one week to characterize the travel patterns of individual taxis. We then evaluate the impact of adopting plug-in hybrid electric vehicles (PHEV) in the taxi fleet on life cycle greenhouse gas emissions based on the characterized individual travel patterns. The results indicate that 1) the largest gasoline displacement (1.1 million gallons per year) can be achieved by adopting PHEVs with modest electric range (approximately 80 miles) with current battery cost, limited public charging infrastructure, and no government subsidy; 2) reducing battery cost has the largest impact on increasing the electrification rate of vehicle mileage traveled (VMT), thus increasing gasoline displacement, followed by diversified charging opportunities; 3) government subsidies can be more effective to increase the VMT electrification rate and gasoline displacement if targeted to PHEVs with modest electric ranges (80 to 120 miles); and 4) while taxi fleet electrification can increase greenhouse gas emissions by up to 115 kiloton CO<sub>2</sub>-eq per year with the current grid in Beijing, emission reduction of up to 36.5 kiloton CO<sub>2</sub>-eq per year can be achieved if the fuel cycle emission factor of electricity can be reduced to 168.7 g/km. Although the results are based on a specific public fleet, this study demonstrates the benefit of using large-scale individual-based trajectory data (big data) to better understand environmental implications of fleet electrification and inform better decision making.

**Subject Areas:** greenhouse gas emissions; fleet electrification

**Availability:** Cai, Hua, and Ming Xu. "Greenhouse Gas Implications of Fleet Electrification Based on Big Data-Informed Individual Travel Patterns." *Environmental science & technology* 47.16 (2013): 9035-9043. <http://pubs.acs.org/doi/abs/10.1021/es401008f>

**Long-Term Trends in Motor Vehicle Emissions in U.S. Urban Areas** *Brian C. McDonald, Drew R. Gentner, Allen H. Goldstein, & Robert A. Harley*

**Abstract:** A fuel-based approach is used to estimate long-term trends (1990–2010) in carbon monoxide (CO) emissions from motor vehicles. Non-methane hydrocarbons (NMHC) are estimated using ambient NMHC/CO ratios after controlling for nonvehicular sources. Despite increases in fuel use of 10–40%, CO running exhaust emissions from on-road vehicles decreased by 80–90% in Los Angeles, Houston, and New York City, between 1990 and 2010. The ratio of NMHC/CO was found to be  $0.24 \pm 0.04$  mol C/mol CO over time in Los Angeles, indicating that both pollutants decreased at a similar rate and were improved by similar emission controls, whereas on-road data from other cities suggest rates of reduction in NMHC versus CO emissions may differ somewhat. Emission ratios of CO/NO<sub>x</sub> (nitrogen oxides = NO + NO<sub>2</sub>) and NMHC/NO<sub>x</sub> decreased by a factor of 4 between 1990 and 2007 due to changes in the relative emission rates of passenger cars versus diesel trucks, and slight uptick thereafter, consistent across all urban areas considered here. These pollutant ratios are expected to increase in future years due to (1) slowing rates of decrease in CO and NMHC emissions from gasoline vehicles and (2) significant advances in control of diesel NO<sub>x</sub> emissions.

**Subject Areas:** Emission rates; pollution ratios

**Availability:** McDonald, Brian C., et al. "Long-term trends in motor vehicle emissions in US urban areas." *Environmental science & technology* 47.17 (2013): 10022-10031.  
<http://pubs.acs.org/doi/abs/10.1021/es401034z>

## **Moving from assumption to observation: Implications for energy and emissions impacts of plug-in hybrid electric vehicles** *Jamie Davies & Kenneth S. Kurani*

**Abstract:** Plug-in hybrid electric vehicles (PHEVs) are currently for sale in most parts of the United States, Canada, Europe and Japan. These vehicles are promoted as providing distinct consumer and public benefits at the expense of grid electricity. However, the specific benefits or impacts of PHEVs ultimately relies on consumers purchase and vehicle use patterns. While considerable effort has been dedicated to understanding PHEV impacts on a per mile basis few studies have assessed the impacts of PHEV given actual consumer use patterns or operating conditions. Instead, simplifying assumptions have been made about the types of cars individual consumers will choose to purchase and how they will drive and charge them. Here, we highlight some of these consumer purchase and use assumptions, studies which have employed these assumptions and compare these assumptions to actual consumer data recorded in a PHEV demonstration project. Using simulation and hypothetical scenarios we discuss the implication for PHEV impact analyses and policy if assumptions about key PHEV consumer use variables such as vehicle choice, home charging frequency, distribution of driving distances, and access to workplace charging were to change.

**Subject Areas:** Plug-in hybrid electric vehicle (PHEV); Charging behaviour; SAEJ2841 utility factor

**Availability:** Davies, Jamie, and Kenneth S. Kurani. "Moving from assumption to observation: Implications for energy and emissions impacts of plug-in hybrid electric vehicles." *Energy Policy* 62 (2013): 550-560. <http://www.sciencedirect.com/science/article/pii/S0301421513006332>

**Land-use and socio-economics as determinants of traffic emissions and individual exposure to air pollution** *Timothy Sider, Ahsan Alam, Mohamad Zukari, Hussam Dugum, Nathan Goldstein, Naveen Eluru, Marianne Hatzopoulou*

**Abstract:** This paper presents a modeling framework developed for the City of Montreal, Canada, and is intended to quantify two indicators that can explain the spatial distribution of traffic-related air pollution at a metropolitan level. The indicators are estimated at the level of the traffic analysis zone (TAZ) and include: (1) the average level of emissions generated per individual, and (2) the level of emissions occurring in a zone as a proxy for air pollution exposure. A regional traffic assignment model is extended with capabilities for emission modeling at an individual trip level while taking into account vehicle (type, age) and trip attributes (road type, speed, volume). We observe that individuals who generate higher emissions from travel tend to reside in areas with lower exposure to traffic emissions while individuals associated with low levels of travel emissions (e.g. travel smaller distances, conduct less trips, use alternative modes) reside in areas with high levels of traffic pollution. A regression analysis of the two indicators against a set of land-use and socio-economic variables shows that generated emissions per individual are positively associated with car ownership and larger vehicles, while being negatively associated with ownership of newer vehicles, and location in dense and walkable neighborhoods with high levels of commercial land-use. Meanwhile, exposure to emissions is positively associated with dense and walkable neighborhoods and negatively associated with car ownership and larger vehicles. These findings indicate major inequities in the generation of and exposure to traffic related air pollution

**Subject Areas:** air pollution indicators; emissions; regression analysis; vehicle ownership; pollution exposure

**Availability:** Sider, Timothy, et al. "Land-use and socio-economics as determinants of traffic emissions and individual exposure to air pollution." *Journal of Transport Geography* 33 (2013): 230-239. <http://jpl.sagepub.com/content/18/4/383.short>

## **Levelized costs of conventional and battery electric vehicles in china: Beijing experiences** *Han Hao, Michael Wang, Yan Zhou, Hewu Wang, Mingguo Ouyang*

**Abstract:** Electric vehicles offer the potential to reduce oil consumption, air pollutants, and greenhouse gas (GHG) emissions. To take advantage of electric vehicles and improve its urban environment, Beijing, as one of China's most polluted cities, launched an electric vehicle promotion program that provided a generous subsidy for consumers who purchased battery electric vehicles (BEVs). In this study, we compare the levelized costs of a conventional vehicle (CV) versus a BEV using real data from the Beijing BEV subsidy program. Levelized cost for this study considers consumer driving patterns and vehicle age. For consumers with average driving profiles—i.e., an average driving distance of around 20 km per trip—the levelized cost of CVs decreases from 1.40 yuan/km for an 8-year vehicle lifetime to 1.04 yuan/km for a 15-year lifetime, while the levelized cost for BEVs decreases from 1.44 yuan/km for an 8-year vehicle lifetime to 1.01 yuan/km for a 15-year lifetime. BEVs are more cost competitive than CVs for consumers with medium and high driving profiles and a 12-year and 15-year lifetime. Under current conditions, the subsidy and tax incentives are necessary to make BEVs cost competitive. However, we project that, even if the subsidy is phased out in 2020, BEVs may become cost competitive with CVs because of the decrease in battery cost. Our study results suggest that the BEV subsidy should reflect changes in battery cost and gasoline prices to help continuing deployment of BEVs.

**Subject Areas:** Levelized cost, Electric vehicle, China, EV Beijing program

**Availability:** Hao, Han, et al. "Levelized costs of conventional and battery electric vehicles in china: Beijing experiences." *Mitigation and Adaptation Strategies for Global Change* (2013): 1-18. <http://link.springer.com/article/10.1007/s11027-013-9536-1>

**The Effectiveness of Plug-in Hybrid Electric Vehicles and Renewable Power in Support of Holistic Environmental Goals: Part 1 – Evaluation of Aggregate Energy and Greenhouse Gas Performance** *Brian Tarroja, Joshua D. Eichman, Li Zhang, Tim M. Brown, Scott Samuelson*

**Abstract:** A study that analyzes the effectiveness of plug-in hybrid vehicles (PHEVs) to meet holistic environmental goals has been performed across the combined electricity and light-duty transportation sectors. PHEV penetration levels are varied from 0-60% and base renewable penetration levels are varied from 10-45%. Part 1 of the study focuses on CO<sub>2</sub> emissions, fuel usage, and the renewable penetration level of individual and combined energy sectors. The effect on grid renewable penetration level depends on two factors: the additional vehicle load demand acting to decrease renewable penetration, and the controllability of vehicle charging acting to reduce curtailment of renewable power. PHEV integration can reduce CO<sub>2</sub> emissions and fuel usage and increase the aggregate renewable energy share compared to the no-vehicle case. The benefits of isolated PHEV integration are slightly offset by increased CO<sub>2</sub> emissions and fuel usage by the electric grid. Significant benefits are only realized when PHEVs are appropriately deployed in conjunction with renewable energy resources, highlighting important synergies between the electric and light-duty transportation sectors for meeting sustainability goals.

**Subject Areas:** Plug-in electric vehicles; renewable energy; electric grid; greenhouse gas; combined energy usage

**Availability:** Tarroja, Brian, et al. "The Effectiveness of Plug-in Hybrid Electric Vehicles and Renewable Power in Support of Holistic Environmental Goals: Part 1–Evaluation of Aggregate Energy and Greenhouse Gas Performance." *Journal of Power Sources* (2013).  
<http://www.sciencedirect.com/science/article/pii/S0378775313018016>

**Integrating Life-cycle Environmental and Economic Assessment with Transportation and Land Use Planning** *Mikhail V. Chester, Matthew J. Nahlik, Andrew M. Fraser, Mindy A. Kimball, and Venu M. Garikapati*

**Abstract:** The environmental outcomes of urban form changes should couple life-cycle and behavioral assessment methods to better understand urban sustainability policy outcomes. Using Phoenix, Arizona light rail as a case study, an integrated transportation and land use life-cycle assessment (ITLU-LCA) framework is developed to assess the changes to energy consumption and air emissions from transit-oriented neighborhood designs. Residential travel, commercial travel, and building energy use are included and the framework integrates household behavior change assessment to explore the environmental and economic outcomes of policies that affect infrastructure. The results show that upfront environmental and economic investments are needed (through more energy-intensive building materials for high-density structures) to produce long run benefits in reduced building energy use and automobile travel. The annualized life-cycle benefits of transit-oriented developments in Phoenix can range from 1.7 to 230 Gg CO<sub>2</sub>e depending on the aggressiveness of residential density. Midpoint impact stressors for respiratory effects and photochemical smog formation are also assessed and can be reduced by 1.2–170 Mg PM<sub>10</sub>e and 41–5200 Mg O<sub>3</sub>e annually. These benefits will come at an additional construction cost of up to \$410 million resulting in a cost of avoided CO<sub>2</sub>e at \$16–29 and household cost savings.

**Subject Areas:** sustainability outcomes; energy consumption; air emissions; TOD

**Availability:** Chester, Mikhail V., et al. "Integrating life-cycle environmental and economic assessment with transportation and land use planning." *Environmental science & technology* 47.21 (2013): 12020-12028. <http://pubs.acs.org/doi/abs/10.1021/es402985g>

**Impacts of plug-in hybrid electric vehicles on a residential transformer using stochastic and empirical analysis** *Ghazal Razeghi, Li Zhang, Tim Brown, & Scott Samuelsen*

**Abstract:** Plug-in electric vehicles (PEV) have been identified as an option that can reduce criteria pollutant and greenhouse gas emissions associated with the transportation sector. The electricity demand of one of these vehicles is comparable to that of a typical U.S. household and thus clustering of PEVs in a neighborhood might have adverse effects on the transformer and disruption of service. In this paper, the electricity demand of a neighborhood is modeled based on measured vehicle and household data. The electricity demand profile of the PEVs is modeled based on the vehicle type, arrival and departure times and the daily miles traveled, all taken from the National Household Travel Survey (NHTS). A thermal model is developed to calculate the hot spot temperature and loss of life of the transformer. Results show that Level 1 charging has a small impact on the transformer aging and that only in one case, with Level 2 charging, the transformer might fail due to excessive temperatures. Overall addition of a significant number of PEVs is manageable for the transformer. The negative effects on the life time can be mitigated by properly designing the transformers and using smart charging scenarios.

**Subject Areas:** PHEV; Distribution transformer; Loss of life; Hot spot temperature

**Availability:** Razeghi, Ghazal, et al. "Impacts of Plug-In Hybrid Electric Vehicles on a Residential Transformer Using Stochastic and Empirical Analysis." *Journal of Power Sources* (2013).  
<http://www.sciencedirect.com/science/article/pii/S0378775313019320>



**Encouraging Sustainable Transport Choices in American Households: Results from an Empirically Grounded Agent-Based Model** *Davide Natalini and Giangiacomo Bravo*

**Abstract:** The transport sector needs to go through an extended process of decarbonisation to counter the threat of climate change. Unfortunately, the International Energy Agency forecasts an enormous growth in the number of cars and greenhouse gas emissions by 2050. Two issues can thus be identified: (1) the need for a new methodology that could evaluate the policy performances ex-ante and (2) the need for more effective policies. To help address these issues, we developed an Agent-Based Model called Mobility USA aimed at: (1) testing whether this could be an effective approach in analysing ex-ante policy implementation in the transport sector; and (2) evaluating the effects of alternative policy scenarios on commuting behaviours in the USA. Particularly, we tested the effects of two sets of policies, namely market-based and preference-change ones. The model results suggest that this type of agent-based approach will provide a useful tool for testing policy interventions and their effectiveness.

**Subject Areas:** Agent-Based Model; environmental policies; price-based policies; preference-based policies; sustainability; transports

**Availability:** Natalini, Davide, and Giangiacomo Bravo. "Encouraging Sustainable Transport Choices in American Households: Results from an Empirically Grounded Agent-Based Model." *Sustainability* 6.1 (2013): 50-69. <http://www.mdpi.com/2071-1050/6/1/50/pdf>

## **Influence of driving patterns on life cycle cost and emissions of hybrid and plug-in electric vehicle powertrains** *Orkun Karabasoglu, Jeremy Michalek*

**Abstract:** We compare the potential of hybrid, extended-range plug-in hybrid, and battery electric vehicles to reduce lifetime cost and life cycle greenhouse gas emissions under various scenarios and simulated driving conditions. We find that driving conditions affect economic and environmental benefits of electrified vehicles substantially: Under the urban NYC driving cycle, hybrid and plug-in vehicles can cut life cycle emissions by 60% and reduce costs up to 20% relative to conventional vehicles (CVs). In contrast, under highway test conditions (HWFET) electrified vehicles offer marginal emissions reductions at higher costs. NYC conditions with frequent stops triple life cycle emissions and increase costs of conventional vehicles by 30%, while aggressive driving (US06) reduces the all-electric range of plug-in vehicles by up to 45% compared to milder test cycles (like HWFET). Vehicle window stickers, fuel economy standards, and life cycle studies using average lab-test vehicle efficiency estimates are therefore incomplete: (1) driver heterogeneity matters, and efforts to encourage adoption of hybrid and plug-in vehicles will have greater impact if targeted to urban drivers vs. highway drivers; and (2) electrified vehicles perform better on some drive cycles than others, so non-representative tests can bias consumer perception and regulation of alternative technologies. We discuss policy implications.

**Subject Areas:** Driving conditions; Life cycle assessment; Plug-in hybrid electric vehicles

**Availability:** Karabasoglu, Orkun, and Jeremy Michalek. "Influence of driving patterns on life cycle cost and emissions of hybrid and plug-in electric vehicle powertrains." *Energy Policy* (2013).

[http://cbey.yale.edu/uploads/Environmental%20Economics%20Seminar/Keiser\\_David\\_JMP.pdf](http://cbey.yale.edu/uploads/Environmental%20Economics%20Seminar/Keiser_David_JMP.pdf)

## **Estimating the Effects of Nutrients on Water-Based Recreational Uses in the United States: An Instrumental Variables Approach** *David A. Keiser*

**Abstract:** Although the U.S. spends tens of billions of dollars a year controlling water pollution, there is little empirical evidence of comparable benefits. This study argues that measurement error in national pollution data has caused benefits to be underestimated. Using an instrumental variables approach, the study shows that there are substantial benefits associated with reducing nutrient pollution, especially phosphorus concentrations in freshwater systems. Instrumental variable estimates of the effects of phosphorus on recreational use are an order of magnitude larger than traditional cross-sectional estimates. The study uses a carefully measured state-level pollution dataset to show that this difference is consistent with an estimate of measurement error in national water pollution data.

**Subject Areas:** water pollution;

**Availability:** Keiser, David A. "Estimating the Effects of Nutrients on Water-Based Recreational Uses in the United States: An Instrumental Variables Approach (Job Market Paper)." (2013). [http://cbey.yale.edu/uploads/Environmental%20Economics%20Seminar/Keiser\\_David\\_JMP.pdf](http://cbey.yale.edu/uploads/Environmental%20Economics%20Seminar/Keiser_David_JMP.pdf)

## **The effect of compact development on travel behavior, energy consumption and GHG emissions in Phoenix metropolitan area** *Zhang, Wenwen*

**Abstract:** Suburban growth in the U.S. urban regions has been defined by large subdivisions of single-family detached units. This growth is made possible by the mobility supported by automobiles and an extensive highway network. These dispersed and highly automobile-dependent developments have generated a large body of work examining the socioeconomic and environmental impacts of suburban growth on cities. The particular debate that this study addresses is whether suburban residents are more energy intensive in their travel behavior than central city residents. If indeed suburban residents have needs that are not satisfied by the amenities around them, they may be traveling farther to access such services. However, if suburbs are becoming like cities with a wide range of services and amenities, travel might be contained and no different from the travel behavior of residents in central areas. This paper will compare the effects of long term suburban growth on travel behavior, energy consumption, and GHG emissions through a case study of neighborhoods in central Phoenix and the city of Gilbert, both in the Phoenix metropolitan region. Motorized travel patterns in these study areas will be generated using 2001 and 2009 National Household Travel Survey (NHTS) data by developing a four-step transportation demand model in TransCAD. Energy consumption and GHG emissions, including both Carbon Dioxide (CO<sub>2</sub>) and Nitrous Oxide (N<sub>2</sub>O) for each study area will be estimated based on the corresponding trip distribution results. The final normalized outcomes will not only be compared spatially between Phoenix and Gilbert within the same year, but also temporally between years 2001 and 2009 to determine how the differential land use changes in those places influenced travel. The results from this study reveal that suburban growth does have an impact on people's travel behaviors. As suburbs grew and diversified, the difference in travel behavior between people living in suburban and urban areas became smaller. In the case of shopping trips the average length of trips for suburban residents in 2009 was slightly shorter than that for central city residents. This convergence was substantially due to the faster growth in trip lengths for central city compared to suburban residents in the 8-year period. However, suburban residents continue to be more energy intensive in their travel behavior, as the effect of reduction in trip length is likely to be offset by the more intensive growth in trip frequency. Additionally, overall energy consumption has grown significantly in both study areas over the period of study.

**Subject Areas:** Energy; GHG; Compact development; Travel behavior; Transportation demand management; Cities and towns Growth; Suburbs; Environmental impact analysis

**Availability:** Zhang, Wenwen. "The effect of compact development on travel behavior, energy consumption and ghg emissions in phoenix metropolitan area." (2013).  
<http://smartech.gatech.edu/handle/1853/47703>

## **Public Comment on Draft Plan Bay Area and Draft Plan Bay Area Draft Environmental Impact Report** *Peter Gordon*

**Abstract:** The Bay Area Plan – Strategy for a Sustainable Region (hereinafter Plan) suggests ways in which the Bay Area can meet mandated emissions targets. Specifically, it asserts that the decentralization of jobs in the region has fostered high levels of traffic congestion and suggests land use and transportation policies that will restrain auto use (“Preferred Scenario”). But to assess the plausibility of all this, three questions must be addressed. (i) What do we know about modern American cities (actually U.S. metropolitan and urbanized areas; differences noted below)? (ii) How does what we know impact the efforts of Bay Area planners and their affiliates as they address air quality issues? (iii) Are the identified long-term trends durable and likely to continue? I will show that substantial available evidence suggests that the Plan’s efforts to funnel job growth to designated areas within the region are (a) unnecessary; and (b) unlikely to have beneficial effects.

**Subject Areas:** sustainability; greenhouse gas emissions

**Availability:** <https://orinda-watch.squarespace.com/s/Peter-Gordon-comment-letter.pdf>.

**Promoting Sustainable Transportation Among Teens** *Jordan Bryner; Yi Ying Chin; Candice Patton; Rebekah Patton; Christopher Stanfill*

**Abstract:** Can an innovative, team-based, hands-on design and construction project involving high school students change their attitudes and personal preferences for transportation to favour lower impact modes? This was the main question PSTAT (Promoting Sustainable Transportation Among Teens) was designed to answer. Since the last decade, global climate change has fuelled increased development of alternative transportation modes that have lesser impact on the environment in terms of greenhouse gas (GHG) emissions. However, society is not embracing the change with open arms; sales of alternative fuel and electric vehicles are a small fraction of the total vehicle fleet. Therefore, there is a critical need for a paradigm shift, which could be especially timely for teen-aged students starting to adopt their own personal transportation preferences. By exposing high school students to a hands-on activity that introduced them to alternative transportation, it was hoped to provide a partially social solution to what is currently viewed as a primarily technical problem – the overwhelming dependence of the United States’ personal transportation system on petroleum. PSTAT involved three teams of high school students in Knoxville, TN, where each had University of Tennessee, Knoxville (UTK) undergraduate engineering students as mentors. The student teams were to design and construct an electrically assisted bicycle, commonly known as an e-bike, that fulfilled the criteria set for a competition of the e-bikes’ performance at the end of the project on UTK campus. A sustainability analysis detailing the environmental, human health and economic impacts of three different commuting scenarios was conducted by each high school as well. The sustainability analysis quantitatively displayed the impacts of various commuting choices, emphasizing the impacts of the current transportation situation in the United States and more importantly the benefits of lower impact transportation modes. Pre-and post-project surveys were conducted to measure the change in students’ perception and likelihood of adopting lower impact transportation modes in the future.

**Subject Areas:** sustainability; greenhouse gas emissions

**Availability:** Bryner, Jordan, et al. "PSTAT: Promoting Sustainable Transportation Among Teens." (2013). [http://trace.tennessee.edu/utk\\_chembiopubs/95/](http://trace.tennessee.edu/utk_chembiopubs/95/)

## **Fuel Economy and Greenhouse Gas Emissions Labeling and Standards for Plug-in Electric Vehicles from a Life Cycle Perspective** *Nathan D. MacPherson*

**Abstract:** Reflecting the greenhouse gas (GHG) emissions attributable to plug-in electric vehicles (PEV) on energy and emissions labels, and in vehicle GHG emissions regulations, is complex due to spatial and temporal variation in fueling sources and vehicle use. The relative environmental performance for conventional gasoline vehicles can be reflected by the fuel economy of the vehicle due to the strong correlation between fuel economy and vehicle life cycle emissions. However, this correlation does not hold for PEVs and a more comprehensive emissions accounting methodology needs to be utilized to evaluate their environmental performance. This thesis is organized into two studies. The first evaluates PEV GHG emissions vehicle labeling and the effects of regional grids and regional daily vehicle miles traveled (VMT) on the total vehicle life cycle energy and GHG emissions. The model results indicate that only 25% of the life cycle emissions from a representative plug-in hybrid vehicle are reflected on current U.S. Environmental Protection Agency (EPA) vehicle labeling. Unexpectedly, for two regional grids the life cycle GHG emissions results were higher in electric mode than in gasoline mode. A recommendation is made that labels include stronger language on their deficiencies and provide ranges for GHG emissions from vehicle charging in regional electricity grids to better inform consumers. The second study evaluates U.S. EPA's GHG emissions accounting methodology and current and future standards for new electrified vehicles. The current approach employed by the EPA is compared with an accounting mechanism where the actual regional sales of PEVs, and the regional electricity emission factor in the year sold, is used to determine the vehicle compliance value. The results showed that in the absence of a major policy shift, the small changes in the emission factors observed suggest that the complexity involved in tracking and accounting for regional PEV sales will not dramatically increase the effectiveness of the regulations to capture PEV electricity related GHG emissions.

**Subject Area:** urban development; environmental impact, PEV, GHG emissions,

**Availability:** MacPherson, Nathan D. Fuel Economy and Greenhouse Gas Emissions Labeling and Standards for Plug-In Electric Vehicles from a Life Cycle Perspective. Diss. University of Michigan, 2013.

[http://deepblue.lib.umich.edu/bitstream/handle/2027.42/97369/Thesis\\_Final\\_MacPherson.pdf?sequence=1](http://deepblue.lib.umich.edu/bitstream/handle/2027.42/97369/Thesis_Final_MacPherson.pdf?sequence=1)

## **Green Cities: Urban Growth and the Environment** *Matthew E. Kahn*

**Abstract:** Rapid Urban Growth and suburban sprawl have heightened concern about sustainable development. Are economic growth and environmental health mutually exclusive? Nearly everyone would agree that both are laudable goals, but many people believe that it would be overly optimistic- perhaps even naïve- to expect both to increase simultaneously. “Green city” proponents, however, do hope to realize both ambitions. This book examines the burgeoning economic literature on the environmental consequences of urban growth. He discusses the environmental Kuznets curve, which theorizes that the relationship between environmental quality and per capita income follows a bell-shaped curve. The heart of the book unpacks and expands this notion by tracing the environmental effects of economic, population, and geographic growth. The concluding chapter addresses the role of cities in promoting climate change and asks how cities in turn are likely to be affected by this trend. Kahn considers the evidence for and against rival perspectives throughout the book. Despite practicing a “dismal science,” economists are often quite optimistic about the relationship between urban development and the environment. In contrast, many ecologists and environmentalists remain wary of the environmental consequences of free-market growth. *Green Cities* does not try to settle this dispute. Instead, it marshals data and arguments to convey the excitement of an ongoing debate, and it better prepares readers to understand and prioritize this critically important issue.

**Subject Area:** urban development; environmental impact

**Availability:** Kahn, Matthew E. *Green cities: urban growth and the environment*. Washington, DC: Brookings Institution Press, 2006.

[http://books.google.com/books?hl=en&lr=lang\\_en&id=icTe8h1nNhoC&oi=fnd&pg=PP1&dq=NHTS&ots=UynI0-GCdu&sig=x1iS0ueW2QnwbUe28y\\_GzoD8vtU#v=onepage&q&f=false](http://books.google.com/books?hl=en&lr=lang_en&id=icTe8h1nNhoC&oi=fnd&pg=PP1&dq=NHTS&ots=UynI0-GCdu&sig=x1iS0ueW2QnwbUe28y_GzoD8vtU#v=onepage&q&f=false)



## **From Cars to Buses: Using OCTA Ridership to Analyze the Emission Benefits of Bus Transportation** *John D. Naviaux*

**Abstract:** The emission benefits of public transportation are primarily realized during periods of high ridership. This research quantifies the emission benefits of buses by calculating the mile-weighted average ridership for the Orange County Transportation Authority (OCTA) bus system in Southern California. Ten routes were randomly selected, and data was collected on passenger counts, boardings, alightings, time of day, and distance between stops. The average ridership was calculated to be 14.49 riders per mile. Once non-revenue vehicle miles are accounted for, OCTA buses emit 20,000–51,000 fewer metric tons of CO<sub>2</sub> than an equivalent number of passengers would if they were transported by car. Using EPA valuations for the social cost of carbon, this decrease provides an annual savings of \$109,800–\$279,990 domestically, and \$724,200–\$1,846,710 globally. OCTA receives approximately \$480 million in subsidies from state and federal sources each year, so an analysis focusing solely on CO<sub>2</sub> emissions must conclude that OCTA's emission benefits are not enough on their own to justify their subsidy. The emission benefits calculated for OCTA likely represent an ideal case. OCTA ranks 18th in the U.S. in number of passenger miles traveled and has completely switched its buses from diesel to natural gas fuels. Other bus systems using less emission-efficient fuels will provide an even smaller benefit.

**Subject Area:** Greenhouse Gas emissions; public transportation; low efficient bus

**Availability:** Naviaux, John D. "From Cars to Buses: Using OCTA Ridership to Analyze the Emission Benefits of Bus Transportation."

[http://www.urop.uci.edu/journal/journal11/03\\_naviaux.pdf](http://www.urop.uci.edu/journal/journal11/03_naviaux.pdf)

## **Development of Decision Tool for Strategies to Reduce Greenhouse Gas Emissions: Role of National Household Travel Survey Data in GreenSTEP Model Development** *Kelly J. Clifton; Brian J. Gregor*

**Abstract:** The National Household Travel Survey (NHTS) provides important information for the development of local and regional models to support decision making related to climate change and sustainability goals. This paper documents the use of NHTS data in the development of the Greenhouse Gas Statewide Transportation Emissions Planning (GreenSTEP) model, which forecasts estimates of greenhouse gas emissions at county and urban area levels. The model was developed to be sensitive to a broad number of policy variables and other factors that were not addressed in existing models. Because there was a lack of local and current sources of information about individuals, households, and their vehicle ownership patterns and travel behavior, GreenSTEP made use of the information in the national sample of the 2001 NHTS to estimate several model modules. The NHTS data were useful specifically in the development of modules on (a) land use characteristics, (b) vehicle ownership, (c) vehicle use [daily vehicle miles traveled (DVMT)], (d) impacts of vehicle travel costs on DVMT, (e) lightweight vehicles (bicycles, mopeds, electric bicycles, etc.), and (f) vehicle fleets (type and age). The NHTS data were particularly important for modeling the adoption and use of limited-range electric vehicles, as the data enabled estimates of trip length distributions to be made. This paper highlights the utility of the NHTS data for this modeling framework, the modifications and augmentations that were necessary, the limitations that were encountered, and the potential for the wider dissemination and use of the GreenSTEP tool because the initial estimation was made with a national sample.

**Subject Area:** Greenhouse Gas emissions;

**Availability:** Clifton, Kelly J., and Brian J. Gregor. "Development of Decision Tool for Strategies to Reduce Greenhouse Gas Emissions." *Transportation Research Record: Journal of the Transportation Research Board* 2291.1 (2012): 124-134. (2013).  
<http://trb.metapress.com/content/h311117857m6180k/>

## **Building and Preserving Affordable Homes Near Transit: Affordable TOD as a Greenhouse Gas Reduction and Equity Strategy** *Skid Row Housing Trust*

**Abstract:** CHPC initiated this report in order to assess existing research on the role of preservation and development of affordable housing in transit-oriented corridors as a greenhouse gas (GHG) reduction strategy for California. As a result of our extensive review of existing literature, we have found three important trends: 1) Lower income households are less likely to own a car, more likely than other income groups to walk or take transit, especially in transit rich areas, and have lower vehicles miles traveled (VMT); 2) living in transit-oriented development (TOD) reduces auto use and resulting GHG emissions while also lowering transportation costs; and 3) housing near transit stations is subject to more rapidly increasing rents and property values, making these areas less affordable to low income households over time. While more study is needed to quantify the specific reductions generated by Affordable TOD, evidence suggests that preserving and building affordable homes near transit will allow California to achieve the maximum VMT and GHG reduction benefits of investment in transit infrastructure and transit-oriented development. Actions must be taken to ensure that people with low incomes, who are most likely to use transit and to benefit from its presence, are able to live nearby.

**Subject Area:** Greenhouse Gas emissions, TOD

**Availability:** Trust, Skid Row Housing. "CHPC Working Paper Building and Preserving Affordable Homes Near Transit: Affordable TOD as a Greenhouse Gas Reduction and Equity Strategy." (2013). [https://scanph.org/files/FullReport\\_CHPCAaffordableTOD013113.pdf](https://scanph.org/files/FullReport_CHPCAaffordableTOD013113.pdf)

## **Is Smart Growth Associated with Reductions in CO2 Emissions?** *Xin Wang, Asad Khattak, & Yichi Zhang*

**Abstract:** The transportation sector is the second largest contributor to human generated CO2 emissions. A key goal of the US Department of Transportation is to implement environmentally sustainable policies that can reduce carbon emissions from transportation sources. Smart growth developments are characterized by compact, mixed use, greater network connectivity and alternative mode friendly environments. These features may encourage reductions in vehicle travel and emissions. A better understanding of travel behavior in conventional and smart growth communities is needed to inform policies and make informed decisions. This study analyzes a behavioral dataset to answer whether smart growth developments are associated with lower CO2 emissions. Using a sample of 15,213 households from a recent (2009) travel behavior survey, sample selection models are estimated to capture the conditionality of emissions on the decision to drive or not by household members on an assigned day. The study found that the activity participation needs for 12% of the responding households allow them to either use alternative modes or not travel out-of-home. The rest of the sample traveled in an automobile and hence contributed to CO2 emissions. The study calculates CO2 emissions based on vehicle miles traveled and the fuel efficiency of the vehicle used for specific trips undertaken by household members. The framework developed in this study models whether CO2 emissions are associated with land use, socio-demographics, and preferences for information technology adoption. Tailpipe CO2 emissions are lower for households that reside in more mixed land use neighborhoods with denser roadway networks and better network connections in the neighborhood (on the order of 12%). As a long term strategy, CO2 emission reductions from smart growth developments can be substantial.

