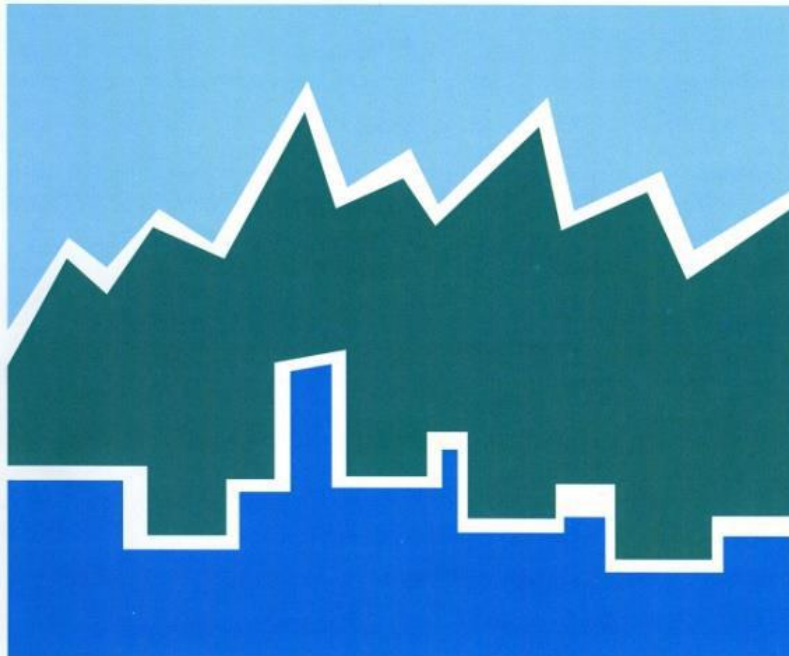


# NHTS



## **NATIONAL HOUSEHOLD TRAVEL SURVEY**

Compendium of Uses

January 2016 – December 2016

## Introduction

This compendium contains various uses and applications of the National Household Travel Survey (NHTS) data used in transportation planning and research from January 2016 to June 2016. 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 95<sup>th</sup> Annual Meeting and can be found in the 2016 TRB Annual Meeting Compendium of Papers.

Please note that this 2016 compendium consists of approximately 375 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 Jasmy Methipara (MacroSys) who also categorized and formatted the paper abstracts.

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## 1. Bike and Pedestrian Studies

**Title:** Bicycle helmet use among persons 5 years and older in the United States, 2012

**Authors:** Jewett, A., Beck, L. F., Taylor, C., & Baldwin, G.

**Abstract:** Introduction: In 2013, injuries to bicyclists accounted for 925 fatalities and 493,884 nonfatal, emergency department-treated injuries in the United States. Bicyclist deaths increased by 19% from 2010 to 2013. The greatest risk of death and disability to bicyclists is head injuries. The objective of this study was to provide estimates of prevalence and associated factors of bicycle riding and helmet use among children and adults in the United States.

Method: CDC analyzed self-reported data from the 2012 Summer ConsumerStyles survey. Adult respondents (18 + years) were asked about bicycle riding and helmet use in the last 30 days for themselves and their children (5 to 17 years). For bicycle riders, CDC estimated the prevalence of helmet use and conducted multivariable regression analyses to identify factors associated with helmet use.

Results: Among adults, 21% rode bicycles within the past 30 days and 29% always wore helmets. Respondents reported that, of the 61% of children who rode bicycles within the past 30 days, 42% always wore helmets. Children were more likely to always wear helmets (90%) when their adult respondents always wore helmets than when their adult respondents did not always wear helmets (38%). Children who lived in states with a child bicycle helmet law were more likely to always wear helmets (47%) than those in states without a law (39%).

Conclusions: Despite the fact that bicycle helmets are highly effective at reducing the risk for head injuries, including severe brain injuries and death, less than half of children and adults always wore bicycle helmets while riding.

Practical application: States and communities should consider interventions that improve the safety of riding such as policies to promote helmet use, modeling of helmet wearing by adults, and focusing on high risk groups, including Hispanic cyclists, occasional riders, adults, and children ages 10 to 14.

**Subject Areas:** Bicycle; Helmet; Children; Adults

**Availability:** Jewett, A., Beck, L. F., Taylor, C., & Baldwin, G. (2016). Bicycle helmet use among persons 5 years and older in the United States, 2012. *Journal of Safety Research*, 59, 1-7. <http://www.sciencedirect.com/science/article/pii/S002243751630278X>

**Title: Velosurance Addresses Women's Safety Concerns to Help Them Get Back on Their Bicycles**

**Authors:** Velosurance

**Abstract:** It's not uncommon to see elementary and middle school girls riding bikes, but by high school most put the bikes away. There was a time when oppression against women ran rampant and bicycles offered a sense of power and independence. In 1986, Susan B. Anthony told New York World's Nellie Bly that bicycling has "done more to emancipate women than anything else in the world." Toward the end of the 20th century, there was a significant drop in the number of teenage girls riding bikes. The National Children's Bureau published research that concluded that on average boys cycle 138 miles a year, whereas girls cycled 24. There were two common factors in bicycle abandonment: fashion or fear.

**Subject Areas:** bicycle abandonment; female

**Availability:** Velosurance. PR Newswire a CISION company *Velosurance Addresses Women's Safety Concerns to Help Them Get Back on Their Bicycles* May 31, 2016

<http://www.prnewswire.com/news-releases/velosurance-addresses-womens-safety-concerns-to-help-them-get-back-on-their-bicycles-300276468.html>

**Title:** Cycling Is Getting a Lot Safer in American Cities Adding a Lot of Bike Lanes

**Authors:** Angie Schmitt

**Abstract:** blog

**Subject Areas:** bike, crash, safety, bike lanes

**Availability:** Schmitt, Angie. *Cycling is Getting a Lot Safer in American Cities Adding a Lot of Bike Lanes* November 16, 2016 StreetsBlog USA <http://usa.streetsblog.org/2016/11/16/cycling-is-getting-a-lot-safer-in-american-cities-adding-a-lot-of-bike-lanes/>

**Title:** Quantifying bicycle network connectivity

**Authors:** Lowry, Michael, and Tracy Hadden Loh

**Abstract:** The intent of this study was to compare bicycle network connectivity for different types of bicyclists and different neighborhoods. Connectivity was defined as the ability to reach important destinations, such as grocery stores, banks, and elementary schools, via pathways or roads with low vehicle volumes and low speed limits. The analysis was conducted for 28 neighborhoods in Seattle, Washington under existing conditions and for a proposed bicycle master plan, which when complete will provide over 700 new bicycle facilities, including protected bike lanes, neighborhood greenways, and multi-use trails. The results showed different levels of connectivity across neighborhoods and for different types of bicyclists. Certain projects were shown to improve connectivity differently for confident and non-confident bicyclists. The analysis showed a positive correlation between connectivity and observed utilitarian bicycle trips. To improve connectivity for the majority of bicyclists, planners and policy-makers should provide bicycle facilities that allow immediate, low-stress access to the street network, such as neighborhood greenways. The analysis also suggests that policies and programs that build confidence for bicycling could greatly increase connectivity.

**Subject Areas:** Built environment; Accessibility; Active transportation; Infrastructure; Neighborhood; Bicycling

**Availability:** Lowry, Michael, and Tracy Hadden Loh. "Quantifying bicycle network connectivity." Preventive Medicine (2016).

<http://www.sciencedirect.com/science/article/pii/S0091743516304029>



**Title:** The Cycling Gender Gap: What Can We Learn From Girls?

**Authors:** Jennifer Dill

**Abstract:** presentation

**Subject Areas:** bike, girls

**Availability:** Dill, Jennifer, "The Cycling Gender Gap: What Can We Learn From Girls?" (2016). TREC Friday Seminar Series. Book 25. [http://pdxscholar.library.pdx.edu/trec\\_seminar/25](http://pdxscholar.library.pdx.edu/trec_seminar/25)

**Title: Rerouting Mode Choice Models: How Including Realistic Route Options Can Help Us Understand Decisions to Walk or Bike**

**Authors:** Joseph Paul Broach

**Abstract:** presentation

**Subject Areas:** bike, walk, commute, route

**Availability:** Joseph Broach, PhD, Research Associate; Urban Studies and Planning-Transportation Research and Education Center (TREC). Portland State University. Friday Transportation Seminar - April 1, 2016 Presentation;  
[http://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1036&context=trec\\_seminar](http://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1036&context=trec_seminar)

**Title:** Webinar: State-Wide Pedestrian and Bicycle Miles Traveled: Can We Estimate It?

**Authors:** Krista Nordback

**Abstract:** presentation

**Subject Areas:** bike, walk, estimation

**Availability:** Nordback, Krista, "Webinar: State-Wide Pedestrian and Bicycle Miles Traveled: Can We Estimate It?" (2016). TREC Webinar Series. 15.

[http://pdxscholar.library.pdx.edu/trec\\_webinar/15](http://pdxscholar.library.pdx.edu/trec_webinar/15)[http://pdxscholar.library.pdx.edu/trec\\_webinar](http://pdxscholar.library.pdx.edu/trec_webinar)

## **Title: An Interim Synthetic Approach For Estimating Pedestrian Volumes In Smaller Communities**

Authors: Herrman, Zach, and John Bolecek

**Abstract:** As multimodal transportation infrastructure becomes common, planners need estimates of non-motorized travel demand in order to evaluate investment choices. Just as transportation agencies rely on established motor vehicle traffic monitoring programs to identify auto-oriented improvements, agencies are beginning to recognize the necessity of a parallel non-motorized traffic monitoring program. For rural communities with limited resources, however, the cost of establishing such a program may be prohibitive.

Accordingly, this paper reports on the development of a relatively simple approach to estimate daily pedestrian volumes using publicly available data: population density, speed limits, number of lanes, traffic volumes, and national household survey results. A comparison of forecast and observed volumes at 30 sites throughout smaller Virginia locations (Charlottesville, Harrisonburg and Roanoke) shows that the approach yields a median error of 254 pedestrians per day. Further, the paper illustrates how a modest amount of additional data can improve the accuracy of the estimates: for example, by using thirty 2015 observations of pedestrian travel to supplement the 2009 NHTS, the median error improved to 230 pedestrians per day. The approach also demonstrates that the variables used therein are reasonable; for example, the model shows that as speed limits drop from 45 mph to 25 mph, one would expect the number of pedestrians to increase by a factor of about 3.1.

To be clear, this approach will not replace a full count program for those jurisdictions that can afford one. However, it may be useful for smaller localities who are considering incremental improvements to counting methods or which need to quickly obtain pedestrian count estimates for a large number of links. The paper illustrates how to develop the estimation approach through geographic information systems (GIS), how to calibrate estimations to a target area, and the accuracy one might expect from using this method.

**Subject Areas:** Pedestrian counts, Traffic counts, Programming (planning), Pedestrians, Bicyclists, Traffic surveillance

**Availability:** Herrman, Zach, and John Bolecek. "An Interim Synthetic Approach For Estimating Pedestrian Volumes In Smaller Communities."

<http://www.trbtoolsofthetrade.org/files/theme/B5-2-paper.pdf>

**Title: Investigating the influence of Trip Distance on Travel Behaviour of Non-Motorized Transport (NMT) users**

**Authors:** Mondal, Swarup, Sudeshna Mitra, and Bandhan Bandhu Majumdar

**Abstract:** Non-Motorized Transport (NMT) modes can only be used for trips of relatively short lengths; hence it is essential to know the spatial extent of the trips taken by such modes and their variation in various land-use and geographic setup. For this exercise, good quality comprehensive data consisting of regions is a must; hence the choice of National Household Travel Survey (NHTS) data from United States. This data consists of household travel survey records from multiple urban and rural areas of all states of the United States for the year 2009 and has been used in this research. Using the mentioned dataset, this study seeks to answer the following research questions of interest: (1) How far users walk or use bicycle typically? (2) How the trip lengths varied across various populations sub-groups? and (3) How the trip lengths varied with variation of size of city, land-use and geography?

With these questions in mind, this paper analyses the nature of trips made by NMT modes and investigates the influence of trip length on travel behavior of NMT users' across various population sub-groups. To start with, the average trip lengths made by walk and bicycles across various geographic locations are estimated. Additionally, estimates of drop in trip patronage with increased trip lengths are obtained using the concept of distance-decay. These distance-decay functions are also estimated for different geographic locations with varying population and land uses, using which it is possible to obtain travel impedance or deterrence of walking and bicycling with increases trip lengths.

As expected the overall results reveal that with an increase in trip length, users are less willing to walk than bicycle with as estimated impedance or level of deterrence of 0.259 for bicycle and 0.687 for walk in urban area. Similarly, the impedance values of 0.254 and 0.679 are estimated for bicycle and walk respectively for rural area. The impedance caused by trip length is observed to vary significantly among different user groups for both pedestrians and bicycle users. For example, in urban area "Shopping" trips made by bicycle users are found to have the maximum impedance of 0.371 and bicycle trips made by users with "Professional, managerial, or technical" occupation are found to be least influenced by trip length with the lowest impedance of 0.136.

**Subject Areas:** Non-Motorized Transport (NMT), Distance-Decay, Impedance, Trip Length Frequency Distribution

**Availability:** Mondal, Swarup, Sudeshna Mitra, and Bandhan Bandhu Majumdar. "Investigating the influence of Trip Distance on Travel Behaviour of Non-Motorized Transport (NMT) users." [https://www.researchgate.net/profile/Bandhan\\_Majumdar/publication/288786922\\_Investigating\\_the\\_influence\\_of\\_Trip\\_Distance\\_on\\_Travel\\_Behaviour\\_of\\_Non-Motorized\\_Transport\\_NMT\\_users/links/57b2e8e808aeb2cf17c73b7f.pdf](https://www.researchgate.net/profile/Bandhan_Majumdar/publication/288786922_Investigating_the_influence_of_Trip_Distance_on_Travel_Behaviour_of_Non-Motorized_Transport_NMT_users/links/57b2e8e808aeb2cf17c73b7f.pdf)

**Title: Demographic factors, workplace factors and active transportation use in the USA: a secondary analysis of 2009 NHTS data**

**Authors:** Quinn, T. D., Jakicic, J. M., Fertman, C. I., & Gibbs, B. B.

**Abstract:**

**Background** While active transportation has health, economic and environmental benefits, participation within the USA is low. The purpose of this study is to examine relationships of demographic and workplace factors with health-enhancing active transportation and commuting.

**Methods** Participants in the 2009 National Household Travel Survey reported demographics, workplace factors (time/distance to work, flextime availability, option to work from home and work start time) and active transportation (for any purpose) or commuting (to and from work, workers only) as walking or biking ( $\geq 10$  min bouts only). Multiple logistic regression examined cross-sectional relationships between demographics and workplace factors with active transportation and commuting.

**Results** Among 152 573 participants, active transportation was reported by 1.11% by biking and 11.74% by walking. Among 111 808 working participants, active commuting was reported by 0.80% by biking and 2.76% by walking. Increased odds ( $p < 0.05$ ) of active commuting and transportation were associated with younger age, lower income, urban dwelling, and the highest and lowest education categories. Males had greater odds of commuting and transporting by bike but decreased odds of walk transporting. Inconsistent patterns were observed by race, but whites had greater odds of any biking ( $p < 0.05$ ). Odds of active commuting were higher with a flexible schedule ( $p < 0.001$ ), the option to work from home ( $p < 0.05$ ), shorter time and distance to work (both  $p < 0.001$ ), and work arrival time between 11:00 and 15:59 (walking only,  $p = 0.001$ ).

**Conclusions** Active transportation differed across demographic and workplace factors. These relationships could inform infrastructure policy decisions and workplace wellness programming targeting increased active transportation.

**Subject Areas:** NHTS, bike, walk, demographics, workplace factors, commuting

**Availability:** Quinn, T. D., Jakicic, J. M., Fertman, C. I., & Gibbs, B. B. (2016). Demographic factors, workplace factors and active transportation use in the USA: a secondary analysis of 2009 NHTS data. *Journal of Epidemiology and Community Health*, jech-2016. <http://jech.bmj.com/content/early/2016/12/16/jech-2016-207820.abstract>

**Title: One-year Stability of Objectively Measured Physical Activity in Young Brazilian Adults**

**Authors:** Martins, R. C., Reichert, F. F., Bielemann, R. M., & Hallal, P. C.

**Abstract:**

**Background:** To evaluate the one-year stability of objectively measured physical activity among young adults living in South Brazil, as well as assessing the influences of temperature, humidity and precipitation on physical activity.

**Methods:** A longitudinal study was conducted over 12 consecutive months (October 2012 to September 2013). Sixteen participants (8 men) used wGT3x+ accelerometers one week per month for the entire year. Climate variables were obtained from an official climate information provider.

**Results:** Physical activity was remarkably stable over the year – the proportion of the day spent in moderate-to-vigorous-intensity physical activity (MVPA) was around 5% in every month. Average temperature ( $\rho = -0.64$ ;  $p = 0.007$ ), humidity ( $\rho = -0.68$ ;  $p = 0.004$ ) and rain ( $\rho = -0.67$ ;  $p = 0.004$ ) were inversely correlated to MVPA in the Summer. Rain was also inversely correlated to MVPA in the Spring ( $\rho = -0.54$ ;  $p = 0.03$ ).

**Conclusions:** Objectively-measured physical activity was stable over a one-year period. Climate variables consistently influenced physical activity practice in the Summer, but not in the other seasons.

**Subject Areas:** Accelerometry, Seasonal Variation, Motor Activity, Climate, Weather

**Availability:** Martins, R. C., Reichert, F. F., Bielemann, R. M., & Hallal, P. C. (2016). One-year Stability of Objectively Measured Physical Activity in Young Brazilian Adults. *Journal of Physical Activity and Health*, 1-16. <http://journals.humankinetics.com/doi/abs/10.1123/jpah.2015-0384>

**Title: Trends in Walking and Cycling Safety: Recent Evidence From High-Income Countries, With a Focus on the United States and Germany**

**Authors:** Ralph Buehler, PhD, and John Pucher, PhD

**Abstract:**

**Objectives.** To examine changes in pedestrian and cyclist fatalities per capita (1990–2014) and per kilometer (2000–2010) in selected high-income countries, and in fatalities and serious injuries per kilometer by age in the United States and Germany (2001–2009).

**Methods.** We used Organisation for Economic Cooperation and Development data to estimate 5-year annual averages of per-capita fatalities relative to the 1990–1994 average. To control for exposure, we divided fatalities and serious injuries by kilometers of walking or cycling per year for countries with comparable data from national household travel surveys.

**Results.** Most countries have reduced pedestrian and cyclist fatality rates per capita and per kilometer. The serious injuries data show smaller declines or even increases in rates per kilometer. There are large differences by age group in fatality and serious injury rates per kilometer, with seniors having the highest rates. The United States has much higher fatality and serious injury rates per kilometer than the other countries examined, and has made the least progress in reducing per-capita fatality rates.

**Conclusions.** The United States must greatly improve walking and cycling conditions. All countries should focus safety programs on seniors and children

**Subject Areas:** bicycle and pedestrian fatality; Germany; United States

**Availability:** Ralph Buehler and John Pucher. (2016). Trends in Walking and Cycling Safety: Recent Evidence From High-Income Countries, With a Focus on the United States and Germany. *American Journal of Public Health*. doi: 10.2105/AJPH.2016.303546  
<http://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2016.303546>



**Title:** Bike Route Choice Modeling Using GPS Data without Choice Sets of Paths

**Authors:** Moultrie News

**Abstract:** Concerned by the nuisances of motorized travel on urban life, policy makers are faced with the challenge of making cycling a more attractive alternative for everyday transportation. Route choice models can help achieve this objective by gaining insights into the trade-offs cyclists make when choosing their routes and by allowing the effect of infrastructure improvements to be analyzed. We estimate a link-based bike route choice model from a sample of GPS observations in the city of Eugene on a network comprising over 40,000 links. The so-called recursive logit (RL) model (Fosgerau et al., 2013), does not require to sample any choice set of paths. We show the advantages of this approach in the context of prediction by focusing on two applications of the model: link flows and accessibility measures. Compared to the path-based approach which requires to generate choice sets, the RL model proves to make significant gains in computational time and to avoid paradoxical accessibility measure results discussed in previous works, e.g. Nassir et al. (2014).

**Subject Areas:** bike route choice, recursive logit, infinite choice set, accessibility, link flows

**Availability:** Dhakar, N. S. (2012). Route Choice Modeling Using GPS Data (Doctoral dissertation, University of Florida). [http://plaza.ufl.edu/nsdhakar/Dhakar\\_N\\_Final\\_Dissertation.pdf](http://plaza.ufl.edu/nsdhakar/Dhakar_N_Final_Dissertation.pdf)

**Title: MUSC supports bike lanes as part of building healthy communities**

**Authors:** Moultrie News

**Abstract:** The leaders of the Medical University of South Carolina (MUSC), David J. Cole, M.D., FACS, MUSC president, and Patrick J. Cawley, M.D., CEO, MUSC Health, have stated their support for bike riding and bike lanes as a health-promoting transportation option in the Charleston area.

**Subject Areas:** MUSC; bicycle lanes; Charleston

**Availability:** moultrienews.com *MUSC supports bike lanes as part of building healthy communities* June 21, 2016; <http://www.moultrienews.com/20160621/160629913/musc-supports-bike-lanes-as-part-of-building-healthy-communities->

**Title:** Hackpack, The Convertible Commuter to Office Work Bag, Surpasses 100% Funded Mark on Kickstarter

**Authors:** Hackpack

**Abstract:** n/a

**Subject Areas:** kickstarter; hackpack

**Availability:** hackpack. [www.prnewswire.com](http://www.prnewswire.com) Hackpack, The Convertible Commuter to Office Work Bag, Surpasses 100% Funded Mark on Kickstarter; A Superior Laptop Bag for Professionals Who Need a Travel Work Bag. Hackpack converts into a Briefcase, Sling, Messenger, and Backpack. Nov 30, 2016 <http://www.prnewswire.com/news-releases/hackpack-the-convertible-commuter-to-office-work-bag-surpasses-100-funded-mark-on-kickstarter-300370484.html>

**Title: Evaluation of a Bicycle Facility User Survey in the Dayton, Ohio Area**

**Authors:** Siler, Emily A. Siler

**Abstract:** Over the past 20 years, there has been increased funding for bicycle facilities which has led to more miles of bicycle facilities. Consequently, there are more needs for understanding the people who use these facilities. Counts can be used to know how many people are using these facilities, but surveys are one of the better methods for a more in depth understanding. Intercept surveys have been typically used in the past but there are limitations with this method. In order to improve upon this method, an initial interview was used in conjunction with the foot-in-the-door method and an online survey. The online survey included bicycle surveys along with a stated preference survey that analyzed the switching point time from one bicycle facility to another. The survey was conducted at Eastwood MetroPark in Dayton, Ohio and at Xenia Station in Xenia, Ohio in August of 2015.

There were 780 initial interviews conducted. The bicyclists' purposes were mostly for recreation or exercising with some work commuters. There were 750 postcards distributed to participants for the online survey with a total response rate was 36.4% and 273 participants for the online survey. There was no significant difference found in the switching point time analysis. Overall the methods used were useful for recruiting participants for the online survey.

**Subject Areas:** bicycle facilities; intercept surveys

**Availability:** Siler, Emily A. Evaluation of a Bicycle Facility User Survey in the Dayton, Ohio Area. Diss. Ohio University, 2016. [https://etd.ohiolink.edu/rave/send\\_file?accession/etdc/view?acc\\_num=ohiou1470257342&disposition=inline](https://etd.ohiolink.edu/rave/send_file?accession/etdc/view?acc_num=ohiou1470257342&disposition=inline)

**Title: Riding tandem: Does cycling infrastructure investment mirror gentrification and privilege in Portland, OR and Chicago, IL?**

**Authors:** Flanagan, Elizabeth, Ugo Lachapelle, and Ahmed El-Geneidy

**Abstract:** Bicycles have the potential to provide an environmentally friendly, healthy, low cost, and enjoyable transportation option to people of all socio-demographic backgrounds. This research assesses the geographic distribution of cycling infrastructure with regard to community demographic characteristics to assess claims that cycling investment arrives in tandem with incoming populations of privilege or is targeted towards neighborhoods with existing socioeconomic wealth. Using census and municipal cycling infrastructure data in Chicago and Portland from 1990 to 2010, we create demographic and cycling infrastructure investment indices at the census tract level. Linear regressions estimate the extent to which existing community demographics and change in demographics associated with gentrification are related to cycling infrastructure investment. In both cities, we identify a bias towards increased cycling infrastructure investment in areas of existing or increasing privilege. This paper suggests that marginalized communities are unlikely to attract as much cycling infrastructure investment without the presence of privileged populations, even when considering population density and distance to downtown, two motivators of urban cycling. To alleviate the continuation of inequitable distributions of cycling investments, planning processes may actively seek out diverse stakeholders and be sensitive to citywide community input and stated needs in future transportation projects.

**Subject Areas:** Bicycle parking; Bicycle lanes; Divvy stations; Gentrification; Census tract

**Availability:** Flanagan, Elizabeth, Ugo Lachapelle, and Ahmed El-Geneidy. "Riding Tandem: Does Cycling Infrastructure Investment Mirror Gentrification and Privilege in Portland, Oregon, and Chicago, Illinois?." Transportation Research Board 95th Annual Meeting. No. 16-1493. 2016. <http://www.sciencedirect.com/science/article/pii/S0739885915300287>

**Title: Adults' Daily Walking for Travel and Leisure**

**Authors:** Yang, Yong, and Ana V. Diez-Roux

**Abstract:**

**Purpose:** Studies on how the interaction of psychological and environmental characteristics influences walking are limited, and the results are inconsistent. Our aim is to examine how the attitude toward walking and neighborhood environments interacts to influence walking.

**Design:** Cross-sectional phone and mail survey.

**Setting:** Participants randomly sampled from 6 study sites including Los Angeles, Chicago, Baltimore, Minneapolis, Manhattan, and Bronx Counties in New York City, and Forsyth and Davidson Counties in North Carolina.

**Participants:** The final sample consisted of 2621 persons from 2011 to 2012.

**Measures:** Total minutes of walking for travel or leisure, attitude toward walking, and perceptions of the neighborhood environments were self-reported. Street Smart (SS) Walk Score (a measure of walkability derived from a variety of geographic data) was obtained for each residential location.

**Analysis:** Linear regression models adjusting for age, gender, race/ethnicity, education, and income.

**Results:** Attitude toward walking was positively associated with walking for both purposes. Walking for travel was significantly associated with SS Walk Score, whereas walking for leisure was not. The SS Walk Score and selected perceived environment characteristics were associated with walking in people with a very positive attitude toward walking but were not associated with walking in people with a less positive attitude.

**Conclusion:** Attitudes toward walking and neighborhood environments interact to affect walking behavior.

**Subject Areas:** walking, attitude toward walking, neighborhood environment, interaction

**Availability:** Yang, Yong, and Ana V. Diez-Roux. "Adults' Daily Walking for Travel and Leisure Interaction Between Attitude Toward Walking and the Neighborhood Environment." *American Journal of Health Promotion* (2016): 0890117116669278.

<http://ahp.sagepub.com/content/early/2016/10/15/0890117116669278.abstract>

**Title: Commuting to work by Bicycle increases by over 490% in Washington D.C.**

**Authors:** PR Rocket

**Abstract:** May is National Bike Month across the U.S. with millions of people celebrating biking. There has been a huge surge in the popularity of biking, from riding to school, commuting to work or in your leisure time. From 2000 to 2013 commuting by bicycle has increased by 105% in bicycle friendly communities (compared to a national increase of 62%) according to the National Household Travel Survey. Key cities have seen a surge in commuting by bicycle, from 1990 – 2013 Washington D.C saw an increase of 498%, Portland an increase of 408% and San Francisco 301%.

**Subject Areas:** national bike month; DC

**Availability:** [pressreleaserocket.net](http://www.pressreleaserocket.net); Commuting to work by Bicycle increases by over 490% in Washington D.C. May 30, 2016 <http://www.pressreleaserocket.net/commuting-to-work-by-bicycle-increases-by-over-490-in-washington-d-c/454112/>

**Title: Can cycling with an E-bike improve fitness? Effect of access to an Electric Assisted Bicycle on cycling distance and cardiopulmonary fitness in inactive Norwegian adults.**

**Authors:** Lena H. Malnes

**Abstract:** Background: The aims of the present study were to assess the effect of an eight-month intervention with access to an Electric assisted bicycle (E-bike) on (1) the amount of E-biking, (2) changes in cardiopulmonary fitness and (3) to assess whether cycled distance was associated with changes in cardiopulmonary fitness, among inactive adults.

Methods: Twenty-five inactive Norwegian adults (33 – 57 years of age, 72 % women), were recruited through convenience sampling. Participants were given an E-bike for eight (N = 23) or three (N = 2) months. Socio-demographic characteristics were reported with a questionnaire. Bicycle use was measured with a GPS bicycle computer and cardiopulmonary fitness were measured as maximal oxygen uptake (VO<sub>2</sub> max), before and after the intervention, using a modified Balke protocol to exhaustion.

Results: During the intervention, cycled distance was 37.6 ± 24 kilometres per week. Participants cycled significantly (P <0.001) more on weekdays (7.1 km/day) compared to weekend days (0.9 km/day). An improvement in VO<sub>2</sub> max (7.7 %, P <0.001) from baseline to post test were associated with cycling distance (r = 0.49, P = 0.042). Stratified by cardiopulmonary fitness status at baseline, participants with lower fitness had a significant increase in VO<sub>2</sub> max (9.6 %, P <0.001) than participants with higher fitness (1.5 %, P = 0.626).

Discussion: Access to an E-bike for eight months resulted in weekly 37.6 km of cycling which was positively associated with average 7.7 % improvements in VO<sub>2</sub> max. E-bikes may contribute to mobilize inactive individuals to initiate transport-related physical activity.

**Subject Areas:** Active commuting, electric assisted bicycle, cycling distance, GPS, maximal oxygen uptake

**Availability:** Malnes, Lena H. Can cycling with an E-bike improve fitness?: effect of access to an Electric Assisted Bicycle on cycling distance and cardiopulmonary fitness in inactive Norwegian adults. MS thesis. Universitetet i Agder; University of Agder, 2016.

<https://brage.bibsys.no/xmlui/handle/11250/2413075>



**Title:** Grant-funded project gets moving Bicycle Colorado spending week in schools

Authors: Waite, Sara

**Abstract:** Grant funding from the Colorado Department of Transportation's Safe Routes to Schools (SRTS) program is gaining traction this week in Sterling.

**Subject Areas:** Safe Routes to School; Bike

**Availability:** Waite, Sara. " Grant-funded project gets moving Bicycle Colorado spending week in schools" Journal-Advocate, September 27, 2016. [http://www.journal-advocate.com/sterling-local\\_news/ci\\_30406860/grant-funded-project-gets-moving](http://www.journal-advocate.com/sterling-local_news/ci_30406860/grant-funded-project-gets-moving)

**Title: Estimating pedestrian and cyclist activity at the neighborhood scale**

**Authors:** Salon, Deborah

**Abstract:** In most parts of the U.S., data on bicycle and pedestrian activity at the neighborhood scale are sparse or non-existent, despite the importance of such data for local planning. Here, a simple small-area estimation method is used to pair travel survey with land use and census data to estimate cyclist and pedestrian activity for census tracts in the state of California. This method is an improvement on fixed per-capita estimates of activity based only on regional or statewide averages. These activity estimates are then used to calculate the intensity of road use by cyclists and pedestrians, and crash rates for these road users. For California, the intensity of pedestrian and cyclist road use in urban census tracts is double that found in suburban tracts, while use in suburban tracts is an order of magnitude greater than that found in rural tracts. Per-capita estimates would suggest substantially smaller differences between neighborhood types. On the safety side, although non-severe crashes involving cyclists and pedestrians are much more likely in more urban areas, severe crash rates for the non-motorized modes exhibit no clear spatial pattern. The method used is simple and easily replicable, potentially filling a critical need for bicycle and pedestrian planners.

**Subject Areas:** Walk; Bicycle; Neighborhood type; Road safety; Small area estimation; Cluster analysis

**Availability:** Salon, Deborah. "Estimating pedestrian and cyclist activity at the neighborhood scale." *Journal of Transport Geography* 55 (2016): 11-21.

<http://www.sciencedirect.com/science/article/pii/S0966692316303593>

**Title: Examining the Impact of Sample Size in the Analysis of Bicycle Sharing Systems**

**Authors:** Faghieh-Imani, Ahmadreza, and Naveen Eluru

**Abstract:** Given the growing installation of bicycle-sharing systems (BSS) across the world, there is a gradual increase in research on BSS over the past few years. Research efforts examining BSS employed a wide range of sample size depending on the temporal or spatial aggregation. The main objective of this paper is to investigate the impact of sample size on BSS analysis using data from New York City's BSS (CitiBike). This paper proposes a systematic evaluation of the impact of sample size on model estimates, inference measures and predictive performance. We evaluate two major dimensions of BSS data: 1) system usage – impact of contributing factors on hourly arrival and departure rates at station level, 2) user destination choice – impact of factors on users' preference of destination station choice. To examine the system usage, we employ the linear mixed model methodology while the user destination choice is studied using the Multinomial Logit Model (MNL). The model estimation exercises for system demand and destination choice are conducted on several samples of data. The performance of these sample models in terms of parameters, inference statistics and predictions relative to a base sample data is observed. The results would help the analysts to make decisions on sample size for accurately examining BSS usage. The analyses show that the impact of sample size on parameters estimated is stronger than that of the impact on prediction performance.

**Subject Areas:** Sample size, bicycle sharing systems, CitiBike New York, linear mixed model, multinomial logit model, arrival and departure rates, destination choice, bicycle infrastructure, land use and built environment

**Availability:** Faghieh-Imani, Ahmadreza, and Naveen Eluru. "Examining the impact of sample size in the analysis of bicycle-sharing systems." *Transportmetrica A: Transport Science* (2016): 1-23. <http://www.tandfonline.com/doi/abs/10.1080/23249935.2016.1223205>

**Title: Planning for Bike Share Connectivity to Rail Transit**

**Authors:** Greg Phillip Griffin and Ipek Nese Sener

**Abstract:** Bike sharing can play a role in providing access to transit stations and then to final destinations, but early implementation of these systems in North America has been opportunistic rather than strategic. This study evaluates local intermodal plan goals using trip data and associated infrastructure such as transit stops and bike share station locations in Austin, Texas, and Chicago, Illinois. Bike sharing use data from both cities suggest a weak relationship with existing rail stations that could be strengthened through collaborative, intermodal planning. The study suggests a planning framework and example language that could be tailored to help address the linkage between bike sharing and transit. Rather than an exhaustive study of the practice, this study provides evidence from these two cities that identify opportunities to improve intermodal planning. Cities that are planning or expanding a bike sharing system should consider carefully how to leverage this mode with existing modes of transport. Regardless of a city's status in implementing a bike sharing system, planners can leverage information on existing transport systems for planning at regional and local levels.

**Subject Areas:** Bike share; GIS; transit; plan evaluation; mixed methods

**Availability:** Griffin, Greg P., and Ipek N. Sener. "Planning for Bike Share Connectivity to Rail Transit." *Journal of Public Transportation* 19.2 (2016): 1.

<http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1477&context=jpt>

**Title: Incorporating the impact of spatio-temporal interactions on bicycle sharing system demand: A case study of New York CitiBike system**

**Authors:** Faghih-Imani, Ahmadreza, and Naveen Eluru

**Abstract:** Recent success of bicycle-sharing systems (BSS) have led to their growth around the world. Not surprisingly, there is increased research towards better understanding of the contributing factors for BSS demand. However, these research efforts have neglected to adequately consider spatial and temporal interaction of BSS station's demand (arrivals and departures). It is possible that bicycle arrival and departure rates of one BSS station are potentially inter connected with bicycle flow rates for neighboring stations. It is also plausible that the arrival and departure rates at one time period are influenced by the arrival and departure rates of earlier time periods for that station and neighboring stations. Neglecting the presence of such effects, when they are actually present will result in biased model estimates. The major objective of this study is to accommodate for spatial and temporal effects (observed and unobserved) for modelling bicycle demand employing data from New York City's bicycle-sharing system (CitiBike). Towards this end, spatial error and spatial lag models that accommodate for the influence of spatial and temporal interactions are estimated. The exogenous variables for these models are drawn from BSS infrastructure, transportation network infrastructure, land use, point of interests, and meteorological and temporal attributes. The results provide strong evidence for the presence of spatial and temporal dependency for BSS station's arrival and departure rates. A hold out sample validation exercise further emphasizes the improved accuracy of the models with spatial and temporal interactions.

**Subject Areas:** Bicycle sharing systems; CitiBike New York; Spatial panel models; Spatial lag; Spatial error; Bicycle infrastructure; Land use and built environment

**Availability:** Faghih-Imani, Ahmadreza, and Naveen Eluru. "Incorporating the impact of spatio-temporal interactions on bicycle sharing system demand: A case study of New York CitiBike system." *Journal of Transport Geography* 54 (2016): 218-227.

<http://www.sciencedirect.com/science/article/pii/S0966692316303143>

**Title: Exploring Factors Regarding Transit-Related Walking and Walking Duration**

**Authors:** Yu, Chia-Yuan, and Hsien-Chang Lin

**Abstract:**

Background: Transit-related walking provides a potential opportunity to promote general walking behavior, yet few studies have examined this issue. Since people's decisions tend to vary as they walk between home and transit and between transit and destination, this study separated trips made in each direction.

Purpose: This study identified the associations between socio-demographics and the two-step process of transit-related walking: 1) whether transit users walked for home-transit trip or transit destination trip, and 2) the walking duration for home-transit trip or transit-destination trip among those who walked.

Methods: This cross-sectional study used the 2009 National Household Travel Survey and used the Heckman 2-step selection model by including 4,042 respondents (10,105 trips) who walked all portions for home-transit trip and 3,756 (8,075 trips) for transit-destination trip.