**Subject Area:** Emissions, smart growth, Greenhouse Gas emissions, built environment, CO2

**Availability:** Wang, Xin, Asad Khattak, and Yichi Zhang. "Is Smart Growth Associated with Reductions in CO2 Emissions?." Transportation Research Board 92nd Annual Meeting. No. 13-2350. 2013. <http://docs.trb.org/prp/13-2350.pdf>

## **Using Traditional Household Survey and GPS Data for Advanced Travel Behavior and Emission Analysis** *Cong, Xiaojie*

**Abstract:** National and regional travel survey data have been widely collected in recent years. This thesis research employs National Household Travel Survey (NHTS) and Maryland GPS survey data sources to accomplish the following two objectives. The primary goal of the study is to assess how residential density, employment density, land use mix, and average block size measured at both the residential locations and at the activity space level influence vehicle miles travelled (VMT) with the Maryland GPS survey data. The secondary goal of the project is to examine the impact of time of day, day of week, trip purpose, vehicle type, gas price on vehicle soak time distributions with the 2009 NHTS data. Econometric models with panel data and Generalized Gamma techniques are developed for the impact analysis.

**Subject Area:** GPS; VMT; generalized gamma techniques

**Availability:** Cong, Xiaojie. Using Traditional Household Survey and GPS Data for Advanced Travel Behavior and Emission Analysis. University of Maryland Masters Diss. 2012.  
[http://drum.lib.umd.edu/bitstream/1903/13550/1/Cong\\_umd\\_0117N\\_13850.pdf](http://drum.lib.umd.edu/bitstream/1903/13550/1/Cong_umd_0117N_13850.pdf)

## **Estimating and Modeling Soak Time Distributions with the 2009 National Household Travel Survey Data** *Zhang, Lei, Xiaojie Cong, Xiang He, and Chenfeng Xiong*

**Abstract:** Vehicle soak time is defined as the duration of time a vehicle's engine is at rest prior to being started. The distribution of soak time is a key input for mobile-source emission models, such as the EPA MOVES. This paper estimates various soak time distributions, and develops statistical models of those distributions. The data source is the National Household Travel Surveys (NHTS) in 2009, which contains information about person and vehicle trips in a 24-hour period for all sampled households. When the weights are introduced, the total vehicle trips for the national level are 467,505,568. We first develop a comprehensive methodology for extracting vehicle soak time distribution information from NHTS data files including the day trip file, person file, vehicle file and household file. The obtained soak time information is then employed in the development of a series of statistical models that can directly provide inputs to mobile-source emission models.

Vehicle emission rates are heavily influenced by soak time distributions due to their impact on vehicle start emissions and evaporative emissions. Since the distribution and duration of soak periods preceding the first vehicle start of day is quite different from those of soak periods preceding non-first starts, we analyze these two types of soak period with separate models. Results show that time of day, day of week, trip purpose, vehicle type, gas price, metropolitan statistical area size and several interaction variables have significant impacts on soak time durations.

A model analyzing the start mode fraction is built with logistic regression methods. The model rho-squared is 0.88 based on more than 0.41 million observations. Again, time of day, trip purpose, day of week and their interactions are found to be the main factors explaining the differences between soak periods prior to first start and those of non-first starts. Following the start mode fraction model, a statistical model on non-first start soak time durations is also established. After fitting the data with several parametric distributions, the generalized Gamma model is chosen for its superior goodness of fit. This model enables emission modelers and analysts to predict soak time distributions based on several demographic, socioeconomic and travel behavior characteristics. The impact of fuel price on soak time is also considered in the model.

**Subject Areas:** soak time; EPA MOVES; vehicle emissions; logistic regression

**Availability:** Zhang, Lei, et al. "Estimating and Modeling Soak Time Distributions with the 2009 National Household Travel Survey Data." Transportation Research Board 91st Annual Meeting. No. 12-4562. 2012. <http://docs.trb.org/prp/12-4562.pdf>

## 5. POLICY AND MOBILITY

### **Evaluating Strategies to Reduce VMT: Planning Level Tool Development and a Framework for Performance Monitoring** *Anne Vernez Moudon & Orion Stewart*

**Abstract:** Part of the research conducted for this project focused on identifying the indicators known to affect NMT and the tools that decision-makers can use to understand how proposed transportation and land use changes will affect travel. Extensive research has been conducted over the past two decades on the relationship between individual, household, land use and built environment (BE) factors associated with transit and NMT. This past research has provided a foundation for numerous tools that attempt to forecast the impact of land use and transportation system changes on transit, NMT, VMT, GHG emissions, and other travel-related outcomes. This report first summarizes the individual, household, and BE factors associated with NMT. It then reviews the tools that use those factors as inputs to predict travel behaviors and related outcomes.

**Subject Area:** Performance monitoring, MAP-21, transportation demand management, VMT reduction, greenhouse gas reduction, GHG, climate change, Washington state, legislation

**Availability:** Hallenbeck, Mark E., Orion Stewart, and Anne Vernez Moudon. A Framework for Monitoring the Performance of Demand Management and Vehicle Miles Traveled (VMT) Reduction Activities. No. WA-RD 806.1. 2013.  
<http://www.wsdot.wa.gov/research/reports/fullreports/806.3.pdf>

**A Framework for Monitoring the Performance of Demand Management and Vehicle Miles Traveled (VMT) Reduction Activities** *Mark E. Hallenbeck, Orion Stewart, Anne Vernez Moudon*

**Abstract:** This report presents a framework to support performance monitoring for demand management related to VMT reduction. The framework consists of performance monitoring measures and a system for their collection and dissemination. The report also provides the context within which the framework would exist, and describes how it will support a wide variety of other statewide and regional needs, thus providing additional incentive for its adoption. The intent of the Framework is to not only meet the requirements of Washington state's legislative requirement to reduce VMT per capita (RCW 47.01.440), but to do so in a way that provides WSDOT and its partner agencies with information that supports planning and programming. The report also provides an excellent framework for developing and reporting congestion-related performance measures in support of MAP-21.

**Subject Area:** Performance monitoring, MAP-21, transportation demand management

**Availability:** Hallenbeck, Mark E., Orion Stewart, and Anne Vernez Moudon. A Framework for Monitoring the Performance of Demand Management and Vehicle Miles Traveled (VMT) Reduction Activities. No. WA-RD 806.1. 2013.

<http://depts.washington.edu/trac/bulkdisk/pdf/806.1.pdf>



## **Equity Evaluation of Sustainable Mileage-Based User Fee Scenarios** *Mark Burris, Sunghoon Lee, Tina Geiselbrecht, and Trey Baker*

**Abstract:** The Texas state gas tax has been 20 cents per gallon since 1991, and the federal gas tax has been 18.4 cents per gallon since 1993. The gas tax is not only stagnant, but depreciating in value due to inflation. This is forcing some transportation providers to increase their focus on spending for a more sustainable transportation system, thus shifting how tax revenues are spent. One proposed alternative to the gas tax is the creation of a mileage-based user fee (MBUF), which would then shift how revenues are collected. This research examined potential equity impacts of these shifts in the collection and disbursement of transportation funds. This research used 2009 National Household Travel Survey (NHTS) Texas data along with detailed spending estimates from the Texas Department of Transportation to consider the equity impacts surrounding three MBUF and spending scenarios. NHTS data were weighted to reflect results representative of Texas vehicle-owning households. Each scenario was run both statically and dynamically under the assumption that the MBUF would replace the state gas tax. Results indicate that the impact of the MBUF on geographic equity can be different depending on allocation of transportation funding. However, the MBUF was essentially as equally vertically equitable as the current state gas tax.

**Subject Area:** Mileage-Based User Fee, Equity, Tax Revenue

**Availability:** Burris, Mark, et al. Equity Evaluation of Sustainable Mileage-Based User Fee Scenarios. No. SWUTC/14/600451-00007-1. 2013.

<http://ntl.bts.gov/lib/50000/50700/50717/600451-00007-1.pdf>

## **Impoverished Data: Experiences and Lessons in Collecting Cape Town Data For the Millennium Cities Database** *L. Kane, V. Baleni and S. Cooke*

**Abstract:** The Millennium Cities Database for Sustainable Transport is a substantial database, funded by the International Association of Public Transport, with over 200 indicators of transport, demographic, economics and land-use data from about one hundred cities. This dataset allows cities to benchmark against “best practice” or similarly positioned cities and it is a valuable aid for better understanding of the status quo, and of the likely trajectories, of cities. In 1995/6 Cape Town and Johannesburg were included in the dataset, but until now the collection of more recent South African data has not been possible. In 2012 a collaboration between three University of Cape Town (UCT) final year undergraduate civil engineering students, staff at the Centre for Transport Studies, UCT, and transport representatives from the City of Cape Town was formed in an attempt to update the Cape Town data from 1995/6 to 2005/6 and 2010. This paper describes the data collected, its quality, and the data gaps which were found. Methodological lessons on this type of data collection are described. The paper ends with some discussion on metropolitan transport data availability and quality, and the implications of this for policy and decision making at a metropolitan level.

**Subject Area:** indicators, sustainable transportation,

**Availability:** Cooke, S., V. Baleni, and L. Kane. "Impoverished data: experiences and lessons in collecting Cape Town data for the millennium cities database." SATC 2013 (2013). <http://www.dspace.up.ac.za/handle/2263/32302>

## **Measuring spatial accessibility to healthcare for populations with multiple transportation modes** *Liang Mao & Dawn Nekorchuk*

**Abstract:** Few measures of healthcare accessibility have considered multiple transportation modes when people seek healthcare. Based on the framework of the 2 Step Floating Catchment Area Method (2SFCAM), we proposed an innovative method to incorporate transportation modes into the accessibility estimation. Taking Florida, USA, as a study area, we illustrated the implementation of the multi-mode 2SFCAM, and compared the accessibility estimates with those from the traditional single-mode 2SFCAM. The results suggest that the multi-modal method, by accounting for heterogeneity in populations, provides more realistic accessibility estimations, and thus offers a better guidance for policy makers to mitigate health inequity issues.

**Subject Area:** Healthcare accessibility; Transportation mode; 2 Step Floating Catchment Area Method (2SFCAM); Geographic information system (GIS)

**Availability:** Mao, Liang, and Dawn Nekorchuk. "Measuring spatial accessibility to healthcare for populations with multiple transportation modes." *Health & place* 24 (2013): 115-122.  
<http://www.sciencedirect.com/science/article/pii/S1353829213001135>

## **Future Mobility Demand in Megaregions: A National Study with a Focus on the Gulf Coast** *Ming Zhang & Wenjia Zhang*

**Abstract:** About three fourth of national population and wealth are concentrated in the 11 megaregional areas that occupy one fourth of the land areas in the US. NHTS reveal that megaregions also concentrate current and future mobility demand. This report presents an approach that utilizes aggregate data for mobility study (for both passenger and freight) in a megaregional scale through a case study of the Gulf Coast megaregion (GCM). GCM exhibits unique travel characteristics relative to the national trend. A preliminary analysis on freight flow was also conducted for the GCM areas utilizing the 2002 and 2007 Commodity Flow Survey (CFS) data. The study shows that the GCM area would experience an enormous amount of mobility growth by year 2050. The per capita traffic volume generated by each traveler in 2050 would double the 2010 level. The total traffic volume in 2050 would grow much faster, four times higher than in 2010. Freight demand in the GCM area is also fast growing. The projected trends of future travel demand indicate a growing pressure on the transportation infrastructure in GCM. It is unlikely that the demand for high-speed travel can all be met by air travel. Accordingly, planning for megaregional transportation should seriously consider high-speed travel in the form of High Speed Rail (HSR) to accommodate the future travel demand in the GCM area.

**Subject Area:** Travel Demand, Megaregion, Gulf Coast Megaregion (GCM), High -speed Travel

**Availability:** Zhang, Ming, and Wenjia Zhang. Future Mobility Demand in Megaregions: A National Study with a Focus on the Gulf Coast. No. SWUTC/13/600451-00074-1. 2013. <http://d2dtl5nnlpfr0r.cloudfront.net/swutc.tamu.edu/publications/technicalreports/600451-00074-1.pdf>

**Analysis of a Consumer Survey on Plug-In Hybrid Electric Vehicles** *Joseph S. Krupa, Donna M. Rizzo, Margaret J. Eppstein, D. Brad Lanute, Diann E. Gaalema, Kiran Lakkaraju, & Christina E. Warrender*

**Abstract:** Plug-in Hybrid Electric Vehicles (PHEVs) show potential to reduce greenhouse gas (GHG) emissions, increase fuel efficiency, and offer driving ranges that are not limited by battery capacity. However, these benefits will not be realized if consumers do not adopt this new technology. We administered a survey to 1000 stated U.S. residents, using Amazon Mechanical Turk, to better understand factors influencing the potential for PHEV market penetration. Our analysis of the survey results reveals quantitative patterns and correlations that expand the existing literature. For example, respondents who felt most strongly about reducing U.S. transportation energy consumption and cutting greenhouse gas emissions had, respectively, 71 and 44 times greater odds of saying they would consider purchasing a compact PHEV than those who felt least strongly about these issues. However, even the most inclined to consider a compact PHEV were not generally willing to pay more than a few thousand U.S. dollars extra for the sticker price. Consistent with prior research, we found that financial and battery-related concerns remain major obstacles to widespread PHEV market penetration. Our results may help inform governmental policies, manufacturer pricing and marketing strategies to promote consumer adoption of PHEVs.

**Subject Area:** Plug-in hybrid electric vehicles (PHEVs); Electric vehicle technology adoption; Crowd-sourced opinion Survey

**Availability:** Krupa, Joseph S., et al. "Analysis of a consumer survey on plug-in hybrid electric vehicles." *Transportation Research Part A: Policy and Practice* (2013).

<http://www.cems.uvm.edu/~meppstei/personal/PHEVSurveyPaperAsSubmittedTRpartA.pdf>

## **Sharing Cities** *Julian Agyeman, Duncan McLaren and Adrienne Schaefer-Borrego*

**Abstract:** This paper highlights the importance of the shared public realm in the history and development, and more recently, in the re-imagining of politics. We argue that the neo-liberal, hegemonic model of development in the modern world prioritizes private interests at the cost of shared interests. Instead, we suggest that a cultural rebalancing is overdue: one that gives much greater recognition and credit to the shared public realm in our cities (both physical and metaphorical); one that supports a revival of 'conventional' sharing - namely of the city as a whole as shared space - as well as a blossoming of novel forms of sharing; and one that recognizes and affirms the ways in which the opportunities afforded to individuals in cities are founded on the collective efforts and actions of whole communities.

**Subject Area:** sharing, collective community

**Availability:** Agyeman, Julian, Duncan McLaren, and Adrienne Schaefer-Borrego. "Sharing cities." (2013). <http://www.stanford.edu/~nall/docs/nall--ident9.1.pdf>

## **The Political Consequences of Spatial Policies: How Interstate Highways Caused Geographic Polarization** *Nall, Clayton*

**Abstract:** In the postwar era, Republicans have become increasingly more likely than Democrats to live in non-urban counties, and the two parties serve increasingly distinct geographic constituencies. Introducing a theory of geographically-induced policy feedback, this paper shows that policies that shape geographic space have contributed to these changes. It examines the effect of the Interstate Highway System, the largest public works project in American history. Interstates are hypothesized to facilitate partisan geographic polarization by catalyzing residential migration and land use changes. These hypotheses are tested by exploiting Interstates' conditionally exogenous placement in suburban counties and metropolitan areas. Two studies show that suburban counties with Interstates became about 2 to 3 points less Democratic than they would have been otherwise (about 5 points in the South), and increasing metro-level highway density from the 25th to the 75th percentile increases the urban-suburban partisan gap by up to 4 points.

**Subject Area:** Spatial Policies, political parties;

**Availability:** Nall, Clayton. "The Political Consequences of Spatial Policies: How Interstate Highways Caused Geographic Polarization." (2013). <http://www.stanford.edu/~nall/docs/nall--ident9.1.pdf>

## **Development of a Framework for Transit-Oriented Development (TOD)**

*Mansoureh Jeihani, Lei Zhang, Anam Ardeshiri, Arash Amiri, Arefeh Nasri, Kiana Roshan Zamir, Babak Baghaei*

**Abstract:** In this project, a comprehensive analysis of TODs in the Washington, D.C., and Baltimore metro areas was performed to investigate if TODs actually can reduce automobile travel and encourage transit use as well as non-motorized modes. The research team modeled vehicle-miles travelled (VMT), trip generation, trip length, and mode share in two case study areas using the most recent local household travel survey data and advanced econometric models. Findings show that people living in TODs overall have lower household VMT, make more trips by all modes of transportation, but make fewer trips by automobiles. Results also show that TOD residents tend to travel shorter distances by all modes of transportation, which implies their selection of closer destinations for their activities. Trips originating from TODs have substantially higher non-auto mode share in both areas after controlling for relevant socioeconomic and demographic factors. The study also finds significant differences in the effectiveness of TODs in these two metropolitan areas due to different TOD locations, transit system availability and level of service, and TOD resident characteristics. The trip generation step of the Maryland Statewide Transportation Model (MSTM) can be modified to incorporate the effect of TODs on a transportation system as a result of this study.

**Subject Area:** Transit-Oriented Development, Travel Behavior, Land Use, Transit Ridership

**Availability:** Jeihani, Mansoureh, et al. "STATE HIGHWAY ADMINISTRATION RESEARCH REPORT." (2013). [http://ntl.bts.gov/lib/50000/50900/50921/Development\\_Jeihani\\_1314.pdf](http://ntl.bts.gov/lib/50000/50900/50921/Development_Jeihani_1314.pdf)



## **America's Changing Economy Searching for Work that Pays in the New Low-Wage Job Market** *Ben Henry and Allyson Fredericksen*

**Abstract:** The indicators of tough economic times underscore the importance of ensuring that hard work pays decent wages for families, communities, and the country. The 2013 Job Gap Study contributes to the discussion of these issues by examining the availability of living wage jobs at the national level, in 10 states, and in New York City. This study provides an analysis of: National calculations of the number jobseekers compared to job openings paying above a baseline threshold of \$15 an hour, Trends in the number of job-seekers nationwide, proportion of low-wage jobs in the economy, and growth or loss of lower wage and higher-wage jobs nationally, State-specific living wage figures for Colorado, Connecticut, Idaho, Florida, Maine, Montana, Nevada, Oregon, Virginia, Washington state, and New York City, The percentage of job openings that pay a living wage in each of these geographies, The ratio of the number of living wage job openings to the number of people looking for work in each of these geographies.

**Subject Area:** low wage jobs; living wage levels

**Availability:** Henry, Ben, and Allyson Fredericksen. "Gap." (2013).

[http://op.bna.com/dlrcases.nsf/id/rsmh-9e3txg/\\$File/2013Job%20GapStudy.pdf](http://op.bna.com/dlrcases.nsf/id/rsmh-9e3txg/$File/2013Job%20GapStudy.pdf)

## **Integration of Travel Demand Models with Operational Analysis Tools** *Jiaqi Ma, and Michael J. Demetsky*

**Abstract:** Continuing growth in urban travel demand inevitably leads to a need for more physical capacity within the transportation system. However, limited financial resources, high construction costs, environmental considerations, long timelines, and an increasingly complex regulatory process have essentially rendered capacity-adding projects to be actions of last resort. Before such projects are undertaken, decision makers, planners, and engineers evaluate alternative operational improvement strategies that can eliminate, mitigate, or forestall the need for a more traditional highway construction project. Effectively evaluating the wide range of operational improvement strategies that are available is not a trivial matter, and this is particularly true when the performance of such strategies is compared to the construction of new lanes. The purpose of this study was to recommend methods to obtain input data for operational analysis tools that operate as post-processors to travel demand models. Among all operational planning tools compatible with the four-step planning process, the Florida ITS Evaluation (FITSEval) tool was selected to be integrated with the primary planning software used by the Virginia Department of Transportation, i.e., Cube. To achieve the objective of this study, methods for estimating peak period flows from travel forecasting model outputs were investigated and Virginia data were examined for areas where planning forecasts and 24-hour travel patterns were available. Relationships between peak period flows and 24-hour data were studied. Procedures for obtaining the time-of-day factors for link and trip tables are provided using continuous count stations and National Household Travel Survey Data for Virginia. The modeling process was demonstrated by two case studies for the Hampton Roads area where the latest travel demand model was recently completed and many potential capacity enhancing operational strategies were available. Two case studies, Incident Management systems and HOT lanes deployment, were evaluated, and the results of the base case and operational strategy deployment scenarios were compared to make recommendations on the feasibility of the evaluated projects. This report is designed to serve as a reference for users of FITSEval or similar operational analysis tools for evaluating operational capacity enhancements.

**Subject Area:** Operational analysis, travel demand modeling, travel forecasting

**Availability:** MA, JIAQI. "Integration of Travel Demand Models With Operational Analysis Tools." [http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/14-r5.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/14-r5.pdf)

## **Till We Drop: A Historical and Policy Analysis of Retail Goods Movement in the US** *Laura Schewel*

**Abstract:** The movement of retail goods is central to modern economies and is a significant – but understudied – fraction of our overall energy footprint. Thus, we propose a new category for energy analysis called Retail Goods Movement (RGM) that draws its boundaries around the portion of freight dedicated to retail goods and the portion of driving dedicated to shopping. Historically, the components of RGM have not enjoyed policy priority. However, the net payoff from energy research and policy directed at RGM may now be high enough relative to other options to deserve increased investment. We combine a quantitative decomposition of the dynamics of RGM energy use with a qualitative discussion of what trends could have contributed to them. The RGM sector's energy use grew from 1.3EJ (2.8% U.S.) in 1969 to 7.0 EJ (6.6% U.S.) in 2009. The major drivers were increases in: population, freight tonnage (before 1990), distance freighted per tonne and driven per shopping trip (after 1990), and weekly shopping trips per household (before 1995). RGM energy intensity increased per capita (180%), per constant dollar GDP (60%) and per retail expenditure (140%). Finally, we describe policy recommendations that could become the basis of a sound RGM resource plan.

**Subject Area:** retail goods movement; energy use

**Availability:** SCHEWEL, Laura. "2013 YOUNG RESEARCHER AWARD."

<http://www.internationaltransportforum.org/2013/pdf/YRASchewelPaper.pdf>

## **Unraveling Ties to Petroleum: How Policy Drives California Demand for Oil** *Juan Matute and Stephanie Pincetl*

**Abstract:** California's energy paradigm is shifting in this new Millennium. The prior paradigm, energy use that tends to promote near-term economic development, no longer serves the state's economic and environmental policy goals. Thus, the state has evolved a new paradigm: energy use capable of sustaining long-term quality of life goals and economic security. As this paradigm shifts, the state, regions, counties, and municipalities have the opportunity to reevaluate legacy policies and their direct or indirect impact on energy use. Moderating petroleum's effect on the state's economic and social systems will assist the transition to a clean economy, where the state can increase economic output while protecting limited natural resources. Rising fuel prices burden all Californians, especially those with little wealth or alternative transportation options. Understanding the connection between petroleum use and anthropogenic climate change provides an additional impetus to reduce California's consumption of petroleum.

**Subject Area:** economic security; fuel prices

**Availability:** Pincetl, Stephanie. "UNRAVELING TIES TO PETROLEUM." (2013).  
<http://next10.org/unraveling-petroleum>

## **Roadblock to Recovery: How FEMA's Liability Insurance Mandate Denies Low-Income Disaster Survivors Essential Transportation Benefits** *Anne Sikes Hornsby*

**Abstract:** For better or worse, we live in a society dominated by the automobile; Americans are notoriously dependent on automobiles for access to goods and services, for social and economic development, and for sustenance. In disaster situations, transportation can be critical to individual and household recovery efforts, particularly for those in areas with no public transportation or where public transportation has been disrupted. FEMA's statutory mandate charges the agency with "alleviat[ing] the suffering and damage," and unsurprisingly, this mandate encompasses disruptions to local transportation systems; the agency's statutes and regulations authorize FEMA to provide financial aid for transportation needs, including repair or replacement of disaster-damaged personal vehicles. But to be eligible, FEMA requires proof of an applicant's auto accident liability insurance—despite the fact that such insurance would not have covered the damaged vehicle. The only plausible policy reason given for this rule is that FEMA will not provide aid for vehicles not in compliance with state law. However, state mandatory insurance laws exist to reduce the numbers of uninsured motorists, a goal with little, if any, discernible relationship to FEMA's mission of disaster relief. Moreover, most uninsured vehicles are owned by low-income households, and the postdisaster punitive effect on uninsured disaster survivors could violate FEMA's antidiscrimination provisions, which include protections on the basis of economic status. What is more, auto insurance mandates are of dubious efficacy—raising more questions about the eligibility requirement. This Article examines and critiques the FEMA auto insurance mandate in light of the agency's mission and history, and the mandate to alleviate disaster-related economic harms to low-income families. Further, this Article considers both the policy arguments and the potential for successful challenges to the policy through litigation or agency procedures.

**Subject Area:** Disaster; auto insurance

**Availability:** Hornsby, Anne Sikes. "Roadblock to Recovery: How FEMA's Liability Insurance Mandate Denies Low-Income Disaster Survivors Essential Transportation Benefits." *Marquette Law Review* 96.3 (2013): 735. <http://scholarship.law.marquette.edu/mulr/vol96/iss3/3/>

## **A New Econometric Approach for Estimating Gasoline Price Elasticity of Automobile Travel and Vehicle Fuel Demand** *Frank Goetzke*

**Abstract:** Accurate estimates of income and gasoline price elasticity of automobile travel and vehicle fuel demand are important for designing efficient and successful transportation policies. The empirical estimation of elasticity has typically been done by employing a double-log regression, but the log-log functional form poses two potential issues: (1) Jensen's inequality, which is  $\log [E(y)] \neq E [\log(y)]$ , may lead to inconsistent regression coefficient estimates; and (2) observations with y-values of zero cause problems, because the log of zero is not a defined number. I propose for the estimation of income and gasoline price elasticity of travel demand the PPML (Poisson Pseudo Maximum Likelihood) approach, which has been previously shown in Monte Carlo simulations to best alleviate both of the above issues (Silva and Tenreiro, 2006; 2010; 2011). Using the 2009 National Household Travel Survey (NHTS), I econometrically estimate short-run income and gasoline price elasticity for automobile travel in the United States using a Poisson pseudo ML approach. The data set is well-suited for this kind of inquiry, because, during the duration of the survey, from March 2008 to May 2009, gasoline prices had been fluctuating between \$1.71 (December 2008) and \$4.17 (July 2008). I find that that the PPML estimation with the full data set yields consistently less inelastic values w.r.t. gasoline prices, but shows more mixed results for income elasticity. Given the theoretical strength of the PPML approach and the superiority in Monte Carlo simulations, I conclude that the traditional way to estimate income and gasoline price elasticity of travel demand leads to significantly biased coefficients.

**Subject Area:** Gasoline elasticity; Poisson Pseudo Maximum Likelihood; Monte Carlo

**Availability:** Goetzke, Frank. "A New Econometric Approach for Estimating Gasoline Price Elasticity of Automobile Travel and Vehicle Fuel Demand."

<http://indico.conferences.dtu.dk/getFile.py/access?contribId=46&sessionId=62&resId=0&materialId=paper&confId=133>.

## **Optimizing Road Capacity and Type** *Kenneth A. Small & Chen Feng Ng*

**Abstract:** We extend the traditional road investment model, with its focus on capacity and congestion as measures of capital and its utilization, to include free-flow speed as another dimension of capital. This has practical importance because one can view free-flow speed as a continuous proxy for road type (e.g. freeway, arterial, urban street). We derive conditions for optimal investment in capacity and free-flow speed, and analyze the optimal balance between the two. We then estimate cost functions for capital and user costs and apply the resulting model using parameters representing large US urban areas. We show that providing high free-flow speed may be quite expensive, and there is sometimes a tradeoff between it and capacity. We find suggestive evidence that representative freeways in most large urban areas provide too high a free-flow speed relative to capacity, thus making the case for reexamination of typical design practice.

**Subject Area:** Capacity; free-flow speed; highway design; optimal highway investment; congestion

**Availability:** Small, Kenneth, and Chen Feng Ng. *Optimizing Road Capacity and Type*. No. 121309. 2013.

<http://www.socsci.uci.edu/~ksmall/Hwy%20Cap%20and%20Type%20v18%20with%20appendices.pdf>.

## **Exercising a megaregion analysis framework in the Chesapeake Bay area** *Tara Weidner; Fred Ducca; Rolf Moeckel; Sabyasachee Mishra*

**Abstract:** Megaregions are a new geography that may well form the “nation’s operative regions when competing in the future global economy,” according to the March 2010 FHWA Strategic Plan. To assess the impact of policies and scenarios, a hypothetical Megaregion governing board, responsible for the broad welfare and economic competitiveness of an interacting region, will need to employ a broader set of tools than is typically used in typical Metropolitan Planning Organization (MPO) or State Department of Transportation (DOT) models. The analysis framework, resulting from a Federal Highway Administration’s Exploratory Advanced Research Program project, suggests an integrated model including travel driven by economic and land use decisions, and capturing effects on the environment, as well as enhancing the travel component to include long distance truck and person travel, the former driven by economic commodity flows. The paper discusses how this analysis framework was exercised in a proof-of-concept High Energy Price scenario for the Chesapeake Bay megaregion.

**Subject Area:** integrated model; proof of concept application;

**Availability:** Weidner, Tara, et al. "Exercising a Mega-Region Analysis Framework in the Chesapeake Bay Area." Transportation Research Board 92nd Annual Meeting. No. 13-2236. 2013. <http://docs.trb.org/prp/13-2236.pdf>



## **Traveling Towards Disease: Transportation Barriers to Health Care Access**

*Samina T. Syed, Ben S. Gerber, Lisa K. Sharp*

**Abstract:** Transportation barriers are often cited as barriers to healthcare access. Transportation barriers lead to rescheduled or missed appointments, delayed care, and missed or delayed medication use. These consequences may lead to poorer management of chronic illness and thus poorer health outcomes. However, the significance of these barriers is uncertain based on existing literature due to wide variability in both study populations and transportation barrier measures. The authors sought to synthesize the literature on the prevalence of transportation barriers to health care access. A systematic literature search of peer-reviewed studies on transportation barriers to healthcare access was performed. Inclusion criteria were as follows: (1) study addressed access barriers for ongoing primary care or chronic disease care; (2) study included assessment of transportation barriers; and (3) study was completed in the United States. In total, 61 studies were reviewed. Overall, the evidence supports that transportation barriers are an important barrier to healthcare access, particularly for those with lower incomes or the under/uninsured. Additional research needs to (1) clarify which aspects of transportation limit health care access (2) measure the impact of transportation barriers on clinically meaningful outcomes and (3) measure the impact of transportation barrier interventions and transportation policy changes.

**Subject Area:** healthcare access

**Availability:** Syed, Samina T., Ben S. Gerber, and Lisa K. Sharp. "Traveling Towards Disease: Transportation Barriers to Health Care Access." *Journal of community health* (2013): 1-18. <http://link.springer.com/article/10.1007/s10900-013-9681-1#>

## **Phantom Trips: Overestimating the Traffic Impacts of New Development** *Adam Millard-Ball*

**Abstract:** Trip Generation is the standard reference for assessing the impacts of new development on traffic congestion and the environment in the U.S. However, a comparison to household surveys suggests that Trip Generation overestimates trips by 56% – likely because its data represent a biased sample of development in the U.S. Moreover, the data in Trip Generation are ill-suited to many analyses of traffic impacts, imposition of development impact fees and studies of greenhouse gas emissions, because they do not account for substitution effects. Most trips to new developments are not new, but involve households reshuffling trips from other destinations. These twin problems – theoretical and practical – help reinforce the dominance of the private auto, and are likely to lead to excessive roadway infrastructure that is unnecessary in practice.

**Subject Area:** trip generation; new development; traffic impacts

**Availability:** Millard-Ball, Adam. "Phantom Trips." <http://docs.trb.org/prp/13-0532.pdf>

## **Implementing Marginal-Cost Vehicle Mileage Fees on the Maryland Statewide Road Network** *Lei Zhang & Yijing Lu*

**Abstract:** Vehicle mileage fees or similar user-based road charge could be an effective supplement or replacement of the current fuel tax on the nation's highways and bridges. At the same time, properly structured mileage fee systems may help transportation professionals and officials at all levels address prominent issues such as funding gap, traffic congestion, and emissions. In theory, vehicles should be assessed a user fee equivalent to the full marginal cost not already borne by the users. This paper first estimates the full marginal cost of auto and truck travel in different time periods on all roadways in Maryland, and evaluates the impacts of such marginal-cost vehicle-miles-traveled fees (VMT fees) on travel behavior, revenue generation, equity, pollution, and GHG emissions both in Maryland and in the surrounding States of Delaware, Pennsylvania, Virginia, West Virginia, and the District of Columbia (DC). Results show that with consideration of all driving externalities, the marginal-cost VMT fee for auto (truck) travel in Maryland during peak periods ranges from 0.20~12.16 (3.91~45.33) cents/mile. Compared to the existing revenue policy, the marginal-cost VMT fee can reduce overall vehicle miles traveled by 7.65% in the multi-state region covered by the quantitative model, by 7.81% just in Maryland. In addition, air pollution and GHG emissions in Maryland can be reduced by 7.62% to 9.42% by pollutant type. Total revenue generation would increase by about 168% from that under the existing revenue policy (including fuel taxes and sporadic bridge/roadway tolls). In terms of income equity, the middle-income group would be hurt the most with the largest consumer surplus decrease, while the highest income group is hurt the least. Results also indicate that the proposed marginal-cost VMT fee in Maryland can affect the neighboring states to varying degrees. For instance, vehicle miles traveled reduction ranges from 0.02% to 1.35% in the neighboring four states and DC, and their revenue generation changes by -1.48% to 0.15%.