Results: The mean walking duration for home-transit trips (7.60 minutes) was shorter than transit-destination trips (7.87 minutes). Hispanics were more likely to walk for both directions and had higher walking durations than did whites. Respondents living in low-income households were more likely to walk for home-transit trip, but not for transit-destination trips.

Conclusions: This study illustrated several implications regarding to transit-related walking, such as creating short home-transit distances and targeting whites in promoting transit-related walking.

**Subject Areas:** transit-related walking, walking duration, physical activity, transit, race/ethnicity

**Availability:** Yu, Chia-Yuan, and Hsien-Chang Lin. "Exploring Factors Regarding Transit-Related Walking and Walking Duration." *Journal of Physical Activity and Health* (2016): 1-28.

<http://journals.humankinetics.com/doi/abs/10.1123/jpah.2015-0667>

**Title: Trends in bicycle crashes in California**

**Authors:** Stimpson JP, Zhu H, Wilson FA.

**Abstract:** Commensurate with the rise and popularity of bicycling, there is growing interest in understanding the trends in bicycle crashes and injuries [1],[2],[3] and [4]. The evidence on the trends in bicycle crash rates is mixed. One study found a decrease in bicycle deaths...

**Subject Areas:** bicycle crashes and injuries; California

**Availability:** Stimpson JP, Zhu H, Wilson FA. Trends in bicycle crashes in California. The American journal of emergency medicine. 2016 May 3.

<http://www.sciencedirect.com/science/article/pii/S0735675716301036>

**Title: Representing pedestrian activity in travel demand models: Framework and application**

**Authors:** Clifton KJ, Singleton PA, Muhs CD, Schneider RJ

**Abstract:** There have long been calls for better pedestrian planning tools within travel demand models, as they have been slow to incorporate the large body of research connecting the built environment and walking behaviors. Most regional travel demand forecasting performed in practice in the US uses four-step travel demand models, despite advances in the development and implementation of activity-based travel demand models. This paper introduces a framework that facilitates the abilities of four-step regional travel models to better represent walking activity, allowing metropolitan planning organizations (MPOs) to implement these advances with minimal changes to existing modeling systems. Specifically, the framework first changes the spatial unit from transportation analysis zones (TAZs) to a finer-grained geography better suited to modeling pedestrian trips. The MPO's existing trip generation models are applied at this spatial unit for all trips. Then, a walk mode choice model is used to identify the subset of all trips made by walking. Trips by other modes are aggregated to the TAZ level and proceed through the remaining steps in the MPO's four-step model. The walk trips are distributed to destinations using a choice modeling approach, thus identifying pedestrian trip origins and destinations. In this paper, a proof-of-concept application is included to demonstrate the framework in successful operation using data from the Portland, Oregon, region. Opportunities for future work include more research on the potential routes between origins and destinations for walk trips, application of the framework in another region, and developing ways the research could be implemented in activity-based modeling systems.

**Subject Areas:** Walking; Pedestrians; Travel demand models; Built environment; Active transportation

**Availability:** Clifton, Kelly J., et al. "Representing pedestrian activity in travel demand models: Framework and application." *Journal of Transport Geography* 52 (2016): 111-122.  
<http://www.sciencedirect.com/science/article/pii/S0966692316301302>



**Title: Sharing urban sidewalks with bicyclists? An exploratory analysis of pedestrian perceptions and attitudes**

**Authors:** Kang, Lei, and Jon D. Fricker

**Abstract:** Bicycling and walking are gaining popularity for both commuting and recreation. However, when faced with limited right-of-way width, many transportation agencies find it impractical to designate separate space for bicyclists in urban roadway corridors, instead devoting their limited funds to other projects. As a result, some bicyclists – feeling threatened by motor vehicles – use sidewalks for at least part of their trip. Laws governing bicyclist use of sidewalks are not consistently enforced in various cities and countries. Pedestrian-bicycle shared space has rarely been studied from a pedestrian's perspective in an urban context. Therefore, gaining a better understanding of the factors that influence pedestrian attitudes toward sharing a sidewalk with bicyclists can be useful in evaluating shared space strategies and guiding investments in bicycle facilities. Using the responses of 114 persons to 15 carefully constructed 60-s video clips of urban sidewalks in four Chinese cities, this study characterizes pedestrian attitudes regarding sharing sidewalks with bicycles under different sidewalk configurations. By estimating a random parameters ordered probability model (to account for unobserved heterogeneity across respondents), we found pedestrians who wanted a “safe distance” greater than 1.5 meters were more likely to possess a less tolerant attitude. Attitudes of pedestrians toward bicyclists on sidewalks also depend on the presence or absence of dedicated bicycle facilities. The effects of other significant factors are also quantified in this paper. Implications for policy makers in evaluating shared-space strategy can be drawn from this empirical study.

**Subject Areas:** Pedestrian attitudes; Bicycles; Shared space; Random parameters ordered probit

**Availability:** Kang, Lei, and Jon D. Fricker. "Sharing urban sidewalks with bicyclists? An exploratory analysis of pedestrian perceptions and attitudes." *Transport Policy* 49 (2016): 216-225. <http://www.sciencedirect.com/science/article/pii/S0967070X16302165>

**Title: Multi-Modal Transportation Choices And Health: An Exploratory Analysis Using Data Fusion Techniques**

**Authors:** Lugo, Miguel, and Sivaramakrishnan Srinivasan

**Abstract:** In this study, we demonstrate the feasibility of fusing large-scale travel and health surveys, and subsequently use the new comprehensive dataset generated to model the relationship between health and multi-modal (walking, biking, transit, and vehicle usage) long-term (weekly/monthly/yearly) travel choices. Two measures of health (BMI and SAPHS) are fused from a health survey on to a travel survey at the disaggregate (individual) level. The probabilistic record linkage software Link Plus was used for the data fusion purposes. The methodology was validated using the "EH module" of the American Time Use Surveys. Subsequently, the algorithm was used to match the health information from the ATUS to the NHTS and the resulting master dataset was used to develop models for multi-modal travel choices and health. The statistical analysis indicates that while increasing walking and transit use is associated with better health (relative to non-users of the mode), those with the highest levels of walking and transit use are also in poor health relative to moderate users of the mode. Similarly, those at the two ends of the VMT spectrum (first and fourth quartiles) have higher BMI compared to those in the middle of the spectrum. There were no statistically significant effects of weekly bike trips on health measures. Overall this study is envisioned as a proof of concept of how data fusion techniques may be used to integrate multiple datasets to facilitate a comprehensive study of multi-modal travel choices and health.

**Subject Areas:** Health, Walking, Biking, VMT, Transit, Data fusion, Mode choice

**Availability:** Lugo, Miguel, and Sivaramakrishnan Srinivasan. "MULTI-MODAL TRANSPORTATION CHOICES AND HEALTH: AN EXPLORATORY ANALYSIS USING DATA FUSION TECHNIQUES."

[http://www.people.cecs.ucf.edu/neluru/Papers/Count%20Copula\\_TRR.pdf](http://www.people.cecs.ucf.edu/neluru/Papers/Count%20Copula_TRR.pdf)

**Title: Walking to Work: Trends in the United States, 2005–2014**

**Authors:** Yang Y.

**Abstract:** I examined trends from 2005 through 2014 in walking to work compared with other modes of travel. For each year, I calculated the percentage of travel to work by private vehicle, public transportation, and walking and used distance decay functions to analyze the distribution of walking by distance. I found that the percentage of travel to work by walking remained stable, with a slight increase over time, and that people tended to walk longer to get to work. The trend is positive and encouraging, although more evidence is needed to confirm my findings.

**Subject Areas:** walking; commute

**Availability:** Yang Y. Walking to Work: Trends in the United States, 2005–2014. *Prev Chronic Dis* 2016;13:160181. DOI: <http://dx.doi.org/10.5888/pcd13.160181>

**Title:** Area conference promotes 'active transportation'

**Authors:** WKBT News8000.com

**Abstract:** Midwest Active Transportation Conference promotes active transportation

**Subject Areas:** Health, Walking, Biking, VMT, Transit, Data fusion, Mode choice

**Availability:** WKBT News8000.com; *Area conference promotes 'active transportation'* May 20, 2016 <http://www.news8000.com/news/Area-conference-promotes-active-transportation/39657236>

**Title: Bicycle Crash Risk: How Does It Vary, and Why?**

**Authors:** Robin Liggett, Herbie Huff, Ryan Taylor-Gratzer, Norman Wong, Diana Benitez, Timothy Douglas, James Howe, Jill Cooper, Julia Griswold, David Amos, and Frank Proulx

**Abstract:** With bicycle infrastructure and bicycling activity on the rise, it is more crucial than ever to understand bicycle crash risk as a function of roadway design and operational characteristics, as well as driver and bicyclist behavior. This report significantly advances that goal by compiling data from just under 500 sites in Los Angeles County. By associating count volumes, we are able to differentiate between high incidence / high risk sites and high incidence / low risk sites. We also analyze a suite of roadway design and operational characteristics, adjacent land uses, and socioeconomic variables, to examine correlations with crash risk.

**Subject Areas:** bicycle infrastructure; crash risk;

**Availability:** Douglas, James Howe, and Nathan Loeb. "Bicycle Crash Risk: How Does It Vary, and Why?." <http://bikinginla.com/wp-content/uploads/2016/08/Final-Report-to-Caltrans-Bicycle-Crash-v3.pdf>

**Title: Bikesharing and Bicycle Safety****Authors:** Martin E, Cohen A, Botha JL, Shaheen S.

**Abstract:** The growth of bikesharing in the United States has had a transformative impact on urban transportation. Major cities have established large bikesharing systems, including Boston, Chicago, Denver, Minneapolis-Saint Paul, New York City, Salt Lake City, the San Francisco Bay Area, Seattle, Washington DC, and others. These systems began operating as early as 2010, and no fatalities have occurred within the US as of this writing. However, three have happened in North America—two in Canada and one in Mexico. Bikesharing has some qualities that appear inherently unsafe for bicyclists. Most prominently, helmet usage is documented to be quite low in most regions. In addition, bikesharing is also used by people who bicycle less frequently, and by tourists, who are often less familiar with the local terrain. In this study, researchers take a closer look at bikesharing safety from qualitative and quantitative perspectives. Through a series of four focus groups, they discussed bikesharing usage and safety with bikesharing members and nonmembers in the Bay Area. They further engaged experts nationwide from a variety of fields to evaluate their opinions and perspectives on bikesharing and safety. Finally, researchers conducted an analysis of bicycle and bikesharing activity data, as well as bicycle and bikesharing collisions to evaluate injury rates associated with bikesharing when compared with benchmarks of personal bicycling. The data analysis found that collision and injury rates for bikesharing are lower than previously computed rates for personal bicycling. Experts and focus group participants independently pointed to bikesharing rider behavior and bikesharing bicycle design as possible factors. In particular, bikesharing bicycles are generally designed in ways that promote stability and limited speeds, which mitigate the conditions that contribute to collisions. Data analysis also explored whether there was evidence of a “safety in numbers benefit” that resulted from bikesharing activity. However, no significant impact from bikesharing activity on broader bicycle collisions could be found within the regions in which they operate. Discussion and recommendations are presented in the conclusion.

**Subject Areas:** Bikesharing; Safety; Bicycle; Collisions**Availability:** Martin E, Cohen A, Botha JL, Shaheen S. Bikesharing and Bicycle Safety. Report No. CA-MTI-15-1204 March 2016[http://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=1206&context=mti\\_publications](http://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=1206&context=mti_publications)

**Title: National Safe Routes to School program and risk of school-age pedestrian and bicyclist injury**

**Authors:** DiMaggio, Charles, Spiros Frangos, and Guohua Li.

**Abstract:** Purpose: Safe Routes to School (SRTS) was a federally funded transportation program for facilitating physically active commuting to and from school in children through improvements of the built environment. There is evidence that SRTS programs increase walking and bicycling in school-age children, but their impact on pedestrian and bicyclist safety has not been adequately examined. We investigate the impact and effects of the SRTS program on school-age pedestrian and bicyclist injuries in a nationwide sample in the United States. Methods: Data were crash records for school-age children (5–19 years) and adults (30–64 years), in 18 U.S. states for a 16-year period (1995–2010). Multilevel negative binomial models were used to examine the association between SRTS intervention and the risk of pedestrian and bicyclist injury in children aged 5–19 years. Results: SRTS was associated with an approximately 23% reduction (incidence rate ratio = 0.77, 95% confidence interval = 0.65–0.92) in pedestrian/bicyclist injury risk and a 20% reduction in pedestrian/bicyclist fatality risk (incidence rate ratio = 0.80, 95% confidence interval = 0.68–0.94) in school-age children compared to adults aged 30–64 years. Conclusions: Implementation of the SRTS program appears to have contributed to improving traffic safety for school-age children in the United States.

**Subject Areas:** Environment and public health; Prevention and control; Motor vehicles; Injuries

**Availability:** DiMaggio, Charles, Spiros Frangos, and Guohua Li. "National Safe Routes to School program and risk of school-age pedestrian and bicyclist injury." *Annals of Epidemiology* (2016). <http://www.sciencedirect.com/science/article/pii/S1047279716300837>

**Title: Joint Modeling of Pedestrian and Bicycle Crashes: A Copula Based Approach**

**Authors:** Nashad, Tammam

**Abstract:** The study contributes to safety literature on active mode transportation safety by employing a copula based model for count frequency analysis at a macro-level. Most studies in the transportation safety area identify a single count variable (such as vehicular, pedestrian or bicycle crash counts) for a spatial unit and study the impact of exogenous variables. While the traditional count models perform adequately in the presence of a single count variable, it is necessary to modify these approaches to examine multiple dependent variables for each study unit. To that extent, the current research effort contributes to literature by developing a multivariate model by adopting a copula based bivariate negative binomial model for pedestrian and bicyclist crash frequency analysis. The proposed approach also accommodates for potential heterogeneity (across zones) in the dependency structure. The formulated models are estimated using pedestrian and bicycle crash count data at the Statewide Traffic Analysis Zone (STAZ) level for the state of Florida for the years 2010 through 2012. The STAZ level variables considered in our analysis include exposure measures, socio-economic characteristics, road network characteristics and land use attributes. A policy analysis is also conducted along with a representation of hotspot identification to illustrate the applicability of the proposed model for planning purposes. The development of such spatial profiles will allow planners to identify high risk zones for screening and treatment purposes.

**Subject Areas:** Copula; spatial profiles; active mode safety

**Availability:** Nashad, Tammam. Joint Modeling of Pedestrian and Bicycle Crashes: A Copula Based Approach. Diss. University of Central Florida, 2015.

[http://www.people.cecs.ucf.edu/neluru/Papers/Count%20Copula\\_TRR.pdf](http://www.people.cecs.ucf.edu/neluru/Papers/Count%20Copula_TRR.pdf)



**Title:** Active Transportation Surveillance—United States, 1999–2012

**Authors:** Geoffrey P. Whitfield

**Abstract:** Results varied widely across assessment types. The prevalence of primarily walking or bicycling to work in the past week ranged from 2.6% to 3.4%; the prevalence of any AT assessed by single-day measures ranged from 10.5% to 18.5%; and the prevalence of any recent, habitual AT ranged from 23.9% to 31.4%. Regardless of assessment type, AT was usually more common among men, younger respondents, minority racial/ethnic groups, and those at either end of the education spectrum (i.e. less than high school and college graduate). AT also tended to be more prevalent in densely populated urban areas. No trends over time were evident.

**Subject Areas:** active transportation

**Availability:** Look F. Active Transportation Surveillance—United States, 1999–2012. Journal Information. 2016 Mar;106(3).

<http://ajph.aphapublications.org/doi/full/10.2105/AJPH.2016.303102>

**Title: Using Pedestrian Accessibility Indicators to Locate Schools: A Site Suitability Analysis in Greenville County, South Carolina**

**Authors:** Nathan Stewart

**Abstract:** Walking and biking have always been important ways for children to get to school, but these modes of transportation have declined significantly in recent years as the majority of children now arrive to school via bus or automobile. Importantly, walking or riding a bike to school can help students; not only does it promote better health, but it also improves student concentration and academic success. Studies have shown that students who walk or ride their bike to school perform better due to the exercise they receive prior to beginning their learning for the day. For this reason, this thesis focuses on finding suitable locations for schools that promote pedestrian accessibility and student walking. Greenville County, in South Carolina, is used as the study area for this thesis. The question that this site suitability analysis (SSA) examines is the following: where are the best possible locations for new schools that meets the district's needs and maximizes the student's pedestrian accessibility? This study uses seven different criteria to determine the most suitable location for an elementary, middle, and high school to answer that question. The data are analyzed and a few suitable locations are identified. Then, the data are scored using population density and pedestrian accessibility. Lastly, the results are tabulated to reveal the best possible location for this SSA. This study could serve as a guide for future planning committees, school boards, districts, or city developers to help determine how and where schools should be placed throughout the country.

**Subject Areas:** school; walk; bike; exercise; accessibility; site suitability analysis

**Availability:** Stewart, Nathan. Using Pedestrian Accessibility Indicators to Locate Schools: A Site Suitability Analysis in Greenville County, South Carolina. Diss. University of Southern California, 2016. <http://spatial.usc.edu/wp-content/uploads/2016/02/Stewart-Nathan.pdf>

**Title: Measuring Low Stress Bike Access To Marta**

**Authors:** Cary Briscoe Bearn

**Abstract:** Level of Traffic Stress (LTS) is a bicycle quality of service measure originally developed by the Mineta Transportation Institute (MTI) that categorizes road infrastructure into four levels based on amount of traffic stress perceived by a bicyclist (Mekuria, Furth, & Nixon, 2012). The concept builds on research indicating that bicyclists can be grouped based on their comfort level. Riders identifying as strong and fearless as well as enthused and confident bicyclists represent most of the current users of the bicycle network across the US. However, there is a large group of cautious and concerned bicyclists that might be more likely to bike if the bicycle infrastructure were less stressful. This research uses a case study approach to show how LTS methodology can be used to define a low stress bicycle network.

This research applies the LTS methodology to quantify low stress bicycle access around the West End, Oakland City, and Lakewood/Ft. McPherson (Metropolitan Atlanta Rapid Transit Authority) MARTA rail stations. The Equitable Transit Oriented Development (TOD) typology analysis conducted by Reconnecting America identified these station areas as highly vulnerable with lagging markets (Reconnecting America, 2013). Additional analysis compares the existing low stress network, improved low stress networks, and the entire (low and high stress) bike network. Ultimately this work can serve as a model for both transportation planners interested in improving bike access both in general and specifically to transit.

**Subject Areas:** LTS, bicycle

**Availability:** Bearn, Cary Briscoe. "Measuring Low Stress Bike Access To Marta." Georgia Tech Diss. (2015). <https://smartech.gatech.edu/bitstream/handle/1853/54474/BEARN-THESIS-2015.pdf>

**Title: RAMSEY COUNTY-WIDE Pedestrian & Bicycle Plan: Purpose Vision and Goals**

**Authors:** Ramsey County

**Abstract:** For over 10 years, Active Living Ramsey Communities, with all of its community partners, has facilitated change to create environments that make it safe and easy for people of all ages and abilities to be physically active in their daily routine. Active Living Ramsey Communities encourages healthy lifestyles by bringing people and resources together to build active, bikeable and walkable communities. Their vision and collaborative efforts inform all aspects of this plan and support active transportation in Ramsey County. This plan is a resource and a framework for development of a connected Ramsey County where communities and residents are engaged in the process of building a great place for walking and bicycling. This is not a typical plan focused on specific projects for an individual jurisdiction, but rather a set of tools, analyses and actions to engage community members at all levels in supporting a place where people of all ages and abilities can safely and comfortably walk and bicycle.

**Subject Areas:** pedestrian and bicycle plan

**Availability:** RAMSEY COUNTY-WIDE Pedestrian & Bicycle Plan: Purpose Vision and Goals

<https://www.ramseycounty.us/sites/default/files/Projects%20and%20Initiatives/Section%201%20-%20Purpose%20Vision%20and%20Goals%20Web.pdf>

**Title: Bicycle-Related Shoulder Injuries: Etiology and the Need for Protective Gear**

**Authors:** Yariv Goldstein MD, Oleg Dolkart PhD, Ehud Kaufman MD, Eyal Amar MD, Zachary T. Sharfman MSc, Ehud Rath MD, Gavriel Mozes MD and Eran Maman MD

**Abstract:** Background: The popularity of bicycle riding for recreation, exercise and transportation has grown enormously in recent years, which has led to an increased incidence of bicycle related injuries. While these injuries involve mainly the musculoskeletal system, data on shoulder-specific injuries incurred while bike riding are lacking. Classifying these shoulder injuries may provide insight and assistance in the creation and implementation of effective protective gear and measures. Objectives: To investigate the types and mechanisms of shoulder injuries among cyclists. Methods: This study retrospectively examined all cyclists who incurred shoulder injuries while riding and were admitted to the emergency department and shoulder clinic between January 2008 and November 2013. The study included 157 subjects with various bicycle-related shoulder injuries treated with either conservative or surgical measures. Results: Eighty-four percent of injuries were caused by a direct blow to the shoulder, 7% by falling on an outstretched hand, 6% were traction injuries, and 3% were due to hyperabduction. Nine different clinical types of injury were observed; the most common injuries were clavicle fractures (32%), followed by acromioclavicular joint dislocations (22%), rotator cuff tears (22%), and humeral fractures (8%). Fifty-one percent of subjects were managed with conservative care and the remaining patients required surgical interventions. Conclusions: Shoulder injuries incurred while riding a bicycle span the entire spectrum of shoulder injuries and often result in debilitating conditions. Although the use of helmets is increasing, there is currently no effective protective gear or measures to prevent riders from suffering shoulder injuries.

**Subject Areas:** bicycle, shoulder injuries, clavicle fractures, protective gear

**Availability:** Goldstein, Yariv, et al. "Bicycle-Related Shoulder Injuries: Etiology and the Need for Protective Gear." The Israel Medical Association journal: IMAJ 18.1 (2016): 23-26.

<http://europepmc.org/abstract/med/26964275>

**Title: Bicycle Helmet Use Trends and Related Risk of Mortality and Traumatic Brain Injury among Pediatric Trauma**

**Authors:** J Laureano Phillips, Tiffany L Overton, Mackenzie Campbell-Furtick\*, Hunter P Nolen, Rajesh R Gandhi, Therese M Duane and Shahid Shafi

**Abstract:** Introduction: An estimated 33 million children ride bicycles annually in the United States, resulting in ~450,000 emergency department visits and 384 deaths--most resulting from traumatic brain injury (TBI). Bicycle helmet use among children is low despite educational and injury prevention efforts. The study aims to evaluate helmet use trends and determine risk of in-hospital mortality and TBI among the national pediatric trauma population. Materials and methods: We analyzed a nationally-representative sample of patients from the National Trauma Data Bank National Sample Program for 2003-2004 and 2007-2010. Patients  $\leq$  17 years of age admitted to a Level I or II trauma center with blunt injury due to pedal cycle and data for helmet use were included. Patients wearing a helmet at the time of injury were compared to those without a helmet. Adjusted logistic regression models determined the odds of helmet use, TBI, and in-hospital mortality. Results: Overall, only 21% of children wore helmets at the time of injury. Helmet use decreased significantly from 28% in 2003-2004 to 19% in 2009-2010. Patients aged 10-17 years, females, Hispanics, African Americans, and those lacking private insurance had higher odds of not wearing a helmet. Helmet use and Hispanic and African American race/ethnicity were protective against TBI. Patients aged 13-17 years and African Americans were at greater risk of in-hospital mortality. Patients who wore a helmet, were male, or were Hispanic had lower odds of death. Conclusions: Bicycle helmet use among the national pediatric trauma population is low and has not improved. While helmet use is protective against TBI and lowers risk of death following bicycle-related injury, certain age and racial/ethnic groups are at increased risk of mortality and have higher odds of suffering a TBI following bicycle-related injury. Knowledge dissemination of helmet use trends and related risks of injury and mortality from non-compliance could improve prevention efforts aimed at increasing helmet compliance among pediatric bicycle riders.

**Subject Areas:** Pediatric trauma; Bicycle helmet; Injury prevention; Protective device; Helmet use; Mortality

**Availability:** J Laureano Phillips, Tiffany L Overton, Mackenzie Campbell-Furtick\*, Hunter P Nolen, Rajesh R Gandhi, Therese M Duane and Shahid Shafi " Bicycle Helmet Use Trends and Related Risk of Mortality and Traumatic Brain Injury among Pediatric Trauma." Journal of Epidemiology and Public Health Reviews: Vol. 1.1 (2016) ISSN 2471-8211  
<https://www.sciforschenonline.org/journals/epidemiology-public-health/article-data/JEPHR-1-103/JEPHR-1-103.pdf>

## 2. Demographic Trends

**Title:** What Drives Gender Differences in Commuting Behavior? Evidence from the American Time Use Survey

**Author:** Gray Kimbrough

**Abstract:** This study takes advantage of a large, nationally representative dataset, the American Time Use Survey (ATUS), to examine gender differences in commute character and time. A method of calculating commuting time that accounts for stops along the journey is applied to ATUS data; analysis of gender differences in the number, type, and length of stops demonstrates the need for this commuting measure. Explanations for women's shorter commutes are reviewed and tested alongside predicted relationships from a simple labor supply model. Controlling for marital status and the presence of children, women are more likely to be accompanied by children for their commute, and women tend to make longer stops than men. Multivariate regression results support two previously proposed explanations for the gender commuting time gap, based on gender differences in wages and types of jobs held. Contrary to the previously proposed Household Responsibility Hypothesis, this analysis provides evidence that greater household responsibility does not explain women's shorter commutes.

**Subject Areas:** gender; commute; ATUS;

**Availability:** Kimbrough, Gray. "What Drives Gender Differences in Commuting Behavior? Evidence from the American Time Use Survey." (2016). UNC Greensboro June 10, 2016  
<http://bryan.uncg.edu/econ/files/2016/06/GenderCommutingJune2016-2.pdf>

**Title: Millennials and car ownership: Less money, fewer cars**

**Author:** Klein NJ, Smart MJ

**Abstract:** Americans are driving less. The changes are most pronounced among Millennials, those born in the 1980s and 1990s. Much ink has been spilled debating whether these changes in travel behavior are due to changing preferences or economic circumstances. In this paper, we use eight waves of data from the Panel Study of Income Dynamics (PSID) to examine recent changes in auto ownership among US families with a particular focus on Millennials. We find that today's young adults do own fewer cars than previous generations did when they were young. However, when we control for whether young adults have become economically independent from their parents, i.e. left the nest, we find that economically independent young adults own slightly more cars than we would expect, given their low incomes and wealth. We caution planners to temper their enthusiasm about "peak car," as this may largely be a manifestation of economic factors that could reverse in coming years.

**Subject Areas:** Travel demographics; Auto ownership; Peak car; Peak travel; Millennials; PSID

**Availability:** Klein NJ, Smart MJ. Millennials and car ownership: Less money, fewer cars.

Transport Policy. 2017 Jan 31;53:20-9.

<http://www.sciencedirect.com/science/article/pii/S0967070X16305571>



**Title: Car less, or car later?—Exploring the factors associated with the decreasing car ownership of Millennial households in the central Puget Sound region between 1989 and 2014**

**Author:** Laitian Zhong

**Abstract:** This research investigates the car ownership of young households (those households mainly composed of young adults 18- to 35-year-olds) in the central Puget Sound region and compares the car ownership of Millennial households (those households mainly composed of adults born in the last two decades of the 20th century, 18- to 35-year-olds in 2015) with that of young households composed of previous generations at the same age using data from the 1989-2014 (11 survey years) household travel surveys conducted by the Puget Sound Regional Council. This study uses descriptive analysis to profile trends and linear regression model to identify and prioritize the factors that associate with the decreased car ownership of Millennial households.

The regression model reveals four major factors that are associated with the decreased car ownership of Millennial households, including changes in life stages and income (size of household, status of marriage, status of having children, number of children in the household, number of employment, household income, etc.), location, the general drop of household car ownership occurring across all age groups (consuming habits, changes over year affect different areas, etc.), and Millennial-specific factors (changing attitude, communication technology use, etc.). For Millennial households in 2014 and young households in 2002, life stages and income, explain 30% to 35% of the decrease in household car ownership; changes in location explain 15% to 20% of the dampening in household car ownership; the general drop of household car ownership occurring across all households explains 30% to 40%; Millennial-specific factors account for the remaining 10% to 20%.

The low portion of Millennial-specific factors in explaining the household car ownership of Millennial households indicates that car ownership of Millennials has high possibility to increase in the future as they age and their economic fortune improve.

**Subject Areas:** car ownership; millennial;

**Availability:** Smart, Michael J., Anne Brown, and Brian D. Taylor. "Sex or sexuality? Analyzing the division of labor and travel in gay, lesbian, and straight households." *Travel Behaviour and Society* 6 (2017): 75-82. <http://www.sciencedirect.com/science/article/pii/S2214367X16300837>

**Title:** Sex or sexuality? Analyzing the division of labor and travel in gay, lesbian, and straight households

**Author:** Smart, Michael J., Anne Brown, and Brian D. Taylor

**Abstract:** People make tradeoffs between paid and unpaid labor, and in straight households women typically do the lion's share of unpaid labor, including household-serving travel. Nearly all of the previous research on this topic is limited to married heterosexual households with children, a surprisingly small and shrinking portion of the population. Using pooled data from the 2003–12 American Time Use Surveys, we explore how household-serving labor and travel vary across household types in the U.S. We examine the paid and unpaid labor tradeoffs made by partnered same-sex couples with and without children, and find that their division of paid and unpaid labor, as well as household-serving travel such as chauffeuring children, occupies a statistical middle ground between straight men and women. This suggests that the gendered nature of paid and unpaid work and travel is muted in the absence of a two-sex household structure, though some gendered differences persist.

**Subject Areas:** Travel behavior; Household division of labor; Gender; Sexuality

**Availability:** Smart, Michael J., Anne Brown, and Brian D. Taylor. "Sex or sexuality? Analyzing the division of labor and travel in gay, lesbian, and straight households." *Travel Behaviour and Society* 6 (2017): 75-82. <http://www.sciencedirect.com/science/article/pii/S2214367X16300837>

### 3. Energy Consumption

**Title:** Electrical Market Management Considering Power System Constraints in Smart Distribution Grids

**Author:** Hasanpor Divshali, Poria, and Bong Jun Choi

**Abstract:** Rising demand, climate change, growing fuel costs, outdated power system infrastructures, and new power generation technologies have made renewable distribution generators very attractive in recent years. Because of the increasing penetration level of renewable energy sources in addition to the growth of new electrical demand sectors, such as electrical vehicles, the power system may face serious problems and challenges in the near future. A revolutionary new power grid system, called smart grid, has been developed as a solution to these problems. The smart grid, equipped with modern communication and computation infrastructures, can coordinate different parts of the power system to enhance energy efficiency, reliability, and quality, while decreasing the energy cost. Since conventional distribution networks lack smart infrastructures, much research has been recently done in the distribution part of the smart grid, called smart distribution grid (SDG). This paper surveys contemporary literature in SDG from the perspective of the electricity market in addition to power system considerations. For this purpose, this paper reviews current demand side management methods, supply side management methods, and electrical vehicle charging and discharging techniques in SDG and also discusses their drawbacks. We also present future research directions to tackle new and existing challenges in the SDG.

**Subject Areas:** demand side management (DSM); electrical vehicle (EV); micro-grid (MG); power market; power stability; smart grid (SG); source side management (SSM)

**Availability:** Hasanpor Divshali, Poria, and Bong Jun Choi. "Electrical Market Management Considering Power System Constraints in Smart Distribution Grids." *Energies* 9.6 (2016): 405. <http://www.mdpi.com/1996-1073/9/6/405/htm>

## **Title: Smart PEV Charging Station Operation and Design Considering Distribution System Impact**

**Author:** Omar Hafez

**Abstract:** Penetration of plug-in electric vehicles (PEVs) into the market is expected to be large in the near future. Also, as stated by the Ontario Ministry of Transportation, the province is investing \$20 million from Ontario's Green Investment Fund to build nearly 500 electric vehicle charging stations (EVCSs) at over 250 locations in Ontario by 2017. Therefore, estimating PEV charging demand at an EVCS with their complex charging behavior, their impact on the power grid, and the optimal design of EVCS need be investigated.

This thesis first presents a queuing analysis based method for modeling the 24-hour charging load profile of EVCSs. The queuing model considers the arrival of PEVs as a non-homogeneous Poisson process with different arrival rates over the day; considering customer convenience and charging price as the factors that influence the hourly arrival rate of vehicles at the EVCS. One of the main contributions of the thesis is to model the PEV service time considering the state-of-charge of the battery and the effect of the battery charging behavior. The impact of PEV load models on distribution systems is studied for a deterministic case, and the impact of uncertainties is examined using the stochastic optimal power flow and Model Predictive Control approaches.

The thesis presents a novel mathematical model for representing the total charging load at an EVCS in terms of controllable parameters; the load model developed using a queuing model followed by a neural network (NN). The queuing model constructs a data set of PEV charging parameters which are input to the NN to determine the controllable EVCS load model. The smart EVCS load is a function of the number of PEVs charging simultaneously, total charging current, arrival rate, and time; and various class of PEVs. The EVCS load is integrated within a distribution operations framework to determine the optimal operation and smart charging schedules of the EVCS. Objective functions from the perspective of the local distribution company (LDC) and EVCS owner are considered for studies. The performance of a smart EVCS vis-à-vis an uncontrolled EVCS is examined to emphasize the demand response (DR) contributions of a smart EVCS and its integration into distribution operations

Finally, the thesis presents the optimal design of an EVCS with the goal of minimizing the life-cycle cost, while taking into account environmental emissions. Different supply options such as renewable energy technology based and diesel generation, with realistic inputs on their physical, operating and economic characteristics are considered, in order to arrive at the optimal design of EVCS. The charging demand of the EVCS is estimated considering real drive data. Analysis is also carried out to compare the economics of a grid-connected EVCS with an isolated EVCS and the optimal break-even distance is determined. Also, the EVCS is assumed to be connected to the grid as a smart energy hub based on different supply options.

**Subject Areas:** PEV Charging stations; EVCS; LDC; NN;

**Availability:** Hafez, Omar. "Smart PEV Charging Station Operation and Design Considering Distribution System Impact." University of Waterloo (2016).

<https://uwspace.uwaterloo.ca/handle/10012/10726>

**Title: Model-based micro-grid modeling and optimal PEV charging control**

**Author:** Wang, Luting, Chong Cao, and Bo Chen

**Abstract:** Micro-grid systems can support distribution network to avoid insufficient electricity supply by effectively integrating renewable energy sources and energy storage systems. This paper studies the modeling of a micro-grid system using SimPowerSystems in Matlab/Simulink environment. The Micro-grid consists of ten Electric Vehicle Service Equipment (EVSE), a Photovoltaics (PV) farm, an Energy Storage System (ESS), and a commercial building. To minimize charging cost as well as limit the micro-grid peak load, the Non-Integer Generic Algorithm (NIGA) optimization method is used to obtain optimized Plug-in Electric Vehicle (PEV) charging/discharging schedule with time-varying charging rate. The time-of-use (TOU) price and discharge incentive are applied to implement the cost minimization. The simulation results show that the total load is flattened corresponding to TOU price structures. The optimization that considers both discharge incentive and micro-grid load limit can generate a cost-power win-win result.

**Subject Areas:** state of charge, plug-in electric vehicles, charging/discharging schedule optimization, microgrid, photovoltaics farm, energy storage system, time-of-use price

**Availability:** Wang, Luting, Chong Cao, and Bo Chen. "Model-based micro-grid modeling and optimal PEV charging control." Mechatronic and Embedded Systems and Applications (MESA), 2016 12th IEEE/ASME International Conference on. IEEE, 2016.  
<http://ieeexplore.ieee.org/abstract/document/7587110/>

**Title: Stochastic Copula-based Multivariate Modeling of Plug-in Hybrid Electric Vehicles Load Demand in Residential Distribution**

**Author:** Vatandoust, Behzad, Ali Ahmadian, and Masoud Aliakbar Golkar

**Abstract:** Plug-in hybrid electric vehicles (PHEVs) are considered as a promising solution to resolve global warming. In order to assess the impact of PHEV's charging on distribution systems, their demand needs to be accurately predicted, especially for planning and operation studies. In this paper, a Monte Carlo-based algorithm is proposed for PHEV demand modeling. Home arrival time, traveled distance, and home departure time of light duty vehicles in Tehran is considered to extract the drivers' behavior, then multivariate student's t-copula is used to model the dependencies between the datasets. Two charging levels which can be implemented in residential distribution networks are considered. Moreover, linear and nonlinear charging profile of batteries are included in this study to increase accuracy of the proposed algorithm. The proposed model is applied to a typical 21-node test system, considering three PHEV penetration levels for year 2026, utilizing vehicle ownership data of Iran. The impacts of PHEV charging on loading, voltage profile, overcurrent incidents, and power loss are investigated and the results are presented.

**Subject Areas:** PEHVs; Monte Carlo; Copula; Uncertainty; Distribution Networks

**Availability:** Vatandoust, Behzad, Ali Ahmadian, and Masoud Aliakbar Golkar. "Stochastic Copula-based Multivariate Modeling of Plug-in Hybrid Electric Vehicles Load Demand in Residential Distribution."

[https://www.researchgate.net/profile/Ali\\_Ahmadian4/publication/311239441\\_Stochastic\\_Copula-based\\_Multivariate\\_Modeling\\_of\\_Plug-in\\_Hybrid\\_Electric\\_Vehicles\\_Load\\_Demand\\_in\\_Residential\\_Distribution/links/5840175e08ae61f75dce1473.pdf](https://www.researchgate.net/profile/Ali_Ahmadian4/publication/311239441_Stochastic_Copula-based_Multivariate_Modeling_of_Plug-in_Hybrid_Electric_Vehicles_Load_Demand_in_Residential_Distribution/links/5840175e08ae61f75dce1473.pdf)

**Title:** The effect of PEV uncontrolled and smart charging on distribution system planning

**Author:** Humayd, Abdullah S. Bin, Badr Lami, and Kankar Bhattacharya

**Abstract:** This paper presents a planning model for distribution systems considering various energy supply options such as distributed generation (DG), substations, and feeders. In addition, the impact of Plug-in-Electric Vehicle (PEV) uncontrolled and smart charging loads on the plan outcome is evaluated. A new optimal power flow (OPF) based optimization model is proposed to schedule PEV uncontrolled and smart charging loads. Test results are presented to demonstrate the effectiveness of the proposed model. The results show that PEV charging loads significantly affects the plan outcomes.