**Subject Area:** VMT fee, marginal costs

**Availability:** Zhang, Lei, and Yijing Lu. "Implementing Marginal-Cost Vehicle Mileage Fees on the Maryland Statewide Road Network." Transportation Research Board 92nd Annual Meeting. No. 13-3171. 2013. <http://docs.trb.org/prp/13-3171.pdf>

## **The Road to Division: How Interstate Highways Caused Geographic Polarization** *Clayton Nall*

**Abstract:** In the postwar era, Republicans have become increasingly more likely than Democrats to live in nonurban counties, and the two parties serve increasingly distinct geographic constituencies. Introducing a theory of geographically-induced policy feedback, this paper shows that policies that shape geographic space have contributed to these changes. It examines the effect of the Interstate Highway System, the largest public works project in American history. Interstates are hypothesized to facilitate partisan geographic polarization by catalyzing residential migration and land use changes. These hypotheses are tested by exploiting interstates' conditionally exogenous placement in suburban counties and metropolitan areas. Two studies show that suburban counties with Interstates became about 2 to 3 points less Democratic than they would have been otherwise (about 5 points in the South), and increasing metrolevel highway density from the 25th to the 75th percentile increases the urban-suburban partisan gap by up to 4 points.

**Subject Area:** geographic polarization; urban-suburban

**Availability:** Nall, Clayton. "The Road to Division: How Interstate Highways Caused Geographic Polarization." Unpublished manuscript (2012). <http://www.stanford.edu/~nall/docs/nall--ident9.pdf>

## **Broken Bootstraps: Falling Behind on Full-Time Work** *Ben Henry and Allyson Fredericksen*

**Abstract:** Pulling yourself up by the bootstraps: The concept is an American ideal, a well-established part of our folklore, an idiom that has embedded itself into our country's lexicon. But, in reality, we find there is a more accurate way to describe it: A fairy tale. For generations, candidates across the country have reveled in the opportunity to tell their own stories of perseverance in the face of adversity. We've all heard the tale: A young man with a tough background and a chip on his shoulder rises from the ashes of a hellish existence, pulling himself up by the bootstraps to make something of himself. Captivating and gripping, these ubiquitous narratives are an essential element of our political theater, required reading for "Getting Elected 101."

**Subject Area:** poverty; living wage; inequality

**Availability:** WORK, FALLING BEHIND ON FULL-TIME. "Broken Bootstraps."  
[http://allianceforajustsociety.org/wp-content/uploads/2013/02/2012-Job-Gap-Report\\_WA\\_FINAL.pdf](http://allianceforajustsociety.org/wp-content/uploads/2013/02/2012-Job-Gap-Report_WA_FINAL.pdf)

**Behavioral Responses to Increased Household Fuel Economy: Regression Discontinuity Evidence** *West, Jeremy, Mark Hoekstra, Jonathan Meer, and Steven L. Puller*

**Abstract:** Due to the high political costs of raising the tax rate on gasoline, the U.S. instead combats the negative externalities associated with gasoline consumption by regulating the fuel efficiency of new cars sold. However, the success of these Corporate Average Fuel Economy (CAFE) restrictions depends crucially on whether inducing households to drive more fuel efficient cars causes them to drive more miles, which would offset some or all of the reduction in gasoline consumption. We examine this question by applying a regression discontinuity design to exploit the increase in vehicle fuel efficiency induced among new car buyers in Texas during the “Cash for Clunkers” program in 2009. While new car buyers whose “clunker” was barely eligible for the subsidy drove a similar number of miles per year prior to the policy and are similar in other ways to barely ineligible new car buyers, they bought significantly more fuel efficient vehicles. However, despite having a more fuel efficient vehicle fleet, the barely eligible households did not respond by driving more miles following the program. As a result, the barely eligible households reduced fuel consumption

**Subject Area:** gas tax; Cash for Clunkers; fuel economy; CAFE

**Availability:** West, Jeremy, et al. "Behavioral Responses to Increased Household Fuel Economy: Regression Discontinuity Evidence." (2013). <http://www.uh.edu/~achin/conference/puller.pdf>

## **Essays on the Economics of Automobile Fuel Economy** *Kiso, Takahiko*

**Abstract:** This dissertation consists of three chapters that analyze issues relating to automobile fuel economy. Chapter 1 discusses automobile fuel economy regulations in the United States. The new U.S. Corporate Average Fuel Economy (CAFE) standards not only tighten the target fuel economy to be achieved by automakers, but also make significant changes to the design/structure of CAFE standards by introducing three policy instruments (footprint-based targets, intra-firm transferring of fuel efficiency credits between passenger cars and light trucks, and inter-firm trading of fuel efficiency credits). Chapter 2 proposes a new approach to analyzing how automobile fuel economy is valued in the market, using a hedonic regression framework. Chapter 3 examines whether Japanese fuel economy regulations established in the 1990s induced technological progress in Japanese automakers' technology for providing fuel economy. By observing how fuel economy of automobiles has improved after controlling for changes in vehicle characteristics such as weight and power, I find that fuel economy improvement accelerated after regulations were introduced, implying induced innovation in fuel efficiency technology.

**Subject Areas:** CAFE; fuel economy;

**Availability:** Kiso, Takahiko. "Essays on the Economics of Automobile Fuel Economy." University of Maryland Diss. (2013). <http://drum.lib.umd.edu/handle/1903/14623>

## 6. SPECIAL POPULATION GROUPS

**Work-Related Travel in an Era of Extended Employment** *Nancy McGuckin, Jana Lynott, and Carlos Figueiredo*

**Abstract:** Growing numbers of older workers are working past traditional retirement age, with important implications for transportation planning. The transition from work to retirement is complex and often includes moving to part-time and/or flexible work schedules, which affects commuting and travel patterns. This paper explores emerging trends as older workers extend employment, and presents recommendations for transportation planners and policymakers to consider.

**Subject Areas:** elderly travel trends

**Availability:** McGuckin, Nancy, Jana Lynott, and Carlos Figueiredo. "Work-Related Travel in an Era of Extended Employment." AARP 2013 [http://refresh.share-ws5-md.aarp.org/content/dam/aarp/research/public\\_policy\\_institute/liv\\_com/2013/work-related-travel-extended-employment-insight-AARP-ppi-liv-com.pdf](http://refresh.share-ws5-md.aarp.org/content/dam/aarp/research/public_policy_institute/liv_com/2013/work-related-travel-extended-employment-insight-AARP-ppi-liv-com.pdf)



## **Auto-Motives: Unraveling the Riddle of Alternative Transportation to School**

*Mikki McDaniel*

**Abstract:** Over the last 40 years, there has been a dramatic increase nationwide in the rate of children being driven to school in a private vehicle in the U.S., exacerbating problems from traffic congestion to childhood obesity. While many studies have focused on walking and cycling for the trip to school, few explore parental decision making and the interaction between all travel modes. This study conducts a survey of parents of children attending six elementary schools in San Luis Obispo regarding their children's travel to school. It explores factors in mode choice, establishes local travel patterns for children, and describes parents' decision making and the interaction between driving and alternative modes: walking, cycling, school bus, and public transit. An association is found between child gender and parental permission for walking/cycling and riding public transit without adult supervision. An association is also found between parents' own activity, walking/cycling and riding public transit, and their likelihood to encourage their children to use these modes. Based on survey findings, the study outlines strategy alternatives and recommends implementing free transit days for families, organizing a community safety audit for transit settings, forming a partnership between San Luis Coastal Unified School District and the City of San Luis Obispo to divert demand for school bus transportation to other alternative modes, and organizing a walking school bus.

**Subject Areas:** travel to school

**Availability:** McDaniel, Mikki Amano. "Auto-Motives: Unraveling the Riddle of Alternative Transportation to School." CalPoly (2013). <http://digitalcommons.calpoly.edu/theses/950/>

## **The Living, Moving and Travel Behaviour of the Growing American Solo: Implications for Cities** *Devajyoti Deka*

**Abstract:** Between 1930 and 2010 the share of single-person, or solo, households in the US increased from 6 per cent to almost 28 per cent, whereas the share of married-couple households decreased from 79 per cent to 49 per cent. Yet solo households have received little attention in urban planning and transport research. Given the significant increase of solo households in US cities, this study identifies the distinctive dwelling, moving and travel characteristics of the American solo households, and examines the reasons for their attraction to cities. It uses historical data from census Public Use Microdata Samples and recent national data from the American Housing Survey and the National Household Travel Survey. Descriptive statistics, basic statistical tests, binary logit models and Heckman sample selection models are used to examine various relationships. Some of the transport-related and environmental implications of the findings are discussed.

**Subject Areas:** single-person households;

**Availability:** Deka, Devajyoti. "The Living, Moving and Travel Behaviour of the Growing American Solo: Implications for Cities." *Urban Studies* (2013).

<http://usj.sagepub.com/content/early/2013/07/05/0042098013492233.abstract>

**Why do immigrants drive less? Confirmations, complications, and new hypotheses from a qualitative study in New Jersey, USA** *Daniel G. Chatman and Nicholas J. Klein*

**Abstract:** Recent immigrants to the United States drive autos less than the US-born, and while this difference diminishes over time, it remains persistent for immigrants originating from many areas. Scholars have not yet explained why, despite many studies that have used quantitative data to control for a wide range of social and economic factors. In this article we take a different tack, relying on qualitative data—by means of six focus groups—to generate new hypotheses that could help explain why immigrants drive less, and to seek evidence of hypotheses for which direct evidence is not available in quantitative data. We conducted six focus groups with New Jersey residents who immigrated from the Philippines, India, and Latin America, which are among the top sending countries/regions to New Jersey as well as to the United States for all immigration, as well as comprising the top three countries for naturalizations in the US between 2008 and 2011 (United States Department of Homeland Security, 2012a, b). We asked the focus group participants to discuss the reasons for their changes in travel habits over time, and how they decided where to live, both when they first arrived in the US and in subsequent moves.

**Subject Areas:** immigrant travel behavior

**Availability:** Chatman, Daniel G., and Nicholas J. Klein. "Why do immigrants drive less? Confirmations, complications, and new hypotheses from a qualitative study in New Jersey, USA." *Transport Policy* 30 (2013): 336-344.

<http://www.sciencedirect.com/science/article/pii/S0967070X13001571>

## **Job Design and Ethnic Differences in Working Women's Physical Activity**

*Grzywacz, Joseph G.; Crain, A. Lauren; Martinson, Brian C.; Quandt, Sara A.*

**Abstract:** To document the role job control and schedule control play in shaping women's physical activity, and how it delineates educational and racial variability in associations of job and social control with physical activity. **Methods:** Prospective data were obtained from a community-based sample of working women (N = 302). Validated instruments measured job control and schedule control. Steps per day were assessed using New Lifestyles 800 activity monitors. **Results:** Greater job control predicted more steps per day, whereas greater schedule control predicted fewer steps. Small indirect associations between ethnicity and physical activity were observed among women with a trade school degree or less but not for women with a college degree. **Conclusions:** Low job control created barriers to physical activity among working women with a trade school degree or less. Greater schedule control predicted less physical activity, suggesting women do not use time "created" by schedule flexibility for personal health enhancement.

**Subject Areas:** Job Control; Physical Activity; Women; Work Organization

**Availability:** Grzywacz, Joseph G., et al. "Job Design and Ethnic Differences in Working Women's Physical Activity." *American journal of health behavior* 38.1 (2014): 63-73.  
<http://www.ingentaconnect.com/content/png/ajhb/2014/00000038/00000001/art00007>

**Brother can you Spare a Ride? Carpooling in Immigrant Neighbourhoods** *Evelyn Blumenberg & Michael Smart*

**Abstract:** Immigrants are more likely to travel by carpool than the US-born. Strong ethnic ties within immigrant communities may contribute to immigrants' propensity to carpool, enabling residents to find carpool partners more easily and increasing the likelihood that residents will travel to and from common destinations. Drawing on data from the 2000 US census and a 2001 regional travel survey, this paper examines whether residents of ethnic neighbourhoods in Southern California are more likely to carpool than other residents. A strong positive relationship is found between the percentage foreign-born in a census tract and carpooling rates. Analysis of individual data shows that this relationship is strongest for immigrants who live in immigrant neighbourhoods; immigrants living in non-immigrant neighbourhoods are less likely to carpool. These findings suggest an important role for social networks in travel behaviour and the potential benefits of linking land use to the specific needs of local residents.

**Subject Areas:** carpooling; immigrants; immigrant neighbourhoods; social networks; travel behaviour

**Availability:** Blumenberg, Evelyn, and Michael Smart. "Brother can you Spare a Ride? Carpooling in Immigrant Neighbourhoods." *Urban Studies* (2013): 0042098013502825. <http://usj.sagepub.com/content/early/2013/09/27/0042098013502825.abstract>

**Modeling Seniors' Activity-Travel Data** *Kouros Mohammadian, Behzad Karimi, Zahra Pourabdollahi, & Martina Frignani*

**Abstract:** The United States is experiencing an increase in its elderly population. According to Census Bureau estimates, this population should increase by 104.2% from 2000 to 2030, which translates into 72.1 million elders by 2030. This demographic change will affect the transportation system, like any other socioeconomic system. Thus, this study seeks to understand the dynamics of elderly activity-travel behavior and its potential effects on the transportation system to better identify and meet seniors' transportation needs. The Urban Travel Route and Activity Choice Survey (UTRACS), an automated, Internet- and GPS-based prompted-recall survey that was coupled with learning algorithms, was employed for that purpose. In this report, the study team analyzes elderly tour formation, activity-trip planning, mode-choice selection, and activity timing.

**Subject Areas:** Seniors, travel behavior, travel survey

**Availability:** Mohammadian, Kouros, et al. "Modeling Seniors' Activity-Travel Data." (2013). <https://www.ideals.illinois.edu/handle/2142/45748>

**Exploring heterogeneity in travel time expenditure of aging populations in the Netherlands: results of a CHAID analysis** *Dujuan Yang, Harry Timmermans & Anna Grigolon*

**Abstract:** The aim of this paper is to contribute to the increasing literature on travel behavior and time use of the elderly. The Dutch National Travel Survey, administered in 2009, was used as a data source. First, various facets of activity-travel patterns of the elderly were compared against overall sample averages. Results indicate that the new generation of elderly people do not differ that much from other age groups in terms of their activity-travel behavior. Differences in behavior can be largely understood in terms of constraints acting on agendas. Moreover, travel patterns of elderly are affected by socio-demographic variables. Second, to further qualify the average findings, the Chi-square automatic interaction detection (CHAID) method was applied to explore heterogeneity among the elderly in terms of travel time expenditure. It is analyzed how differences in travel time co-vary with socio-demographics, in addition to activity type, activity duration and travel aspects. The results suggest that the aging population can be systematically broken down into several homogeneous cohort segments. Travel time of elderly groups depends significantly on transport modes, travel motivation, and seven socio-demographic variables (gender, age, living environment, personal net-income, household size and season). Moreover, there is less heterogeneity in travel time of elderly who are older than 75 years old. However, for younger elderly people, especially the group aged from 65 to 74 years old, heterogeneity affects their travel.

**Subject Areas:** Travel behavior; Travel time; Elderly; Aging populations; CHAID

**Availability:** Yang, Dujuan, Harry Timmermans, and Anna Grigolon. "Exploring heterogeneity in travel time expenditure of aging populations in the Netherlands: results of a CHAID analysis." *Journal of Transport Geography* 33 (2013): 170-179.  
<http://www.sciencedirect.com/science/article/pii/S0966692313001890>

## **Will you escort your child to school? The effect of spatial and temporal constraints of parental employment** *Sylvia Y. He*

**Abstract:** Children's independent mobility in many urban areas in the United States has been in decline. This implies that children's out-of-home travel involves the company of adults more often than before. This need requires parents to seek ways to balance work-family life. This study examines the factors that influence a parent-child joint trip to school in dual-earner households, with special consideration given to parental work arrangements and location, which act as intra-household temporal and spatial constraints. The study is carried out in the five-county Los Angeles region, drawing from household travel diaries from the 2001 Southern California Association of Governments (SCAG) Post Census Regional Household Travel Survey. The results show that parental employment, especially the mother's, is a very important factor influencing the probability of a joint trip to school. In terms of temporal constraints, longer working hours will reduce the likelihood that a child will be escorted by its parents. However, the option of flexible work hours offsets the negative effect of long working hours by offering a higher degree of scheduling flexibility. In terms of spatial constraints, the closer the mother's workplace is to the school, the more likely it is that the child will be escorted by the parents. This research provides important evidence that a child's joint trip is heavily influenced by the parents' work schedule and location. The findings shed light on how the provision of certain employment policies and programs may affect joint trips to school.

**Subject Areas:** Children; Escort decision; Joint trip; Parental employment; School; Spatial and temporal constraints

**Availability:** He, Sylvia Y. "Will you escort your child to school? The effect of spatial and temporal constraints of parental employment." *Applied Geography* 42 (2013): 116-123. [www.sciencedirect.com/science/article/pii/S0143622813001161](http://www.sciencedirect.com/science/article/pii/S0143622813001161)



## **An explanation of the relationship between adults' work trip mode and children's school trip mode through the Heckman approach** *Devajyoti Deka*

**Abstract:** Most studies on children's travel hypothesize that the characteristics of children, households, schools, and neighborhoods exogenously affect their travel mode to school. This study makes an additional assumption that children's mode to school and household adults' travel mode to work are interrelated because of a lifestyle choice made by parents and caregivers. With this assumption, Heckman probit models were used with data from the 2009 US National Household Travel Survey to predict household adults' travel mode to work and children's travel mode to school jointly. It found strong evidence that household adults' decision to drive to work significantly increases the probability of children being dropped off at school and decreases their likelihood of walking and bicycling, but not vice versa. As adults' mode choice is more fundamental in the household decision-making process, the study suggests that children's mode choice studies should not ignore how parents or caregivers travel to work.

**Subject Areas:** Mobility; School trips; Children's travel; Mode choice; Heckman model

**Availability:** Deka, Devajyoti. "An explanation of the relationship between adults' work trip mode and children's school trip mode through the Heckman approach." *Journal of Transport Geography* 31 (2013): 54-63.

<http://www.sciencedirect.com/science/article/pii/S0966692313000823>

## **Rural to Urban Intercity Transit User Characteristics Analysis, Demand Estimation and Network Design** *Hongtai Yang*

**Abstract:** Rural transit always plays a critical role in transporting rural residents, especially the ones who do not have a car, cannot drive, or choose not to drive. Intercity bus (ICB), deviated fixed route transit (DFRT) and demand responsive transit (DRT) are three major modes of rural public transportation. Although there are more DFRT and DRT service providers and services in the US, due to institutional issues, there are much more studies about ICB than DFRT and DRT. Meanwhile, state governments are struggling on how to improve the rural transit system with limited budget. This dissertation is aimed to fill the gap by studying the rural transit rider characteristics, ICB system evaluation method and DFRT route design. First, surveys were performed to understand who are using the rural DFRT and DRT services and why they use them. It was found out that DFRT and DRT passengers, whose characteristics are similar to ICB riders, are likely to be female, of minority races, have low personal and household income, low number of vehicles in the household and rent the house. 90% of the riders have difficulty finding alternative transportation mode, suggesting they are captive riders, not choice riders. Secondly, a methodology to locate the high ICB demand area and design ICB stops accordingly is proposed. The existing stop locations are compared to the high demand areas and meaningful destinations. It was found out that the ICB stops in Tennessee are well connected to the meaningful destinations but poorly located to cover the high demand areas. Finally, a methodology to find the most cost effective routes is developed. It uses DRT trip records of a local DRT service provider to construct a trip generation model. The model finds that the trip generation rate of a census tract is significantly positively related to the density of population over 16 years old and density of no-vehicle household in the census tract. The method to find the best routes is presented using Tennessee as an example. This dissertation provides useful information to state government on how to evaluate ICB system, improve rural transit and design DFRT network.

**Subject Areas:** Rural Transit; Deviated fixed route transit; demand responsive transit

**Availability:** Yang, Hongtai. "Rural to Urban Intercity Transit User Characteristics Analysis, Demand Estimation and Network Design." (2013).

[http://tesp.engr.utk.edu/people/PDF/HongtaiYang\\_Dissertation\\_v7.pdf](http://tesp.engr.utk.edu/people/PDF/HongtaiYang_Dissertation_v7.pdf)

## **Free Public Transportation Passes to Students in Los Angeles County** *Los Angeles County Department of Public Health*

**Abstract:** The Los Angeles County Education Coordinating Council, which comprises representation from the community, the courts, law enforcement, and the education sector, has recommended collaborating with the Los Angeles County Metropolitan Transportation Authority (MTA), school districts, and other organizations to secure free transit passes for all students pre-kindergarten through college, regardless of income. The Los Angeles County Department of Public Health conducted a health impact assessment (HIA) to examine the potential financial and health impacts of such a program. Although it was not possible to directly quantify improvements in school attendance, the program likely will result in significant social and downstream health benefits. Costs accrue primarily to transit agencies, while financial benefits accrue to school districts and families.

**Subject Areas:** students; public transit fare; school attendance; health benefits

**Availability:** Gase, Lauren N., et al. "The Potential Costs and Benefits of Providing Free Public Transportation Passes to Students in Los Angeles County."

<http://publichealth.lacounty.gov/plan/docs/HIAFullReport2013.docx>

**Population Density, Distance to Public Transportation, and Health of Women in Low-Income Neighborhoods** *Pamela B. DeGuzman, Elizabeth I. Merwin, Cheryl Bourguignon*

**Abstract:** The purpose of this research was to determine the impact of two neighborhood walkability (the extent to which the built environment is pedestrian friendly) metrics on health outcomes of women living in low-income urban neighborhoods, both before and after accounting for individual and neighborhood factors. A cross-sectional, retrospective design was used. The sample of 1800 low-income women was drawn from Welfare, Children and Families: A Three-City Study (a study of low-income women from three U.S. cities). Using multilevel modeling and geographic information systems, the study sought to determine the effect of distance to public transportation and residential density on health status, mental health symptoms, and health-related limitations. No significant relationship was found between the two walkability metrics and health outcomes. Instead, neighborhood problems that affect crime and safety impacted health status and mental health symptoms. As cities make changes to the built environment with the hope of affecting residents' health outcomes, public health nurses need to be aware that changing walkability characteristics in a neighborhood may not affect the health of residents of high crime, low-income neighborhoods. Without first addressing neighborhood crime, efforts to improve walkability in low-income neighborhoods may fail.

**Subject Areas:** health disparities; neighborhoods; socioeconomic factors; vulnerable populations

**Availability:** DeGuzman, Pamela B., Elizabeth I. Merwin, and Cheryl Bourguignon. "Population Density, Distance to Public Transportation, and Health of Women in Low - Income Neighborhoods." *Public Health Nursing* (2013).

<http://onlinelibrary.wiley.com/doi/10.1111/phn.12051/full>

## **Factors influencing mode of transport in older adolescents: a qualitative study**

*Dorien Simons, Peter Clarys, Ilse De Bourdeaudhuij, Bas de Geus, Corneel Vandelanotte and Benedicte Deforche*

**Abstract:** Since a decline in activity levels occurs in adolescence, active transport could be important to increase daily physical activity in older adolescents (17–18 years). To promote active transport, it is necessary to be aware of the barriers and facilitators of this type of transport, but also of other transport modes. This study sought to uncover the factors influencing the choice of transport mode for short distance travel to various destinations in older adolescents using focus groups.

**Subject Areas:** adolescence; active transport

**Availability:** Simons, Dorien, et al. "Factors influencing mode of transport in older adolescents: a qualitative study." *BMC public health* 13.1 (2013): 323. <http://www.biomedcentral.com/1471-2458/13/323/>

**Work-Related Travel in an Era of Extended Employment** *Nancy McGuckin, Jana Lynott & Carlos Figueiredo*

**Abstract:** Growing numbers of older workers are working past traditional retirement age, with important implications for transportation planning. The transition from work to retirement is complex and often includes moving to part-time and/or flexible work schedules, which affects commuting and travel patterns. This paper explores emerging trends as older workers extend employment, and presents recommendations for transportation planners and policymakers to consider.

**Subject Areas:** elderly; retirement

**Availability:** McGuckin, Nancy, Jana Lynott, and Carlos Figueiredo. "Work-Related Travel in an Era of Extended Employment.

"[http://www.aarp.org/content/dam/aarp/research/public\\_policy\\_institute/liv\\_com/2013/work-related-travel-extended-employment-insight-AARP-ppi-liv-com.pdf](http://www.aarp.org/content/dam/aarp/research/public_policy_institute/liv_com/2013/work-related-travel-extended-employment-insight-AARP-ppi-liv-com.pdf)

## **Winners or Losers: Resident Perceptions of Transit-Induced Neighborhood Change** *Yingling Fan, Andrew Guthrie*

**Abstract:** Existing research rarely goes beyond individual dimensions of neighborhood change to explore the broader neighborhood impacts of transit investments as perceived by neighborhood residents. To fill gaps in this knowledge, the residents of selected neighborhoods along four transit corridors in the Twin Cities area of Minnesota were surveyed. Survey results show that residents of the study neighborhoods had generally positive perceptions of transit-induced neighborhood change. However, significant differences existed between urban and suburban areas and between individual neighborhoods. In addition, African-Americans, immigrants, frequent transit users, carless residents, and new residents in general had more positive perceptions of transit-induced neighborhood change than did whites, nonimmigrants, infrequent or nontransit users, residents with access to a motor vehicle, and longtime residents. Asian urbanites had more negative perceptions. Implications of these findings are discussed.

**Subject Areas:** transit perception; demographic groups; neighborhood

**Availability:** Fan, Yingling, and Andrew Guthrie. "Winners or Losers." *Transportation Research Record: Journal of the Transportation Research Board* 2276.1 (2012): 89-100.  
<http://trb.metapress.com/content/7n3132472821k676/>

## **Travel to School in California: Findings from the California - National Household Travel Survey** *Nancy McGuckin*

**Abstract:** School-aged children merit special attention for safety planning, and recently have been the focus of public health initiatives to increase their physical activity. As a result, many officials and policy makers are interested in information on children's daily travel, and especially their travel to school. To provide that needed information the State of California purchased a supplemental sample to the 2009 National Household Travel Survey (called the CA-NHTS in this report) which contains data on the general travel of residents of California and allows detailed analysis of children's travel to school.

**Subject Areas:** safe routes; school

**Availability:** McGuckin, Nancy. "Travel to School in California." Prepared for: Active Living Research Bikes Belong Foundation and The Safe Routes to School National Partnership (2013). <http://www.travelbehavior.us/Nancy-pdfs/Travel%20to%20School%20in%20California.pdf>



## **The low-and moderate-income population in recession and recovery: results from a new survey** *Edmiston, Kelly*

**Abstract:** This article summarizes both the statistical data and the qualitative commentary collected by the Kansas City Fed's LMI Survey. Section I outlines how the LMI cohort has fared relative to other income cohorts during the recent recession and recovery, drawing on traditional data sources. Section II introduces the LMI Survey and describes how it is conducted. Each of the next four sections corresponds to a specific set of questions on the survey and describes a different aspect of the LMI population's financial conditions. Section III covers job availability for LMI workers, Section IV covers trends in affordable housing, Section V covers access to credit, and Section VI covers shifts in demand for services related to basic needs, such as food, utility and housing assistance. In each section, other Federal Reserve bank surveys and additional data sources are used to corroborate the LMI Survey findings and to extend the discussion.

**Subject Areas:** low income; economic conditions;

**Availability:** Edmiston, Kelly D. "The low-and moderate-income population in recession and recovery: results from a new survey." *Economic Review QI* (2013): 33-57.  
<http://www.kansascityfed.org/publicat/econrev/pdf/13q1Edmiston.pdf>

## **Travel Behavior and Mobility of Transportation-Disadvantaged Populations: Evidence from the National Household Travel Survey** *Mattson, Jeremy Wade*

**Abstract:** Older adults, people with disabilities, individuals in low-income households, and those living in rural areas can face significant mobility challenges. This study examines travel behavior and mobility of these transportation-disadvantaged groups by analyzing data from the National Household Travel Survey (NHTS). NHTS data on driving, trip frequency, staying in the same place all day or week, miles driven per year, mode choice, use of public transportation, trip purpose, trip distance, and issues and concerns regarding transportation are highlighted. Differences are shown by age group, gender, household income, whether a person has a disability or condition affecting ability to travel, and whether the individual lives in a rural or urban area. Differences between 2001 and 2009 are documented to identify trends in travel behavior. A binary logit model is used to estimate whether an individual took a trip during the day or week. For those who have not taken a trip for more than a day, a negative binomial logit model is used to estimate the number of days since the last trip. For those who have not taken a trip in more than a week, a binary logit model is used to identify the characteristics of those who would like to get out more often. Lastly, cluster analysis was used to identify transportation disadvantaged groups. NHTS survey respondents were clustered into 12 groups based on household income, age, gender, household size, and if they had a medical condition affecting their ability to travel, and the travel behavior of each cluster was analyzed.

**Subject Areas:** seniors; disability; rural; mobility; binary logit

**Availability:** Mattson, Jeremy Wade, Small Urban, and Rural Transit Center. Travel Behavior and Mobility of Transportation-Disadvantaged Populations: Evidence from the National Household Travel Survey. No. DP-258. Upper Great Plains Transportation Institute, 2012.  
<http://www.ugpti.org/pubs/pdf/DP258.pdf>

**Impacts of parental gender and attitudes on children's school travel mode and parental chauffeuring behavior: results for California based on the 2009 National Household Travel Survey** Hsu, Hsin-Ping, and Jean-Daniel Saphores

**Abstract:** Research has shown that parental attitudes are a significant predictor of children's active commuting (walking or biking) to school. However, the impact of parental gender on parental attitudes, and the link between parental attitudes and the gender gap in parental chauffeuring behavior have not received much attention. This paper examines these questions by applying discrete choice models to California data from the 2009 National Household Travel Survey while controlling for a wide range of variables characterizing parents, their children, households, schools, and the local built environment. Our results, conveyed via odds ratios, show that mothers are more likely to have higher concerns about traffic volume, which in turn reduces the likelihood that their children will walk or bike to school. Moreover, even though parental attitudes significantly influence parental chauffeuring behavior, their ability to explain the gender chauffeuring gap is limited. When holding equal concerns, mothers are still more likely than fathers to chauffeur their children to school. Finally, while distance to school and several land use measures (e.g., population density, urbanization level, and percentage of renters) are statistically significant, the impact of an objective measure of walkability is quite small. These results suggest that interventions targeting an increase in children's walking and biking to school should focus on the concerns of mothers, especially as they relate to traffic characteristics.

**Subject Areas:** student; commuting; built environment

**Availability:** Hsu, Hsin-Ping, and Jean-Daniel Saphores. "Impacts of parental gender and attitudes on children's school travel mode and parental chauffeuring behavior: results for California based on the 2009 National Household Travel Survey." *Transportation*: 1-23. <http://link.springer.com/article/10.1007/s11116-013-9500-7#>

## 7. SURVEY, DATA SYNTHESIS, AND OTHER APPLICATIONS

### **A Latent Segmentation Based Multiple Discrete Continuous Extreme Value Model** *Anae Sobhani, Naveen Eluru & Ahmadreza Faghih-Imani*

**Abstract:** We examine an alternative method to incorporate potential presence of population heterogeneity within the Multiple Discrete Continuous Extreme Value (MDCEV) model structure. Towards this end, an endogenous segmentation approach is proposed that allocates decision makers probabilistically to various segments as a function of exogenous variables. Within each endogenously determined segment, a segment specific MDCEV model is estimated. This approach provides insights on the various population segments present while evaluating distinct choice regimes for each of these segments. The segmentation approach addresses two concerns: (1) ensures that the parameters are estimated employing the full sample for each segment while using all the population records for model estimation, and (2) provides valuable insights on how the exogenous variables affect segmentation. An Expectation-Maximization algorithm is proposed to address the challenges of estimating the resulting endogenous segmentation based econometric model. A prediction procedure to employ the estimated latent MDCEV models for forecasting is also developed. The proposed model is estimated using data from 2009 National Household Travel Survey (NHTS) for the New York region. The results of the model estimates and prediction exercises illustrate the benefits of employing an endogenous segmentation based MDCEV model. The challenges associated with the estimation of latent MDCEV models are also documented.

**Subject Areas:** Multiple discrete continuous models, latent segmentation approaches, daily vehicle type and use decisions, activity type, accompaniment type, and mileage

**Availability:** Sobhani, Anae, Naveen Eluru, and Ahmadreza Faghih-Imani. "A latent segmentation based multiple discrete continuous extreme value model." *Transportation Research Part B: Methodological* 58 (2013): 154-169.

<http://www.sciencedirect.com/science/article/pii/S0191261513001240>

## **IDVR-PFM: A connectivity-oriented VANET routing protocol in urban scenarios**

*Huijing Shi ; Kunming Shipborne Equip. Res. & Test Centre, Kunming, China ;  
Chong Ma ; Liang Chen ; Zhizhong Ding*

**Abstract:** It is the challenging issue to find a reliable and efficient routing path in intermittent VANET due to high vehicle mobility and frequent link breakage. Network connectivity is the key factor as it greatly affects the VANET performance. Motivated by this, an intersection dispatch-based VANET protocol with parked vehicles forwarding mechanism (IDVR-PFM) was proposed in this paper. The connection probability of the farthest nodes was used to estimate the connectivity of branch road, and then the FDM could choose the best path based on the latency information. Then the parked cars were utilized to participate in the forwarding process, which strengthen the area connectivity and connection probability effectively. The results of simulations reveal that IDVR-PFM has better performance in terms of packet delivery ratio and end-to-end delay than the existing ad hoc routing protocols.