**Subject Areas:** distribution system planning, Plug-in electric vehicles, distributed generation

**Availability:** Humayd, Abdullah S. Bin, Badr Lami, and Kankar Bhattacharya. "The effect of PEV uncontrolled and smart charging on distribution system planning." Electrical Power and Energy Conference (EPEC), 2016 IEEE. IEEE, 2016.

<http://ieeexplore.ieee.org/abstract/document/7771783/>



**Title: Developing a multi-objective framework for planning studies of modern distribution networks**

**Author:** Olia, S. A. H. S., Jooshaki, M., Moeini-Aghaie, M., & Fotuhi-Firuzabad, M.

**Abstract:** This paper presents a new framework for planning studies of modern distribution networks. Presence of electric vehicles (EVs) and various technologies of distributed generation (DG) technologies are considered in the studies as two upcoming events of the future systems. In this regard, place and capacity of DG units along with the reinforcement of distribution lines are determined running a multi-objective (MO) optimization algorithm. Total losses of the distribution network along with annualized cost of expansion plans including investment, operation and maintenance costs are introduced as the main criteria which should be optimized in the proposed framework. An effective Posteriori optimization tool, i. e. Non-Dominated Sorting Genetic Algorithm II (NSGAI) is borrowed to solve the attained optimization problem of the studies. The proposed planning procedure is implemented on a distribution test system (IEEE RBTS-BUS5) and the optimal solutions have been found which shows the applicability and effectiveness of proposed algorithm.

**Subject Areas:** total losses, Distributed Generations (DGs), Electric vehicles (EVs), Multi-Objective (MO) optimization

**Availability:** Olia, S. A. H. S., Jooshaki, M., Moeini-Aghaie, M., & Fotuhi-Firuzabad, M. (2016, December). Developing a multi-objective framework for planning studies of modern distribution networks. In Probabilistic Methods Applied to Power Systems (PMAPS), 2016 International Conference on (pp. 1-6). IEEE.

<http://ieeexplore.ieee.org/abstract/document/7764221/>

**Title: Boosting the adoption and the reliability of renewable energy sources: Mitigating the large-scale wind power intermittency through vehicle to grid technology**

**Author:** Zhao, Yang, Mehdi Noori, and Omer Tatari

**Abstract:** The integration of wind energy in the electricity sector and the adoption of electric vehicles in the transportation sector both have the potential to significantly reduce greenhouse gas emissions individually as well as in tandem with Vehicle-to-Grid technology. This study aims to evaluate the greenhouse gas emission savings of mitigating intermittency resulting from the introduction of wind power through Vehicle-to-Grid technologies, as well as the extent to which the marginal electricity consumption from charging an electric vehicle fleet may weaken this overall environmental benefit. To this end, the comparisons are conducted in seven independent system operator regions. The results indicate that, in most cases, the emission savings of a combination of wind power and Vehicle-to-Grid technology outweighs the additional emissions from marginal electricity generation for electric vehicles. In addition, the fluctuations in newly-integrated wind power could be balanced in the future using EVs and V2G technology, provided that a moderate portion of EV owners is willing to provide V2G services. On the other hand, such a combination is not favorable if the Vehicle-to-Grid service participation rate is less than 5% of all electric vehicle owners within a particular region.

**Subject Areas:** Vehicle to grid; Wind power integration; Regulation requirements; Marginal electricity generation; GHG emissions

**Availability:** Zhao, Yang, Mehdi Noori, and Omer Tatari. "Boosting the adoption and the reliability of renewable energy sources: Mitigating the large-scale wind power intermittency through vehicle to grid technology." *Energy* (2016).

<http://www.sciencedirect.com/science/article/pii/S0360544216317674>

**Title: Modeling and Impacts of Plug-in Electric Vehicles in Residential Distribution Systems with Coordinated Charging Schemes**

**Author:** S. Zambrano-Perilla, G. Ramos, D. Celeita

**Abstract:** This paper proposes a modeling methodology for implementation of a charging infrastructure of Plug-in Electric Vehicles (PEVs) within residential distribution systems. Using the feeder daily models, driving patterns, PEVs penetration and charging characteristics, the impact of their connection in the Power Distribution Network (PDN) is determined. In doing so, the number and distribution of PEVs in a residential distribution network are applied to the IEEE 13-node test feeder. Then, coordinated charging of the PEVs is proposed in order to minimize overloading and under-voltage events in the network, and also to perform peak load shaving through the means of load shifting, by delaying the start charging time of PEVs to off peak hours. Finally, impacts such as change in feeder demand curves, voltage deviation, overloading elements, electrical losses, and voltage unbalance, are addressed; taking into account the coordinated charging schemes proposed.

**Subject Areas:** Coordinated Charging, Distribution System, Peak Load Shaving, Plug-in Electric Vehicles

**Availability:** Zambrano-Perilla, S., G. Ramos, and D. Celeita. "Modeling and Impacts of Plug-in Electric Vehicles in Residential Distribution Systems with Coordinated Charging Schemes." (2016).

[https://www.researchgate.net/profile/David\\_Felipe\\_Celeita\\_Rodriguez/publication/309957596\\_Modeling\\_and\\_Impacts\\_of\\_Plug-in\\_Electric\\_Vehicles\\_in\\_Residential\\_Distribution\\_Systems\\_with\\_Coordinated\\_Charging\\_Schemes/links/582f106a08ae138f1c034ce3.pdf](https://www.researchgate.net/profile/David_Felipe_Celeita_Rodriguez/publication/309957596_Modeling_and_Impacts_of_Plug-in_Electric_Vehicles_in_Residential_Distribution_Systems_with_Coordinated_Charging_Schemes/links/582f106a08ae138f1c034ce3.pdf)

**Title: A novel feature fitting simulation algorithm for estimating electric vehicle demand**

**Author:** Shahrukh, Shahzada M., and Kankar Bhattacharya

**Abstract:** Electric vehicles will drive the future, therefore forecasting and simulating 'transportation electrification' demand over the coming years has become important for utilities. Ever since electricity was commercialized there has been a need for demand forecasting and simulation because electricity provider's ability to produce energy far exceeds their ability to store energy. This is an industry worth billions of dollars and therefore even a marginal improvement in the way it's predicted can have a great impact. Demand forecasting is critical for unit commitment and broadly effects the wholesale electricity market price. With the addition of transportation electrification this process has become even more challenging. Traditional ways are hard to model and computationally intensive, nowadays this type of problem is of great interest in the field of machine learning as well, because of the availability of large datasets from utilities. However datasets for transportation electrification still remain a huge challenge therefore more work needs to be done in forecasting electric vehicular loads. This paper tackles this new problem and presents a new method called Feature Fitting Simulation Algorithm to estimate electric vehicle charging demand profiles. The simulation was performed on MATLAB and Excel using various tools and functions to ensure the algorithms run on optimum efficiency. The novel feature of the algorithm is its hybrid structure of considering both historical and simulation data for temporal predication, secondly it introduces two key variables scaling and sensitivity to better control the time series output. FFSA is vetted against machine learning algorithms and the results indicate a better performance achieved by FFSA.

**Subject Areas:** Demand forecasting, Electric vehicles

**Availability:** Shahrukh, Shahzada M., and Kankar Bhattacharya. "A novel feature fitting simulation algorithm for estimating electric vehicle demand." Electrical Power and Energy Conference (EPEC), 2016 IEEE. IEEE, 2016.

<http://ieeexplore.ieee.org/abstract/document/7771780/>

**Title: Mitigation of the Impact of High Plug-in Electric Vehicle Penetration on Residential Distribution Grid Using Smart Charging Strategies**

**Author:** Cao, Chong, Luting Wang, and Bo Chen

**Abstract:** Vehicle electrification presents a great opportunity to reduce transportation greenhouse gas emissions. The greater use of plug-in electric vehicles (PEVs), however, puts stress on local distribution networks. This paper presents an optimal PEV charging control method integrated with utility demand response (DR) signals to mitigate the impact of PEV charging to several aspects of a grid, including load surge, distribution accumulative voltage deviation, and transformer aging. To build a realistic PEV charging load model, the results of National Household Travel Survey (NHTS) have been analyzed and a stochastic PEV charging model has been defined based on survey results. The residential distribution grid contains 120 houses and is modeled in GridLAB-D. Co-simulation is performed using Matlab and GridLAB-D to enable the optimal control algorithm in Matlab to control PEV charging loads in the residential grid modeled in GridLAB-D. Simulation results demonstrate the effectiveness of the proposed optimal charging control method in mitigating the negative impacts of PEV charging on the residential grid.

**Subject Areas:** demand response (DR); GridLAB-D; plug-in electric vehicle (PEV) charging; power distribution system

**Availability:** Cao, Chong, Luting Wang, and Bo Chen. "Mitigation of the Impact of High Plug-in Electric Vehicle Penetration on Residential Distribution Grid Using Smart Charging Strategies." *Energies* 9.12 (2016): 1024. <http://www.mdpi.com/1996-1073/9/12/1024/htm>

**Title: CatCharger: Deploying Wireless Charging Lanes in a Metropolitan Road Network through Categorization and Clustering of Vehicle Traffic**

**Author:** Yan, L., Shen, H., Zhao, J., Xu, C., Luo, F., & Qiu, C.

**Abstract:** The future generation of transportation system will be featured by electrified public transportation. To fulfill metropolitan transit demands, electric vehicles (EVs) must be continuously operable without recharging downtime. Wireless Power Transfer (WPT) techniques for in-motion EV charging is a solution. It however brings up a challenge: how to deploy charging lanes in a metropolitan road network to minimize the deployment cost while enabling EVs' continuous operability. In this paper, we propose CatCharger, which is the first work that handles this challenge. From a metropolitan-scale dataset collected from multiple sources of vehicles, we observe the diversity of vehicle passing speed and daily visit frequency (called traffic attributes) at intersections (i.e., landmarks), which are important factors for charging lane deployment. To select landmarks for deployment, we first group landmarks with similar traffic attribute values using the entropy minimization clustering method, and choose better candidate landmarks from each group suitable for deployment. To determine the deployment locations from the candidate landmarks, we infer the expected vehicle residual energy at each landmark using a Kernel Density Estimator fed by the vehicles' mobility, and formulate and solve an optimization problem to minimize the total deployment cost while ensuring a certain level of expected residual energy of EVs at each landmark. Our trace-driven experiments demonstrate the superior performance of CatCharger over other methods.

**Subject Areas:** metropolitan transit demand, EV, Wireless Power Transfer, CatCharger

**Availability:** Yan, L., Shen, H., Zhao, J., Xu, C., Luo, F., & Qiu, C. CatCharger: Deploying Wireless Charging Lanes in a Metropolitan Road Network through Categorization and Clustering of Vehicle Traffic. [http://www.people.virginia.edu/~ly4ss/papers/conference/catcharger\\_conf.pdf](http://www.people.virginia.edu/~ly4ss/papers/conference/catcharger_conf.pdf)

**Title: Estimated Bounds and Important Factors for Fuel Use and Consumer Costs of Connected and Automated Vehicles**

**Author:** Stephens, T. S., Gonder, J., Chen, Y., Lin, Z., Liu, C., & Gohlke, D.

**Abstract:** The rapid advancement of connected and automated vehicle (CAV) technologies may disrupt vehicle use, ownership, and design, resulting in large changes in energy consumption, use of alternative transportation modes, and development and deployment of efficiency-improving vehicle technologies. To help identify analysis and research needs related to CAVs, this report:

- Reviews recent literature related to CAVs
- Provides a framework that synthesizes analysis and simulation case studies of potential CAV deployment scenarios
- Identifies key knowledge gaps and uncertainties for assessing CAV energy impacts, emphasizing future research and analysis priorities to better understand these impacts.

The remainder of Section 1 describes the scenario-based approach used by this study to examine CAV technology impacts. Section 2 estimates lower and upper bounds on the long-term impacts of CAVs for light-duty vehicles (LDVs) with a focus on energy impacts in Section 2.1 and on consumer costs in Section 2.2. Section 3 provides details on the analysis methodology and literature-extracted input assumptions that supported the Section 2 findings. Section 4 highlights the major factors contributing to the ranges of potential CAV impacts identified in Section 2, and discusses key data gaps and uncertainties identified as priority areas for future research to address. Section 5 summarizes the report's findings and conclusions.

**Subject Areas:** CAVs, energy impact

**Availability:** Stephens, T. S., Gonder, J., Chen, Y., Lin, Z., Liu, C., & Gohlke, D. (2016). Estimated Bounds and Important Factors for Fuel Use and Consumer Costs of Connected and Automated Vehicles (No. NREL/TP-5400-67216). NREL (National Renewable Energy Laboratory (NREL), Golden, CO (United States)). <http://www.nrel.gov/docs/fy17osti/67216.pdf>

**Title:** Research on large scale EV charging optimization strategy

**Author:** Zhang, J., Zhou, Q., Li, M., & Long, H.

**Abstract:** The charging behavior of large scale electric vehicle (EV) fleet has the time-spatial characteristics, in this paper the charging characteristics and driving behaviors of an EV was analyzed, and the EV charging load model has been developed. Based on the Monte Carlo method, the charging model of large scale EVs has been built and the impacts of the charging behaviors of the large amount EVs has been simulated. The optimal EV orderly charging model has been developed with the objectives of system load shaving and charging cost minimization. The Particle Swarm Optimization (PSO) method was applied to solve the EV orderly charging problem in order to achieve the optimal charging strategy. An IEEE distribution network was used for the case simulations. The results show that the proposed EV orderly charging strategy could effectively reduce the system peak-valley load difference and minimize the impacts to the power grid caused by the large scale EV charging. When the real-time pricing or time-of-use pricing scheme applied, it could also significantly reduce the EV charging cost.

**Subject Areas:** PSO Algorithm, EV Coordinated Charging, Charging Infrastructure

**Availability:** Zhang, J., Zhou, Q., Li, M., & Long, H. (2016, November). Research on large scale EV charging optimization strategy. In Power System Technology (POWERCON), 2016 IEEE International Conference on (pp. 1-6). IEEE.

<http://ieeexplore.ieee.org/abstract/document/7754062/>



**Title: Vehicle Miles (Not) Traveled: Fuel Economy Requirements, Vehicle Characteristics, and Household Driving**

**Author:** West, J., Hoekstra, M., Meer, J., & Puller, S. L.

**Abstract:** A major concern with addressing the negative externalities of gasoline consumption by regulating fuel economy, rather than increasing fuel taxes, is that households respond by driving more. This paper exploits a discrete threshold in the eligibility for Cash for Clunkers to show that fuel economy restrictions lead households to purchase vehicles that have lower cost-per-mile, but are also smaller and lower-performance. Whereas the former effect can increase driving, the latter effect can reduce it. Results indicate these households do not drive more, suggesting that behavioral responses do not necessarily undermine the effectiveness of fuel economy restrictions at reducing gasoline consumption.

**Subject Areas:** Fuel economy, rebound effect, regression discontinuity

**Availability:** West, J., Hoekstra, M., Meer, J., & Puller, S. L. (2016). Vehicle miles (not) traveled: Fuel economy requirements, vehicle characteristics, and household driving. *Journal of Public Economics*. <http://www.sciencedirect.com/science/article/pii/S0047272716301463>

**Title: On the role of prosumers owning rooftop solar photovoltaic in reducing the impact on transformer's aging due to plug-in electric vehicles charging**

**Author:** Gray, M. K., and W. G. Morsi

**Abstract:** This paper investigates the synergetic effect of rooftop solar photovoltaic (PV) generation owned by residential prosumers (power producers and consumers) on reducing the distribution substation transformer's aging caused by charging plug-in electric vehicles (PEVs). Unlike previous work considering surveys based on internal combustion engine-based vehicle data (e.g., National Household Travel Survey (NHTS)) are used in estimating the charging demand of PEVs, this work considers actual PEVs charging data based on the 2015 Canadian Plug-in Electric Vehicle Survey (CPEVS). This work further quantifies the resultant aging seen on substation transformers when internal combustion engine-based National Household Travel Survey data as compared to plug-in electric vehicle driving data from the Canadian Plug-in Electric Vehicle Survey. Moreover, a comparison of the substation transformer aging is performed based on varying plug-in electric vehicle charging levels. Results of the scenarios have shown substation transformer loss of life is found to be at least 30% higher when vehicle data is based on plug-in electric vehicle studies versus conventional internal combustion engine vehicles with 0% PV penetration, up to twice as high at 100% PV penetration. Further studies have shown grouped plug-in electric vehicle charging using 3.3 kW at 7 pm results in twice the transformer aging seen versus plug-in electric vehicles charging beginning upon returning home. Finally, results have shown that the effect of rooftop solar PV owned by residential prosumers was found to reduce substation transformer loss-of-life by 75% in the case of 3.3 kW plug-in electric vehicle charging when 100% PV penetration was added to the system. Such reduction is due to a decrease in transformer's winding hot-spot temperature caused by PV generation despite the non-coincidence between the peak charging demand of plug-in electric vehicles and the peak power generation from rooftop solar photovoltaic.

**Subject Areas:** Electric vehicles; Monte Carlo simulation; Power quality; Rooftop solar photovoltaic; Transformer loss of life

**Availability:** Gray, M. K., and W. G. Morsi. "On the role of prosumers owning rooftop solar photovoltaic in reducing the impact on transformer's aging due to plug-in electric vehicles charging." *Electric Power Systems Research* (2016).

<http://www.sciencedirect.com/science/article/pii/S0378779616304679>

**Title:** Charging behavior characteristic simulation of plug-in electric vehicles for demand response

**Author:** Liu, Peng, and Jilai Yu

**Abstract:** This paper aims to obtain the natural charging behavior characteristic (NCBC) of plug-in electric vehicles (PEVs) via stochastic simulation. To this end, a novel stochastic simulating methodology is proposed. Compared to earlier studies, advantages of the proposed methodology are: 1) it does not need sophisticated transportation datasets; 2) it simulates the charging behaviors of aggregated PEVs more convincingly for a long time window (multi weeks). Then, two parameters are defined to characterize the natural charging behaviors of the large scale aggregated PEVs. And the time-varying pattern of these two NCBC-parameters are analyzed by using the proposed simulating methodology. Finally, the results of NCBC-parameters for large scale heterogeneous PEVs are simulated. These results can be used to evaluate the demand response flexibility of the aggregated charging load (ACL), which is the key to design smart charging schemes.

**Subject Areas:** parameter, plug-in electric vehicle, natural charging behavior characteristic, stochastic simulation

**Availability:** Liu, Peng, and Jilai Yu. "Charging behavior characteristic simulation of plug-in electric vehicles for demand response." Control (CONTROL), 2016 UKACC 11th International Conference on. IEEE, 2016. <http://ieeexplore.ieee.org/abstract/document/7737632/>

**Title: Optimal Penetration of Home Energy Management Systems in Distribution Networks Considering Transformer Aging**

**Author:** Olsen, Daniel Julius, Mushfiqur R. Sarker, and Miguel A. Ortega-Vazquez

**Abstract:** In the near future, Home Energy Management Systems (HEMSs) will become common in reaction to timevarying pricing, and residential electricity customers' striving to minimize their energy costs. However, if many residences connected to a common pole-top transformer are all optimizing their electricity consumption based on the same electricity tariff, their aggregated demand may result in large, short-lived peaks. Traditional demand peaks would be reduced since the electricity prices are high, but early morning (low price periods) demand peaks would be increased. Since high demand increases transformer temperatures and degrades their insulation, managing these peaks extends transformer life and reduces network upkeep costs. This study presents an approach for managing the rollout of HEMSs on a distribution feeder. Several heuristic strategies for incentivizing customer adoption of HEMSs are investigated and compared to the optimal adoption strategy. A case study using representative data is conducted and the results show that transformer aging costs can be reduced by an order of magnitude by managing adoption rates and strategies. When incentivization costs are included, the optimal HEMS penetration and net benefit are reduced, but a value proposition still exists for targeted HEMS adoption.

**Subject Areas:** insulation life, home automation, load modeling, power transformer insulation, power distribution planning

**Availability:** Olsen, Daniel Julius, Mushfiqur R. Sarker, and Miguel A. Ortega-Vazquez. "Optimal Penetration of Home Energy Management Systems in Distribution Networks Considering Transformer Aging." IEEE Transactions on Smart Grid (2016).  
<http://ieeexplore.ieee.org/abstract/document/7748519/>

**Title: A novel approach for sizing electric vehicles Parking Lot located at any bus on a network**

**Author:** El-Bayeh, C. Z., Mougharbel, I., Saad, M., Chandra, A., Lefebvre, S., Asber, D., & Lenoir, L.

**Abstract:** Many studies have concentrated on how to optimize the size and placement of Parking Lots (PLs) on a distribution network. Within this context, this study consists of presenting a systematic approach for sizing the PL in terms of number of simultaneously plugged-in vehicles. This approach is original since it takes into account the loads' profile on the bus where the PL is connected (it is valid for any load profile on the bus), the PL manager benefits and the vehicles' owners requirements. Multiple technical constraints are respected, those imposed by the PL infrastructure and those related to the distribution network. A mathematical model and an algorithm are developed for this purpose using MATLAB.

**Subject Areas:** Size of a Parking Lot, Parking Lot, Electric Vehicles, Charging Discharging Modes

**Availability:** El-Bayeh, C. Z., Mougharbel, I., Saad, M., Chandra, A., Lefebvre, S., Asber, D., & Lenoir, L. (2016, November). A novel approach for sizing electric vehicles Parking Lot located at any bus on a network. In Power and Energy Society General Meeting (PESGM), 2016 (pp. 1-5). IEEE. <http://ieeexplore.ieee.org/abstract/document/7741105/>

**Title: Plug-in hybrid electric vehicle LiFePO<sub>4</sub> battery life implications of thermal management, driving conditions, and regional climate**

**Author:** Yuksel, T., Litster, S., Viswanathan, V., & Michalek, J. J.

**Abstract:** Battery degradation strongly depends on temperature, and many plug-in electric vehicle applications employ thermal management strategies to extend battery life. The effectiveness of thermal management depends on the design of the thermal management system as well as the battery chemistry, cell and pack design, vehicle system characteristics, and operating conditions. We model a plug-in hybrid electric vehicle with an air-cooled battery pack composed of cylindrical LiFePO<sub>4</sub>/graphite cells and simulate the effect of thermal management, driving conditions, regional climate, and vehicle system design on battery life. We estimate that in the absence of thermal management, aggressive driving can cut battery life by two thirds; a blended gas/electric-operation control strategy can quadruple battery life relative to an all-electric control strategy; larger battery packs can extend life by an order of magnitude relative to small packs used for all-electric operation; and batteries last 73–94% longer in mild-weather San Francisco than in hot Phoenix. Air cooling can increase battery life by a factor of 1.5–6, depending on regional climate and driving patterns. End of life criteria has a substantial effect on battery life estimates.

**Subject Areas:** Battery life; Battery degradation; Plug-in hybrid electric vehicle; Thermal management; Lithium-ion

**Availability:** Yuksel, T., Litster, S., Viswanathan, V., & Michalek, J. J. (2017). Plug-in hybrid electric vehicle LiFePO<sub>4</sub> battery life implications of thermal management, driving conditions, and regional climate. *Journal of Power Sources*, 338, 49-64.

<http://www.sciencedirect.com/science/article/pii/S0378775316315130>

**Title:** Adequacy assessment of power systems with PEV charging loads considering customer behaviour

**Author:** Lami, Badr, Abdullah Bin Humayd, and Kankar Bhattacharya

**Abstract:** Electrifying the transportation sector will undoubtedly influence power systems in various aspects from network losses and cost of operation to system reliability. This paper presents a novel framework to evaluate the impact of PEV charging loads on composite power system reliability. An optimal power flow (OPF) based model combined with a minimum cut set approach is proposed to evaluate nodal and system reliability indices. In addition, the impact of PEV types, charging characteristics, driver behaviour, and time of use electricity price have been considered through a wide range of scenarios. As well, detailed studies that consider the IEEE RTS, demonstrating the applicability of the proposed technique, are presented.

**Subject Areas:** Reliability, Composite Power System, Minimal cut sets, Plug-in electric vehicles

**Availability:** Lami, Badr, Abdullah Bin Humayd, and Kankar Bhattacharya. "Adequacy assessment of power systems with PEV charging loads considering customer behaviour." Power and Energy Society General Meeting (PESGM), 2016. IEEE, 2016.

<http://ieeexplore.ieee.org/abstract/document/7741985/>

**Title: Decentralized Coordination of a Building Manager and an Electric Vehicle Aggregator**

**Author:** Contreras-Ocana, Jesus E., Mushfiqur R. Sarker, and Miguel A. Ortega-Vazquez

**Abstract:** The ability to control commercial buildings and electric vehicles (EVs) is a promising source of demand flexibility. In some cases, buildings and EVs share common infrastructure (e.g. a transformer) or interact with each other to accomplish a goal (e.g. reduce local peak demand). In such cases, the building and EV demand scheduling problems are effectively a single demand scheduling problem. Ideally, it would be solved as a single optimization problem. However, doing so might not be possible due to a number of concerns (e.g. data privacy). This paper proposes the use of a mixed-integer adaptation of the Dantzig-Wolfe decomposition to solve the building-EV demand scheduling problem in a decentralized fashion. The effectiveness of the proposed methodology is demonstrated in three case studies where the building and EV problems are coupled by either: i) demand limits, ii) a peak demand charge, or an iii) itemized billing tariff. Results show that the optimal solution can be reached while sharing a minimal amount of information. Furthermore, we show that the proposed methodology is scalable.

**Subject Areas:** data privacy, Electric vehicles, buildings, energy management systems, Dantzig-Wolfe decomposition, distributed optimization

**Availability:** Contreras-Ocana, Jesus E., Mushfiqur R. Sarker, and Miguel A. Ortega-Vazquez. "Decentralized Coordination of a Building Manager and an Electric Vehicle Aggregator." IEEE Transactions on Smart Grid (2016). <http://ieeexplore.ieee.org/abstract/document/7581019/>



**Title: Modelling electric vehicles use: a survey on the methods**

**Author:** Daina, Nicolò, Aruna Sivakumar, and John W. Polak

**Abstract:** In the literature electric vehicle use is modelled using of a variety of approaches in power systems, energy and environmental analyses as well as in travel demand analysis. This paper provides a systematic review of these diverse approaches using a twofold classification of electric vehicle use representation, based on the time scale and on substantive differences in the modelling techniques. For time of day analysis of demand we identify activity-based modelling (ABM) as the most attractive because it provides a framework amenable for integrated cross-sector analyses, required for the emerging integration of the transport and electricity network. However, we find that the current examples of implementation of ABM simulation tools for EV-grid interaction analyses have substantial limitations. Amongst the most critical there is the lack of realism how charging behaviour is represented.

**Subject Areas:** Electric vehicles use; Activity based models; Charging behaviour

**Availability:** Daina, Nicolò, Aruna Sivakumar, and John W. Polak. "Modelling electric vehicles use: a survey on the methods." *Renewable and Sustainable Energy Reviews* 68 (2017): 447-460. <http://www.sciencedirect.com/science/article/pii/S1364032116306566>

**Title: Optimal Charging Control of Electric Vehicles in Smart Grids**

**Author:** Tang, Wanrong, and Ying Jun Angela Zhang

**Abstract:** The wide penetration of renewable energy sources and plug-in electric vehicles (PEVs) has imposed significant challenges to the design and operation of the power grid. In particular, the increase in the intermittent renewable sources, such as solar and wind power, seriously affects the provision of system services that balance supply and demand. Such services include frequency regulation, voltage control, and the control and management in day-ahead, hour-ahead, and real-time operation. Utilizing the energy storage system (ESS) in power grids is considered an effective mechanism for absorbing the fluctuation of energy generation and consumption. Besides traditional ESSs, such as pump hydro, the increasing number of PEVs can be viewed as an emerging type of battery energy storage systems (BESSs) that are widely available at the distribution level. This book studies the optimal online charging control of BESS and PEVs, with the aim to absorb the random fluctuation in the power supply as well as demand and reduce the additional burden on the grid due to massive EV penetration. Both the theoretic analysis and numerical results show the effectiveness and efficiency of the proposed online control techniques. This book not only provides researchers with the latest research results timely and extensively but also presents a comprehensive overview of the online charging control techniques. In particular, the online control techniques have strong practicability since they do not rely on any noncausal knowledge of future information. The researchers, operators of power grid, and EV users will find this to be an exceptional resource.

**Subject Areas:** Power Electronics, Electrical Machines and Networks, Computer Communication Networks

**Availability:** Tang, Wanrong, and Ying Jun Angela Zhang. "Optimal Charging Control of Electric Vehicles in Smart Grids." (2016). <http://link.springer.com/book/10.1007/978-3-319-45862-5>

**Title: Modeling daily electrical demand in presence of PHEVs in smart grids with supervised learning**

**Author:** Pellegrini, Marco, and Farshad Rassaei

**Abstract:** Replacing a portion of current light-duty vehicles (LDVs) with plug-in hybrid electric vehicles (PHEVs) offers the possibility to reduce the dependence on fossil fuels together with environmental and economic benefits. However, charging a myriad of PHEVs will certainly introduce a huge new load to the power grid. In the framework of the development of a smarter grid, the primary focus of the present study is to propose a model for the daily electrical demand from the residential sector in presence of PHEVs. The expected demand from a PHEV is modeled by assigning certain probability distributions to the PHEV's required charging time and the starting time of charge. We assign a normal distribution for the starting time of charge which follows the real world practice. Furthermore, several distributions for the required charging time are considered: uniform distribution, Gaussian with positive support, Rician distribution and a non-uniform distribution coming from driving patterns in real-world data. We generate daily demand profiles by using real-world residential profiles throughout 2014 in the presence of different expected PHEV demand scenarios. Support vector machines (SVMs), a set of supervised machine learning models, are employed in order to find the best model to fit the data. SVMs with radial basis function (RBF) and polynomial kernels were tested. Model performances are evaluated by means of mean squared error (MSE) and mean absolute percentage error (MAPE). We show that the best results are obtained with RBF kernel: maximum (worst) values for MSE and MAPE are about  $2.89 \cdot 10^{-8}$  and 0.023, respectively.

**Subject Areas:** support vector machines (SVMs), Artificial intelligence (AI), energy demand, plug-in hybrid electric vehicle (PHEV), smart grids

**Availability:** Pellegrini, Marco, and Farshad Rassaei. "Modeling daily electrical demand in presence of PHEVs in smart grids with supervised learning." Research and Technologies for Society and Industry Leveraging a better tomorrow (RTSI), 2016 IEEE 2nd International Forum on. IEEE, 2016. <http://ieeexplore.ieee.org/abstract/document/7740571/>

**Title: Quantifying the impact of PEV charging loads on the reliability performance of generation systems**

**Author:** Almutairi, Abdulaziz, Abdullah Bin Humayd, and M. M. A. Salama

**Abstract:** Plug-in electric vehicle (PEV) charging load represents a large and uncontrollable load that behaves far differently from a conventional load. This paper presents a methodology for evaluating the adequacy of the power capacity of systems that include PEV charging loads. A probabilistic analytical approach has been employed using an IEEE reliability test system. The PEV charging load is modeled based on the National Household Travel Survey and on currently available market data pertaining to PEV type and charging level. Also presented is the effect on the adequacy indices of each PEV load parameter, specifically penetration level, PEV type, and charging level. A further case study was conducted in order to evaluate the impact of the current time-of-use tariff in response to the expected increase in power demand due to the massive deployment of PEVs. The results show that the addition of PEVs significantly affects the generation reliability, and that higher charging levels and PEVs with greater battery capacity create a severe risk to generation reliability. Investigation of solutions that maintain reliability indices is therefore required.

**Subject Areas:** Probabilistic analytical approach, Capacity adequacy evaluation, Plug-in electric vehicle

**Availability:** Almutairi, Abdulaziz, Abdullah Bin Humayd, and M. M. A. Salama. "Quantifying the impact of PEV charging loads on the reliability performance of generation systems." Power and Energy Society General Meeting (PESGM), 2016. IEEE, 2016.

<http://ieeexplore.ieee.org/abstract/document/7742044/>

**Title: A Novel Framework for Evaluating Maximum PEV Penetration into Distribution Systems**

**Author:** Humayd, Abdullah S. Bin, and Kankar Bhattacharya

**Abstract:** Due to environmental concerns and depletion of fossil fuel resources, the penetration of plug-in electric vehicles (PEVs) is expected to increase in the near future. However, such electrification of the transportation sector is expected to impact the distribution grid adversely. This paper presents a novel framework to determine the appropriate level of PEV penetration that distribution systems can accommodate. Monte Carlo Simulation has been used to simulate the uncertainty of typical demand, drivers' behaviour, PEV market share, and charging level share. Moreover, the maximum allowable penetration of uncontrolled and smart charging loads are determined based on the current available market data pertaining to PEV type and charging level, considering different charging scenarios. The proposed framework is examined and compared across a number of scenarios.

**Subject Areas:** uncontrolled charging, Plug-in electric vehicles, local distribution company, smart charging

**Availability:** Humayd, Abdullah S. Bin, and Kankar Bhattacharya. "A Novel Framework for Evaluating Maximum PEV Penetration into Distribution Systems." IEEE Transactions on Smart Grid (2016). <http://ieeexplore.ieee.org/abstract/document/7592470/>

**Title: Using CPE Function to Size Capacitor Storage for Electric Vehicles and Quantifying Battery Degradation during Different Driving Cycles**

**Author:** Zhang, C., Min, H., Yu, Y., Wang, D., Luke, J., Opila, D., & Saxena, S.

**Abstract:** Range anxiety and battery cycle life are two major factors which restrict the development of electric vehicles. Battery degradation can be reduced by adding supercapacitors to create a Hybrid Energy Storage System. This paper proposes a systematic approach to configure the hybrid energy storage system and quantifies the battery degradation for electric vehicles when using supercapacitors. A continuous power-energy function is proposed to establish supercapacitor size based on national household travel survey statistics. By analyzing continuous driving action in standard driving cycles and special driving phases (start up and acceleration), the supercapacitor size is calculated to provide a compromise between the capacitor size and battery degradation. Estimating the battery degradation after 10 years, the battery capacity loss value decreases 17.55% and 21.6%, respectively, under the urban dynamometer driving schedule and the US06. Furthermore, the battery lifespan of the continuous power-energy configured system is prolonged 28.62% and 31.39%, respectively, compared with the battery alone system.

**Subject Areas:** battery; super-capacitor; electric vehicle; hybrid energy storage system; continuous power-energy

**Availability:** Zhang, C., Min, H., Yu, Y., Wang, D., Luke, J., Opila, D., & Saxena, S. (2016). Using CPE Function to Size Capacitor Storage for Electric Vehicles and Quantifying Battery Degradation during Different Driving Cycles. *Energies*, 9(11), 903. <http://www.mdpi.com/1996-1073/9/11/903/htm>

**Title: A hybrid meta-heuristic method for unit commitment considering flexible charging and discharging of plug-in electric vehicles**

**Author:** Lehtola, Timo, and Ahmad Zahedi

**Abstract:** Unit commitment is a key issue in power system operation and has long been an intractable problem due to its complex mix-integer nonlinear formulation. The original unit commitment problem aims to minimize the fossil fuel cost by determining the on/off status of power units and power contribution of each online unit at the same time. However, the uncoordinated large charging power necessity of plug-in electric vehicles brings unprecedented challenges to the power system operators and further complicates the unit commitment problem. To seamlessly integrate the plug-in electric vehicles into the unit commitment, a new binary/real-value hybrid meta-heuristic algorithm framework is proposed in this paper, simultaneously determining the binary status and power output of units as well as the power delivered to/feedback from flexible charging and discharging of plug-in electric vehicles. A batch of binary particle swarm optimisation variants with different transfer functions are implemented and compared in solving the unit commitment problem with and without plug-in electric vehicles. Numerical studies illustrate the effectiveness of the proposed intelligent algorithm and the impact of different transfer functions is evaluated.

**Subject Areas:** transfer function, unit commitment, plug-in electric vehicles, binary, real-valued

**Availability:** Yang, Zhile, Kang Li, and Xiandong Xu. "A hybrid meta-heuristic method for unit commitment considering flexible charging and discharging of plug-in electric vehicles." Evolutionary Computation (CEC), 2016 IEEE Congress on. IEEE, 2016.  
<http://ieeexplore.ieee.org/abstract/document/7744035/>

**Title:** Automatic charging scheme for electric vehicle to grid using vehicle built-in monitoring device

**Author:** Lehtola, Timo, and Ahmad Zahedi

**Abstract:** In a vehicle to grid (V2G) system, electric vehicle (EV) batteries are providing regulation up and regulation down power to the electricity network. Regulation is needed to keep power networks stable and sustainable. The V2G system may provide economic benefit to the grid operator, the aggregator and to the electric car owner. Because the electric car owner is sharing battery capacity with the grid operator, the car driver has to provide details about the next trip, such as, when, and how many kilometres are needed. However, this communication can be avoided by using Automatic Charging Scheme (ACS), where next trip is estimated by using available information. Drivers do not need to provide details about a trip plan, and charging is done by this proposed system.