**Subject Areas:** Roads, Routing, Routing protocols, Vehicles, Vehicular ad hoc networks

**Availability:** Shi, Huijing, et al. "IDVR-PFM: A connectivity-oriented VANET routing protocol in urban scenarios." Intelligent Control and Information Processing (ICICIP), 2013 Fourth International Conference on. IEEE, 2013.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6568134](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6568134)

## **Comparison and Validation of Synthetic Social Contact Networks for Epidemic Modeling** *Huadong Xia; Jiangzhuo Chen; Madhav V. Marathe; & Samarth Swarup*

**Abstract:** We describe the synthesis of a detailed social contact network of Delhi, India, for urban-scale epidemiological simulations. The network synthesis is done by combining information from multiple data sources, since social contact information (the set of people a person comes into contact with during a day) cannot be obtained through direct surveys. We compare this network to a previously generated social contact network for the city of Los Angeles, USA, on various structural and dynamical metrics. These networks are comprised of millions of nodes and hundreds of millions of edges. Through the comparison between the two cities, we show important similarities and differences between urban regions in different parts of the world. Epidemic simulations highlight policy-relevant differences in outcomes. The comparison also serves as a validation of the Delhi social contact network generation methodology, because the LA network generation methodology is a mature technology that has been used in many studies and refined through multiple iterations, and the Delhi network shows sufficiently similar behavior even though it has been constructed using different data sources. The differences we observe are expected and explainable in terms of the differing socio-economic and demographic conditions in the two cities.

**Subject Areas:** Computational Epidemiology, Synthetic Populations, Social Contact Networks

**Availability:** Xia, Huadong, et al. "Comparison and Validation of Synthetic Social Contact Networks for Epidemic Modeling." (2013). <http://staff.vbi.vt.edu/chenj/pub/NDSSL-TR-13-178.pdf>

## **Detecting modes of transport from unlabelled positioning sensor data** *Miao Lin, Wen-Jing Hsu & Zhuo Qi Lee*

**Abstract:** Global positioning systems (GPS) logs recorded in personal devices contain rich information such as travel patterns, locations of frequent visits and place–event associations. There have been rather successful attempts in detecting the mode of transport from GPS logs such as walking, driving or taking a bus, which has found varied applications. However, the best-known schemes either require tedious manual labelling or pre-training process (or both). We present MoDetect (MD), a unsupervised scheme which eliminates the need of manual labelling and pre-training while attaining equal or greater accuracy compared with the best-known supervised methods. MD can also cater for differences in individual's behaviours, and hence may be more widely applicable than the existing schemes. To achieve this, MD relies on Kolmogorov–Smirnov test which offers a theoretical assurance when computing similarity between segments of records. Our analysis shows that the higher speed modes can be better differentiated through a weighted bootstrapping procedure. We also augment the decisions with reference to the transfer probabilities between different modes at locations identified from the GPS records.

**Subject Areas:** spatio-temporal data mining, GPS data, transportation modes, Kolmogorov–Smirnov test, kernel density estimator

**Availability:** Lin, Miao, Wen-Jing Hsu, and Zhuo Qi Lee. "Detecting modes of transport from unlabelled positioning sensor data." *Journal of Location Based Services* 7.4 (2013): 272-290. <http://www.tandfonline.com/doi/abs/10.1080/17489725.2013.819128>

## **Spatial Transferability of Person-Level Daily Activity Generation and Time Use Models Empirical Assessment** *Sujan Sikder, Abdul Rawoof Pinjari*

**Abstract:** An empirical assessment is made of the spatial transferability of person-level daily activity generation and time use models in regions in Florida and between Florida and California. The empirical models are for unemployed adults and are based on the multiple discrete-continuous extreme value structure. The prediction properties of the model are examined first. The results shed new light on the prediction properties of the multiple discrete-continuous extreme value model that have implications for transferability and that provide insight into how the model structure could be improved. Two approaches to transferring models are evaluated—naïve transfer and updating model constants—with measures such as log likelihood-based metrics, aggregate predictive ability, and model sensitivity to changes in demographic characteristics. Results suggest that accurate prediction of aggregate observed patterns is not an adequate yardstick with which to assess transferability; emphasis should be placed on model sensitivity to changes in explanatory variables. Updating of constants improves a transferred model's aggregate prediction ability, but not necessarily its policy sensitivity. The extent of transferability between regions within a state is greater than that across states. Within Florida, there is greater transferability between urban regions (especially between Southeast Florida and Central Florida) than between urban and rural regions.

**Subject Areas:** transferability; multiple discrete-continuous extreme value

**Availability:** Sikder, Sujan, and Abdul Rawoof Pinjari. "Spatial Transferability of Person-Level Daily Activity Generation and Time-Use Models: Empirical Assessment." Transportation Research Board 92nd Annual Meeting. No. 13-3944. 2013.  
<http://trb.metapress.com/content/r7g6323871357860/>



## **Household Travel App** *Reid Ewing*

**Abstract:** Some of today's most vexing problems, including sprawl, congestion, oil dependence, and climate change, are prompting states and localities to turn to land planning and urban design to rein in automobile use. But how much effect can land planning and urban design have on automobile use, walking, biking, and transit use?

This chapter describes the 6D household travel app. This application within the Envision Tomorrow Plus (ET+) suite is perhaps the most critical of all. This is because the outputs of this app feed into many other apps. For example, the vehicle emission app depends on two outputs of this app, household vehicle miles traveled (VMT) and household vehicle trips (VT). The public health app depends on three outputs, walk bike, and transit trip frequency. All told, six apps are linked to this one app.

**Subject Areas:** health; vmt; walk; bike; transit; app; vehicle trips

**Availability:** Ewing, Reid. "HOUSEHOLD TRAVEL APP." University of Utah  
[http://www.envisiontomorrow.org/storage/research\\_docs/Household7D\\_app.1-20-13.pdf](http://www.envisiontomorrow.org/storage/research_docs/Household7D_app.1-20-13.pdf)

**National Survey Respondents as Agents in a Model of Plug-In Hybrid Electric Vehicle Adoption** *Margaret J. Eppstein, Donna M. Rizzo, Brian H.Y. Lee, Joseph S. Krupa, & Narine Manukyan*

**Abstract:** Plug-in hybrid electric vehicles (PHEVs) offer the potential to significantly reduce greenhouse gas emissions, if vehicle consumers are willing to adopt this new technology. Consequently, there has been much interest in exploring models of PHEV market penetration. In prior work, we developed an agent-based model (ABM) of potential PHEV consumer adoption that incorporated several spatial, social, and media influences, to identify nonlinear interactions among potential leverage points that may impact PHEV market penetration. In developing that model, however, the need for additional data to properly inform both the decision-making rules and agent initialization became apparent. To address these issues, we recently conducted and analyzed an extensive consumer survey; in this work, we modify the ABM to reflect the survey findings. We create a one-to-one correspondence between agents in the model and survey respondents, thus obtaining realistic distributions of cross-correlated agent attributes. Based on our analysis of survey responses, our modified model includes dynamically-changing attitudes subject to social and media influences, a PHEV-technology threshold component, a multinomial logistic prediction of willingness to consider a compact PHEV, and a delay discounting function that predicts the amount agents are willing to pay up front for greater fuel savings. Results of 10 survey-based ABM scenarios are reported with important implications for policy-makers and manufacturers. We believe that such close integration of consumer surveys and the design of ABMs is a key step in the development of useful decision-support models

**Subject Areas:** Plug-in hybrid electric vehicles (PHEVs); agent-based model; market penetration; electric vehicle adoption; vehicle choice simulation, vehicle choice survey

**Availability:** Eppstein, Margaret J., et al. "National Survey Respondents as Agents in a Model of Plug-In Hybrid Electric Vehicle Adoption."  
<http://www.cems.uvm.edu/~meppstei/personal/ABMpaperAsSubmittedTRpartA.pdf>

## **iRoad: A Framework For Scalable Predictive Query Processing On Road Networks** *Abdeltawab M., Hendawi Jie Bao & Mohamed F. Mokbel*

**Abstract:** This demo presents the iRoad framework for evaluating predictive queries on moving objects for road networks. The main promise of the iRoad system is to support a variety of common predictive queries including predictive point query, predictive range query, predictive KNN query, and predictive aggregate query. The iRoad framework is equipped with a novel data structure, named reachability tree, employed to determine the reachable nodes for a moving object within a specified future time  $T$ . In fact, the reachability tree prunes the space around each object in order to significantly reduce the computation time. So, iRoad is able to scale up to handle real road networks with millions of nodes, and it can process heavy workloads on large numbers of moving objects. During the demo, audience will be able to interact with iRoad through a well-designed Graphical User Interface to issue different types of predictive queries on a real road network, to obtain the predictive heat map of the area of interest, to follow the creation and the dynamic update of the reachability tree around a specific moving object, and finally to examine the system efficiency and scalability.

**Subject Areas:** predictive point query; reachability tree; road network

**Availability:** Hendawi, Abdeltawab M., Jie Bao, and Mohamed F. Mokbel. "iRoad: a framework for scalable predictive query processing on road networks." Proceedings of the VLDB Endowment 6.12 (2013): 1262-1265. <http://dl.acm.org/citation.cfm?id=2536291>

## **Analysis of European mobility surveys and their potential to support studies on the impact of electric vehicles on energy and infrastructure needs in Europe**

*Guzay Pasaoglua, Alyona Zubaryeva, Davide Fiorelloc & Christian Thiel*

**Abstract:** Projections show that CO<sub>2</sub> emissions from road transport will continue to rise in the future if adequate policy measures are not implemented. Electrically driven vehicle (EDV) deployment is one way to reduce the CO<sub>2</sub> emissions. EDV drive and charge patterns determine the resulting electricity demand, emission reductions, future infrastructure requirements and the integration of non-dispatchable renewable electricity. In order to analyse the impact of EDVs on European energy and infrastructure needs, the driving patterns of potential EDV users should be analysed. Due to the lack of sufficient historical representative data on driving patterns with EDVs, this study analyses whether European national travel surveys (NTS) can be a potential data source to derive usage patterns for EDVs. We perform a meta-analysis of NTS from 9 European countries to assess their adequacy for analysing the impacts of EDVs on the European electricity system. Several gaps in data availability and comparability are identified. Except for the UK, European NTS are not detailed enough to assess EDV charging profiles, which is also due to the methodological differences used for NTS data collection in the various countries. We conclude that a dedicated survey needs to be developed to reliably estimate EDV charging profiles.

**Subject Areas:** Electric vehicles; European national travel surveys; Charging profiles

**Availability:** Pasaoglu, Guzay, et al. "Analysis of European mobility surveys and their potential to support studies on the impact of electric vehicles on energy and infrastructure needs in Europe." *Technological Forecasting and Social Change* (2013).

<http://www.sciencedirect.com/science/article/pii/S004016251300228X>

## **Chapter 4: Spatial Structure and Travel Trends in Commuting and Non-Commuting Travel in US Metropolitan Areas** *Peter Gordon & Bumsoo Lee*

**Abstract:** Whether we consider commuting or nonwork travel, the data and findings we described reveal that, in spite of the continued spreading out of cities, the effect on traffic conditions (measured by average travel times) is remarkably benign. Transportation economists often point to the absence of peak-load pricing on most urban roads and the non-price rationing (crowding) that results. Indeed, traffic congestion is cited as a major complaint by many Americans. But in spite of all this, it is interesting that aggregate travel time measures show no significant deterioration as the population grows and as cities spread. These results are perhaps counter-intuitive unless we consider the possibility that land markets are able to accommodate the co-locations of many origins and destinations so that reasonable travel times remain available to most people. In a world of second-best (many “market failures” and many “policy failures”), these results will comfort some and surprise others.

**Subject Areas:** average travel times; peak-load pricing; non-price rationing; crowding

**Availability:** A chapter for the International Handbook on Transport and Development edited by Robin Hickman, David Bonilla, Moshe Givoni, and David Banister. Cheltenham, UK: Edward Elgar: September 2013; [http://www-cf.usc.edu/~pgordon/pdf/GORDON\\_LEE\\_SEP\\_25\\_2013.pdf](http://www-cf.usc.edu/~pgordon/pdf/GORDON_LEE_SEP_25_2013.pdf)

## **A process for trip purpose imputation from Global Positioning System data** *Li Shen & Peter R. Stopher*

**Abstract:** Global Positioning System (GPS) devices have been applied in travel data collection for much of the past decade to improve data quality. These devices can record positions, time, and travel speed. However, trip purposes currently cannot be recorded automatically by the devices, therefore, the accuracy of purpose imputation becomes important to improve the quality of travel survey data. This paper proposes an improved process which introduces some additional information (e.g., activity duration, tour information) for trip purpose imputation. An application of this approach is reported in this paper based on a Global Positioning System survey in the Greater Cincinnati region to show the improvement in the accuracy of trip purpose detection over more conventional methods. Whether we consider commuting or nonwork travel, the data and findings we described reveal that, in spite of the continued spreading out of cities, the effect on traffic conditions (measured by average travel times) is remarkably benign. Transportation economists often point to the absence of peak-load pricing on most urban roads and the non-price rationing (crowding) that results. Indeed, traffic congestion is cited as a major complaint by many Americans. But in spite of all this, it is interesting that aggregate travel time measures show no significant deterioration as the population grows and as cities spread. These results are perhaps counter-intuitive unless we consider the possibility that land markets are able to accommodate the co-locations of many origins and destinations so that reasonable travel times remain available to most people. In a world of second-best (many "market failures" and many "policy failures"), these results will comfort some and surprise others.

**Subject Areas:** GPS survey; Trip purpose imputation; Tour-based information

**Availability:** Shen, Li, and Peter R. Stopher. "A process for trip purpose imputation from Global Positioning System data." *Transportation Research Part C: Emerging Technologies* 36 (2013): 261-267. <http://www.sciencedirect.com/science/article/pii/S0968090X13001848>

**Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine-Grained Time-Sensitive Network** *Mark Bradley; John Bowman; Mohammed Hadi; Ram Pendyala; Chandra Bhat; Travis Waller; North Florida Transportation Planning Organization*

**Abstract:** The primary objective of the C10A project is to test the principal of making operational a dynamic integrated model—an integrated, advanced travel-demand model with a fine-grained, time-dependent network, and to demonstrate the model’s performance through validation tests and policy analyses. This integrated model system is necessary because most current travel models are not sufficiently sensitive to the dynamic interplay between travel behavior and network conditions, and are unable to reasonably represent the effects of transportation policies such as variable road pricing and travel demand management strategies. Secondary project goals include producing a transferrable process and sample data that can be used in other regions, demonstrating an effective interface with EPA’s MOVES model, incorporating knowledge from other SHRP 2 efforts such as C04 (pricing) and C05 (operations) and addressing travel time reliability in travel models. This report describes the tools incorporated into the integrated model system, the data required to implement these tools, modifications to the tools that were necessary to achieve this integration, and results of a set sensitivity tests of the integrated model system.

**Subject Areas:** travel-demand model; time-dependent network;

**Availability:** DRAFT, PREPUBLICATION, and NOT EDITED. "Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine-Grained Time-Sensitive Network." (2013). <http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2prepubC10Areport.pdf>

## **Supporting large-scale travel surveys with smartphones – A practical approach**

*Philippe Nitsche, Peter Widhalm, Simon Breuss, Norbert Brändle, Peter Maurer*

**Abstract:** Collection of travel data is a key task of transportation modeling. Data collection is currently based on costly and time-intensive questionnaires, and can thus only provide limited cross-sectional coverage and inadequate updates. There is an urgent need for technologically supported travel data acquisition tools. We present a novel approach for supporting travel surveys using data collected with smartphones. Individual trips of the person carrying the phone are automatically reconstructed and trip legs are classified into one of eight different modes of transport. This task is performed by an ensemble of probabilistic classifiers combined with a Discrete Hidden Markov Model (DHMM). Classification is based on features extracted from the motion trajectory recorded by the smartphone's positioning system and signals of the embedded accelerometer. Our approach can cope with GPS signal losses by including positioning data obtained from the mobile phone cell network, and relies solely on accelerometer features when the trajectory cannot be reconstructed with sufficient accuracy. To train and evaluate the models, 355 h of probe travel data were collected in the metropolitan area of Vienna, Austria by 15 volunteers over a period of 2 months. Distinguishing eight different transportation modes, the classification results range from 65% (train, subway) to 95% (bicycle). The increasing popularity of smartphones gives the proposed method the potential to be used on a wide-spread basis and can complement existing travel survey methods.

**Subject Areas:** Smartphones; Mobility data; Travel survey; Accelerometer; GPS; Transport modes; Mode detection

**Availability:** Nitsche, Philippe, et al. "Supporting large-scale travel surveys with smartphones—A practical approach." *Transportation Research Part C: Emerging Technologies* (2013). <http://www.sciencedirect.com/science/article/pii/S0968090X13002325>



## **Estimating the Distribution of Welfare Effects Using Quantiles** *Stefan Hoderlein and Anne Vanhems*

**Abstract:** This paper proposes a framework to model empirically welfare effects that are associated with a price change in a population of heterogeneous consumers which is similar to Hausman and Newey (1995), but allows for more general forms of heterogeneity. Individual demands are characterized by a general model which is nonparametric in the regressors, as well as monotonic in unobserved heterogeneity. In this setup, we first provide and discuss conditions under which the heterogeneous welfare effects are identified, and establish constructive identification. We then propose a sample counterpart estimator, and analyze its large sample properties. For both identification and estimation, we distinguish between the cases when regressors are exogenous and when they are endogenous. Finally, we apply all concepts to measuring the heterogeneous effect of a change of gasoline price using US consumer data and find very substantial differences in individual effects across quantiles.

**Subject Areas:** Welfare, Consumer Surplus, Price Effect, Nonparametric, Quantile, Endogeneity, Compensating Variation.

**Availability:** Hoderlein, Stefan, and Anne Vanhems. "Estimating the Distribution of Welfare Effects Using Quantiles." <https://www2.bc.edu/~hoderlei/HVWelfareSep13.pdf>

**Understanding the Impact of Face Mask Usage Through Epidemic Simulation of Large Social Networks** *Susan M. Mniszewski; Sara Y. Del Valle; Reid Priedhorsky; James M. Hyman; Kyle S. Hickman*

**Abstract:** Evidence from the 2003 SARS epidemic and 2009 H1N1 pandemic shows that face masks can be an effective non-pharmaceutical intervention in minimizing the spread of airborne viruses. Recent studies have shown that using face masks is correlated to an individual's age and gender, where females and older adults are more likely to wear a mask than males or youths. There are only a few studies quantifying the impact of using face masks to slow the spread of an epidemic at the population level, and even fewer studies that model their impact in a population where the use of face masks depends upon the age and gender of the population. We use a state-of-the-art agent-based simulation to model the use of face masks and quantify their impact on three levels of an influenza epidemic and compare different mitigation scenarios. These scenarios involve changing the demographics of mask usage, the adoption of mask usage in relation to a perceived threat level, and the combination of masks with other non-pharmaceutical interventions such as hand washing and social distancing. Our results shows that face masks alone have limited impact on the spread of influenza. However, when face masks are combined with other interventions such as hand sanitizer, they can be more effective. We also observe that monitoring social internet systems can be a useful technique to measure compliance. We conclude that educating the public on the effectiveness of masks to increase compliance can reduce morbidity and mortality.

**Subject Areas:** Social networks; pandemic; influenza;

**Availability:** Mniszewski, Susan M., et al. "Understanding the Impact of Face Mask Usage Through Epidemic Simulation of Large Social Networks." *Theories and Simulations of Complex Social Systems*. Springer Berlin Heidelberg, 2014. 97-115.

[http://link.springer.com/chapter/10.1007/978-3-642-39149-1\\_8](http://link.springer.com/chapter/10.1007/978-3-642-39149-1_8)

**Sustainable Transport Data Collection and Application: China Urban Transport Database** *Tian Jiang, Zhongyi Wu, Yu Song, Xianglong Liu, Haode Liu, Haozhi Zhang*

**Abstract:** Transport policy making process of national and local governments should be supported by a comprehensive database to ensure sustainable and healthy development of urban transport. China Urban Transport Database (CUTD) has been built to play such a role. This paper is to make an introduction of CUTD framework including user management, data warehouse and application modules. Considering the urban transport development features of Chinese cities, sustainable urban transport development indicators are proposed to evaluate public transport service level in Chinese cities. International urban transport knowledge base is developed as well. CUTD has been applied in urban transport data processing, urban transport management and urban transport performance evaluation in national and local transport research agencies, operators and governments in China, and it will be applied to a broader range of fields.

**Subject Areas:** urban transport; database; public transport

**Availability:** Jiang, Tian, Zhongyi Wu, Yu Song, Xianglong Liu, Haode Liu, and Haozhi Zhang.

"Sustainable Transport Data Collection and Application: China Urban Transport Database."

[http://scholar.google.com/scholar?hl=en&q=Sustainable+Transport+Data+Collection+and+Application%3A+China+Urban+Transport+Database&as\\_sdt=1%2C9&as\\_sdtp=](http://scholar.google.com/scholar?hl=en&q=Sustainable+Transport+Data+Collection+and+Application%3A+China+Urban+Transport+Database&as_sdt=1%2C9&as_sdtp=)

## **Towards “Live” Synthetic Populations for Large-scale Realistic Multiagent Simulations** *Nidhi Parikh*

**Abstract:** Synthetic populations attempt to capture population dynamics of a geographic region and hence are widely used in large-scale multiagent applications simulating real-world phenomena. However, current synthetic populations are mostly static | individuals are assumed to perform same daily routine every day. My thesis aims at taking the first step towards making it a “live” synthetic population that would update automatically to reflect changes in the real population, by incorporating information from social media and other online data resources. As an initial step, I have extended synthetic population model for Washington DC metro area to include transient (tourists and business travelers) population. This is done by combining data from various online and offline data resources by hand. This subpopulation which keeps changing with time, has also shown to have an important effect on disease dynamics of the city. Next, I propose to use information from social media to improve activity patterns of individuals using hidden semi-Markov model.

**Subject Areas:** Synthetic Population, Social Media, Hidden Semi-Markov Model

**Availability:** Parikh, Nidhi. "Towards live synthetic populations for large-scale realistic multiagent simulations." Proceedings of the 2013 international conference on Autonomous agents and multi-agent systems. International Foundation for Autonomous Agents and Multiagent Systems, 2013. <http://trid.trb.org/view.aspx?id=1242302>

**Ordered and Unordered Discrete-Continuous Models: A Comparative Analysis for Household Vehicle Holding and Mileage Travelled Decisions** *Cirillo, Cinzia; Liu, Yangwen; Tremblay, Jean-Michel*

**Abstract:** Integrated models for household vehicle holding and mileage travelled are used for strategic planning and are necessary to analyze policies concerning congestion management, land use, fuel consumption, energy pricing, and pollution. A number of studies have demonstrated that unordered behavioral models perform better than ordered mechanisms for vehicle holding decisions. Those comparative studies have been conducted for the discrete part only and are often of logit type. Probit type models are usually adopted for joint discrete-continuous decisions for the flexibility offered by the multivariate normal to capture correlations across the two independent variables. Ordered probit models are in general preferred to unordered probit for the saving in computational costs deriving from the closed mathematical form of the choice probabilities. In this study, the authors extend to ordered probit a previous discrete-continuous model based on a density estimation approach with unrestricted correlation between the discrete and the continuous parts. A comparative analysis is then performed using data extracted from the 2001 and 2009 National Household Travel Survey (NHTS) data. Estimation results show that discrete-continuous ordered probit are superior to unordered structures in terms of goodness of fit. Model applications for policy analysis reveals that density and driving cost only affect marginally vehicle holding decisions and annual miles driven. Those results seem to be stable across 2001 and 2009.

**Subject Areas:** Automobile ownership; Automobile travel; Choice models; Households; Population density; Probits; Vehicle miles of travel

**Availability:** Cirillo, Cinzia, Yangwen Liu, and Jean-Michel Tremblay. "Ordered and Unordered Discrete-Continuous Models: A Comparative Analysis for Household Vehicle Holding and Mileage Travelled Decisions." Transportation Research Board 92nd Annual Meeting. No. 13-3965. 2013. <http://trid.trb.org/view.aspx?id=1242302>

## **Development and Calibration of a Long Distance Passenger Traffic Assignment Model** *Wen Wang; Bruce X. Wang; Jing Dong*

**Abstract:** This paper studies the assignment of long distance passenger traffic on a highway corridor network. First, we propose a traditional model for the long distance traffic assignment considering interactions with local commuter traffic. It addresses the effect of local sub-networks on highway corridors. An interactive algorithm is developed to solve for the exact solution. Then, to address the potential computational issues that arise therein, a decomposition method is proposed by introducing a new concept of corridor elasticity. An assignment procedure for long distance passenger traffic is developed accordingly. Numerical tests show that the proposed decomposition method makes significant improvements in computational performance at a small loss of optimality. This decomposition method well approximates the exact assignment from the traditional formulation, especially when the highway corridors are near-saturation. The proposed decomposition method appears practical for application.

**Subject Areas:** Long distance passenger travel, Bush-based traffic assignment, Capacity elasticity

**Availability:** Wang, Wen, Bruce X. Wang, and Jing Dong. "Development and Calibration of a Long Distance Passenger Traffic Assignment Model 5." *Development 3* (2013): 4.  
<http://docs.trb.org/prp/13-4108.pdf>

**Multiple Discrete-Continuous Model of Activity Type Choice and Time Allocation for Home-Based Nonwork Tours:** *You, Daehyun; Garikapati, Venu M.; Konduri, Karthik Charan; Pendyala, Ram M.; Vovsha, Peter; Livshits, Vladimir*

**Abstract:** Transferring trip rates to areas without local survey data is a common practice which is typically performed in an ad-hoc fashion using household-based cross-classification tables. This paper applies a rule-based method called decision tree to develop individual-level trip generation models for eight different trip purposes as defined in the National Household Travel Survey data (NHTS 2009) in addition to their daily vehicle miles traveled (VMT). For each trip purpose, the models are then obtained by finding the best-fitted statistical distribution to each one of the final decision tree clusters while considering the correlation between different trip purposes. The rule-based models utilize several socio-demographic and land-use explanatory variables and are sensitive to changes in demographics. The performance of the models are then tested and validated in a transferability application to Phoenix Metropolitan Region. These models can be employed in a disaggregate microsimulation framework to generate trips with different purposes at individual or household level. They can also be used as an alternative solution for trip generation step of a conventional four step travel demand model.

**Subject Areas:** Activity choices; Choice models; Methodology; Time; Travel demand

**Availability:** You, Daehyun, et al. "Multiple Discrete-Continuous Model of Activity Type Choice and Time Allocation for Home-Based Nonwork Tours." Transportation Research Board 92nd Annual Meeting. No. 13-5266. 2013. <http://trid.trb.org/view.aspx?id=1243061>

## **Investigating the Transferability of Individual Trip Rates: Decision Tree Approach** *Fasihozaman Langerudi, Mehran; Hossein Rashidi, Taha; Mohammadian, Abolfazl*

**Abstract:** Transferring trip rates to areas without local survey data is a common practice which is typically performed in an ad-hoc fashion using household-based cross-classification tables. This paper applies a rule-based method called decision tree to develop individual-level trip generation models for eight different trip purposes as defined in the National Household Travel Survey data (NHTS 2009) in addition to their daily vehicle miles traveled (VMT). For each trip purpose, the models are then obtained by finding the best-fitted statistical distribution to each one of the final decision tree clusters while considering the correlation between different trip purposes. The rule-based models utilize several socio-demographic and land-use explanatory variables and are sensitive to changes in demographics. The performance of the models are then tested and validated in a transferability application to Phoenix Metropolitan Region. These models can be employed in a disaggregate microsimulation framework to generate trips with different purposes at individual or household level. They can also be used as an alternative solution for trip generation step of a conventional four step travel demand model.

**Subject Areas:** Decision trees; Demographics; Social factors; Travel demand; Trip generation; Trip purpose; Vehicle miles of travel; Data transfers; Sociodemographics; Transferability

**Availability:** Fasihozaman Langerudi, Mehran, Taha Hossein Rashidi, and Abolfazl Mohammadian. "Investigating the Transferability of Individual Trip Rates: Decision Tree Approach." Transportation Research Board 92nd Annual Meeting. No. 13-0218. 2013. <http://trid.trb.org/view.aspx?id=1240410>



**Add-On Program for National Household Travel Survey: Experience of Stakeholders and Best Practices to Maximize Program Benefits** *Stephanie S. Ivey; Daniel A. Badoe; Stephen Edwards*

**Abstract:** The National Household Travel Survey (NHTS) is conducted by FHWA every 5 to 7 years to determine the travel characteristics of the American public. In 1990, FHWA began offering the add-on program, which allowed state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) to purchase additional sample data for their local areas. In the 2009 NHTS, the Tennessee DOT purchased add-on sample data for use by the state DOT and MPOs. To derive the most benefit from the data, the Tennessee DOT sponsored a study to determine how previous add-on program participants had used the samples and what lessons the participants had learned in those applications, as well as to identify the best practices to maximize program benefits. A literature review and Internet and phone surveys were used to ascertain this information. The major findings of the study included (a) the add-on participants' opinion that the program was a cost-effective way of obtaining data that are consistent at the local, state, and national levels; (b) the use of the data in a wide variety of transportation planning applications; (c) the handling of the encountered challenges through greater communication between the add-on participants and FHWA, particularly during the survey-planning phase; and (d) the compilation of a set of best practices to improve the add-on experience.

**Subject Areas:** Household travel survey; Add-on program; NHTS uses

**Availability:** Ivey, Stephanie S., Daniel A. Badoe, and Stephen Edwards. "Add-On Program for National Household Travel Survey." *Transportation Research Record: Journal of the Transportation Research Board* 2291.1 (2012): 102-110.  
<http://trb.metapress.com/index/G1195573527X206R.pdf>

## **Non-coverage Errors in Travel Surveys Due to Mobile Phone Only Households** *Sanghoon Son, Asad Khattak and Nak-Kyeong Kim*

**Abstract:** National and regional household travel surveys have conventionally sampled landline telephone households through list-assisted random digit dialing. However, a recent increase in “mobile phone only” households results in either non coverage or under-coverage of a growing segment of the population. This can potentially cause a substantial bias in the representativeness of travel behavior toward the target population. To cover mobile phone only households, an address based sampling method is of interest. This study explores whether the characteristics and travel behavior of mobile phone only households differ from those of households with landline telephones. In addition, this study quantifies the extent of non-coverage errors in the surveys in terms of the respondents’ travel behavior. Along with census data, the mobile phone only sample (N=2,988) was compared with the landline telephone sample (N=7,774) drawn from the 2008 National Capitol Region Household Travel Survey. Results show that the mobile phone only sample consists of relatively more single-person households, younger individuals, and Blacks/Asians/Hispanics, which are generally identified as hard-to-reach groups. Statistical models were developed to examine differences in travel behavior (e.g., trip-making), suggesting that the mobile phone only households make more transit (27%) and walking (18%) trips. This is partly due to the spatial distribution of the residential locations between the two groups, which are found to be statistically significant. Regarding non-coverage errors, results show that the inclusion of the mobile phone only households can reduce the errors, especially for transit and walking travel behaviors. The implications for travel survey methods are further discussed.

**Subject Areas:** Household travel survey; random digit dial sampling; address-based sampling; mobile phone only; spatial distribution; permutation test; transit trip; walking trip

**Availability:** Son, Sanghoon, Asad Khattak, and Nak-Kyeong Kim. "Non-Coverage Errors in Travel Surveys Due to Mobile Phone Only Households." Submitted to 92nd Annual Meeting of Transportation Research Board. Vol. 16. 2013. <http://docs.trb.org/prp/13-2028.pdf>

## **On the Estimation and Application of Flexible Unordered Spatial Discrete Choice Models** *Raghuprasad Sidharthan*

**Abstract:** Unordered choice models are commonly used in the field of transportation and several other fields to analyze discrete choice behavior. In the past decade, there have been substantial advances in specifying and estimating such models to allow unobserved taste variations and flexible error covariance structures. However, the current estimation methods are still computationally intensive and often break down when spatial dependence structures are introduced (due to the resulting high dimensionality of integration in the likelihood function). But a recently proposed method, the Maximum Approximate Composite Marginal Likelihood (MACML) method, offers an effective approach to estimate such models. The MACML approach combines a composite marginal likelihood (CML) estimation approach with an approximation method to evaluate the multivariate standard normal cumulative distribution (MVNCD) function. The composite likelihood approach replaces the likelihood function with a surrogate likelihood function of substantially lower dimensionality, which is then subsequently evaluated using an analytic approximation method rather than simulation techniques. This combination of the CML with the specific analytic approximation for the MVNCD function is effective because it involves only univariate and bivariate cumulative normal distribution function evaluations, regardless of the dimensionality of the problem.

For my dissertation, I have four objectives. The first is to evaluate the performance of the MACML method to estimate unordered response models by undertaking a Monte Carlo simulation exercise. The second is to formulate and estimate a spatial and temporal unordered discrete choice model and apply this model to a land use change context and to the mode choice decision of school children. The third objective is to formulate a random coefficient model with non-normal mixing distributions on model parameters which can be estimated using the MACML approach. Finally, the fourth objective is to propose an improvement to the MACML method by incorporating a second order MVNCD function that is more accurate and evaluate its performance in estimating parameters for a variety of model structures.