**Subject Areas:** Vehicle to Grid, Ancillary Services, Automatic Charging Scheme, Electric Vehicle, Up and Down Regulation

**Availability:** Lehtola, Timo, and Ahmad Zahedi. "Automatic charging scheme for electric vehicle to grid using vehicle built-in monitoring device." Power Engineering Conference (AUPEC), 2016 Australasian Universities. IEEE, 2016. <http://ieeexplore.ieee.org/abstract/document/7576348/>



**Title: A novel statistical Markov-based approach for modeling charging demand of plug-in electric vehicles**

**Author:** Sun, S., Q. Yang, and W. Yan

**Abstract:** The integration of a massive number of plug-in electric vehicles (PEVs) in power distribution infrastructure brings direct technical challenges to the network management in terms of planning, control and operation. In order to promote the penetration level of PEVs, it is important to understand the different PEV states as well as the PEV charging demand. This paper attempts to address such technical challenge to present a novel statistical modeling approach for PEV charging demand through adopting a Markov-based approach. Through the analysis of the available driving behavior statistics data, the PEV states can be mathematically formulated and derived. Through the adoption of Markov model and Monte Carlo simulation technique, the Markov transition probability matrix of PEVs can be obtained. As a result, the transition among different PEV states of individual PEVs can be explicitly described. A number of case studies are carried out to validate the effectiveness of the proposed modeling approach.

**Subject Areas:** charging demand, Plug-in electric vehicles (PEVs), State of charge (SoC), Monte Carlo simulation, Markov model, & PEV state

**Availability:** Sun, S., Q. Yang, and W. Yan. "A novel statistical Markov-based approach for modeling charging demand of plug-in electric vehicles." Electricity Distribution (CICED), 2016 China International Conference on. IEEE, 2016.

<http://ieeexplore.ieee.org/abstract/document/7576348/>

**Title:** Electric Vehicle Charging Facility as a Smart Energy Microhub

**Author:** Forrest, K. E., Tarroja, B., Zhang, L., Shaffer, B., & Samuelsen, S.

**Abstract:** This paper presents a novel framework for designing an electric vehicle charging facility (EVCF) as a smart energy microhub from the perspectives of both an investor and a local distribution company. The proposed framework includes a Vehicle Decision Tree, a Queuing Model, a Distribution Margin Assessment Model, a Distributed Generation (DG) Penetration Assessment Model, an Economic Assessment Model, and a Distribution Operations Model. Three design options for the EVCF are examined, battery energy storage systems (BESS), renewables based DG, and a microhub that incorporates both BESS and renewables based DG with the option of exchanging power with the main grid. Test results considering a 33 bus distribution system and realistic vehicle statistics extracted from the 2009 (US) National Household Travel Survey are presented and discussed. The findings demonstrate the effectiveness of the proposed smart energy microhub design framework.

**Subject Areas:** Queuing theory, Battery energy storage system, Electric vehicle charging facility, Microhub

**Availability:** Alharbi, Walied, and Kankar Bhattacharya. "Electric Vehicle Charging Facility as a Smart Energy Microhub." IEEE Transactions on Sustainable Energy.

<http://ieeexplore.ieee.org/abstract/document/7579168/keywords>

**Title: Charging a renewable future: The impact of electric vehicle charging intelligence on energy storage requirements to meet renewable portfolio standards**

**Author:** Forrest, K. E., Tarroja, B., Zhang, L., Shaffer, B., & Samuelson, S.

**Abstract:** Increased usage of renewable energy resources is key for energy system evolution to address environmental concerns. Capturing variable renewable power requires the use of energy storage to shift generation and load demand. The integration of plug-in electric vehicles, however, impacts the load demand profile and therefore the capacity of energy storage required to meet renewable utilization targets. This study examines how the intelligence of plug-in electric vehicle (PEV) integration impacts the required capacity of energy storage systems to meet renewable utilization targets for a large-scale energy system, using California as an example for meeting a 50% and 80% renewable portfolio standard (RPS) in 2030 and 2050. For an 80% RPS in 2050, immediate charging of PEVs requires the installation of an aggregate energy storage system with a power capacity of 60% of the installed renewable capacity and an energy capacity of 2.3% of annual renewable generation. With smart charging of PEVs, required power capacity drops to 16% and required energy capacity drops to 0.6%, and with vehicle-to-grid (V2G) charging, non-vehicle energy storage systems are no longer required. Overall, this study highlights the importance of intelligent PEV charging for minimizing the scale of infrastructure required to meet renewable utilization targets.

**Subject Areas:** Battery electric vehicle; Vehicle-to-grid; Renewable energy; Energy storage; Smart charging

**Availability:** Forrest, K. E., Tarroja, B., Zhang, L., Shaffer, B., & Samuelson, S. (2016). Charging a renewable future: The impact of electric vehicle charging intelligence on energy storage requirements to meet renewable portfolio standards. *Journal of Power Sources*, 336, 63-74. <http://www.sciencedirect.com/science/article/pii/S0378775316314409>

**Title:** Modeling and optimization oriented to the micro-grid-EV joint system

**Author:** Li, Y., Han, P., Wang, J., & Song, X.

**Abstract:** With the increasingly serious energy scarcity and environment pollution, the wide application of the renewable energy and the popularization of the electric vehicle are considered as two effective ways to improve the energy and environment situation. However, the negative effect on the system stability could not be ignored for their intermittent, fluctuant and random characteristics. Aiming to study the operation of micro-grid with access of the renewable energy and EVs, the synthetically modeling method that includes agent-based modeling and system dynamics modeling is applied to built the micro-grid-EV joint system model. Considering the time difference of renewable energy generation, EV charging and the residential load demands, the cascade charging strategy is proposed for scheduling the EV charging behavior to maintain the stable operation of the micro-grid-EV joint system and extremely improve the utilization of the renewable energy. Finally, the comparative simulations are carried out in the same conditions with the other two strategies include charging after travel and charging at night, and the optimal performance of the proposed cascade charging strategy is verified by index evaluation of the renewable energy utilization rate, the energy supplement ability and the peak-to-average ratio.

**Subject Areas:** cascade charging strategy, micro-grid-EV joint system, agent-based modeling, system dynamics modelling

**Availability:** Li, Y., Han, P., Wang, J., & Song, X. (2016, October). Modeling and optimization oriented to the micro-grid-EV joint system. In *Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD)*, 2016 12th International Conference on (pp. 336-341). IEEE. <http://ieeexplore.ieee.org/abstract/document/7603197/>

**Title:** A discontinuous coordinated charging strategy for electric vehicles

**Author:** Yanjin, H., Yong, Y., Zhizhen, L., & Linlin, S.

**Abstract:** At present, the capacity of most residential areas cannot meet the need of large-scale EVs (Electric Vehicles) charging. A strategy of coordinated charging for private EVs in residential area is proposed. Based on daily trip habit of EV and base loads of residential area, the method seeks for the period of the lowest total loads and arranges EVs for discontinuous coordinated charging in the valley period that makes sure the total loads are flat as soon as possible. The daily trip rule of EV user is simulated by Monte Carlo method, and the load condition of distribution transformer under three charging modes, namely the uncoordinated charging, the continuous coordinated charging and the discontinuous coordinated charging, are simulated and analyzed. Research results show that the discontinuous coordinated charging can reduce peak-valley ratio significantly and cannot cause new peak load, thus it is suitable for practical application.

**Subject Areas:** based load, coordinated charging, Electric Vehicles, Monte Carlo method

**Availability:** Yanjin, H., Yong, Y., Zhizhen, L., & Linlin, S. (2016, October). A discontinuous coordinated charging strategy for electric vehicles. In *Industrial Electronics and Applications (ICIEA), 2016 IEEE 11th Conference on* (pp. 1099-1102). IEEE.  
<http://ieeexplore.ieee.org/abstract/document/7603746/>

**Title: Cost-Constrained Dynamic Optimal Electric Vehicle Charging**

**Author:** Crow, Mariesa, and Maigha Maigha

**Abstract:** Electric vehicles are an integral component of an environmentally sustainable and resilient infrastructure. Successful penetration of electric vehicles requires close coupling between the customers and load serving entities, adaptive energy markets and technological advancements. In this paper, distribution line over-loading due to vehicle charging has been mitigated using both day-ahead (static) and real-time (dynamic) frameworks, using continuous and discrete charging rates. The proposed solution focuses on valley filling (system perspective) and charging cost reduction (customer perspective). The real-time solution was achieved using a moving horizon optimization technique. In addition to providing charging coordination, the impacts of two different pricing structures were analyzed to ascertain the customer's individual cost optima with respect to the system optima. The results presented strongly indicate that a global pricing structure will not be optimal for all consumers due to their diverse driving habits.

**Subject Areas:** energy management, electric vehicles, demand-response, & moving horizon optimization

**Availability:** Crow, Mariesa, and Maigha Maigha. "Cost-Constrained Dynamic Optimal Electric Vehicle Charging." IEEE Transactions on Sustainable Energy (2016).

<http://ieeexplore.ieee.org/abstract/document/7586066/>

**Title:** Electric Vehicles as Grid Resources

**Author:** Mushfiqur R. Sarker

**Abstract:** Electric vehicles (EV) are poised as environmentally-friendly alternatives to conventional combustion vehicles because of the internal battery which uses electricity for transportation. It is estimated the global EV penetration will hit upwards of 20 million on the road by 2020. Even with this technology available today, consumers' EV adoption is hindered due to the high upfront cost, lack of adequate charging infrastructure, range anxiety, and slow charging times. On the other hand, the potential revolution of the transportation sector will bring forth economic benefits to the operations of the power system. The EV batteries allow flexibility in the amount of power and the specific time of day when they can charge and discharge. Such features enable the extraction of resources from these batteries in order to benefit the power system and EV owner's themselves. However, the challenge remains on how to reduce the issues of EV ownership while the power system extracts services from EVs that benefit operations. The main motivation behind this dissertation is to develop frameworks that take advantage of EVs as grid resources.

**Subject Areas:** EV adoption; Grid Resource; power

**Availability:** Sarker, Mushfiqur. Electric Vehicles as Grid Resources. Diss. 2016.

[https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37107/Sarker\\_washington\\_0250E\\_16383.pdf?sequence=1&isAllowed=y](https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37107/Sarker_washington_0250E_16383.pdf?sequence=1&isAllowed=y)

**Title: Impacts of plug-in electric vehicles in a balancing area**

**Author:** Razeghi, Ghazal, and Scott Samuelsen

**Abstract:** High contributions of the electricity generation and transportation sectors to criteria pollutant and greenhouse gas emissions have resulted in an increased interest and shift towards low to non-carbon generation options such as renewable wind and solar, and alternative transportation options including plug-in electric vehicles. Since plug-in electric vehicles transfer the tailpipe emissions to the electric grid, it is important to study the interaction between the two sectors. In this paper, a previously developed spatially and temporally resolved unit commitment model is used to determine the dispatch schedule of resources with and without battery electric vehicles for 2050 in a fictitious balancing area located within the South Coast Air Basin of California. Cases studied include various charging profiles, penetration in light-duty fleet, imports mix, and grid dispatch strategies. Results of the analysis include average cost of electricity production, market clearing price, temporal production of individual generators, and emissions from electricity generation and the transportation sectors.

The results show that deploying battery electric vehicles (1) has little impact on the average cost of electricity generation-maximum of \$2.5 per MW h for the cases studied with 40% penetration in the light-duty fleet, (2) reduces the overall criteria pollutant emissions except for one case, and (3) results in a smoother load profile, reduces the use of peaking units, and reduces the average emission intensity of the grid through controlled off-peak charging.

**Subject Areas:** Plug-in electric vehicles; Grid modeling; Cost of electricity; Emissions; Unit commitment; Economic impacts

**Availability:** Razeghi, Ghazal, and Scott Samuelsen. "Impacts of plug-in electric vehicles in a balancing area." *Applied Energy* 183 (2016): 1142-1156.

<http://www.sciencedirect.com/science/article/pii/S0306261916313654>



**Title: Modeling Charging Choices of Small-Battery Plug-In Hybrid Electric Vehicle Drivers by Using Instrumented Vehicle Data**

**Author:** Yu, Haixiao, and Don MacKenzie

**Abstract:** Methods for modeling plug-in hybrid electric vehicle drivers' choices of whether to charge at the end of a trip are compared. Instrumented vehicle data from 125 preproduction Toyota Prius plug-in hybrids were combined with electric vehicle supply equipment (i.e., charging station) location data from multiple sources, including PlugShare and the U.S. Department of Energy. The effects of factors including battery state of charge (SOC), dwell time, and location on the probability that a driver will charge during a stop were then modeled for locations where charging was possible. The amount of energy that can be transferred during a charging session was a better predictor of charging behavior than SOC and dwell time considered independently. Results were sensitive to data and methods used to identify charging locations, which indicated that caution is needed in this area. Finally, a latent class logit model was investigated and found to provide a better fit to the observed data than did the mixed logit model. The results of the latent class model indicated that all users were more likely to charge after 8:00 p.m. and at times when doing so provided a larger gain in SOC. For some classes of users, charging was more likely at home or after the last trip of the day.

**Subject Areas:** PHEV; charging behavior; DOE;

**Availability:** Yu, Haixiao, and Don MacKenzie. "Modeling Charging Choices of Small-Battery Plug-In Hybrid Electric Vehicle Drivers by Using Instrumented Vehicle Data." *Transportation Research Record: Journal of the Transportation Research Board* 2572 (2016): 56-65.  
<http://trrjournalonline.trb.org/doi/abs/10.3141/2572-07>

**Title: Stochastic control of smart home energy management with plug-in electric vehicle battery energy storage and photovoltaic array**

**Author:** Wu, X., Hu, X., Moura, S., Yin, X., & Pickert, V.

**Abstract:** Energy management strategies are instrumental in the performance and economy of smart homes integrating renewable energy and energy storage. This article focuses on stochastic energy management of a smart home with PEV (plug-in electric vehicle) energy storage and photovoltaic (PV) array. It is motivated by the challenges associated with sustainable energy supplies and the local energy storage opportunity provided by vehicle electrification. This paper seeks to minimize a consumer's energy charges under a time-of-use tariff, while satisfying home power demand and PEV charging requirements, and accommodating the variability of solar power. First, the random-variable models are developed, including Markov Chain model of PEV mobility, as well as predictive models of home power demand and PV power supply. Second, a stochastic optimal control problem is mathematically formulated for managing the power flow among energy sources in the smart home. Finally, based on time-varying electricity price, we systematically examine the performance of the proposed control strategy. As a result, the electric cost is 493.6% less for a Tesla Model S with optimal stochastic dynamic programming (SDP) control relative to the no optimal control case, and it is by 175.89% for a Nissan Leaf.

**Subject Areas:** Energy management; Stochastic dynamic optimization; Smart home; Plug-in electric vehicle; Batteries; Photovoltaic array

**Availability:** Wu, X., Hu, X., Moura, S., Yin, X., & Pickert, V. (2016). Stochastic control of smart home energy management with plug-in electric vehicle battery energy storage and photovoltaic array. *Journal of Power Sources*, 333, 203-212.

<http://www.sciencedirect.com/science/article/pii/S037877531631357X>

**Title: Stochastic Optimal Energy Management of Smart Home with PEV Energy Storage**

**Author:** Wu, X., Hu, X., Yin, X., & Moura, S.

**Abstract:** This paper proposes a stochastic dynamic programming framework for the optimal energy management of a smart home with plug-in electric vehicle (PEV) energy storage. This work is motivated by the challenges associated with intermittent renewable energy supplies and the local energy storage opportunity presented by vehicle electrification. This paper seeks to minimize electricity ratepayer cost, while satisfying home power demand and PEV charging requirements. First, various operating modes are defined, including vehicle-to-grid (V2G), vehicle-to-home (V2H), and grid-to-vehicle (G2V). Second, we use equivalent circuit PEV battery models and probabilistic models of trip time and trip length to formulate the PEV to smart home energy management stochastic optimization problem. Finally, based on time-varying electricity price and time-varying home power demand, we examine the performance of the three operating modes for typical weekdays.

**Subject Areas:** Plug-in Electric Vehicle, Vehicle to Grid, Energy Management, Stochastic Dynamic Optimization, Smart Home

**Availability:** Wu, Xiaohua, et al. "Stochastic Optimal Energy Management of Smart Home with PEV Energy Storage." IEEE Transactions on Smart Grid.

<http://ieeexplore.ieee.org/abstract/document/7562357/>

**Title: Distribution and scale studies of public charging stations considering electric vehicles' optimal charging choose**

**Author:** Dong, Wang, Liu JiChun, and Liu Junyong

**Abstract:** Based on the Dijkstra algorithm and Time-division traffic network, distribution and scale model of public charging station which considering users' optimal choose is proposed. Comprehensive analysis charge probabilities of different state of capacity under various functional areas, and each period characteristics of parked car in industrial, commercial, residential area then the temporal and spatial distribution characteristics of charging demands are analyzed. A new fuzzy Bi-objective optimization approach that can reflect the relevant priority between objectives is presented to strike an effective balance economic objective and user convenience objective. To solve this optimization, the particle swarm optimization is improved. Finally the example analysis verifies correctness and effectiveness of the proposed model.

**Subject Areas:** particle swarm optimization, electric vehicle, distribution and scale, Time-division traffic network, & optimal route

**Availability:** Dong, Wang, Liu JiChun, and Liu Junyong. "Distribution and scale studies of public charging stations considering electric vehicles' optimal charging choose." Electricity Distribution (CICED), 2016 China International Conference on. IEEE, 2016.  
<http://ieeexplore.ieee.org/abstract/document/7576200/>

**Title:** Quantifying electric vehicle battery degradation from driving vs. vehicle-to-grid services

**Author:** Wang D, Coignard J, Zeng T, Zhang C, Saxena S.

**Abstract:** The risk of accelerated electric vehicle battery degradation is commonly cited as a concern inhibiting the implementation of vehicle-to-grid (V2G) technology. However, little quantitative evidence exists in prior literature to refute or substantiate these concerns for different grid services that vehicles may offer. In this paper, a methodology is proposed to quantify electric vehicle (EV) battery degradation from driving only vs. driving and several vehicle-grid services, based on a semi-empirical lithium-ion battery capacity fade model. A detailed EV battery pack thermal model and EV powertrain model are utilized to capture the time-varying battery temperature and working parameters including current, internal resistance and state-of-charge (SOC), while an EV is driving and offering various grid services. We use the proposed method to simulate the battery degradation impacts from multiple vehicle-grid services including peak load shaving, frequency regulation and net load shaping. The degradation impact of these grid services is compared against baseline cases for driving and uncontrolled charging only, for several different cases of vehicle itineraries, driving distances, and climate conditions.

Over the lifetime of a vehicle, our results show that battery wear is indeed increased when vehicles offer V2G grid services. However, the increased wear from V2G is inconsequential compared with naturally occurring battery wear (i.e. from driving and calendar ageing) when V2G services are offered only on days of the greatest grid need (20 days/year in our study). In the case of frequency regulation and peak load shaving V2G grid services offered 2 hours each day, battery wear remains minimal even if this grid service is offered every day over the vehicle lifetime. Our results suggest that an attractive tradeoff exists where vehicles can offer grid services on the highest value days for the grid with minimal impact on vehicle battery life.