**Subject Areas:** discrete choice behavior; MACML; MVNCD; Monte Carlo

**Availability:** Sidharthan, Raghuprasad. On the Estimation and Application of Flexible Unordered Spatial Discrete Choice Models. Diss. University of Texas, 2012.  
[http://repositories.lib.utexas.edu/bitstream/handle/2152/19561/sidharthan\\_dissertation\\_2012\\_91.pdf?sequence=1](http://repositories.lib.utexas.edu/bitstream/handle/2152/19561/sidharthan_dissertation_2012_91.pdf?sequence=1)

## **On Generalizing the Multiple Discrete-Continuous Extreme Value (MDCEV) Model** *Marisol Andrea Castro*

**Abstract:** The overall goal of the dissertation is to contribute to the growing literature on multiple discrete-continuous (MDC) choice models. In MDC choice situations, consumers often encounter two inter-related decisions at a choice instance – which alternative(s) to choose for consumption from a set of available alternatives, and the amount to consume of the chosen alternatives. In the recent literature, there is increasing attention on modeling MDC situations based on a rigorous underlying micro-economic utility maximization framework. Among these models, the multiple-discrete continuous extreme value MDCEV model (Bhat, 2005, 2008) provides a number of advantages over other models. The primary objective of this dissertation is to extend the MDCEV framework to accommodate more realistic decision-making processes from a behavioral standpoint. The dissertation has two secondary objectives. The first is to advance the current operationalization and the econometric modeling of MDC choice situations. The second is to contribute to the transportation literature by estimating MDC models that provide new insights on individuals' travel decision processes. The proposed extensions of the MDCEV model include: (1) To formulate and estimate a latent choice set generation model within the MDCEV framework, (2) To develop a random utility-based model formulation that extends the MDCEV model to include multiple linear constraints, and (3) To extend the MDCEV model to relax the assumption of an additively separable utility function. The methodologies developed in this dissertation allow the specification and estimation of complex MDC choice models, and may be viewed as a major advance with the potential to lead to significant breakthroughs in the way MDC choices are structured and implemented. These methodologies provide a more realistic representation of the choice process. The proposed extensions are applied to different empirical contexts within the transportation field, including participation in and travel mileage allocated to non-work activities during various time periods of the day for workers, participation in recreational activities and time allocation for workers, and household expenditures in disaggregate transportation categories. The results from these exercises clearly underline the importance of relaxing some of the assumptions made, not only in the MDCEV model, but in MDC models in general.

**Subject Areas:** multiple discrete-continuous (MDC) choice models

**Availability:** Castro, Marisol Andrea. On generalizing the multiple discrete-continuous extreme value (MDCEV) model. Diss. University of Texas, 2012.  
[http://repositories.lib.utexas.edu/bitstream/handle/2152/19562/castro\\_dissertation\\_201291.pdf?sequence=1](http://repositories.lib.utexas.edu/bitstream/handle/2152/19562/castro_dissertation_201291.pdf?sequence=1)

## **Quantifying Key Errors in Household Travel Surveys: Comparison of Random-Digit-Dial Survey and Address-Based Survey** *Son, Sanghoon; Khattak, Asad; Wang, Xin; Agnello, Paul; Chen, Ju-Yin*

**Abstract:** Identifying and minimizing potential errors in household travel surveys can facilitate collecting more representative and accurate data. Through a comparison of two recent travel surveys with census data, this paper presents how sampling, noncoverage, nonresponse, and measurement errors work their way into surveys. The 2009 National Household Travel Survey (NHTS) Add-On in Virginia was implemented with a comprehensive survey instrument and random-digit-dial (RDD) sampling. The 2008 National Capital Region Household Travel Survey collected behavioral data with a concise instrument, while adopting address-based sampling (ADD). Focusing on a common area of Northern Virginia, this study examined differences in sociodemographics and travel behavior of the extracted samples (N = 597 and N = 3,581, respectively). Results show that the ADD survey collected data on more single-person households, younger individuals, and Hispanics and Mexicans, which are generally identified as hard-to-reach groups. A comparison of the two samples with the census data shows that the ADD sample was more representative of the population and area, partly because of the inclusion of mobile phone-only households (28%), which were not fully covered in RDD. To quantify a measurement error, this study estimated rigorous statistical models in regard to reported trip frequency. Results show that the NHTS captured 10% more trips, partly as a result of diary instructions and the presence of walking and biking questions in the instrument. Details of other errors and implications for reducing key survey errors are discussed.

**Subject Areas:** Random Digit Dial, Address-based Sampling, single-person household, hispanics

**Availability:** Son, Sanghoon, et al. "Quantifying Key Errors in Household Travel Surveys 3." Transportation Research Board 92nd Annual Meeting. No. 13-0552.  
<http://trb.metapress.com/content/07001722v665w3g2/?genre=article&id=doi%3a10.3141%2f2354-02>

## **Vehicle Ownership Modeling Framework for the State of Maryland: Analysis and Trends from 2001 and 2009 NHTS Data *Cinzia Cirillo and Yangwen Liu***

**Abstract:** This paper presents a vehicle ownership modeling framework for the state of Maryland estimated on data extracted from the 2001 and 2009 National Household Travel Survey. The framework consists of vehicle ownership models and vehicle usage models; the models are based on a wide variety of sociodemographics, land-use variables, and operating cost. The models' results and the deriving sensitivity analyses show that changes in income and unemployment rate or compact development have little effect on vehicle ownership rates. Nevertheless, the combined effect of high density and increase in fuel cost produce a significant reduction in vehicle usage. The vehicle ownership model estimated on 2001 data has been successfully incorporated into the Maryland Statewide Transportation Model (MSTM).

**Subject Areas:** Vehicles; sensitivity analysis; Maryland; Surveys; Transportation Models

**Availability:** Cirillo, Cinzia, and Yangwen Liu. "Vehicle Ownership Modeling Framework for the State of Maryland: Analysis and Trends from 2001 and 2009 NHTS Data." *Journal of Urban Planning and Development* 139.1 (2013): 1-11.  
[http://ascelibrary.org/doi/pdf/10.1061/\(ASCE\)UP.1943-5444.0000128](http://ascelibrary.org/doi/pdf/10.1061/(ASCE)UP.1943-5444.0000128)

## **Spread and control of influenza in two groups: A model** *O.P. Misraa, D.K. Mishra*

**Abstract:** Influenza, or the flu, is a common respiratory disease caused by influenza virus. The flu spreads easily from person to person through coughing, sneezing and hands touching your eyes, mouth or nose. In order to study the spread of influenza an economic status based structured model has been proposed and analyzed in this paper. In the proposed model the total underlying populations is divided into two subpopulations, consisting of persons having higher and lower economic status. For the control of the disease it has been assumed in the model that susceptibles of both the subpopulations are vaccinated at a constant rate. Linear and non-linear stability analyses of the model have been carried out. From the analysis we have derived the control reproductive number  $R_c$  which involves vaccination rate and vaccine efficacy. We have also found from the stability analysis that the disease free equilibrium point is locally asymptotically stable for  $R_c < 1$  and unstable for  $R_c > 1$ . Further, we have proved that a unique endemic equilibrium point will exist when  $R_c > 1$ . Thus, we have concluded from the analysis of the model that the disease will either die out or will remain endemic depending on the value of control reproductive number.

**Subject Areas:** influenza

**Availability:** Misra, O. P., and D. K. Mishra. "Spread and control of influenza in two groups: A model." *Applied Mathematics and Computation* 219.15 (2013): 7982-7996.  
<http://www.sciencedirect.com/science/article/pii/S0096300313001823>

## **Evaluating strategies for pandemic response in Delhi using realistic social networks** *Huadong Xia; Kalyani Nagaraj; Jiangzhuo Chen; Madhav V. Marathe*

**Abstract:** We analyze targeted layered containment strategies to contain an influenza pandemic in the National Capital Territory of India (NCT-I, including New Delhi and its surrounding areas). A key contribution of our work is to synthesize a realistic individual-based social contact network for NCT-I using a wide variety of open source and commercial data. New techniques were developed to infer daily activities for individuals using aggregate data published in transportation science, combined with human development surveys and targeted local surveys. The resulting social contact network is the first such network constructed for any urban region of India. The time varying spatially explicit network has over 13 million people and more than 200 million people-people contacts. The network has several interesting similarities and differences as compared to similar networks for US cities. As a second step, we use a high performance computing based modeling environment to study how an influenza-like illness (ILI) would spread over the NCT-I network. We also analyze well understood pharmaceutical and non-pharmaceutical containment strategies to control a pandemic outbreak. Our methodology builds on earlier work in this area. The results suggest: (i) pharmaceutical containment strategies typically are more effective than non-pharmaceutical for NCT-I residents; (ii) the epidemic dynamics of the region are strongly influenced by activity pattern and demographic structure of the local residents; (iii) a high resolution social contact network helps us make a better public health policy. To the best of our knowledge this is the first such study in the Indian sub-continent.

**Subject Areas:** pandemic response; activity interdependence

**Availability:** Xia, Huadong, et al. "Evaluating strategies for pandemic response in Delhi using realistic social networks." NDSSL Technical Report 13-016; Virginia Tech (2013). Springer New York, 2013. 59-77. <http://staff.vbi.vt.edu/chenj/pub/NDSSL-TR-13-016.pdf>



## **Modeling the Impact of Behavior Changes on the Spread of Pandemic Influenza** *Del Valle, Sara Y., Susan M. Mniszewski, and James M. Hyman*

**Abstract:** We use mathematical models to assess the impact of behavioral changes in response to an emerging epidemic. Evaluating the quantitative and qualitative impact of public health interventions on the spread of infectious diseases is a crucial public health objective. The recent avian influenza (H5N1) outbreaks and the 2009 H1N1 pandemic have raised significant global concerns about the emergence of a deadly influenza virus causing a pandemic of catastrophic proportions. Mitigation strategies based on behavior changes are some of the only options available in the early stages of an emerging epidemic when vaccines are unlikely to be available and there are only limited stockpiles of antiviral medications. Mathematical models that capture these behavior changes can quantify the relative impact of different mitigation strategies, such as closing schools, in slowing the spread of an infectious disease. Including behavior changes in mathematical models increases complexity and is often left out of the analysis. We present a simple differential equation model which allows for people changing their behavior to decrease their probability of infection. We also describe a large-scale agent-based model that can be used to analyze the impact of isolation scenarios such as school closures and fear-based home isolation during a pandemic. The agent-based model captures realistic individual-level mixing patterns and coordinated reactive changes in human behavior in order to better predict the transmission dynamics of an epidemic. Both models confirm that changes in behavior can be effective in reducing the spread of disease. For example, our model predicts that if school closures are implemented for the duration of the pandemic, the clinical attack rate could be reduced by more than 50%. We also verify that when interventions are stopped too soon, a second wave of infection can occur.

**Subject Areas:** pandemic influenza; epidemic;

**Availability:** Del Valle, Sara Y., Susan M. Mniszewski, and James M. Hyman. "Modeling the Impact of Behavior Changes on the Spread of Pandemic Influenza." *Modeling the Interplay Between Human Behavior and the Spread of Infectious Diseases*. Springer New York, 2013. 59-77. [http://link.springer.com/chapter/10.1007/978-1-4614-5474-8\\_4](http://link.springer.com/chapter/10.1007/978-1-4614-5474-8_4)

## **Integrated Multi-Network Modeling Environment for Spectrum Management**

*Beckman, Richard, Karthik Channakeshava, Fei Huang, Junwhan Kim, Achla Marathe, Madhav Marathe, Guanhong Pei, Sudip Saha, and Anil Kumar S. Vullikanti*

**Abstract:** We describe a first principles based integrated modeling environment to study urban socio-communication networks which represent not just the physical cellular communication network, but also urban populations carrying digital devices interacting with the cellular network. The modeling environment is designed specifically to understand spectrum demand and dynamic cellular network traffic. One of its key features is its ability to support individual-based models at highly resolved spatial and temporal scales. We have instantiated the modeling environment by developing detailed models of population mobility, device ownership, calling patterns and call network. By composing these models using an appropriate in-built workflow, we obtain an integrated model that represents a dynamic socio-communication network for an entire urban region. In contrast with earlier papers that typically use proprietary data, these models use open source and commercial data sets. The dynamic model represents for a normative day, every individual in an entire region, with detailed demographics, a minute-by-minute schedule of each person's activities, the locations where these activities take place, and calling behavior of every individual. As an illustration of the applicability of the modeling environment, we have developed such a dynamic model for Portland, Oregon comprising of approximately 1.6 million individuals. We highlight the unique features of the models and the modeling environment by describing three realistic case studies

**Subject Areas:** networks; spectrum management

**Availability:** Beckman, Richard, et al. "Integrated multi-network modeling environment for spectrum management." *Selected Areas in Communications, IEEE Journal on* 31.6 (2013): 1158-1168.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6517119&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D6517119](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6517119&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D6517119)

## **A Positive Model of Route Choice Behavior and Value of Time Calculation Using Longitudinal GPS Survey Data** *Cory Krause*

**Abstract:** This thesis approaches the topic of value of time calculation and route choice behavior with a new and innovative methodology using a survey dataset that was uniquely designed and implemented for this purpose. The survey is a 70 day, 218 participant GPS travel survey used to track individual location constantly at one minute intervals. Using a positive behavior theory framework, an in depth knowledge database for each user is created that iteratively updates the learned behavior and experienced travel conditions for each trip the user takes. A new approach for calculating value of time is presented; using the cost and trip duration of previous trips. The bounds (or caps and floors) are averaged to achieve the individual's value of time based upon their route (and therefore cost) decisions. Also using this updating knowledge base, route decision rules are derived using machine learning algorithms to tell why a user has decided to take the toll road option for certain days, and under what conditions the user will not take the toll road option. The final contribution is a model that fully takes advantage of longitudinal GPS data to create an adaptive system for value of time calculation and positive route decision making.

**Subject Areas:** value of time; GPS; Behavior theory

**Availability:** Krause, Cory. A POSITIVE MODEL OF ROUTE CHOICE BEHAVIOR AND VALUE OF TIME CALCULATION USING LONGITUDINAL GPS SURVEY DATA. Diss. 2012.  
<http://drum.lib.umd.edu/handle/1903/13529>

**Comparison of quick charge technologies for electric vehicle introduction in Netherlands** *Harikumaran, Jayakrishnan, Gyorgy Vereczki, Csaba Farkas, and Pavol Bauer*

**Abstract:** In this paper the Electric Vehicle (EV) charging demand on quick charge replenishment (QCR), by Fast Charging and Battery Switching, based on Dutch travel pattern is modeled and compared. A comparison between the QCR methods based on number of visits to these facilities and the time of service is obtained. The extra number of batteries to be introduced into the battery switching network is calculated. Using queuing theory the required number of charging points/ switching lanes per quick charge replenishment station is estimated. Based on this the potential peak power requirements of the two methods are obtained.

**Subject Areas:** electric vehicle; quick charge replenishment

**Availability:** Harikumaran, Jayakrishnan, et al. "Comparison of quick charge technologies for electric vehicle introduction in Netherlands." IECON 2012-38th Annual Conference on IEEE Industrial Electronics Society. IEEE, 2012.  
[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6389433](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6389433)

**A Synthetic Information Approach to Urban-scale Disaster Modeling** *Swarup, Samarth, Kristian Lum, Christopher L. Barrett, Keith Bisset, Stephen G. Eubank, Madhav V. Marathe, and Paula Stretz*

**Abstract:** We describe a large-scale simulation of a hypothetical nuclear detonation in an urban region. Simulating such a complex scenario requires modeling the population and its interactions with interdependent infrastructures such as transportation, communications, and healthcare. Our work represents the first model of a behaving human population, resolved to the individual level, where agents make decisions based on their health state, environmental conditions, and (informational) awareness. This “big simulation” approach requires a large amount of carefully curated data at the input, which is combined into a “synthetic information” model. The simulation is database-driven in a novel architecture that enables scaling, and it produces large amounts of data that in turn require advanced analytics in order to extract policy-relevant conclusions. We present results from a spatiotemporal analysis that draw out the connections between spatial variations in population behaviors and health outcomes.

**Subject Areas:** disaster modeling

**Availability:** Swarup, Samarth, et al. "A Synthetic Information Approach to Urban-scale Disaster Modeling." [http://staff.vbi.vt.edu/swarup/papers/ndssl\\_bdse2013.pdf](http://staff.vbi.vt.edu/swarup/papers/ndssl_bdse2013.pdf)

## Using Activity Space to Define and Analyze Long-Distance Passenger Travel

Zhang, Lei, and Cory Krause

**Abstract :** The definition for long distance travel is constantly evolving and widely varying between organizations and areas. The classification for long distance travel mostly deals with having a basic distance threshold for which trips are classified as long distance or normal travel. Those definitions that do not have a basic distance threshold instead use a qualitative definition that is difficult to use in modeling environments. This paper creates a new classification system for long distance travel, using a hard quantitative measure that is not simply a distance threshold. Instead, individual location density, activity space and trip length (miles) are considered. Using global positioning system (GPS) panel data, the user's normal activity space is developed. Then, a long distance trip classification is defined, dependent upon the distance traveled outside of this normal activity space. Results show that the new approach delivers a larger percentage of long distance trips, compared to the National Household Travel Survey (NHTS) definition, where 50 miles from home is determined as long distance. The distance based approach disqualifies trips that are taken frequently, such as commute trips, and include those that are shorter and lie outside the individual's normal travel pattern. With this in mind, the activity space approach proves to be an advancement to the strictly distance based definition currently used by the NHTS. Finally, suggestions for future advancements as well as the next-best qualification system are presented. The activity space approach proves to be an advancement to strictly distance based definitions for long distance travel currently in use by the National Household Travel Survey.

**Subject Area:** long distance travel; GPS;

**Availability:** Zhang, Lei, and Cory Krause. "Using Activity Space to Define and Analyze Long-Distance Passenger Travel." *Transportation Research Board 92nd Annual Meeting*. No. 13-3079. 2013. <http://trid.trb.org/view.aspx?id=1241819>

**Add-On Program for National Household Travel Survey** Ivey, Stephanie S., Daniel A. Badoe, and Stephen Edwards

**Abstract :** The National Household Travel Survey (NHTS) is conducted by FHWA every 5 to 7 years to determine the travel characteristics of the American public. In 1990, FHWA began offering the add-on program, which allowed state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) to purchase additional sample data for their local areas. In the 2009 NHTS, the Tennessee DOT purchased add-on sample data for use by the state DOT and MPOs. To derive the most benefit from the data, the Tennessee DOT sponsored a study to determine how previous add-on program participants had used the samples and what lessons the participants had learned in those applications, as well as to identify the best practices to maximize program benefits. A literature review and Internet and phone surveys were used to ascertain this information. The major findings of the study included (a) the add-on participants' opinion that the program was a cost-effective way of obtaining data that are consistent at the local, state, and national levels; (b) the use of the data in a wide variety of transportation planning applications; (c) the handling of the encountered challenges through greater communication between the add-on participants and FHWA, particularly during the survey-planning phase; and (d) the compilation of a set of best practices to improve the add-on experience.

**Subject Areas:** NHTS Add-on

**Availability:** Ivey, Stephanie S., Daniel A. Badoe, and Stephen Edwards. "Add-On Program for National Household Travel Survey." *Transportation Research Record: Journal of the Transportation Research Board* 2291.1 (2012): 102-110.  
<http://trb.metapress.com/index/G1195573527X206R.pdf>

## **Transferring Telephone-Based National Household Travel Survey to the Internet** *Son, Sanghoon, Asad Khattak, Xin Wang, and Ju-Yin Chen*

**Abstract:** Transfer of the National Household Travel Survey (NHTS) and regional travel surveys to the Internet is inevitable, partly because online surveys offer an efficient means of collecting data. Behavioral surveys are increasingly being offered in multiple media and giving respondents the choice of filling out the survey by using the Internet, the telephone, or other means. This study reports experience and lessons learned from transforming the computer-assisted telephone interview methodology used for the NHTS to an Internet-based method for university students, who have ubiquitous access to the Internet. The study reflects innovations in survey research methodology in the context of surveying students at large universities in Virginia. Comparisons of two rounds of behavioral surveys conducted in 2009 and 2010 are provided, and statistical models that quantify trip underreporting are developed. In an attempt to mimic closely the NHTS instrument, the Internet instrument had a relatively high survey response burden. On the basis of analysis of trip frequencies, trip underreporting was suspected in the first round of surveys. Documented here are improvements in survey design that were intended to lower the survey response burden and reduce trip underreporting. Statistical models are estimated to quantify how changes in the instrument captured more trips. Results show that survey design improvements can encourage students to recall and report 15% to 20% more trips. The study also found that, consistent with earlier studies, discretionary trips and shorter trips were more likely to be underreported. The results from this study are valuable for future regional and national survey implementations.

**Subject Areas:** internet survey;

**Availability:** Son, Sanghoon, et al. "Transferring Telephone-Based National Household Travel Survey to the Internet." *Transportation Research Record: Journal of the Transportation Research Board* 2285.1 (2012): 91-99. <http://trb.metapress.com/content/d0165342n6x6u545/>



## 8. TRAFFIC SAFETY

### **Analyzing and modeling risk exposure of pedestrian children to involvement in car crashes** *Wafa Elias & Yoram Shifan*

**Abstract:** This paper analyzes the various variables affecting pedestrian children road crashes, placing emphasis on the effect of daily activity patterns and the built environment, including the children's residential neighborhoods and the land use of the places where they conduct their activities. Two complementary data sources from the case study of an Arab town in northern Israel were used to provide a holistic picture of child-pedestrian road crashes: police files providing detailed analyzes of the reason for each crash, its location, and the characteristics of the driver involved; and a survey of 199 households with both involved and not involved children in road crashes, including a one-day travel diary. The study found that a combination of three groups of variables affects child-pedestrian road crashes: socio-economic status, travel patterns, and land use. Most vulnerable are boys from a low socio-economic group who live in areas of high density and mixed land use near a major road and who tend to walk to and from school and additional activities after school.

**Subject Areas:** Child-pedestrian road crash; Travel patterns; Built environment; Road safety

**Availability:** Elias, Wafa, and Yoram Shifan. "Analyzing and modeling risk exposure of pedestrian children to involvement in car crashes." *Accident Analysis & Prevention* 62 (2014): 397-405. <http://www.sciencedirect.com/science/article/pii/S0001457513002637>

## **Examining the association between age-related macular degeneration and motor vehicle collision involvement: a retrospective cohort study**

*Gerald McGwin Jr, Bradford Mitchell, Karen Searcey, Michael A Albert, Richard Feist, John O Mason III, Martin Thomley, Cynthia Owsley*

### **Abstract:**

Background: Little is known about motor vehicle collision (MVC) risk in older drivers with age-related macular degeneration (AMD). The purpose of this study is to examine associations between MVC involvement and AMD presence and severity. Methods: In a retrospective cohort study pooling the samples from four previous studies, we examined associations between MVC rate and older drivers with early, intermediate or advanced AMD as compared with those in normal eye health. MVC data were based on accident reports obtained from the state agency that compiles this information. Results: MVC rate was highest among those in normal eye health and progressively declined among those with early and intermediate disease, and then increased for those with advanced AMD. However, only for drivers with intermediate AMD was the MVC rate significantly different (lower) as compared with those in normal eye health, regardless of whether the rate was defined in terms of person-years (RR 0.34, 95% CI 0.13 to 0.89) or person-miles (RR 0.35, 95% CI 0.13 to 0.91) of driving. Conclusions: These results suggest that older drivers with intermediate AMD have a reduced risk of collision involvement. Further research should investigate whether self-regulatory driving practices by these drivers (avoiding challenging driving situations) underlies this reduced risk.

**Subject Areas:** CAFE; Age-related macular degeneration; collision; risk

**Availability:** McGwin, Gerald, et al. "Examining the association between age-related macular degeneration and motor vehicle collision involvement: a retrospective cohort study." *British journal of ophthalmology* 97.9 (2013): 1173-1176.

<http://bjo.bmj.com/content/97/9/1173.short>

## **Cars That Kill You? The Effect of Fuel Economy Standards on Vehicle Weight Dispersion** *Antonio Bento, Kenneth Gillingham, & Kevin Roth*

**Abstract:** The firm response to regulation is seldom as controversial as in the context of fuel economy standards, the dominant policy to reduce emissions from vehicles in the United States. It has long been argued that such standards have led to a downweighting of vehicles, increasing accident fatalities. This paper uses three measures of the stringency of historical fuel economy standards to demonstrate that downweighting was not uniform across the fleet. Domestic automakers downweighted primarily in the lower half of the distribution of weight, while Asian manufacturers appear to upweight in the same region, indicative of competitive effects. Preliminary counterfactual simulations indicate that CAFE standards led to very few additional traffic fatalities.

**Subject Areas:** CAFE; emissions; downweighting; traffic fatalities

**Availability:** Bento, Antonio, Kenneth Gillingham, and Kevin Roth. "Cars That Kill You? The Effect of Fuel Economy Standards on Vehicle Weight Dispersion." (2013).

<http://economics.ualberta.ca/en/EventsandSeminars/EMEE2013/~media/economics/EventsAndS/EMEE-2013/P5-Bento-Gillingham-Roth.pdf>

## **Injury prediction in a side impact crash using human body model simulation**

*Golman, Adam J., Kerry A. Danelson, Logan E. Miller, and Joel D. Stitzel*

**Abstract:** Background: Improved understanding of the occupant loading conditions in real world crashes is critical for injury prevention and new vehicle design. The purpose of this study was to develop a robust methodology to reconstruct injuries sustained in real world crashes using vehicle and human body finite element models. Methods: A real world near-side impact crash was selected from the Crash Injury Research and Engineering Network (CIREN) database. An average sedan was struck at approximately the B-pillar with a 290 degree principal direction of force by a lightweight pickup truck, resulting in a maximum crush of 45 cm and a crash reconstruction derived Delta-V of 28 kph. The belted 73-year-old midsize female driver sustained severe thoracic injuries, serious brain injuries, moderate abdominal injuries, and no pelvic injury. Vehicle finite element models were selected to reconstruct the crash. The bullet vehicle parameters were heuristically optimized to match the crush profile of the simulated struck vehicle and the case vehicle. The Total Human Model for Safety (THUMS) midsize male finite element model of the human body was used to represent the case occupant and reconstruct her injuries using the head injury criterion (HIC), half deflection, thoracic trauma index (TTI), and pelvic force to predict injury risk. A variation study was conducted to evaluate the robustness of the injury predictions by varying the bullet vehicle parameters. Results: The THUMS thoracic injury metrics resulted in a calculated risk exceeding 90% for AIS3+ injuries and 70% risk of AIS4+ injuries, consistent with her thoracic injury outcome. The THUMS model predicted seven rib fractures compared to the case occupant's 11 rib fractures, which are both AIS3 injuries. The pelvic injury risk for AIS2+ and AIS3+ injuries were 37% and 2.6%, respectively, consistent with the absence of pelvic injury. The THUMS injury prediction metrics were most sensitive to bullet vehicle location. The maximum 95% confidence interval width for the mean injury metrics was only 5% demonstrating high confidence in the THUMS injury prediction. Conclusions: This study demonstrates a variation study methodology in which human body models can be reliably used to robustly predict injury probability consistent with real world crash injury outcome.

**Subject Areas:** Human body model; Finite element analysis; Injury metrics; Thoracic injury; Real world; Motor vehicle crash

**Availability:** Golman, Adam J., et al. "Injury prediction in a side impact crash using human body model simulation." *Accident Analysis & Prevention* 64 (2014): 1-8.

<http://www.sciencedirect.com/science/article/pii/S0001457513004363>

**Revisiting exposure: Fatal and non-fatal traffic injury risk across different populations of travelers in Wisconsin, 2001–2009** *Carolyn McAndrews, Kirsten Beyer, Clare E. Gusec, Peter Laydee*

**Abstract:** Comparing the injury risk of different travel modes requires using a travel-based measure of exposure. In this study we quantify injury risk by travel mode, age, race/ethnicity, sex, and injury severity using three different travel-based exposure measures (person-trips, person-minutes of travel, and person-miles of travel) to learn how these metrics affect the characterization of risk across populations. We used a linked database of hospital and police records to identify non-fatal injuries (2001–2009), the Fatality Analysis Reporting System for fatalities (2001–2009), and the 2001 Wisconsin Add-On to the National Household Travel Survey for exposure measures. In Wisconsin, bicyclists and pedestrians have a moderately higher injury risk compared to motor vehicle occupants (adjusting for demographic factors), but the risk is much higher when exposure is measured in distance. Although the analysis did not control for socio-economic status (a likely confounder) it showed that American Indian and Black travelers in Wisconsin face higher transportation injury risk than White travelers (adjusting for sex and travel mode), across all three measures of exposure. Working with multiple metrics to form comprehensive injury risk profiles such as this one can inform decision making about how to prioritize investments in transportation injury prevention.

**Subject Areas:** Exposure; Accident; Traffic safety; Injury prevention; Victim characteristics

**Availability:** McAndrews, Carolyn, et al. "Revisiting exposure: Fatal and non-fatal traffic injury risk across different populations of travelers in Wisconsin, 2001–2009." *Accident Analysis & Prevention* 60 (2013): 103-112.

<http://www.sciencedirect.com/science/article/pii/S0001457513003163>

## **Improving Safety of Teenage and Young Adult Drivers in Kansas** *Sunanda Dissanayake, Ph.D., P.E.; Niranga Asmarasingha, B.S., M.S.*

**Abstract:** Statistics show that young drivers have higher motor vehicle crash rates compared to other age groups. This study investigated characteristics, contributory causes, and factors which increase injury severity of young driver crashes in Kansas by comparing young drivers with more experienced drivers. Crash data were obtained from the Kansas Department of Transportation. Young drivers were divided into two groups: 15–19 years (teen) and 20–24 years (young adult) for a detailed investigation. Using data from 2006 to 2009, frequencies, percentages, and crash rates were calculated for each characteristic and contributory cause. Contingency table analysis and odds ratios (OR) analysis were carried out to identify overly represented factors of young-driver crashes as compared to experienced drivers. Young drivers were more likely to be involved in crashes due to failure to yield right-of-way, disregarding traffic signs/signals, turning, or lane changing when compared to experienced drivers. Ordered logistic regression models were developed to identify severity-affecting factors in young driver crashes. According to model results, factors that decreased injury severity of the driver were seat belt use, driving at low speeds, driving newer vehicles, and driving with an adult passenger. The models also showed that alcohol involvement, driving on high-posted-speed-limit roadways, ejection at the time of crash, and entrapment at the time of crash can increase young drivers' injury severity. Based on identified critical factors, countermeasure ideas were suggested to improve the safety of young drivers. It is important for teen drivers and parents/guardians to gain better understanding of critical factors that are helpful in preventing crashes and minimizing driving risk. Parents/guardians should consider high-risk conditions such as driving during dark, during weekends, on rural roads, on wet road surfaces, and on roadways with high speed limits when planning teen driving. Protective devices, crash-worthy cars, and safe road infrastructures such as rumble strips and forgiving roadsides, particularly reduce young drivers' risk. Predictable traffic situations and low complexity resulting from improved road infrastructure are beneficial to young drivers. The effectiveness of Kansas Graduated Driver Licensing (GDL) system needs to be investigated in the future.

**Subject Areas:** Safety, Graduated Driver Licensing, Teen Drivers, Accidents, Statistics

**Availability:** Dissanayake, Sunanda, and PE Niranga Asmarasingha. "Improving Safety of Teenage and Young Adult Drivers in Kansas." [https://www.ksdot.org/PDF\\_Files/KSU-10-6\\_Final.pdf](https://www.ksdot.org/PDF_Files/KSU-10-6_Final.pdf)

**Injury Patterns and Discharge Dispositions in BC Motorcycle Accident Victims: A Retrospective Chart Analysis** *Shawna Sweet, Noah Alexander, Sarah Foster, Marcio Penner, Erika Penner, & Murray Penner*

**Abstract:** Motorcycle ridership is rising in Canada. Though motorcycling injuries have been studied in the US, Europe and Asia, there is a paucity of Canadian studies. We provide a descriptive analysis of injury patterns in motorcycle crash victims and their relationship to discharge disposition and length of hospital stay. We performed a retrospective chart review of all patients involved in a motorcycle crash and admitted to Vancouver General Hospital between April 2001 and December 2009. We extracted data from the ICD-10 coded Discharge Abstract Database, and re-coded injuries into overarching anatomical categories. Discharge dispositions were recorded as they appeared in patient charts. Riders tended to be male and had a mean age of 37.2. The average length of stay was 14.4 days. The most common injuries were tibial fractures, forearm fractures, and rib fractures. Most riders were discharged home, and these patients most commonly sustained tibial and forearm fractures. Those who remained in hospital were most likely to have sustained injuries to the pelvis, cervical spine or thoracic spine. Among the 14 patients who expired, the most common injuries were intracranial haemorrhage, rib fracture, haemothorax, liver injury, and cervical spine fracture. The results provide a starting point to help physicians predict injuries in motorcycle crash victims, as well as predict their dispositions.

**Subject Areas:** motorcycle, accident, trauma, injury patterns, discharge disposition

**Availability:** Sweet, Shawna, et al. "Injury Patterns and Discharge Dispositions in BC Motorcycle Accident Victims: A Retrospective Chart Analysis."

[http://www.ubcmj.com/pdf/ubcmj\\_5\\_1\\_2013\\_10-14.pdf](http://www.ubcmj.com/pdf/ubcmj_5_1_2013_10-14.pdf)

## **A Model to Predict Driver Task Performance When Interacting with In-Vehicle Speech Interfaces for Destination Entry and Music Selection** *Ei-Wen Lo*

**Abstract:** Motor vehicle crashes were estimated to be the eleventh leading cause of death in United States in 2009. The percentage of fatal crashes in which driver distraction was a causal factor increased from 10% in 2005 to 16% in 2009, and this was particularly likely for systems with visual-manual driver interfaces, such as infotainment systems. Using a speech interface to operate infotainment systems while driving can potentially reduce driver distraction. Unfortunately, evaluations of driver interfaces are typically conducted after the hardware and software are developed, which is often too late to make changes. An alternative approach is to model driver task performance when using speech interfaces and to use the model to predict system performance early in design when changes are easier to make. The purposes of this research are to understand how drivers interact with current in-vehicle speech interfaces and based on that knowledge, develop and validate a simulation model of how drivers interact with speech interfaces to aid speech-interface development. Specifically, this model will predict user task performance (task completion times and errors) when drivers interact with in-vehicle speech controlled interfaces to complete destination entry and music selection tasks.

To develop the simulation model, a preliminary survey and a driving simulator experiment were conducted to identify how these tasks are carried out and the values for the process parameters. First, using a survey, frequency data for tasks and methods, (e.g., how often destinations are selected using street addresses vs. point of interest), and the content in user-generated databases (e.g., prior destination lists, play lists, etc.) were collected to assure that real tasks and constraints are considered in the simulation model. Next, a driving simulator experiment involving 48 subjects interacting with an existing in-vehicle speech interface was conducted to understand how drivers perform destination entry and music selection and to determine the time drivers need to construct utterances (and their distributions), the types of errors drivers make (and their probability), and the probability of various correction strategies are used for each type of error. Half of these data were used to create the simulation model structure and provide the model parameters for entering destinations and selecting music using speech. Finally, the simulation model was validated for these two tasks using the second half of the data from the previous experiment.

**Subject Areas:** infotainment; crashes; driver error

**Availability:** Lo, Ei-Wen. A Model to Predict Driver Task Performance When Interacting with In-Vehicle Speech Interfaces for Destination Entry and Music Selection. Diss. University of Michigan, 2013.

[http://deepblue.lib.umich.edu/bitstream/handle/2027.42/99777/loe\\_1.pdf?sequence=1](http://deepblue.lib.umich.edu/bitstream/handle/2027.42/99777/loe_1.pdf?sequence=1)



## Characteristics of teens-with-teens fatal crashes in the United States, 2005–2010

Allan F. & Brian C. Tefft

**Abstract:** More than 40% of fatal crashes of 16- and 17-year-old drivers occur when transporting teenagers. Characteristics of this predominant crash type and prevention possibilities are described, based on data from fatal crashes in the United States during 2005–2010. Fifty-seven percent of 16- and 17-year old drivers in fatal crashes had at least one passenger. Most commonly, all passengers were ages 13–19 (42% of all drivers and 73% of those with passengers). Of fatal crash involved drivers with teenage passengers and no passengers of other ages, 56% had one passenger, 24% had two, and 20% had three or more. Most frequently, passengers were the same sex and within one year of the driver. Risk factors involving speeding, alcohol use, late-night driving, lack of a valid license, seat belt non-use, and crash responsibility were more prevalent with teenage passengers than when driving alone, and the prevalence of these factors increased with the number of teenage passengers. Many risk factors were most prevalent with passengers ages 20–29, although few crashes had this occupant configuration. Risk factors were least prevalent with a passenger 30 or older. Fatal crashes of 16- and 17-year-old drivers with teen passengers are a common crash scenario, despite passenger restrictions in 42 states and the District of Columbia during some or all of the study period. The proportion of these fatal crashes decreased slightly from 46% in 1995 (pre-GDL) to 43% in 2010 and showed no signs of decreasing during the six-year study period (range 41% to 43%). Existing passenger restrictions are relatively weak and could be strengthened. Fatal crashes involving teen passengers, especially multiple passengers, are more likely to involve alcohol, late-night driving, driver error, and invalid licensure, so stepped-up enforcement of existing laws involving these behaviors might reduce the prevalence of such crashes.

**Subject Areas:** Teenagers; Teenage driving; Passengers; Passenger restrictions; Graduated driver licensing

**Availability:** Williams, Allan F., and Brian C. Tefft. "Characteristics of teens-with-teens fatal crashes in the United States, 2005–2010." *Journal of Safety Research* (2013).  
<http://www.sciencedirect.com/science/article/pii/S0022437513001667>

## **A Cost-Effective Sideslip Estimation Method Using Velocity Measurements from Two GPS Receivers** *Yoon, J. & Peng, H*

**Abstract:** This paper demonstrates that the vehicle sideslip can be estimated through the kinematic relationship of velocity measurements from two low-cost GPS (Global Positioning System) receivers. To compensate for the low update rate of low-cost GPS receivers, acceleration/angular rate measurements from an IMU (Inertial Measurement Unit) are merged with the GPS measurements using an Extended Kalman Filter. Two technical challenges were addressed: (i) unsynchronized updates of the two GPS receivers and (ii) significant delays in GPS velocity measurement. A stochastic observability analysis reveals that the proposed method guarantees the observability when a vehicle has non-zero yaw rates. Experimental verification shows that the vehicle sideslip is estimated regardless of surface friction levels under several maneuvers.

**Subject Areas:** Global Positioning System (GPS); Kalman Filter; Sideslip estimation; Stochastic Observability

**Availability:** Yoon, J., and Huei Peng. "A Cost-Effective Sideslip Estimation Method Using Velocity Measurements from Two GPS Receivers." (2013): 1-1.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6680690&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D6680690](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6680690&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D6680690)

## **Vehicular relay nodes for cellular deployment: Downlink channel modeling and analysis** *Schein, Jacob & Lavi, Nadav*

**Abstract:** The exponential growth in traffic demand over wireless cellular networks challenges the operators' business model as it requires significant investments in infrastructure. Multi-layers deployment, i.e., heterogeneous networks (HetNet), is one of the solutions operators are deploying to overcome this “capacity-crunch” phenomena. Yet even by adopting HetNet operators are still required to invest in network planning, sites deployment, maintenance and on-going operational costs. This paper proposes a novel cost-effective HetNet deployment approach based on nomadic vehicular relay nodes (VeRN). VeRN downlink performance are analyzed in two deployment models, which focus on VeRN impact on the network as a function of its placement. The 2-hop relay link via a VeRN is analyzed compared to the cellular direct-link for the proposed deployment models investigating both link level and spectral efficiency (SE) aspects. The analysis is based on extensive simulations with an indicative proposed figure of merit. The results show significant improvement in link level as well as substantial increase in spectral efficiency when using VeRNs across a set of deployment parameters.

**Subject Areas:** wireless networks; traffic demand; VeRN; spectral efficiency

**Availability:** Schein, Jacob, and Nadav Lavi. "Vehicular relay nodes for cellular deployment: Downlink channel modeling and analysis." *Microwaves, Communications, Antennas and Electronics Systems (COMCAS)*, 2013 IEEE International Conference on. IEEE, 2013.  
[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6685270](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6685270)

## **A Comprehensive Review on the Quasi-Induced Exposure Technique** *Xinguo Jianga, Richard W. Lylesb, & Runhua Guoc*

**Abstract:** The goal is to comprehensively examine the state-of-the-art applications and methodological development of quasi-induced exposure and consequently pinpoint the future research directions in terms of implementation guidelines, limitations, and validity tests. The paper conducts a comprehensive review on approximately 45 published papers relevant to quasi-induced exposure regarding four key topics of interest: applications, responsibility assignment, validation of assumptions, and methodological development. Specific findings include that: 1) there is no systematic data screening procedure in place and how the eliminated crash data will impact the responsibility assignment is generally unknown; 2) there is a lack of necessary efforts to assess the validity of assumptions prior to its application and the validation efforts are mostly restricted to the aggregated levels due to the limited availability of exposure truth; and 3) there is a deficiency of quantitative analyses to evaluate the magnitude and directions of bias as a result of injury risks and crash avoidance ability. The paper points out the future research directions and insights in terms of the validity tests and implementation guidelines.

**Subject Areas:** Quasi-induced Exposure; Responsibility Assignment; Validation; Underlying assumptions; Exposure Measurements

**Availability:** Jiang, Xinguo, Richard W. Lyles, and Runhua Guo. "A Comprehensive Review on the Quasi-Induced Exposure Technique." *Accident Analysis & Prevention* (2013).  
<http://www.sciencedirect.com/science/article/pii/S0001457513005058>

## **Advanced auditory cues on mobile phones help keep drivers' eyes on the road**

*Thomas M. Gable; Bruce N. Walker; Haifa R. Moses; Ramitha D. Chitloor*

**Abstract:** In-vehicle technologies can create dangerous situations through driver distraction. In recent years, research has focused on driver distraction through communications technologies, but others, such as scrolling through a list of songs or names, can also carry high attention demands. Research has revealed that the use of advanced auditory cues for in-vehicle technology interaction can decrease cognitive demand and improve driver performance when compared to a visual-only system. This paper discusses research investigating the effects of applying advanced auditory cues to a search task on a mobile device while driving, particularly focusing on visual fixation. Twenty-six undergraduates performed a search task through a list of 150 songs on a cell phone while performing the lane change task, wearing eye-tracking glasses. Eye-tracking data, performance, workload, and preferences for six conditions were collected. Compared to no sound, visual fixation time on driving and preferences were found to be significantly higher for the advanced auditory cue of spindex. Results suggest more visual availability for driving when the spindex cue is applied to the search task and provides further evidence that these advanced auditory cues can lessen distraction from driving while using mobile devices to search for items in lists.

**Subject Areas:** auditory cues; driver distraction;

**Availability:** Gable, Thomas M., et al. "Advanced auditory cues on mobile phones help keep drivers' eyes on the road." Proceedings of the 5th International Conference on Automotive User Interfaces and Interactive Vehicular Applications. ACM, 2013.  
<http://dl.acm.org/citation.cfm?id=2516541>

**Fatality trends and projections for drivers and passengers: Differences between observed and expected fatality rates with a focus on older adults** *Nadia W. Mullen; Sacha Dubois; Michel Bédard*

**Abstract:** Using 1975–2008 data from the United States' Fatality Analysis Reporting System, we examined fatality trends, projected future fatality trends to 2025, and estimated the number of fatalities expected if fatalities had continued to occur at the 1975 rate. Driver and passenger fatalities were stratified by sex and age group before fitting models to the data. These models were used to perform fatality projections to 2025. Using the 1975 fatality rate, we estimated the number of fatalities expected due to increased exposure to determine whether efforts to decrease fatalities were working. Results showed that, since 1975, fatalities have decreased for younger drivers and passengers and increased for middle-aged adults. Over the past 10 years, fatalities have decreased for older adults. Expected fatalities from the 1975 rate were higher than that observed for most adults. Fatalities were projected to decrease through to 2025 for younger adults, increase for middle-aged adults, and level off for older adults. A cohort effect was found for older adults, whereby from 1975 to 2008, the oldest members of the group (85–89 years) accounted for an increasingly larger proportion of fatalities. The recent decrease in older adult fatalities is remarkable given their increased number and exposure. Observed fatalities were lower than expected after controlling for increased exposure, suggesting that efforts to decrease fatalities have been effective, although further research is needed to confirm this. The cohort effect suggests recent older drivers are involved in a smaller proportion of fatal crashes than their predecessors.

**Subject Areas:** Traffic fatalities; Older drivers

**Availability:** Mullen, Nadia W., Sacha Dubois, and Michel Bédard. "Fatality trends and projections for drivers and passengers: Differences between observed and expected fatality rates with a focus on older adults." *Safety Science* 59 (2013): 106-115.  
<http://www.sciencedirect.com/science/article/pii/S0925753513001203>

## **Child Passenger Safety Committee on Injury, Violence, and Poison Prevention**

**Abstract:** Despite significant reductions in the number of children killed in motor vehicle crashes over the past decade, crashes continue to be the leading cause of death for children 4 years and older. Therefore, the American Academy of Pediatrics continues to recommend inclusion of child passenger safety anticipatory guidance at every health-supervision visit. This technical report provides a summary of the evidence in support of 5 recommendations for best practices to optimize safety in passenger vehicles for children from birth through adolescence that all pediatricians should know and promote in their routine practice. These recommendations are presented in the revised policy statement on child passenger safety in the form of an algorithm that is intended to facilitate their implementation by pediatricians with their patients and families. The algorithm is designed to cover the majority of situations that pediatricians will encounter in practice. In addition, a summary of evidence on a number of additional issues that affect the safety of children in motor vehicles, including the proper use and installation of child restraints, exposure to air bags, travel in pickup trucks, children left in or around vehicles, and the importance of restraint laws, is provided. Finally, this technical report provides pediatricians with a number of resources for additional information to use when providing anticipatory guidance to families.

**Subject Areas:** car safety seat; booster seat; child restraint system; air bag; child passenger safety; motor vehicle crash

**Availability:** Durbin, Dennis R. "Child passenger safety." *Pediatrics* 127.4 (2011): e1050-e1066.  
<http://pediatrics.aappublications.org/content/early/2011/03/21/peds.2011-0215>

## **A Binary Logit Model Approach to Bicycle-Motor Vehicle Crashes** *Mubassira Khan; Randy B. Machemehl*

**Abstract:** This paper examines bicyclist injury severity in bicycle-motor vehicle crashes using the 2012 Texas Department of Transportation's (TxDOT) Crash Records Information System (CRIS) database. A binary logit model framework is used for analyzing the data. All bike-motor crashes that involved a single motor vehicle and a single bicyclist are included. Three data sub-sets are examined to identify bike-motor crash risk factors associated with fatal crashes. These include all bike-motor vehicle crash data, only intersection related crash data and only non-intersection related crash data. The model results indicate that the common factors that affect all crashes include bicyclist and motor vehicle driver demographic characteristics, land use characteristics of the crash location, motor vehicle body type and the roadway speed limit. The involvement of alcohol and the time of day affect primarily the injury severity of the non-intersection related crashes. The days of week and the presence of a signalized intersection have effects on intersection related crashes. Results of this study can help to educate and train road users about traffic safety, improve traffic regulations and strengthen enforcement, and also suggest designs for roadway safety features to enhance safety for all road users.

**Subject Areas:** binary logit; traffic safety

**Availability:** Khan, Mubassira. "A Binary Logit Model Approach to Bicycle-Motor Vehicle Crashes." University of Austin.

[http://assets.conferencespot.org/fileservers/file/53197/filename/0259-000237\\_Paper.pdf](http://assets.conferencespot.org/fileservers/file/53197/filename/0259-000237_Paper.pdf)



**From destination prediction to route prediction** *John Krumma, Robert Gruena & Daniel Delling*

**Abstract:** A prediction of a vehicle's route would be useful for giving the driver advance warnings and alerts about upcoming situations and opportunities. This paper presents a new algorithm for predicting a driver's route based on a probabilistic prediction of the driver's destination. For each candidate destination, our route prediction algorithm plans a route to that destination. Roads on these routes accumulate the probabilities of their respective destinations, giving higher probabilities to roads along the way to higher probability destinations. The algorithm is based on a single parameter that characterises how efficiently a driver drives. Once this parameter is computed, it does not require storing a history of trips, and it works in places a driver has never visited. We test the algorithm on 100 routes recorded with the Global Positioning System (GPS) and show that the route prediction quickly narrows down the future route to a small fraction of the road network. We also compare our algorithm to two other algorithms to show how it performs better.

**Subject Areas:** destination prediction, route prediction, location prediction

**Availability:** Krumm, John, Robert Gruen, and Daniel Delling. "From destination prediction to route prediction." *Journal of Location Based Services* ahead-of-print (2013): 98-120.

<http://www.tandfonline.com/doi/abs/10.1080/17489725.2013.788228>

## **Modeling Injury Severity of Young Drivers Using Highway Crash Data from Kansas** *Niranga Amarasingha and Sunanda Dissanayake*

**Abstract:** Young drivers have higher motor vehicle crash rates compared to other drivers, and understanding the reasons for this would help to improve safety. This study, therefore, investigated characteristics and contributory causes of young-driver crashes and developed multinomial logit models to identify severity affecting factors. It was found that teen drivers were more likely to be involved in crashes due to failure to give time and attention and falling asleep. Among other factors, alcohol involvement, not wearing a seat belt, driving without a valid license, having restrictions on driver's license, and involvement in off-roadway crashes were factors that increased young-driver injury severity. Based on identified factors, countermeasure ideas for improving safety have also been suggested.

**Subject Areas:** young drivers; crash rate; multinomial logit

**Availability:** Amarasingha, Niranga, and Sunanda Dissanayake. "Modeling injury severity of young drivers using highway crash data from Kansas." *Journal of the Transportation Research Forum*. Vol. 52. No. 1. Transportation Research Forum, 2013.  
<http://www.trforum.org/journal/downloads/2013v52n1.pdf#page=7>

## **New highway geometric design methods for minimizing vehicular fuel consumption and improving safety** *Min-Wook Kanga, Shaghayegh Shariatb, & Manoj K. Jha*

**Abstract:** This paper proposes separate computational methods for evaluating (1) fuel efficiency, (2) sight distance deficiencies and (3) expected accident costs for a given highway alignment, depending on its detailed geometric characteristics. A fuel consumption model is developed based on two important concepts: (i) variability in the amount of fuel consumed by vehicles depending on variability in highway geometry and (ii) minimization of the fuel consumption by ensuring conditions suitable for driving at cruising speed. The methods estimate the fuel consumption by integrating vehicle propulsive force necessary to maintain the cruising speed from the beginning to the end of an alternative highway being evaluated. A sight distance model that not only automatically calculates available sight distance (ASD) and stopping sight distance (SSD), but also evaluates sight distance deficiency of alternative alignments is proposed. The total sight distance deficiency of an alternative alignment is estimated based on (i) the length of the road segments where  $ASD < SSD$  and (ii) the significance of sight distance restriction. A crash prediction model proposed in the Highway Safety Manual (HSM) is adopted to evaluate and compare alternative alignments from safety perspective. A case study is presented to demonstrate the effectiveness of the developed methods. These methods will be integrated into a highway alignment optimization model (HAO) previously developed by the authors to evaluate numerous possible alternative alignments of a new highway system through tradeoffs among various relevant decision criteria. Those criteria may include vehicle fuel efficiency, sight distance, and safety, besides various cost factors, such as the construction cost, maintenance cost, user cost, and environmental impact cost. Such an integrated modeling framework will help evaluate green and environmentally sustainable highways. Many extensions of the work remain to be worked in the future, for example: (1) the effects of gain in propulsive force when traveling down from the crest of a curve; and (2) variability in fuel consumption rate based on vehicle type, gradient, critical length of grade, weather, and other factors.

**Subject Areas:** Green highway infrastructure design; Highway alignment evaluation; Optimization; Fuel consumption; Sight distance; Safety

**Availability:** Kang, Min-Wook, Shaghayegh Shariat, and Manoj K. Jha. "New highway geometric design methods for minimizing vehicular fuel consumption and improving safety." *Transportation Research Part C: Emerging Technologies* 31 (2013): 99-111. <http://www.sciencedirect.com/science/article/pii/S0968090X13000569>

**A comprehensive survey on vehicular Ad Hoc network** *Saif Al-Sultan, Moath M. Al-Doori, Ali H. Al-Bayatti, & Hussien Zedan*

**Abstract:** Vehicular ad hoc networks (VANETs) are classified as an application of mobile ad hoc network (MANET) that has the potential in improving road safety and in providing travellers comfort. Recently VANETs have emerged to turn the attention of researchers in the field of wireless and mobile communications, they differ from MANET by their architecture, challenges, characteristics and applications. In this paper we present aspects related to this field to help researchers and developers to understand and distinguish the main features surrounding VANET in one solid document, without the need to go through other relevant papers and articles starting from VANET architecture and ending up with the most appropriate simulation tools to simulate VANET protocols and applications.

**Subject Areas:** vehicle networks; VANET

**Availability:** Al-Sultan, Saif, et al. "A comprehensive survey on vehicular Ad Hoc network." *Journal of Network and Computer Applications* 37 (2014): 380-392.  
<http://www.sciencedirect.com/science/article/pii/S108480451300074X>

**Exploring the age discrepancy in death rates from motorcycle injury in the United States of America: the decomposition method** *Coben, Jeffrey; Li, Guohua; Zhu, Motao; Zhao Songzhu*

**Abstract:** Motorcyclist deaths in 2009 in the United States of America. Previous research has suggested age discrepancy among motorcycle drivers. We examined the various factors that contribute to this age discrepancy.

**Subject Areas:** Motorcycle deaths

**Availability:** Coben, Jeffrey; Li, Guohua; Zhu, Motao; Zhao Songzhu, Short reports, Traffic accident and injury, "Exploring the age discrepancy in death rates from motorcycle injury in the United States of America: the decomposition method" FORENSIC SCI SEM, 1 (2013) 74-78  
<http://fss.xxyy.info/journal/2013/2157118X.3.A6.pdf>

**Spatial prediction of traffic levels in unmeasured locations: applications of universal kriging and geographically weighted regression** *Selby, Brent, and Kara M. Kockelman*

**Abstract:** This work explores the application of two distinctive spatial methods for prediction of average daily traffic counts across the Texas network. Results based on Euclidean distances are compared to those using network distances, and both allow for strategic spatial interpolation of count values while controlling for each roadway's functional classification, lane count, speed limit, and other site attributes. Both universal kriging and geographically weighted regression (GWR) are found to reduce errors (in practically and statistically significant ways) over non-spatial regression techniques, though errors remain quite high at some sites, particularly those with low counts and/or in less measurement-dense areas. Nearly all tests indicated that the predictive capabilities of kriging exceed those of GWR by average absolute errors of 3–8%. Interestingly, the estimation of kriging parameters by network distances show no enhanced performance over Euclidean distances, which require less data and are much more easily computed.

**Subject Areas:** traffic counts

**Availability:** Selby, Brent, and Kara M. Kockelman. "Spatial prediction of traffic levels in unmeasured locations: applications of universal kriging and geographically weighted regression." *Journal of Transport Geography* 29 (2013): 24-32.  
<http://www.sciencedirect.com/science/article/pii/S0966692312003079>

## **Understanding geographical variations in road traffic fatalities in South Africa**

*Sukhai, A. and A. P. Jones*

**Abstract:** South Africa (SA) faces an unprecedented burden of injuries from road traffic crashes, yet the distribution of these events has not yet been studied using a geographical approach in order to help understand the importance of putative social and environment drivers. Such an approach was used in this study to investigate the correlates of spatial variations in road traffic fatalities (RTFs) in SA. Variations in RTFs between 2002 and 2006 were studied for 993 police areas. A wide range of explanatory variables comprising physical, environmental and socio-demographic characteristics were generated, and multilevel negative binomial regression models were fitted to identify those associated with RTFs. An area measure of violence and crime was shown to be a significant predictor of RTFs in SA in addition to a range of factors associated with driver behaviour, traffic exposure and socio-economic deprivation. Our research provides new insights into the correlates of road traffic mortality in this less developed country, and our findings have implications for the development of integrated resource-efficient strategies that allow for enforcement and other broader structural interventions to target injuries and crime in general.

**Subject Areas:** traffic crashes; South Africa

**Availability:** Sukhai, A., and A. P. Jones. "Understanding geographical variations in road traffic fatalities in South Africa." *South African Geographical Journal* ahead-of-print (2013): 1-18.  
<http://www.tandfonline.com/doi/full/10.1080/03736245.2013.847802>

## 9. TRANSIT PLANNING

### **An Examination of the influence of urban form and land use on bus ridership in Montreal** *Vincent Chakour*

**Abstract:** The emphasis of this study is on a systems approach where transit ridership is studied from the perspective of the transit provider, with the objective of quantifying the influence of transit system operational attributes, transportation system infrastructure attributes and built environment attributes on the disaggregate stop level boardings and alightings by time of day for the bus network in the Montreal region. A Composite Marginal Likelihood (CML) based ordered response probit (ORP) model, that simultaneously allows us to incorporate the influence of exogenous variables and potential correlations between boardings and alightings across multiple time periods of the day is employed. Our results indicate that headway impacts ridership negatively, while the presence of public transportation around the stop has a positive and significant effect. Moreover, parks, commercial enterprises, and residential area, amongst others, impact boardings and alightings at bus stops. An elasticity analysis provides useful insights. Specifically, we observe that the most effective way to increase ridership is to increase public transport service and accessibility, whereas changes in land-use are very inelastic. The framework from our analysis provides transit agencies a mechanism to study the influence of transit accessibility, transit connectivity, transit schedule alterations (to increase/reduce headway), and land-use pattern changes on ridership.

**Subject Areas:** transit ridership; built environment;

**Availability:** Chakour, Vincent, and Naveen Eluru. "An Examination of the influence of urban form and land use on bus ridership in Montreal." (2013).

<http://stmm.mcgill.ca/Papers/BusPaperjuly31.pdf>



## **Toward Transit Metropolis: Status Quo Analysis for Chinese Major Cities** *Tian Jiang, Mingzhu Song, Yulin Jiang, Meng Li, Haoda Zou*

**Abstract:** In order to promote low-carbon transport, “The 12th five-year Transport Development Planning” released by the Ministry of Transport (MoT) of P. R. China in 2011, indicates that MoT will provide significant funds to support 30 cities to build “The Transit Metropolis” before 2015. In order to support the “Transit Metropolis” project, the authors led great efforts on collecting statistic and economy data, geography and population data, transportation infrastructure and operation data, transit passenger degree of satisfaction data, etc. Based on all the ground information, this paper assessed the status of urban public transit in China, and analyzed the factors that affect the public transit development. It is found that the relationship between the transit mode share and the GDP per capita follows a “flash” shape and can be divided into three phases. With the growth of GDP, the trend of the transit mode share typically goes “up-down-up” due to the different stages of economy level, car ownership and investment on transit system. Based on the analysis and discussion, some suggestions are provided to develop a hierarchical multi-modal transit system with smooth transfers and good coverage to mitigate traffic congestion and improve the sustainability of urban transportation system in China.

**Subject Areas:** Public transit; Mode share; Transit net length; Transit development

**Availability:** Jianga, Tian, et al. "Toward Transit Metropolis: Status Quo Analysis for Chinese Major Cities." (2013). <http://www.sciencedirect.com/science/article/pii/S1877042813024191>

## **Bringing People to Work: A Sustaining Function of Commuter Rail Services**

*Rongfang (Rachel) Liu, Ph.D., AICP, P.E.; and Zhaodong Huang*

**Abstract:** As evidenced by the services provided to travelers for almost a century, commuter rail proved that it not only played significant roles in reducing congestion but also a sustainable mode in providing safe, reliable, and high-quality options for commuters. Recent travel behavior changes show that the share of commuting trips during peak periods are declining while recreational, social, and personal trips during nonpeak times and weekends are rising. This manuscript records an effort to explore viable ways for a traditional commuter rail, Atlantic City Rail, to serve the current travel market. After a brief review of the historical development, the authors have focused on temporal distribution of travel demands along the ACRL corridor. Responding to the demands of patrons, schedule optimization was developed and partially implemented for the service.

**Subject Areas:** Commute, Optimization, Public transportation

**Availability:** Liu, R. and Huang, Z. (2013) Bringing People to Work: A Sustaining Function of Commuter Rail Services. *Urban Public Transportation Systems 2013*: pp. 158-167.  
<http://dx.doi.org/10.1061/9780784413210.015>

## **Does TOD Need the T? Auto Use, Residential Sorting, and Access to Rail**

*Chatman, Daniel G.*

**Abstract:** Smart growth planning often focuses on building new housing near rail stations, on the assumption that transit-oriented development can reduce driving and therefore mitigate climate change, pollution and congestion. But research has rarely investigated how transit-oriented development affects auto use—or asked whether new development should be oriented away from autos, rather than toward rail.

This study addresses two questions. First, do households choosing new housing near rail stations have different patterns of auto ownership and use? Second, are those differences a result of rail access, or other factors associated with rail access? Previous studies have not used comparable data to compare nearby and farther away housing units; have lacked data on parking supply; have not controlled for characteristics of the housing itself, particularly the age of the housing; and have generally failed to account for how residential choices may affect TOD housing outcomes.

I surveyed over 1,100 households within two miles of ten rail stations, and conducted a field count of over 6,200 on-street parking spaces on 818 block faces near the stations. The household survey collected information on housing characteristics, parking, travel, and household demographics as well as stated residential choice criteria to control for heterogeneity in preferences. The survey data were geocoded and joined to on-street parking supply data and other spatial data from secondary sources. I used regression analysis to examine how housing, parking, neighborhood and subregional spatial characteristics are correlated with automobile ownership, commuting, and grocery trips.

Auto ownership and use is much lower among households living in new housing near rail stations, but these differences are not explained by rail access. Off- and on-street parking availability, housing type and tenure, local and subregional density, and bus service are much more highly correlated with residential choices and subsequent auto ownership and travel. Rail access is associated with lower auto use when combined with factors like parking supply and housing type, but rail by itself has little explanatory power.

The details of TOD matter, and some of the things that “work” about TOD have little or nothing to do with rail access by itself. Planners should broaden efforts to develop dense, mixed use housing beyond rail station areas. Denser housing development coupled with good management of automobile parking and improved bus service could be more -effective, and less expensive, than a development policy oriented around rail stations.

**Subject Areas:** TOD; vehicle ownership

**Availability:** Chatman, Daniel G. "Does TOD Need the T? Auto Use, Residential Sorting, and Access to Rail." Transportation Research Board 92nd Annual Meeting. No. 13-5164. 2013. <http://docs.trb.org/prp/13-5164.pdf>

## **The Rise of the Low Carbon Consumer City** *Matthew J. Holian; Matthew E. Kahn*

**Abstract:** Urban density both facilitates consumption opportunities and encourages individuals to drive less and walk and use public transit more. Using several data sets, we document that high quality of life consumer center cities are low carbon cities. We discuss possible causal channels for this association.

**Subject Areas:** urban density; public transit;

**Availability:** Holian, Matthew J., and Matthew E. Kahn. The Rise of the Low Carbon Consumer City. No. w18735. National Bureau of Economic Research, 2013.

<http://www.chaight.com/Wk%201%20E205B%20Holian%20-%20Low%20Carbon%20Consumer.pdf>

**Infrastructure and automobile shifts: positioning transit to reduce life-cycle environmental impacts for urban sustainability goals** *Mikhail Chester, Stephanie Pincetl, Zoe Elizabeth, William Eisenstein and Juan Matute*

**Abstract:** Public transportation systems are often part of strategies to reduce urban environmental impacts from passenger transportation, yet comprehensive energy and environmental life-cycle measures, including upfront infrastructure effects and indirect and supply chain processes, are rarely considered. Using the new bus rapid transit and light rail lines in Los Angeles, near-term and long-term life-cycle impact assessments are developed, including consideration of reduced automobile travel. Energy consumption and emissions of greenhouse gases and criteria pollutants are assessed, as well the potential for smog and respiratory impacts. Results show that life-cycle infrastructure, vehicle, and energy production components significantly increase the footprint of each mode (by 48–100% for energy and greenhouse gases, and up to 6200% for environmental impacts), and emerging technologies and renewable electricity standards will significantly reduce impacts. Life-cycle results are identified as either local (in Los Angeles) or remote, and show how the decision to build and operate a transit system in a city produces environmental impacts far outside of geopolitical boundaries. Ensuring shifts of between 20–30% of transit riders from automobiles will result in passenger transportation greenhouse gas reductions for the city, and the larger the shift, the quicker the payback, which should be considered for time-specific environmental goals.

**Subject Areas:** public transit; energy consumption; emissions; greenhouse gases

**Availability:** Chester, Mikhail, et al. "Infrastructure and automobile shifts: positioning transit to reduce life-cycle environmental impacts for urban sustainability goals." *Environmental Research Letters* 8.1 (2013): 015041.

<http://iopscience.iop.org/1748-9326/8/1/015041>

**A method to define public transit opportunity space** Mamun, Sha A., Nicholas E. Lownes, Jeffrey P. Osleeb, and Kelly Bertolaccini

**Abstract:** A public transit performance measure quantifying the ease of reaching a destination from a given location is important for describing the efficiency and convenience of public transit. In this paper, a new method for quantifying public transit performance, the Transit Opportunity Index (TOI), is presented. This measure accounts for both transit accessibility (the level of access to the transit system) and transit connectivity (the system's provision of services between origins and destinations) by combining measures of spatial coverage, temporal coverage, and trip coverage. Spatial and temporal coverage measures are calculated using an origin–destination (O–D) representation of the transit network and then combined to create a transit accessibility score for each O–D pair. Transit accessibility is weighted by a binary connectivity parameter and a connectivity decay factor. The connectivity decay factor is derived from a travel time-based logistic function to reflect the decreasing connectivity with increasing travel time. The binary connectivity parameter and the connectivity decay factor are used to account for trip coverage, or transit connectivity. The Transit Opportunity Index (TOI) is then applied to the bus network of the city of New Haven, Connecticut. The results of this case study suggest that the TOI is a more complete and practical measure of public transit service performance than previously established measures. This method also has the potential to identify transfer zones for public transit trips between O–D pairs without direct connections. However, the TOI is most powerful when used in conjunction with a public transit demand measure to identify underserved areas.

**Subject Areas:** public transit performance; Transit Opportunity Index

**Availability:** Mamun, Sha A., et al. "A method to define public transit opportunity space." *Journal of Transport Geography* 28 (2013): 144-154.  
<http://www.sciencedirect.com/science/article/pii/S0966692312002992>

## **Central Business Districts and Transit Ridership: A Reexamination of the Relationship in the United States** *Brown, Jeffrey R., and Dristi Neog*

**Abstract:** Many scholars claim that public transit's long-term ridership decline can be attributed to the decentralization of U.S. metropolitan areas and the decline of the central business district (CBD) as their primary economic engine. However, recent research has begun to challenge this view and has prompted this reexamination. Using multivariate analysis, we examine the relationship between the strength of the CBD and transit ridership in all U.S. metropolitan areas with more than 500,000 persons in 2000, while controlling for other factors thought to influence bus and rail transit ridership. We find no relationship between the strength of the CBD and transit ridership, which suggests that other factors are much more important contributors to transit ridership.

**Subject Areas:** transit ridership; CBD; multivariate analysis

**Availability:** Brown, Jeffrey R., and Dristi Neog. "Central Business Districts and Transit Ridership: A Reexamination of the Relationship in the United States." *Journal of Public Transportation* 15.4 (2012). [http://www.nctr.usf.edu/wp-content/uploads/2012/12/15.4\\_Brown.pdf](http://www.nctr.usf.edu/wp-content/uploads/2012/12/15.4_Brown.pdf)

# 10. TRAVEL BEHAVIOR

## **The Rebound Effect for Passenger Vehicles** *Joshua Linn*

**Abstract:** Increasingly stringent fuel economy standards will reduce per-mile driving costs and may raise vehicle miles traveled, which is referred to as the rebound effect. All previous estimates impose at least one of three behavioral assumptions: (a) fuel economy is uncorrelated with other vehicle attributes; (b) fuel economy is uncorrelated with attributes of other vehicles owned by the household; and (c) the effect of gasoline prices on vehicle miles traveled is inversely proportional to the effect of fuel economy. Relaxing these assumptions yields a large and robust rebound effect; a one percent fuel economy increase raises driving 0.2 to 0.4 percent.

**Subject Areas:** fuel economy standards, passenger vehicles, vehicle miles traveled, household driving demand

**Availability** Linn, Joshua. The rebound effect for passenger vehicles. No. dp-13-19-rev. 2013. <http://rff.org/RFF/Documents/RFF-DP-13-19-REV.pdf>



## **Developing a Utility Factor for Battery Electric Vehicles** *Michael Duoba*

**Abstract:** As new advanced-technology vehicles are becoming more mainstream, analysts are studying their potential impact on petroleum use, carbon emissions, and smog emissions. Determining the potential impacts of widespread adoption requires testing and careful analysis. PHEVs possess unique operational characteristics that require evaluation in terms of actual in-use driving habits. SAE J2841, "Utility Factor Definitions for Plug-In Hybrid Electric Vehicles Using 2001 U.S. DOT National Household Travel Survey Data," published by SAE in 2009 with a revision in 2010, is a guide to using DOT's National Household Travel Survey (NHTS) data to estimate the relative split between driving in charge-depleting (CD) mode and charge-sustaining (CS) mode for a particular PHEV with a given CD range. Without this method, direct comparisons of the merits of various vehicle designs (e.g., efficiency and battery size) cannot be made among PHEVs, or between PHEVs and other technologies.

The dedicated battery electric vehicle (BEV) is now becoming a viable alternative to conventional vehicles and other advanced vehicles (like HEVs and PHEVs). However, a shortcoming persists in current comparisons between BEVs and other vehicles. The BEV cannot satisfy all individual driving needs and most likely will be used alongside other household vehicles (which use petroleum fuel). To properly assess impacts of widespread BEV adoption, a "BEV Utility Factor" will be necessary. Using the most current NHTS data with individual trip data, several charging and vehicle-use scenarios are presented to bookend the expected utility of electric drive capability at any given BEV range. This analysis reveals that a real-world 75-mile-range BEV with a safety reserve of 10 miles has virtually the same electric drive utility as a PHEV with a 38-mile electric-only (CD) range.

**Subject Areas:** BEV; emissions; BEV range;

**Availability** Duoba, Michael. "Developing a Utility Factor for Battery Electric Vehicles." SAE International Journal of Alternative Powertrains 2.2 (2013): 362-368. <http://intl-saealtpow.saejournals.org/content/2/2/362.abstract>

**A Multivariate Hurdle Count Data Model with an Endogenous Multiple Discrete-Continuous Selection System** *Chandra R. Bhat, Subodh K. Dubey, Raghuprasad Sidharthan, & Prerna C. Bhat*

**Abstract:** This paper proposes a new econometric formulation and an associated estimation method for multivariate count data that are themselves observed conditional on a participation selection system that takes a multiple discrete-continuous model structure. This leads to a joint model system of a multivariate count and a multiple discrete-continuous selection system in a hurdle type model. The model is applied to analyze the participation and time investment of households in out-of-home activities by activity purpose, along with the frequency of participation in each selected activity. The results suggests that the number of episodes of activities as well as the time investment in those activities may be more of a lifestyle- and lifecycle-driven choice than one related to the availability of opportunities for activity participation.

**Subject Areas:** multivariate count data, generalized ordered-response, multiple discrete-continuous models, hurdle model system, endogeneity

**Availability** Bhat, Chandra R., et al. "A Multivariate Hurdle Count Data Model with an Endogenous Multiple Discrete-Continuous Selection System." (2013).  
<http://www.cae.utexas.edu/prof/bhat/ABSTRACTS/MDCPcountmodel.pdf>

**A Joint Count-Continuous Model of Travel Behavior with Selection Based on a Multinomial Probit Residential Density Choice Model** *Chandra R. Bhat, Sebastian Astroza, Raghuprasad Sidharthan, Mohammad Jobair Bin Alam, & Waleed H. Khushefati*

**Abstract:** This paper formulates a multidimensional choice model system that is capable of handling multiple nominal variables, multiple count dependent variables, and multiple continuous dependent variables. The system takes the form of a treatment-outcome selection system with multiple treatments and multiple outcome variables. The Maximum Approximate Composite Marginal Likelihood (MACML) approach is proposed in estimation, and a simulation experiment is undertaken to evaluate the ability of the MACML method to recover the model parameters in such integrated systems. These experiments show that our estimation approach recovers the underlying parameters very well and is efficient from an econometric perspective. The parametric model system proposed in the paper is applied to an analysis of household-level decisions on residential location, motorized vehicle ownership, the number of daily motorized tours, the number of daily non-motorized tours, and the average distance for the motorized tours. The empirical analysis uses the NHTS 2009 data from the San Francisco Bay area. Model estimation results show that the choice dimensions considered in this paper are inter-related, both through direct observed structural relationships and through correlations across unobserved factors (error terms) affecting multiple choice dimensions. The significant presence of self-selection effects (endogeneity) suggests that modeling the various choice processes in an independent sequence of models is not reflective of the true relationships that exist across these choice dimensions, as also reinforced through the computation of treatment effects in the paper.

**Subject Areas:** multivariate dependency; self-selection; treatment effects; maximum approximate composite marginal likelihood; land-use and built environment; travel behavior

**Availability** Bhat, Chandra R., et al. "A Joint Count-Continuous Model of Travel Behavior with Selection Based on a Multinomial Probit Residential Density Choice Model." (2013).

[http://www.cae.utexas.edu/prof/bhat/ABSTRACTS/Jeddah\\_paper.pdf](http://www.cae.utexas.edu/prof/bhat/ABSTRACTS/Jeddah_paper.pdf)

## **Tools for Estimating VMT Reductions From Built Environment Changes** *Anne Vernez Moudon, Orion Stewart*

**Abstract:** Built environment characteristics are associated with walking, bicycling, transit use, and vehicle miles traveled (VMT). Developing built environments supportive of walking, bicycling, and transit use can help meet state VMT reduction goals. But tools are necessary to understand how changes to the built environment may translate into changes in travel. Such tools can help optimize land use and transportation investments for reduced VMT and communicate such changes to the public. This report reviews the built environment characteristics associated with travel and the tools available that utilize these built environment characteristics to estimate travel and related outcomes such as vehicle emissions and health co-benefits. Tools ranged from simple to complex, and a number of factors should be considered when applying a tool to a planning effort.

**Subject Areas:** Walking, Bicycling, Transit, VMT, Transportation planning, Travel Behavior

**Availability** Moudon, Anne Vernez, and Orion Stewart. Tools for Estimating VMT Reductions from Built Environment Changes. No. WA-RD 806.3. 2013.  
<http://www.wsdot.wa.gov/research/reports/fullreports/806.3.pdf>

## **Examining effects of the built environment along commuting routes on travel outcomes by using a GPS dataset** *Xiaoguang Wang, Joe Grengs, & Lidia Kostyniuk*

**Abstract:** While extensive research has investigated how the built environment near people's homes and work places influence automobile travel behavior, little is known about how commuting routes affect travel outcomes. This article presents a methodology that addresses this question by examining the correlation between built environment along commuting routes and vehicle miles traveled (VMT) and fuel consumption for non-work automobile travel. Using a Global Positioning Systems (GPS) dataset collected from automobile trips of 46 drivers from the Southeast Michigan area over a 30 day time frame, this study identifies the actual commuting routes for all drivers and derives their fuel consumption for non-work travel. Although we do not find statistically significant relationships between route environments and non-work VMT and fuel consumption, this study is unique in its focus on the commuting routes and in establishing a methodology for using GPS data in transportation and land-use research, and it offers suggestions for refining the modeling of travel behavior along commuting routes.

**Subject Areas:** built environment; GPS; travel behavior; commuting routes;

**Availability** Wang, Xiaoguang, Joe Grengs, and Lidia Kostyniuk. "Examining effects of the built environment along commuting routes on travel outcomes by using a GPS dataset." *Journal of Urban Planning and Development* (2013).

[http://ascelibrary.org/doi/abs/10.1061/\(ASCE\)UP.1943-5444.0000181](http://ascelibrary.org/doi/abs/10.1061/(ASCE)UP.1943-5444.0000181)

**Determinants of household vehicle miles traveled in Oregon** *Holder, Daniel R.*  
(Daniel Ross)

**Abstract:** This study models the household demand for vehicle miles traveled with a focus on the effects from bicycle ridership and transit ridership. Through the use of data from the Oregon Household Activity Survey collected on behalf of the Oregon Department of Transportation, evidence is found that households participating in bicycle travel do not consider the price of driving or income when making vehicle travel decisions. The study also finds that for households using public transit, the distance traveled using transit is not significant in impacting a household's consumption of vehicle travel. The methods and results of this study provide a foundation for future vehicle and bicycle demand research and provide pertinent information to policy makers intending to alter driving behavior within the state of Oregon and elsewhere.

**Subject Areas:** Local transit; Bicycle commuting; Motor vehicle driving; Economics; Transportation; vehicle miles traveled; demand; bicycle; public transit

**Availability** Holder, Daniel Ross. "Determinants of household vehicle miles traveled in Oregon." (2013). <http://ir.library.oregonstate.edu/xmlui/handle/1957/43057>

## **A Survey on Routing and Data Dissemination in Opportunistic Mobile Social Networks** *Behrouz Jedari and Feng Xia*

**Abstract:** Opportunistic mobile social networks (MSNs) are modern paradigms of delay tolerant networks that consist of mobile users with social characteristics. The users in MSNs communicate with each other to share data objects among users. In this setting, humans are the carriers of mobile devices, so their social features such as movement patterns, similarities, and interests can be exploited to design efficient data forwarding algorithms. In this paper, a comparative survey of routing and data dissemination issues in opportunistic MSNs with a focus on (1) MSN characteristics, (2) human mobility models, (3) dynamic community detection methods, and (4) routing and data dissemination protocols are elaborated. Firstly, characteristics of MSNs which lead to the exposure of patterns of interaction among mobile users are explored. Secondly, properties of human mobility models are discussed and recently proposed mobility models are surveyed. Thirdly, community detection and evolution analysis algorithms are investigated. Finally, a comparative review of unprecedented routing and data dissemination algorithms in MSNs is presented. Furthermore, some new data forwarding techniques with respect to context-awareness, user selfishness and incentive schemes are addressed. To conclude, some open issues are discussed.

**Subject Areas:** Mobile social networks; opportunistic communications; human mobility; community detection; routing and data dissemination.

**Availability** Jedari, Behrouz, and Feng Xia. "A Survey on Routing and Data Dissemination in Opportunistic Mobile Social Networks." arXiv preprint arXiv:1311.0347 (2013).

<http://arxiv.org/abs/1311.0347>

**Linking Land Use, Transportation and Travel Behavior in Ohio** *Gulsah Akar, Steven I. Gordon and Yuan Zhang*

**Abstract:** This study developed a Regional Land Use Allocation Decision Analysis Tool, which enables decision makers to quantify the impacts of population and employment distribution in terms of the resulting VMT (Vehicle Miles Traveled). The study addresses the need for improving our understanding of the links between land use and transportation and provides ODOT a user-friendly modeling tool to develop forecasts based on different land use, transportation, and policy scenarios. The Regional Land Use Allocation Decision Analysis Tool developed through this study has two main components: a Land Allocation Component and a Transportation Component. This tool forecasts the impacts of future land-use policies in Ohio, based on alternative assumptions of highway and mass transit corridor development, zoning and environmental constraints, regional growth or decline projections, and changes in travel associated with auto trip generation rates and trip distances.

**Subject Areas:** Land allocation, travel patterns, auto trip rates, trip distance

**Availability** Akar, Gulsah, Steven I. Gordon, and Yuan Zhang. Linking Land Use, Transportation and Travel Behavior in Ohio. No. FHWA/OH-2013/7. 2013.

[http://ntl.bts.gov/lib/50000/50900/50914/134624\\_FR.pdf](http://ntl.bts.gov/lib/50000/50900/50914/134624_FR.pdf)



**A joint model of weekend discretionary activity participation and episode duration** *Born, Kathryn; Yasmin, Shamsunnahar; You, Daehyun; Eluru, Naveen; Bhat, Chandra R.; & Pendyala, Ram M.*

**Abstract:** Research on travel demand modeling has primarily focused on weekday activity-travel patterns. However, weekend activities and travel constitute a major component of individuals' overall weekly activity-travel participation. This paper describes a modeling effort that focuses on discretionary-event weekend activity-travel demand. This study bridges the gap in the literature by modeling discretionary event type participation, duration of participation, and accompaniment type jointly in a simultaneous equations model system. A joint discrete-continuous modeling framework is formulated for analyzing these dimensions as a choice bundle. Specifically, the combination of event type and accompaniment type constitutes the discrete component while the duration of participation constitutes the continuous component. The model employs a copula-based sample selection approach that ties the discrete choice error component with the duration error component in a flexible manner. The data used in the paper is drawn from the 2008-2009 National Household Travel Survey sample of the Greater Phoenix metropolitan area in Arizona. The results from the estimation process clearly highlight the presence of sample selection in the joint modeling context. Furthermore, the results also highlight the flexibility of copula models in capturing such sample selection. The best copula model results were employed to generate hazard profiles for various alternative related duration intervals. The profiles generated highlight the inaccurate predictions obtained using approaches that ignore the presence of sample selection.

**Subject Areas:** weekend activity participation, sample selection, copula, duration modeling, & hazard profiles

**Availability** Born, Kathryn, et al. "A joint model of weekend discretionary activity participation and episode duration." (2013). <https://repositories.lib.utexas.edu/handle/2152/21093>

## **Incorporating the Influence of Latent Modal Preferences in Travel Demand Models** *Akshay Vij*

**Abstract:** Latent modal preferences, or modality styles, are defined as behavioral predispositions towards a certain travel mode or set of travel modes that an individual habitually uses. They are reflective of higher-level orientations, or lifestyles, that are hypothesized to influence all dimensions of an individual's travel and activity behavior. For example, in the context of travel mode choice different modality styles may be characterized by the set of travel modes that an individual might consider when deciding how to travel, her sensitivity, or lack thereof, to different level-of-service attributes of the transportation (and land use) system when making that decision, and the socioeconomic characteristics that predispose her one way or another. Travel demand models currently in practice assume that individuals are aware of the full range of alternatives at their disposal, and that a conscious choice is made based on a tradeoff between perceived costs and benefits associated with alternative attributes. Heterogeneity in the choice process is typically represented as systematic taste variation or random taste variation to incorporate both observable and unobservable differences in sensitivity to alternative attributes. Though such a representation is convenient from the standpoint of model estimation, it overlooks the effects of inertia, incomplete information and indifference that are reflective of more profound individual variations in lifestyles built around the use of different travel modes and their concurrent influence on all dimensions of individual and household travel and activity behavior. The objectives of this dissertation are three-fold: (1) to develop a travel demand model framework that captures the influence of modality styles on multiple dimensions of individual and household travel and activity behavior; (2) to test that the framework is both methodologically flexible and empirically robust; and (3) to demonstrate the value of the framework to transportation policy and practice.

**Subject Areas:** latent modal preferences; activity behavior; travel demand model

**Availability** Vij, Akshay. "Incorporating the Influence of Latent Modal Preferences in Travel Demand Models." University of California Transportation (2013).

<http://escholarship.org/uc/item/7nq9p0cv.pdf>

## **The role of proximity in reducing auto travel: Using VMT to identify key locations for development, from downtown to the exurbs** *Robert Case*

**Abstract:** The purpose of this dissertation is to discover the VMT impact of each level of proximity in order to help government identify key locations for housing development, and thereby lower VMT and reduce dependence on foreign oil. By discovering the VMT impact of each level of proximity, this dissertation provides a) the first known means of calculating the proximity-based VMT benefit of subject locations by individual proximity level, and b) the new finding that it is likely that high VMT benefit can be achieved at moderate proximity levels acceptable to many households, enabling representative governments to be politically successful while promoting housing in locations that will lower the average VMT of the population. After discussing the impetus for the work, this dissertation presents a theory of the determinants of VMT, searches the literature for appropriate techniques for empirical analysis of the proximity-VMT relationship, and presents results of the empirical research to be expected based on the presented theory and literature. Empirical efforts are used to discover VMT impact by proximity level using three differing measures of proximity: density, distance-threshold-based total opportunities, and centrality. In the first effort, national data is used to discover VMT impact by proximity level, for both population and employment density. In order to determine the role played by alternative modes in the VMT-density curves of the first effort, the second effort uses national data to discover the impact of each level of density on usage of alternative modes. In the third and final effort, data from Hampton Roads, Virginia, are used to discover the VMT impact of each level of opportunity and centrality. In addition, the discovered VMT impact of each level of proximity informs the key hypothesis of this dissertation that there exists a sweet spot on the VMT-proximity curve that has high VMT benefit and a proximity level acceptable to many households. Although the hypothesis tests indicate that it is not certain that the sweet spot exists, the mean coefficients of the models indicate that it is likely that the sweet spot exists, i.e. that there are high-VMT-benefit proximity levels acceptable to many households. The overall implication of this is that representative governments in the U.S. who promote housing development at these moderate levels of proximity will not only lower average VMT in the short term, but they will not be punished politically for doing so, and therefore may be successful in thereby lowering average VMT in the long term. In summary, the dissertation provides encouragement to governments hoping to lower average VMT and an accurate method of calculating VMT for choosing SGAs with which to actually lower average VMT. It is hoped that this combination will help U.S. governments become independent of foreign oil.

**Subject Areas:** Civil engineering; Public policy; Transportation planning; Urban planning

**Availability** Case, Robert B., Ph.D., OLD DOMINION UNIVERSITY, 2013, 155 pages; 3569941  
<http://gradworks.umi.com/35/69/3569941.html>

**Recommendations to Harmonize Travel Behaviour Analysis** *Mert Kompil, Angelika Schulz, Tiina-Maria Seppänen, & Arno Schrotten*

**Abstract:** OPTIMISM's scope is to provide a scientifically documented insight of the transport system and people's travel choices via the study of social behaviour, mobility patterns and business models. The overall aim of OPTIMISM project is to define which of the future changes in the travel system would lead to a sustainable way of travel-ing, as people could travel more efficiently, cleaner and more safely, without compromising mobility. The OPTIMISM project consists of six work packages (WPs): Management, Harmonisation of national travel statistics in Europe, Demand and supply factors for passenger transport and mobility patterns – status quo and foresight, Analysing measures for decarbonisation of transport, Elaborating on strategies for integrating and optimising transport systems, & Dissemination and Awareness.

**Subject Areas:** Optimism; transport; mobility; transport systems

**Availability:** Kompil, Mert, et al. "Recommendations to Harmonize Travel Behaviour Analysis." (2013). <ftp://ftp.jrc.es/pub/EURdoc/EURdoc/JRC85446.pdf>

## **Modeling Commuters' Travel Behavior by Bayesian Networks** *Jingxian Wu, Min Yang*

**Abstract:** Previous studies indicate that residential location and commute distance may influence individual's travel behavior, but most models are limited to capture the internal relationship. In this paper, the methodology of Bayesian networks is introduced. With the combination of network structure and conditional probability table, Bayesian networks are capable of capturing the uncertainty nature. Moreover, the data is based on Fuyang Resident Travel Survey in 2012. The outputs illustrate that commute distance influences commuters' travel mode choice directly while the residential location doesn't. The experimental results show that different groups of people have different reactions to distance on mode.

**Subject Areas:** Bayesian networks; travel behavior; commute distance; residential location

**Availability:** Wu, Jingxian, and Min Yang. "Modeling commuters' travel behavior by Bayesian networks." (2013). <http://www.sciencedirect.com/science/article/pii/S1877042813021861>

## **Purchase and Utilization of New Fuel Efficient Vehicles in the US: Evidence from the 2009 National Household Transportation Survey Data** *Qing Su*

**Abstract:** This paper applies a simultaneous equation model to examine the relationship between choices of new fuel efficient vehicles and their utilization using the 2009 NHTS data. The regression results indicate that travelers purchasing new fuel efficient vehicles with a fuel economy of at least 30 mpg drive more on a monthly basis than others owning a new vehicle with lower fuel economy. In addition, those who travel more are more likely to purchase a new fuel efficient vehicle with a fuel economy of at least 30 mpg in the study period. The gasoline price has a significant negative impact on new vehicle utilization while a significant positive impact on choices of new vehicles with a fuel economy of at least 30 mpg.

**Subject Areas:** new fuel efficient vehicle; new vehicle utilization; simultaneous equation model; impact of gasoline prices; vehicle type choice

**Availability:** Su, Qing. "Purchase and Utilization of New Fuel Efficient Vehicles in the US: Evidence from the 2009 National Household Transportation Survey Data." *International Journal of Energy Economics and Policy* 4.1 (2013): 1-14.  
<http://www.econjournals.com/index.php/ijeep/article/view/613>

## **Testing the Reciprocal Relationship between Attitudes and Land Use in Relation to Trip Frequencies: A Nonrecursive Model** *Tae-Hyoung Tommy Gim*

**Abstract:** Nonrecursive structural equation modeling is applied to cross-sectional data from a survey conducted in Seoul, Korea, in 2009 and from geographic information systems, in an effort to model the reciprocal relationship between attitudes toward travel modes and land use in a neighborhood. Then, this study examines how the direction of the relationship differentiates the effects that the two factors have on trip frequencies. The direction is found to be contingent on trip purpose, that is, the attitudes–land use relationship is recursive for commuting trips, reciprocal for leisure trips, and insignificant for shopping trips. If the attitudes are omitted altogether, the estimated land use effect decreases considerably for commuting trips and slightly for leisure trips, which suggests the degree to which residential self-selection is concerned with these purposes of trips.

**Subject Areas:** land use; GIS;

**Availability:** Gim, Tae-Hyoung Tommy. "Testing the Reciprocal Relationship between Attitudes and Land Use in Relation to Trip Frequencies: A Nonrecursive Model." *International Regional Science Review* (2013): 0160017613512651.

<http://irx.sagepub.com/content/early/2013/11/22/0160017613512651.abstract>

## **Understanding Travel Modes to Non-work Destinations: Analysis of an Establishment Survey in Portland, Oregon** *Christopher Devlin Muhs*

**Abstract:** During the past three decades, research in travel behavior has generally proceeded from broad-level, aggregate analysis of mode share—the proportions of walking, bicycling, transit, and vehicle travel occurring in traffic analysis zones, census tracts, neighborhood, or other geographical units—to fine-grained, disaggregate analysis of mode choices and other trip-making attributes at the individual level. One potential issue is whether there are differences in the types of conclusions drawn from results of analyses performed at these different levels, as these results directly inform transportation planning and policy. This thesis aims in part to confirm whether the types of conclusions drawn from different levels of analysis are different, and to what extent. We also examine the relationships between the built environment and non-work travel choices from a unique analysis perspective. To do this, we use data from a 2011 travel intercept survey in the Portland, Oregon metropolitan region that was administered at convenience store, bar, and restaurant establishments. We estimate, for each of the travel modes—walk, bicycle, and automobile—two analysis models: one binary logistic regression model for mode choice of the individual traveler going to the establishment and one multiple linear regression model for mode share of shoppers at the establishment. Both models control for socio-demographics, trip characteristics, and built environment measures of travelers. For the binary logistic regression models, the data are disaggregate and particular to the individual traveler. These models also controlled for attitudes and preference towards travel modes. For the multiple regression models, data are aggregated to the establishment. The built environment data in each model represent characteristics of urban form surrounding the establishment. The data being oriented to the destination-end of the trip, as well as providing controls on land use make this analysis unique in the literature, as most non-work travel studies use residential-based data. The results suggest on their own a move away from non-motorized travel to be considered as equivalent or assessed as one item in research and in practice.

**Subject Areas:** Travel behavior; multiple regression models

**Availability:** Muhs, Christopher Devlin. Understanding Travel Modes to Non-work Destinations: Analysis of an Establishment Survey in Portland, Oregon. Diss. Portland State University, 2013. [http://www.its.pdx.edu/upload\\_docs/1371228077.pdf](http://www.its.pdx.edu/upload_docs/1371228077.pdf)



## **The declining role of the automobile and the re-emergence of place in urban transportation: The past will be prologue** *Marlon G. Boarnet*

**Abstract:** The dominant view among transportation scholars is that transportation history flows from older to newer travel modes, with each mode being superior to and, for the most part, displacing the earlier modes. America, an early adopter of widespread automobility, was in this view a harbinger of trends that would follow elsewhere, and hence the US experience of passenger travel based almost completely on car travel was a signal of things to come. Yet this paper argues that interpreting from the US experience with the interstate highway era misses key points. The interstate system, and the planning that surrounded it, was developed during a brief period of time when transportation policy was centralized, standardized, and largely divorced from questions of local impacts and place-based political pressures. That made the years immediately after the 1956 Interstate Highway Act unusual in the broader context of transportation planning. The US has recently witnessed a return of pre-interstate urban transportation planning realities, and transportation in large US cities is now multi-modal, contextualized by ties to land use and neighborhoods, and fraught with the politics and incrementalism of the pre-interstate era. Regional science research, grounded in the era of national highway construction, can adapt to the realities of modern urban transportation planning by focusing more on collaboration and financing in ill-defined institutional settings, environmental externalities and non-market impacts, and retrospective project evaluation.

**Subject Areas:** Transportation planning; automobile; transit; walking

**Availability:** Boarnet, Marlon G. "The declining role of the automobile and the re - emergence of place in urban transportation: The past will be prologue." *Regional Science Policy & Practice* (2013). <http://trid.trb.org/view.aspx?id=1241542>

## **Using National Household Travel Survey Data for Assessment of Transportation System Vulnerabilities** *Kim, Karl; Pant, Pradip; Yamashita, Eric Yukio*

**Abstract:** This paper describes how the National Household Travel Survey (NHTS) data can be used within the framework of FEMA's recently promulgated THIRA (Threat Hazard Identification Risk Assessment) approach to assess transportation system vulnerability. Following this five step process for identifying and assessing risks and associated impacts, the purpose of this paper is three-fold. First, the intent of the paper is to find common ground between the Department of Homeland Security, Federal Emergency Management Agency, and the Department of Transportation systems, approaches, and methods of risk assessment. Second, the paper looks specifically at transportation vulnerabilities. Vulnerability has been traditionally associated with the loss of the transportation infrastructure assets or the loss of efficacy of the transportation system. This approach is expanded and improved by shifting the focus of transportation system infrastructure to the travel patterns and attributes of the individuals. Third, using data from Honolulu, the largest county in Hawaii, the vulnerability of transportation assets is evaluated. The findings are useful not just for Hawaii, but the methodological contributions are relevant to broader concerns regarding risk, risk assessment, threat and hazard reduction. The paper first describes how the proposed approach of transportation system vulnerability assessment fits within the THIRA process. A transportation system vulnerability assessment method is then developed and demonstrated using data from the 2001 NHTS Oahu add-on survey and probable coastal inundation scenario caused by hurricane storm surge, inland flooding and sea level rise. A GIS-based approach was used for simulation of travel routes and to assess the transportation system vulnerabilities for individuals and households. In addition to demonstrating the importance and value of NHTS data, recommendations for improving the quality, availability, and usefulness of this important data source for the reduction of risks are provided

**Subject Areas:** Methodology; Risk Assessment; Travel Behavior

**Availability:** Kim, Karl, Pradip Pant, and Eric Yukio Yamashita. "Using National Household Travel Survey Data for Assessment of Transportation System Vulnerabilities." Transportation Research Board 92nd Annual Meeting. No. 13-2527. 2013. <http://trid.trb.org/view.aspx?id=1241542>

## **Causality between the Built Environment and Travel Behavior: A Structural Equations Model Applied to Southern California** *Wang, Ke*

**Abstract:** The goal of this study is to explore the causality between the built environment and three transportation modes (private vehicles, mass transit, and non-motorized modes such as bicycling and walking) while accounting for socio-demographical characteristics to understand what factors may foster transit and non-motor use. Data from the National Household Transportation Survey 2009 (NHTS 2009) combined with Los Angeles County land use data were used to estimate a recursive Structural Equations Model, to examine the causality direction and to quantify the built environment effect and residential self-selection effect. Results suggest that urban planning strategies that promote high population and employment density, land use mix, high 4-way intersection density and road density as well as good transit service can either significantly encourage transit use, bicycling and walk or reduce vehicle miles of travel (VMT). However, the relatively small effect size of the built environment on travel behavior implies that achieving the above planning goals may cause considerable residential relocation, which contributes the major part of observed travel behavior changes.

**Subject Areas:** Automobile ownership; City planning; Land use planning; Nonmotorized transportation; Population density; Public transit; Residential location; Structural equation modeling; Travel behavior; Travel surveys; Urban design

**Availability:** Kim, Karl, Pradip Pant, and Eric Yukio Yamashita. "Using National Household Travel Survey Data for Assessment of Transportation System Vulnerabilities." Transportation Research Board 92nd Annual Meeting. No. 13-2527. 2013.<http://trid.trb.org/view.aspx?id=1242183>

## **How do built-environment factors affect travel behavior? A spatial analysis at different geographic scales** *Jinhyun Hong, Qing Shen, Lei Zhang*

**Abstract:** Much of the literature shows that a compact city with well-mixed land use tends to produce lower vehicle miles traveled (VMT), and consequently lower energy consumption and less emissions. However, a significant portion of the literature indicates that the built environment only generates some minor—if any—influence on travel behavior. Through the literature review, we identify four major methodological problems that may have resulted in these conflicting conclusions: self-selection, spatial autocorrelation, inter-trip dependency, and geographic scale. Various approaches have been developed to resolve each of these issues separately, but few efforts have been made to reexamine the built environment-travel behavior relationship by considering these methodological issues simultaneously. The objective of this paper is twofold: (1) to better understand the existing methodological gaps, and (2) to reexamine the effects of built-environment factors on transportation by employing a framework that incorporates recently developed methodological approaches. Using the Seattle metropolitan region as our study area, the 2006 Household Activity Survey and the 2005 parcel and building data are used in our analysis. The research employs Bayesian hierarchical models with built-environment factors measured at different geographic scales. Spatial random effects based on a conditional autoregressive specification are incorporated in the hierarchical model framework to account for spatial contiguity among Traffic Analysis Zones. Our findings indicate that land use factors have highly significant effects on VMT even after controlling for travel attitude and spatial autocorrelation. In addition, our analyses suggest that some of these effects may translate into different empirical results depending on geographic scales and tour types.

**Subject Areas:** mixed land use; VMT

**Availability:** Hong, Jinhyun, Qing Shen, and Lei Zhang. "How do built-environment factors affect travel behavior? A spatial analysis at different geographic scales." *Transportation* (2013): 1-22. <http://link.springer.com/article/10.1007/s11116-013-9462-9#>

## **Integrated Analysis of Workers' Physically Active Activity and Active Travel Choice Behavior** *Sener, Ipek Nese, and Phillip R. Reeder*

**Abstract:** Employing 2009 National Household Travel Survey (NHTS) Texas add-on sample data, this study examines individual's active choice decisions with a specific market focus on adult workers. This is achieved by examining worker's two choice behaviors: active activity and active travel. The first choice behavior is developed as an ordered-response model based on the number of physically active recreational activities pursued during the workday. The second model is developed as a binary-response model that examines worker's active travel choices; whether or not the worker used any active mode of travel during the same workday. The current study contributes to the field by improving our understanding and knowledge of factors influencing worker's physically active activity-travel behavior. The study provides several insights regarding the role (and constraints) of employment in individual's active choices while demonstrating that transportation and public health policy makers can mutually benefit from encouraging workers to be physically active (from an activity and/or travel perspective). Using a flexible and robust copula modeling methodology, the authors explore the 'true' correlation (or dependence) between the two behavior choices that might occur due to the presence of unobserved factors, in addition to the examination of various observed factors, suggesting a simultaneous low or simultaneously high propensity toward being physically active across workers. Overall, the study unifies and reveals the integrated nature of the public health and transportation fields thereby providing a distinct view of active/inactive choice behavior.

**Subject Areas:** Pedestrians and Bicyclists; Planning and Forecasting; Society; Commuters; Employed; Mode choice; Nonmotorized transportation; Parametric analysis; Public health; Travel behavior; Traffic and Transport Planning

**Availability:** Sener, Ipek Nese, and Phillip R. Reeder. "Integrated Analysis of Workers' Physically Active Activity and Active Travel Choice Behavior." Transportation Research Board 92nd Annual Meeting. No. 13-2213. 2013. <http://trid.trb.org/view.aspx?id=1241388>

## **Does flexitime affect choice of departure time for morning home-based commuting trips? Evidence from two regions in California** *Sylvia Y. He*

**Abstract:** Over the past twenty-five years, more workers in the United States have been given the option of flexible work schedules, which are designed to redistribute commuter traffic over the course of a day by allowing employees to vary their arrival and/or departure times. This paper examines whether and to what degree access to flexible work schedules affects the departure times of commuters in the two largest and most congested areas of California: the Los Angeles and San Francisco regions. Trip data were obtained from the 2009 US National Household Travel Survey (NHTS). The results of this study show that people who have access to flexitime preferred later departure times rather than earlier times. Workers with flexible schedules were 3.30% less likely to depart before peak hours, 4.11% less likely during peak hours, and 7.41% more likely afterwards. Based on these findings, government agencies and private firms in regions with severe traffic congestion problems may consider adopting alternative work schedules.

**Subject Areas:** flexitime; congestion mitigation

**Availability:** He, Sylvia Y. "Does flexitime affect choice of departure time for morning home-based commuting trips? Evidence from two regions in California." *Transport Policy* 25 (2013): 210-221.

[http://scholar.google.com/scholar?q=Does+flexitime+affect+choice+of+departure+time+for+morning+home-based+commuting+trips%3F+Evidence+from+two+regions+in+California&hl=en&as\\_sdt=0%2C9#](http://scholar.google.com/scholar?q=Does+flexitime+affect+choice+of+departure+time+for+morning+home-based+commuting+trips%3F+Evidence+from+two+regions+in+California&hl=en&as_sdt=0%2C9#)

## **Telecommuting, Household Commute and Location Choice** *Pengyu Zhu*

**Abstract:** Previous empirical studies have made contributions to the understanding of the impact of telecommuting on individual travel patterns. There has been much less research that has examined the impact of telecommuting on commute travel at the household level. Using data from the 2001 and 2009 US National Household Travel Surveys, this study focuses on one-worker and two-worker households and investigates how telecommuting affects household one-way commute distance and duration. The results show that telecommuting increases the commute distance and duration for both one-worker households and two-worker households. It is also found that, in two-worker households, the telecommuting status of one worker does not increase the commute distance and duration of the other worker. These findings suggest that telecommuting (two-worker) households tend to choose locations involving a longer total one-way commute than non-telecommuting households, and this difference is largely due to the longer commute of their telecommuting members.

**Subject Areas:** telecommuting; commute distance

**Availability:** Zhu, Pengyu. "Telecommuting, Household Commute and Location Choice." *Urban Studies*, Boise State University (2013).

<http://usj.sagepub.com/content/early/2013/03/07/0042098012474520.abstract>

## **Morning And Afternoon Peak-Hour Vehicle Trip Generation At Mid-Rise, Transit-Oriented Apartments Near Bay Area Rapid Transit (Bart) Stations** *Gurpreet Singh Dhaliwal*

**Abstract:** The impact of Bay Area Rapid Transit (BART) proximity on morning and afternoon peak-hour vehicle trips generated by Transit-Oriented Apartments (TOAs) was observed. BART is one of the busiest rail transit system in the U.S. located in the. It connects San Francisco and the Peninsula region to the East Bay of the San Francisco Bay Area. Ten TOAs, both in the East Bay and Peninsula region, were selected near ten BART stations. The morning and afternoon peak-hour volumes were observed from 6:00 a.m. to 9:30 a.m. and 4:00 p.m. to 7:30 p.m., and then compared with the peak-hour trips estimated by the Trip Generation Manual (8th Edition) published by the Institute of Transportation Engineers (ITE). The analysis and comparison of observed trip generation data with ITE estimates suggests that fewer peak-hour vehicle trips were generated both in the morning and afternoon, however the impact varied from site to site. Most TOAs showed a reduction in the morning and afternoon peak-hour volumes. In the morning, about 19% fewer vehicle trips were produced; whereas in the afternoon, about 50% fewer vehicle trips were produced. It is hypothesized that this reduction in peak-hour trips can be attributed, in part, to the TOA's proximity to BART.

**Subject Areas:** BART; TOA; TOD ; vehicle trips

**Availability:** Dhaliwal, Gurpreet Singh. Morning and afternoon peak-hour vehicle trip generation at mid-rise, transit-oriented apartments near Bay Area Rapid Transit (BART) stations. Diss. California State University, 2012. [http://csus-dspace.calstate.edu/xmlui/bitstream/handle/10211.9/1955/Dhaliwal\\_Gurpreet\\_CE500\\_Project\\_Report.pdf?sequence=2](http://csus-dspace.calstate.edu/xmlui/bitstream/handle/10211.9/1955/Dhaliwal_Gurpreet_CE500_Project_Report.pdf?sequence=2)



## **Mobility Crowdsourcing: Toward Zero-Effort Carpooling on Individual Smartphone** *Nianbo Liu, Yong Feng, Feng Wang, Bang Liu, and Jinchuan Tang*

**Abstract:** In current carpooling systems, drivers and passengers offer and search for their trips through available mediums, for example, accessing carpool website by smartphone, for finding a possible match of the journey. While efforts have been made to achieve fast matching for known trips, the need for accurate mobile tracking for individual users still remains a bottleneck. For example, drivers feel impatient to input their routes before driving, or centralized systems has difficulties to track a large number of vehicles in real time. In this paper, we present the idea of Mobility Crowdsourcing (MobiCrowd), which leverages private smartphone to collect individual trips for carpooling, without any explicit effort on the part of users. Our scheme generates daily trips and mobility models for each user, and then makes carpooling zero-effort by enabling travel data to be crowdsourced instead of tracking vehicles or asking users to input their trips. With prior mobility knowledge, one user's travel routes and positions for carpooling can be predicted according to the location of the time and other mobility context. Based on a realistic travel survey and simulation, we prove that our scheme can provide efficient and accurate position estimation for individual carpools.

**Subject Areas:** smartphone; carpool

**Availability:** Tang, Jinchuan. "Mobility Crowdsourcing: Toward Zero-Effort Carpooling on Individual Smartphone." *International Journal of Distributed Sensor Networks* 2013 (2013). <http://www.hindawi.com/journals/ijdsn/aip/615282/>

**PASS: Parking-Lot-Assisted Carpool over Vehicular Ad Hoc Networks** *Zhu, Jinqi, Yong Feng, and Bang Liu*

**Abstract:** Information interaction is a crucial part of modern transportation activities. In this paper, we propose the idea of PASS: a parking-lot-assisted carpool method over vehicular ad hoc networks (VANETs). PASS aims at optimizing transport utilization by the carpooling among car drivers who cover a part of the same traveling route. With wireless device enabled in the vehicle, a user can easily get matched vehicles information and then express his travel demands via radio queries over VANETs to the corresponding driver. The driver can decide whether to provide carpooling services or not. We investigate the main challenges in PASS design, via the parking lot to collect vehicle trajectories, via accelerator sensor to sense vehicle's movement, establish a routing tree to delivery vehicle trajectory information to nearby parking lots, and design a suitable matching scheme to match the target vehicle in VANETs. Finally, simulation results prove that PASS is effective and efficient in carpooling among vehicle drivers.

**Subject Areas:** smartphone; carpool

**Availability:** Zhu, Jinqi, Yong Feng, and Bang Liu. "PASS: Parking-Lot-Assisted Carpool over Vehicular Ad Hoc Networks." *International Journal of Distributed Sensor Networks* 2013 (2013). <http://www.hindawi.com/journals/ijdsn/2013/491756/abs/>

## **Public Health App** *Meakins, Gail, and Reid Ewing*

**Abstract:** The Public Health App can be used to estimate levels of physical activity, specifically active Travel, within differing physical environments. Active travel is defined as physical activity resulting from purposeful travel. Trips for work, errands, and school are examples. Because physical inactivity is associated with many health risks including obesity and the incidence of chronic diseases such as diabetes and high blood pressure, physical activity is an important predictor of health. Environments that support and encourage active travel have the potential to improve health status. To estimate measures of physical activity, average time per trip by mode is calculated using the 2009 Nationwide Household Travel Survey (NHTS). The NHTS is administered by the Federal Highway Administration and serves as the nation's inventory of daily travel. Travel times for walking and biking are included, as is walk time to and from public transportation. These estimates for physical activity are then converted to the Metabolic Equivalent of Task (MET), a physiological measure of the energy cost of physical activity, using The Compendium of Physical Activity (Haskell, 2011).

**Subject Areas:** public health; app

**Availability:** Meakins, Gail, and Reid Ewing. "Public Health App."

[http://www.envisiontomorrow.org/storage/research\\_docs/PublicHealthapp\\_April\\_2013.pdf](http://www.envisiontomorrow.org/storage/research_docs/PublicHealthapp_April_2013.pdf)

## **Health and Travel." Handbook of Sustainable Travel** *Handy, Susan*

**Abstract:** Awareness of the many different connections between health and travel is growing. While safety has long been the pre-eminent health concern in the transportation field, the health impacts of harmful pollutants became a public concern starting in the 1950s, and concerns over a decline in active forms of travel rose to prominence in the last decade. Efforts to address these concerns recognize that driving has negative impacts on health, while the alternatives can have positive impacts. Travel choices are thus central to all three health concerns. Strategies that aim to improve the healthiness of travel by changing these choices fall into three general categories: reducing the harms of driving, reducing the amount of driving, and increasing the use of active travel modes. Many of these strategies are synergistic in that they help to address all three health concerns simultaneously and are more effective when employed together. Given the substantial connections between health and daily household travel, it is important that health impacts be considered in the formation of transport policy. The movement towards "sustainable transport planning" offers an unprecedented opportunity to bring health considerations into the mainstream by recognizing health as a critical component of sustainability.

**Subject Areas:** public health; sustainability

**Availability:** Handy, Susan. "Health and Travel." Handbook of Sustainable Travel. Springer Netherlands, 2014. 199-214. [http://link.springer.com/chapter/10.1007/978-94-007-7034-8\\_13#](http://link.springer.com/chapter/10.1007/978-94-007-7034-8_13#)

# 11. TREND ANALYSIS AND MARKET SEGMENTATION

## **Unfalsified uncertainty modeling for computing tight bounds on peak spacing errors in vehicle platoons** *Rodonyi, G.; Gaspar, P.; & Bokor, J.*

**Abstract:** A joint uncertainty modeling and robust performance analysis method is proposed for describing brake/driveline actuator uncertainties in heavy vehicles and calculating tight upper bounds on peak spacing errors due to these uncertainties in autonomous vehicle platoons. Evaluation of robust performance of the platoon in terms of peak-to-peak norm is imperative in determining minimal safety gaps. The method can be characterized as a constrained nonlinear optimization problem that can be efficiently solved by pattern search algorithms. Actuator uncertainties are modeled by filtered  $\ell^\infty$  disturbances. The set of consistent filters are determined from experimental data based on unfalsification. From this set of filters the one is selected that provides the smallest upper bounds on peak spacing errors. Calculations based on experimental data are presented.

**Subject Areas:** Acceleration; Actuators; Computational modeling; Data models; Gears; Uncertainty; Vehicles

**Availability:** Rodonyi, Gabor, Peter Gaspar, and Jozsef Bokor. "Unfalsified uncertainty modeling for computing tight bounds on peak spacing errors in vehicle platoons." American Control Conference (ACC), 2013. IEEE, 2013.

[http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6580300&url=http%3A%2F%2Fieeexplore.ieee.org%2Fexpls%2Fabs\\_all.jsp%3Farnumber%3D6580300](http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6580300&url=http%3A%2F%2Fieeexplore.ieee.org%2Fexpls%2Fabs_all.jsp%3Farnumber%3D6580300)

**A New Way to Go - The Transportation Apps and Vehicle-Sharing Tools that Are Giving More Americans the Freedom to Drive Less** *Tony Dutzik and Travis Madsen; Phineas Baxandall, Ph.D.*

**Abstract:** Most Americans want to drive less. For some, it's a matter of economics. Transportation is the second-largest household expenditure, after only housing, and ahead of food, clothing, education and health care. Owning, maintaining and fueling a car is a significant drain on household budgets, especially when times are tight. For others, the desire to drive less stems from fatigue with the daily grind of commuting. Commuting by car is a stressful experience. Traffic congestion and unpleasant commutes are among the major reasons that an increasing number of Americans find driving to be a chore. At the same time, Americans are increasingly coming to recognize that time behind the wheel cannot also be spent staying connected with others via cell phones or the Internet—at least not safely. For still others, driving less is a way to improve their health, or the health of the planet. Bicycling and walking are increasingly seen as important ways to stay active and healthy. Meanwhile, more than 40 percent of American drivers age 18 to 34—and more than 35 percent of all other age groups—report that their concern for the environment leads them to drive less. Cutting back on driving isn't easy, though, especially given the transportation and land-use decisions local, state and federal governments have made since World War II. For decades, American communities have been built on the self-fulfilling assumption that people will drive wherever they need to go, leaving many of us dependent on cars for even the most basic daily tasks. Carpooling, public transportation, bicycling and walking are important and viable options for millions of Americans, but nine out of 10 American households feel the need to own at least one car. The rapid advance of the Internet, mobile communications technologies and social networking—and the technology enabled transportation services they are spawning—has the potential to expand the share of American households with the freedom to live without a car, or to live with fewer cars than they own today. These new tools give Americans a broader array of convenient, flexible transportation choices—enabling them to drive when and where they need to, share rides where they can, and take full advantage of the particular benefits of public transportation, bicycling and walking. Many of these new services are still in their infancy, while others are well on their way to becoming important fixtures of the nation's transportation system. Local, state and federal officials should take immediate steps to facilitate the growth of these services, while integrating emerging transportation technologies and tools into our planning and decision-making for the future.

**Subject Areas:** smartphone app; VMT; ride sharing; bikeshare;

**Availability:** SHARE, CAR. "A New Way to Go." (2013).

<http://frontiergroup.org/sites/default/files/reports/A%20New%20Way%20to%20Go%20vUS.pdf>

## **Studying the PEV Market in California: Comparing the PEV, PHEV and Hybrid Markets** *Gil Tal; Michael A. Nicholas*

**Abstract:** Who is buying electric vehicles? Who is buying new cars in general? Is the first group a subset of the second? What are the similarities and differences of the two groups? Can we use hybrid buyers to predict the future plug-in electric vehicle (PEV) market? This study explores the characteristics of new car buyer households who purchased a new vehicle in California during 2011-2012 comparing three main populations: internal combustion engine (ICE) buyers, hybrid buyers and PEV buyers. We show that PEV households have different socio-demographic characteristics than ICE buyers with, for example, higher income, higher education, and more new cars while hybrid owners are a middle group with characteristics that fall between those of ICE and PEV owners. We also found differences among PEV buyers. Pure battery electric vehicle (BEV) and plug-in hybrid electric (PHEV) households have similar sociodemographic characteristics but they are differentiated by driving characteristics and home location. The PEV market today is based on small number of buyers and small number of potential new car buyers. Targeting the potential car buyers can more rapidly increase the market, create a used market and will open PEV options to larger segments of the population.

**Subject Areas:** PEV ownership, California, New car buyers, market analysis

**Availability:** Tal, Gil, and Michael A. Nicholas. "Studying the PEV Market in California: Comparing the PEV, PHEV and Hybrid Markets."

[http://pevcollaborative.org/sites/all/themes/pev/files/EVS27\\_Gil%20Tal%20Mike\\_11\\_14\\_final.pdf](http://pevcollaborative.org/sites/all/themes/pev/files/EVS27_Gil%20Tal%20Mike_11_14_final.pdf)

**Projections of Household Vehicle Consumption in the United States** *Yi Zeng, Kenneth C. Land, Danan Gu, Zhenglian Wang*

**Abstract:** Forecasts of household vehicle consumption are important for automobile market analyses and related socioeconomic planning. This chapter employs the ProFamy extended cohort-component method to project household vehicle consumption from 2000 to 2025 across four regions of the United States (the Northeast, Midwest, South, and West). The results show that the total number of household vehicles (The term “household vehicles” refers to vehicles for household use in this book) in 2025 will reach 235 million, representing a 31 % increase over 25 years. About a half of the increase is due to the consumption of cars, while the household consumption of vans will increase at a faster rate than that of cars and trucks. Household vehicle consumption will grow more in white non-Hispanic and Hispanic households in comparison with black non-Hispanic and Asian and other non-Hispanic households. Owners of household vehicles in the United States will be aging quickly. Among households of different sizes, the largest increase in household vehicles will come from two-person households. Across the four regions, the largest increase in household vehicle consumption will be in the South, followed by the West, Midwest, and Northeast.

**Subject Areas:** vehicle ownership/consumption;

**Availability:** Zeng, Yi, et al. "Projections of Household Vehicle Consumption in the United States." Household and Living Arrangement Projections. Springer Netherlands, 2014. 189-207. [http://link.springer.com/chapter/10.1007/978-90-481-8906-9\\_11](http://link.springer.com/chapter/10.1007/978-90-481-8906-9_11)



**Driverless vehicles: liability and new automotive technologies** *Sarah Croft and John Reynolds*

**Abstract:** The Advance of GPS Mapping, Radar and wireless systems are making the ‘driverless car’ a possibility, sooner than many may have anticipated. The widely reported trials of an automated vehicle fleet utilizing Google technology has raised the profile of automated vehicles significantly. Following these successful trials, the US states of Nevada, California and Florida have all passed laws permitting automated cars to drive on their roads. Sarah Croft and John Reynolds, of Shook Hardy & Bacon International, assess the evolution of driverless or partially autonomous vehicle technology and consider the product liability issues arising for automotive manufacturers in the UK.

**Subject Areas:** driverless car; GPS Mapping; automated vehicles;

**Availability:** SARAH, BY, and BY JOHN. "Driverless vehicles: liability and new automotive technologies." <http://www.shb.com/attorneys/ReynoldsJohn/DriverlessVehicles.pdf>

## **Beyond sharing: cultivating cooperative transportation systems through geographic information science** *Harvey J. Miller*

**Abstract:** Transportation systems are facing unprecedented challenges in the 21st century. Increasing the efficiency of transportation systems alone will not solve these problems and may exacerbate them. Instead, we must extract new transportation capabilities related to more cooperative decision-making across a wide range of time horizons, spatial scales and decision contexts. This paper discusses the role of sensed transportation, geographic information science and social media to cultivate transportation systems where participants share, cooperate and act collectively to solve operational, tactical and strategic mobility and accessibility problems. This paper also provides a vision of the future by imaging a seamless multimodal transportation system combined with a virtual environment where data streams are fused, interpreted and made available with tools for human engagement and shared decision making. This paper concludes by outlining a GIScience-centric research agenda.

**Subject Areas:** Transportation; Cooperation; Game theory; Big Data

**Availability:** Miller, Harvey J. "Beyond sharing: cultivating cooperative transportation systems through geographic information science." *Journal of Transport Geography* (2013).  
<http://www.sciencedirect.com/science/article/pii/S0966692313000719>

**Transportation in Transition A Look at Changing Travel Patterns in America's Biggest Cities** *Benjamin Davis, Frontier Group; Phineas Baxandall, U.S. PIRG Education Fund*

**Abstract:** Americans' transportation habits have changed. The average American drives 7.6 percent fewer miles today than when per-capita driving peaked in 2004. A review of data from the Federal Highway Administration, Federal Transit Administration and Census Bureau for America's 100 most populous urbanized areas – which are home to over half of the nation's population – shows that the decline in per-capita driving has taken place in a wide variety of regions. From 2006 to 2011, the average number of miles driven per resident fell in almost three-quarters of America's largest urbanized areas for which up-to-date and accurate data are available. Most urbanized areas have also seen increases in public transit use and bicycle commuting and decreases in the share of households owning a car.

**Subject Areas:** transportation habits; urban areas

**Availability:** Baxandall, Phineas, and US PIRG Education Fund. "TRANSPORTATION IN TRANSITION." (2013). [http://www.uspirg.org/sites/pirg/files/reports/US\\_Transp\\_trans\\_scrn.pdf](http://www.uspirg.org/sites/pirg/files/reports/US_Transp_trans_scrn.pdf)

## **Context-Aware Driver Behavior Detection System in Intelligent Transportation Systems** *Al-Sultan, S.; Al-Bayatti, A.H. ; Zedan, H.*

**Abstract:** Vehicular ad hoc networks (VANETs) have emerged as an application of mobile ad hoc networks (MANETs), which use dedicated short-range communication (DSRC) to allow vehicles in close proximity to communicate with each other or to communicate with roadside equipment. Applying wireless access technology in vehicular environments has led to the improvement of road safety and a reduction in the number of fatalities caused by road accidents through development of road safety applications and facilitation of information sharing between moving vehicles regarding the road. This paper focuses on developing a novel and nonintrusive driver behavior detection system using a context-aware system in VANETs to detect abnormal behaviors exhibited by drivers and to warn other vehicles on the road to prevent accidents from happening. A five-layer context-aware architecture is proposed, which is able to collect contextual information about the driving environment, to perform reasoning about certain and uncertain contextual information, and to react upon that information. A probabilistic model based on dynamic Bayesian networks (DBNs) in real time, inferring four types of driving behavior (normal, drunk, reckless, and fatigue) by combining contextual information about the driver, the vehicle, and the environment, is presented. The dynamic behavior model can capture the static and the temporal aspects related to the behavior of the driver, thus leading to robust and accurate behavior detection. The evaluation of behavior detection using synthetic data proves the validity of our model and the importance of including contextual information about the driver, the vehicle, and the environment.

**Subject Areas:** probability; road safety; transportation; vehicular ad hoc networks

**Availability:** Al-Sultan, Saif, A. Al-Bayatti, and Hussien Zedan. "Context Aware Driver Behaviour Detection System in Intelligent Transportation Systems (ITS)." (2013): 1-1.  
<http://www.sciencedirect.com/science/article/pii/S108480451300074X>

**Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations for Capitalizing on Self-Driven Vehicles** *Reid Ewing; Michael J. Greenwald; Ming Zhang; Meghan Bogaerts; William Greene*

**Abstract:** Autonomous vehicles (AVs) represent a potentially disruptive and beneficial change to the way in which we travel. This new technology has the potential to impact personal travel across a wide array of impacts including safety, congestion, and travel behavior. All told, major social AV impacts in the form of crash savings, travel time reduction, fuel efficiency and parking benefits are likely on the order of \$2,000 per year per AV, or \$3,000 eventually increasing to nearly \$5,000 when comprehensive crash costs are accounted for. Yet barriers to implementation and mass-market penetration remain. Initial costs will likely be unaffordable and licensing and testing standards in the U.S. are being developed at the state level, rather than adopting a national framework, which may lead to inconsistencies across states. Liability regimes remain undefined, security concerns linger, and absent new privacy standards, a default lack of privacy for personal travel may become the norm. Finally, with the advent of this new technology, many impacts, interactions with other components of the transportation system, and implementation details remain uncertain. To address these concerns, research in these areas should be expanded, and the U.S. and other countries should create nationally recognized licensing structures for AVs, and determine appropriate standards for liability, security, and data privacy.

**Subject Areas:** Vehicle automation, autonomous vehicles, cost-benefit analysis, safety, congestion, market penetration, licensing, liability, privacy, cyber security

**Availability:** Fagnant, Daniel J., and Kara Kockelman. "Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations for Capitalizing on Self-Driven Vehicles." *Transportation Research* 20 (2014).

[http://www.caee.utexas.edu/prof/kockelman/public\\_html/TRB14EnoAVs.pdf](http://www.caee.utexas.edu/prof/kockelman/public_html/TRB14EnoAVs.pdf)

**Predicting Transportation Outcomes for LEED Projects** *Reid Ewing; Michael J. Greenwald; Ming Zhang; Meghan Bogaerts; William Greene*

**Abstract:** The article first estimates models of mode choice and average trip length for 239 diverse mixed-use developments in six diverse regions. It then applies these models to twelve Leadership in Energy and Environmental Design for Neighborhood Development (LEED-ND) pilot projects to predict approximate vehicle miles of travel (VMT) per person trip. Finally, it compares LEED-ND values to regional average values from the National Household Travel Survey. The VMT per person trip, for LEED-ND projects, ranges from 24 to 60 percent of the respective regional averages. The most urban and centrally located projects tended to achieve the highest alternative mode shares and the lowest private vehicle trip lengths.

**Subject Areas:** sustainable development; LEED; mixed-use developments; vehicle miles traveled

**Availability:** Ewing, Reid, et al. "Predicting transportation outcomes for LEED projects." *Journal of Planning Education and Research* (2013).

<http://jpe.sagepub.com/content/early/2013/04/19/0739456X13482978.abstract>

## **A Socio-Technical Analysis of Widespread Electric Vehicle Adoption** *Onanwa Nneka Egbue; Suzanna Long*

**Abstract:** Electric Vehicles (EVs) are promoted as a viable near-term vehicle technology to reduce dependence on fossil fuels and resulting greenhouse gas (GHG) emissions associated with conventional vehicles (CVs). In spite of the benefits of EVs, several obstacles need to be overcome before EVs will be widely adopted. A major barrier is that consumers tend to resist new technologies that are considered alien or unproved, thus, policy decisions that consider their critical concerns will have a higher level of success. This research identifies potential socio-technical barriers to consumer adoption of EVs and determines if sustainability issues influence consumer decision to purchase an EV. This study provides valuable insights into preferences and perceptions of technology enthusiasts; individuals highly connected to technology development and better equipped to sort out the many differences between EVs and CVs. This group of individuals will likely be early adopters of EVs only if they perceive them to be superior in performance compared to CVs. These results can guide policymakers in crafting energy and transportation policy. It can also provide guidance to EV engineers' decision in incorporating consumer preference into EV engineering design.

**Subject Areas:** Electric Vehicles, Consumer Attitudes, Socio-Technical Barriers

**Availability:** Egbue, Ona, and Suzanna Long. "Department of Engineering Management and Systems Engineering, Missouri University of Science and Technology 600 W. 14th St. Rolla, MO 65409-0370." A SOCIO-TECHNICAL ANALYSIS OF WIDESPREAD ELECTRIC VEHICLE ADOPTION (2012): 6.

[https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/33046/Egbue\\_2012.pdf?sequence=1#page=17](https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/33046/Egbue_2012.pdf?sequence=1#page=17)

## **Managing a Sustainable Transportation System: Exploring a Community's Attitude, Perception, and Behavior of the Morgantown Public Rapid Transit (PRT)**

*Vishakha Maskey, Michael P. Strager & Claudia Bernasconi*

**Abstract:** Automated transportation is an innovative and sustainable concept that works emission-free with fully-automated and driverless vehicles on a network of specially-built, elevated guide ways. These systems are also called Automated People Mover (APM) or Public Rapid Transit (PRT) and are considered to be a solution to many global and environmental problems related to the use of the automobile. These transportation systems claim to be clean, affordable and safe technology, and a smart urban planning solution to move away from America's dependence on foreign oil, the faltering auto industry, and the misuse of urban landscapes. One of the first APM systems has been operating since the 1970's at West Virginia University in Morgantown, West Virginia. In order to examine community's attitude, perception and individual characteristic that influence the use of the systems, a random intercept survey was conducted. Findings from correlation analysis and an ordered probit model suggest socio-demographic attributes associated with attitudes toward the system. The frequent users are characterized as having a higher level of educational attainment, and are primarily students. Findings explore underlying factors regarding commuting, crucial for transportation policies and practices for managing sustainable transportation systems in comparable urban settings.

**Subject Areas:** automated transportation systems, user preference surveys, ordered probit model

**Availability:** Maskey, Vishakha, Michael Strager, and Claudia Bernasconi. "Managing a Sustainable Transportation System: Exploring a Community's Attitude, Perception, and Behavior of the Morgantown Public Rapid Transit (PRT)." *Journal of Management and Sustainability* 3.2 (2013): p56.

<http://ccsenet.org/journal/index.php/jms/article/viewFile/25205/15693>



**Who Is Buying Electric Cars in California? Exploring Household and Vehicle Fleet Characteristics of New Plug- In Vehicle Owners** *Tal, Gil, Michael A. Nicholas, Justin Woodjack, and Daniel Scrivano*

**Abstract:** For many years researchers have been trying to predict who would purchase electric vehicles such as plug-in hybrids (PHEV) or battery electric vehicles (BEV). This study explores the characteristics of 1,200 households who actually purchased a new plug-in vehicle in California during 2011-2012. These households are not part of a small scale demonstration project or a limited study, rather part of the new developing market for plug-in vehicles. Most of the owners purchased the Nissan LEAF, a BEV, while small portion of the sample purchased a Chevrolet Volt, a PHEV, or a Tesla roadster, also a BEV. We use the 2009 National household Travel Survey to compare the new plug-in car buyer's characteristics to the general population and new car buyers in California. We focus on socio-demographic, vehicle fleet characteristics, regional and location factors, and purchasing motivations factors. The result of this study can be used to improve the modeling process of the potential demand for plug-in vehicles and the derived demand for charging and to help in evaluating the impact of policies to increase the demand for these vehicles.

**Subject Areas:** EV; plug-in, PHEV, electric vehicle

**Availability:** Tal, Gil, et al. "Research Report–UCD-ITS-RR-13-02."

[http://scholar.google.com/scholar\\_url?hl=en&q=http://pubs.its.ucdavis.edu/download\\_pdf.php%3Fid%3D1839&sa=X&scisig=AAGBfm0knTSiCuZGSnlk8OKS-jio4mm5lg&oi=scholaralrt](http://scholar.google.com/scholar_url?hl=en&q=http://pubs.its.ucdavis.edu/download_pdf.php%3Fid%3D1839&sa=X&scisig=AAGBfm0knTSiCuZGSnlk8OKS-jio4mm5lg&oi=scholaralrt)

## **Investigating the Neighborhood Effect on the Hybrid Vehicle Adoption** *Zhu, Xiaoyu; Liu, Chao*

**Abstract:** Transportation contributes a large percent of total U.S. greenhouse gas (GHG) emissions. To reduce petroleum consumption, vehicle air pollution, and noise emissions, hybrid electric vehicle (HEV), offers the new efficiency-improving technologies and has been introduced into the United States market since 1999. However, the current market share and hybrid adoption rate is still low by observing 0.1 percent of registered HEVs in the U.S. in 2010 (BTS, 2011). The sales of HEV are not uniform across space and over time. The authors investigate the spatial diffusion process of the HEVs and analyze how the related factors (including socio-demographic attributes and spatial factors) influence the HEV adoption. Utilizing the 2009 Florida National Household Travel Survey (NHTS) add-on data, they conducted a cluster analysis to display the spatial clusters of the households who purchased the HEVs during the period of 2005-2008 and found that more clusters of HEVs emerged overtime. Geographic patterns also demonstrated the increasing number of clusters featured by households with hybrid vehicles and the surrounding hybrid vehicle adopters. Further, the relationship between the hybrid vehicle adoption and neighborhood effects (NE) and social-demographic factors are analyzed using Binary Logit models with and without weight. Neighborhood effects are confirmed to be significant in both urban and rural models, especially the factors of 1-mile and 5-mile neighborhood coverage. This indicates that potential buyers are more likely to purchase the HEVs when there are more HEVs exposures surrounding, and this measurement of exposure is proved to be reasonable for neighborhood effect. Among the social and demographic attributes, household income is the most significant variable and plays a dominant role in affecting the propensity to buy hybrid vehicles. Other factors, such as vehicle ownership, household structure and education attainment level also significantly affect households' choice of hybrid cars. Vehicle usage is a controversial factor in this study because of the interactive correlation between the type of vehicle owned and corresponding usage.

**Subject Areas:** HEV; Hybrid

**Availability:** Zhu, Xiaoyu, and Chao Liu. "Investigating the Neighborhood Effect on the Hybrid Vehicle Adoption." Transportation Research Board 92nd Annual Meeting. No. 13-2017. 2013. <http://trid.trb.org/view.aspx?id=1241281>

## **Work Trips on Public Transportation: An Analysis of Trends, Select Markets, and Users Using the National Household Travel Survey Series** *Taniguchi, Kyle Ken*

**Abstract:** This document attempts to be a comprehensive resource which can provide current information on the persons and trips being taken on public transit for travel to/from work. This research looks at the 2009 National Household Travel Survey (NHTS) to examine the difference between work and non-work transit trips and riders, choice and captive work trips and riders, and New York City (NYC) and non-NYC work trips and riders. In addition, transit mode share for work trips across an array of socio-demographic factors is examined. As a supplement, historical trend data utilizing past NHTS/Nationwide Personal Transportation Surveys (NPTS), the American Community Survey, and American Public Transportation Association data is used. In the historical trend analysis, it was discovered that the proportion of transit trips being for travel to/from work has declined since 1983. In terms of work transit trips, it was discovered that they tend to be taken on faster modes (such as commuter rail and elevated/subway) resulting in slightly higher in-vehicle speeds than non-work transit trips (11.8 MPH versus 11.2 MPH). The analysis also showed that those commuting via non-transit modes were 20 percent more likely to make a stop on their commute than those that took transit. An analysis of choice and captive riders found that in the 16-24 year old age group, 85 percent of riders were choice riders. This finding could perhaps signify that more young adults are choosing to ride transit.

**Subject Areas:** work trips;

**Availability:** Taniguchi, Kyle Ken. *Work Trips on Public Transportation: An Analysis of Trends, Select Markets, and Users Using the National Household Travel Survey Series*. Diss. University of South Florida, 2012. <http://scholarcommons.usf.edu/etd/4411/>

## **How People Use Their Vehicles: Statistics from the 2009 National Household Travel Survey** *Krumm, John*

**Abstract:** The 2009 U.S. National Household Travel Survey (NHTS) contains detailed data on individual vehicle trips. This paper demonstrates several useful statistics from the NHTS concerning how people use their vehicles, such as how far they drive, where they go, how long they stay, and their sequence of destinations. These statistics, in turn, are potentially useful for vehicle design, vehicle use simulation, navigation algorithms, interpreting GPS data, and the placement of electric vehicle charging stations.

**Subject Areas:** travel behavior; individual vehicle trips

**Availability:** Krumm, John. "How People Use Their Vehicles: Statistics from the 2009 National Household Travel Survey." *Society of Automotive Engineers (SAE) 2012 World Congress*. 2012. <http://131.107.65.14/en-us/um/people/jckrumm/Publications%202012/2012-01-0489%20SAE%20published.pdf>

## **A quantile regression analysis of the rebound effect: Evidence from the 2009 National Household Transportation Survey in the United States** *Su, Qing*

**Abstract:** This paper applies quantile regression method to measure the rebound effect and differentiate it with respect to demand for mobility using the 2009 National Household Transportation Survey (NHTS). The quantile regression results indicate that the rebound effect varies with the distribution of vehicle miles traveled (VMT), ranging between 0.11 and 0.19. Road network density and population density also play an important role in determining travel demand. Regression results indicate that travelers living in areas with higher road network density travel more miles although this positive impact consistently declines along the VMT distribution. Travelers living in areas with population density of at most 3000 persons per square miles travel more miles than those living in higher density areas. The quantile regression results also indicate that the impact of income is positive but declines consistently along the VMT distribution.

**Subject Area:** rebound effect; quantile regression; VMT

**Availability:** Su, Qing. "A quantile regression analysis of the rebound effect: Evidence from the 2009 National Household Transportation Survey in the United States." *Energy Policy* 45 (2012): 368-377. <http://www.sciencedirect.com/science/article/pii/S0301421512001620>