**Subject Areas:** Electric vehicle; Battery degradation; Vehicle-to-grid

**Availability:** Wang D, Coignard J, Zeng T, Zhang C, Saxena S. Quantifying electric vehicle battery degradation from driving vs. vehicle-to-grid services. *Journal of Power Sources*. 2016 Nov 15;332:193-203. <http://www.sciencedirect.com/science/article/pii/S0378775316313052>

**Title: Electric Vehicles as Grid Resources**

**Author:** Sarker, Mushfiqur

**Abstract:** Electric vehicles (EV) are poised as environmentally-friendly alternatives to conventional combustion vehicles because of the internal battery which uses electricity for transportation. It is estimated the global EV penetration will hit upwards of 20 million on the road by 2020. Even with this technology available today, consumers' EV adoption is hindered due to the high upfront cost, lack of adequate charging infrastructure, range anxiety, and slow charging times. On the other hand, the potential revolution of the transportation sector will bring forth economic benefits to the operations of the power system. The EV batteries allow flexibility in the amount of power and the specific time of day when they can charge and discharge. Such features enable the extraction of resources from these batteries in order to benefit the power system and EV owner's themselves. However, the challenge remains on how to reduce the issues of EV ownership while the power system extracts services from EVs that benefit operations. The main motivation behind this dissertation is to develop frameworks that take advantage of EVs as grid resources.

**Subject Areas:** PHEV; charging; battery state of charge EV batteries; grid resources;

**Availability:** Sarker, Mushfiqur. Electric Vehicles as Grid Resources. Univ. of Wash. Diss. 2016.  
[https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37107/Sarker\\_washington\\_0250E\\_16383.pdf?sequence=1&isAllowed=y](https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37107/Sarker_washington_0250E_16383.pdf?sequence=1&isAllowed=y)  
<http://trrjournalonline.trb.org/doi/abs/10.3141/2572-07>

**Title: Assessing the regional energy impact of connected vehicle deployment**

**Author:** Auld, Joshua, Dominik Karbowski, and Vadim Sokolova

**Abstract:** Connected and automated vehicle technologies are likely to have significant impacts on not only how vehicles operate within the transportation system, but also on how individuals behave and utilize their vehicles. While many connected and autonomous vehicle technologies have the potential to increase network throughput and/or efficiency, i.e. connected adaptive cruise control, eco-signals, many of these same technologies have a secondary effect of reducing driver burden which can drive changes in travel behaviour. Such changes in travel behaviour, in effect lowering the cost of driving, have the potential to greatly increase the utilization of the transportation systems with concurrent negative externalities such as congestion, energy use, emissions, and so on, working against the positive effects on the transportation system due to increased capacity. To date relatively few studies have analysed the potential impacts on CAV technologies from a systems perspective, often focusing on gains and losses to an individual vehicle, at a single intersection, or along a corridor. However, travel demand and traffic flow is a complex, adaptive, non-linear system, so in this study we use an advanced transportation systems simulation model, POLARIS, which includes co-simulation of travel behaviour and traffic flow, to study potential impacts of several connected and automated vehicle technologies at the regional-level. We have analysed potential impacts, in terms of changes in vehicle miles travelled, over various market penetration levels for a feasible range of changes in travel time sensitivity to determine a potential range of VMT impacts from CAV.

**Subject Areas:** Activity-based modeling, energy use, connected and autonomous vehicles

**Availability:** Auld, Joshua, Dominik Karbowski, and Vadim Sokolova. "Assessing the regional energy impact of connected vehicle deployment." (2017).

[http://polaris.es.anl.gov/pdf/WCTR\\_CAV\\_paper\\_v2.pdf](http://polaris.es.anl.gov/pdf/WCTR_CAV_paper_v2.pdf)

**Title: Planning Model for Implementing Electric Vehicle Charging Infrastructure in Distribution System**

**Author:** Alhazmi, Yassir

**Abstract:** Plug-in electric vehicles (PEVs) are growing in popularity in developed countries in an attempt to overcome the problems of pollution, depleting natural oil and fossil fuel reserves and rising petrol costs. In addition, automotive industries are facing increasing community pressure and governmental regulations to reduce emissions and adopt cleaner, more sustainable technologies such as PEVs. However, accepting this new technology depends primarily on the economic aspects for individuals and the development of adequate PEV technologies. The reliability and dependability of the new vehicles (PEVs) are considered the main public concerns due to range anxiety. The limited driving range of PEVs makes public charging a requirement for long-distance trips, and therefore, the availability of convenient and fast charging infrastructure is a crucial factor in bolstering the adoption of PEVs. The goal of the work presented in this thesis was to address the challenges associated with implementing electric vehicle fast charging stations (FCSs) in distribution system.

**Subject Areas:** PEVs; FCSs; driving range; emissions; range anxiety

**Availability:** Alhazmi, Yassir. "Planning Model for Implementing Electric Vehicle Charging Infrastructure in Distribution System." (2016).

<https://uwspace.uwaterloo.ca/handle/10012/10766>



## **Title: Reliability Impacts of Plug-in Hybrid Electric Vehicles on Power Systems**

**Author:** Xue Wang

**Abstract:** Modern power system aims to provide reliable, economic, as well as environmental friendly power supply to its customers. In the past few decades, power systems are going through considerable changes to both the power consumption side as well as the power generation side. The power system planners are faced with growing challenges in maintaining acceptable level of system reliability as new types of loads and generation introduce increased uncertainty in power system planning and operation.

New types of electric devices or loads are often introduced in the market to provide customers more convenience and energy efficiency of utilizing electric power. Electric Vehicle provides an alternative to conventional transport vehicles that burn petroleum fuel and release harmful greenhouse gas emissions. Plug-in hybrid electric vehicle (PHEV) is a relatively new model of EV with more flexibility, and is considered in this research to assess the impacts of charging behavior on the overall power system reliability. PHEV load is different from other types of electric loads as it introduces high variability and uncertainty, and therefore, requires proper modeling of its special characteristics. Different charging scenarios significantly influence power system reliability. This thesis provides a PHEV modeling methodology that incorporates the uncertainty in charging and driving behaviors using Monte Carlo Simulation (MCS) method.

As PHEV sales are increased in response to environmental support, their impacts to system reliability will also increase. A range of reliability studies are carried out in the IEEE Reliability Test System (IEEE-RTS) to investigate the impacts of PHEV charging on system reliability. The system reliability degrades significantly with increase in PHEV penetration if PHEV owners charge their vehicles as soon as they arrive home from work. This effect can be mitigated by introducing a policy for delayed charging. Access to public charging will increase as PHEV increase in the future. The results show that a policy to manage public charging will be important to maintain power system reliability within acceptable limits. As the growth of PHEV is mainly driven by perceived environmental benefits, this research also explores the interactions between PHEV load and wind energy, and their combined impact of power system reliability. Based on the analysis of the results from case studies performed on the IEEE-RTS, this research provides valuable input for future power systems that are expected to support more PHEV and renewable energy.

**Subject Areas:** Power system reliability; EV; PHEV; MCS; IEEE\_RTS; renewable energy

**Availability:** Wang, Xue. Reliability Impacts of Plug-in Hybrid Electric Vehicles on Power Systems. Diss. University of Saskatchewan Saskatoon, 2016.

<https://ecommons.usask.ca/bitstream/handle/10388/7407/WANG-THESIS-2016.pdf?sequence=1&isAllowed=y>

**Title: Online Charging Scheduling Algorithms of Electric Vehicles in Smart Grid: An Overview**

**Author:** Wanrong Tang, Suzhi Bi, and Ying Jun (Angela) Zhang

**Abstract:** As an environment-friendly substitute for conventional fuel-powered vehicles, electric vehicles (EVs) and their components have been widely developed and deployed worldwide. The largescale integration of EVs into power grid brings both challenges and opportunities to the system performance. On one hand, the load demand from EV charging imposes large impact on the stability and efficiency of power grid. On the other hand, EVs could potentially act as mobile energy storage systems to improve the power network performance, such as load flattening, fast frequency control, and facilitating renewable energy integration. Evidently, uncontrolled EV charging could lead to inefficient power network operation or even security issues. This spurs enormous research interests in designing charging coordination mechanisms. A key design challenge here lies in the lack of complete knowledge of events that occur in the future. Indeed, the amount of knowledge of future events significantly impacts the design of efficient charging control algorithms. This article focuses on introducing online EV charging scheduling techniques that deal with different degrees of uncertainty and randomness of future knowledge. Besides, we highlight the promising future research directions for EV charging control.

**Subject Areas:** Power grid, Electric vehicles, charging control algorithms

**Availability:** Tang, Wanrong, Suzhi Bi, and Ying Jun. "Online Charging Scheduling Algorithms of Electric Vehicles in Smart Grid: An Overview." arXiv preprint arXiv:1609.02791 (2016).

<https://arxiv.org/pdf/1609.02791.pdf>

**Title: A Model Predictive Control Approach for Low-Complexity Electric Vehicle Charging Scheduling: Optimality and Scalability**

**Author:** Tang, Wanrong, and Ying Zhang

**Abstract:** With the increasing adoption of plug-in electric vehicles (PEVs), it is critical to develop efficient charging coordination mechanisms that minimize the cost and impact of PEV integration to the power grid. In this paper, we consider the optimal PEV charging scheduling, where the non-causal information about future PEV arrivals is not known in advance, but its statistical information can be estimated. This leads to an “online” charging scheduling problem that is naturally formulated as a finite horizon dynamic programming with continuous state space and action space. To avoid the prohibitively high complexity of solving such a dynamic programming problem, we provide a Model Predictive Control (MPC) based algorithm with computational complexity  $O(T^3)$ , where  $T$  is the total number of time stages. We rigorously analyze the performance gap between the near optimal solution of the MPC-based approach and the optimal solution for any distributions of exogenous random variables. Furthermore, our rigorous analysis shows that when the random process describing the arrival of charging demands is first-order periodic, the complexity of proposed algorithm can be reduced to  $O(1)$ , which is independent of  $T$ . Extensive simulations show that the proposed online algorithm performs very closely to the optimal online algorithm. The performance gap is smaller than 0.4% in most cases.

**Subject Areas:** Protocols, Electric vehicles, Charging stations, Pricing, Numerical models

**Availability:** Tang, Wanrong, and Ying Zhang. "A Model Predictive Control Approach for Low-Complexity Electric Vehicle Charging Scheduling: Optimality and Scalability." (2016). <http://ieeexplore.ieee.org/abstract/document/7500060/>

**Title: Scalable Electric Vehicle Charging Protocols****Author:** Liang Zhang; Vassilis Kekatos; Georgios B. Giannakis

**Abstract:** Although electric vehicles are considered a viable solution to reduce greenhouse gas emissions, their uncoordinated charging could have adverse effects on power system operation. Nevertheless, the task of optimal electric vehicle charging scales unfavorably with the fleet size and the number of control periods, especially when distribution grid limitations are enforced. To this end, vehicle charging is first tackled using the recently revived Frank-Wolfe method. The novel decentralized charging protocol has minimal computational requirements from vehicle controllers, enjoys provable acceleration over existing alternatives, enhances the security of the pricing mechanism against data attacks, and protects user privacy. To comply with voltage limits, a network-constrained EV charging problem is subsequently formulated. Leveraging a linearized model for unbalanced distribution grids, the goal is to minimize the power supply cost while respecting critical voltage regulation and substation capacity limitations. Optimizing variables across grid nodes is accomplished by exchanging information only between neighboring buses via the alternating direction method of multipliers. Numerical tests corroborate the optimality and efficiency of the novel schemes.

**Subject Areas:** Protocols, Electric vehicles, Charging stations, Pricing, Numerical models**Availability:** Zhang, Liang, Vassilis Kekatos, and Georgios B. Giannakis. "Scalable Electric Vehicle Charging Protocols." <http://ieeexplore.ieee.org/document/7496921/>

**Title: Modeling charging choices of small-battery plug-in hybrid electric vehicle drivers using instrumented vehicle data**

**Author:** Yu, Haixiao, and Don MacKenzie

**Abstract:** This paper compares methods for modeling PHEV drivers' choices of whether or not to charge at the end of a trip. We combine instrumented vehicle data from 125 pre-production Toyota Prius Plug-in Hybrids with EVSE location data from multiple sources including PlugShare and the U.S. Department of Energy. We then model the effects of factors including battery state of charge (SOC), dwell time, and location on the probability that a driver charges during a stop, for locations where charging is possible. We find that the amount of energy that can be transferred during a charging session is a better predictor of charging behavior than SOC and dwell time considered independently. Results were sensitive to data and methods used to identify charging locations, indicating that caution is needed in this area. Finally, a latent class logit model was investigated and found to provide a better fit to the observed data than did the mixed logit model. The results of the latent class model indicate that all users were more likely to charge after 8:00 PM and when doing so provides a larger gain in SOC. For some classes of users, charging was more likely at home, or following the last trip of the day.

**Subject Areas:** plug in hybrid; EVSE; SOC

**Availability:** Yu, Haixiao, and Don MacKenzie. "Modeling Charging Choices of Small-Battery Plug-In Hybrid Electric Vehicle Drivers by Using Instrumented Vehicle Data." *Transportation Research Record: Journal of the Transportation Research Board* 2572 (2016): 56-65.  
<http://faculty.washington.edu/dwhm/wp-content/uploads/2016/09/Yu-MacKenzie-2016.pdf>

**Title: Effect of extreme temperatures on battery charging and performance of electric vehicles**

**Author:** Lindgren, Juuso, and Peter D. Lund

**Abstract:** Extreme temperatures pose several limitations to electric vehicle (EV) performance and charging. To investigate these effects, we combine a hybrid artificial neural network-empirical Li-ion battery model with a lumped capacitance EV thermal model to study how temperature will affect the performance of an EV fleet. We find that at  $-10\text{ }^{\circ}\text{C}$ , the self-weighted mean battery charging power (SWMCP) decreases by 15% compared to standard  $20\text{ }^{\circ}\text{C}$  temperature. Active battery thermal management (BTM) during parking can improve SWMCP for individual vehicles, especially if vehicles are charged both at home and at workplace; the median SWMCP is increased by over 30%. Efficiency (km/kWh) of the vehicle fleet is maximized when ambient temperature is close to  $20\text{ }^{\circ}\text{C}$ . At low ( $-10\text{ }^{\circ}\text{C}$ ) and high ( $+40\text{ }^{\circ}\text{C}$ ) ambient temperatures, cabin preconditioning and BTM during parking can improve the median efficiency by 8% and 9%, respectively. At  $-10\text{ }^{\circ}\text{C}$ , preconditioning and BTM during parking can also improve the fleet SOC by 3–6%-units, but this also introduces a “base” load of around 140 W per vehicle. Finally, we observe that the utility of the fleet can be increased by 5%-units by adding 3.6 kW chargers to workplaces, but further improved charging infrastructure would bring little additional benefit.

**Subject Areas:** Electric vehicle; Charging; Winter; Cabin preconditioning; HVAC; Extreme temperature

**Availability:** Lindgren, Juuso, and Peter D. Lund. "Effect of extreme temperatures on battery charging and performance of electric vehicles." *Journal of Power Sources* 328 (2016): 37-45. <http://www.sciencedirect.com/science/article/pii/S0378775316308941>

**Title: Individual trip chain for passenger cars: Implications for market acceptance of battery electric vehicles and energy consumption by plug-in electric vehicles**

**Author:** Xiaoyi He, Ye Wu, Shaojun Zhang, Michael A. Tamor, Timothy J. Wallington, Wei Shen, Weijian Han, Lixin Fu, & Jiming Hao.

**Abstract:** The energy and environmental benefits of electric vehicles (EVs) are highly dependent on individual driving patterns. To characterize individual driving patterns in Beijing, a populated megacity in East Asian, GPS-based travel data from 459 private passenger vehicles were gathered covering nearly 17,000 sampling days in 2013-2015. The data were analyzed using a statistical model to produce 0.5 hour, 4 hour, 8 hour and daily individual trip chain distributions, which were used to evaluate customer acceptance for battery electric vehicles (BEVs) based on inconvenience thresholds and to assess the energy consumption for plug-in hybrids (PHEVs). The mean daily distances travelled on weekdays and weekends in Beijing were found to be 44.6 km and 51.4 km respectively. In Beijing the mean habitual travel distance (40.4 km) is modest, the random component of travel distance is lower, and the fraction of habitual travel is higher than for cities in the U.S. and in Germany. We show that the estimated acceptance rate for BEVs is very sensitive to the predetermined inconvenience threshold level. The abundant public transportation alternatives and traffic management in Beijing are factors which reduce the inconvenience of BEVs and may make them acceptable without substantially increased cost for larger battery capacity. PHEVs with all-electric ranges of 50 km (PHEV50) have an ensemble utility factor (UF) and equivalent gasoline consumption estimated to be 0.55 and 4.39 L/100km. However, for 50% of vehicle owners PHEV50s would have a UF of .94 and equivalent gasoline consumption of 3.03 L/100km. Our results show that attention to heterogeneity among individuals instead of analysis at the ensemble level is essential to understanding the real-world acceptance and benefits of EVs.

**Subject Areas:** Individual trip chain distribution; vehicle usage; battery electric vehicle; plug-in hybrid vehicle; acceptance energy consumption

**Availability:** He, Xiaoyi, et al. "Individual trip chain distributions for passenger cars: Implications for market acceptance of battery electric vehicles and energy consumption by plug-in hybrid electric vehicles." *Applied Energy* 180 (2016): 650-660.

<http://www.sciencedirect.com/science/article/pii/S0306261916311084>

**Title: Partial Decomposition for Distributed Electric Vehicle Charging Control Considering Electric Power Grid Congestion**

**Author:** Shahidehpour M, Shao C, Wang X, Wang X, Wang B.

**Abstract:** The electric vehicles (EVs) can introduce new operation strategies, such as charging and vehicle-to-grid (V2G) control, which could provide a considerable level of distributed storage to the power grid. In this paper, a partial decomposition method which is based on the Lagrangian Relaxation (LR) framework is proposed for the EV charging control in transmission-constrained power systems. The partial decomposition method helps reduce the number of dual multipliers and stabilize the iterative process. The proposed partial decomposition framework is applied to a day-ahead SCUC algorithm which can be easily implemented in the existing hierarchical power system operations. The proposed EV charging control method can not only help reduce the total generation cost of power systems but also alleviate the transmission grid congestion. The feasibility of the proposed method is validated by the case studies applied to the modified IEEE-RTS1979.

**Subject Areas:** EV; V2G; LR; transmission grid congestion

**Availability:** Shahidehpour, Mohammad, et al. "Partial Decomposition for Distributed Electric Vehicle Charging Control Considering Electric Power Grid Congestion." IEEE Transactions on Smart Grid. <http://ieeexplore.ieee.org/document/7524029/>



**Title: A Method of Site Selection for Fast Charging Stations**

**Author:** Du, Yunke

**Abstract:** Plug-in electric vehicles (PEVs) has received a great deal of attention recently due to its environmentally friendly characteristics. The ability of fast charging the batteries of vehicles has become one of the most important factors that could limit the widespread use of the PEVs. Effective planning and installation of charging stations is also important to meet the needs of potential PEV drivers. Another concern for utility companies is to understand the necessary infrastructure requirements to minimize their impacts on the electric grid. This study presents a method of PEV demand estimation and site selection of fast charging stations to maximize the demand under cost and power grid constraints. A case study was performed and results show the feasibility and effectiveness of the method.

**Subject Areas:** PEVs; charging stations; batteries; electric grid

**Availability:** Du, Yunke. "A Method of Site Selection for Fast Charging Stations." CICTP 2016. 2411-2421. <http://ascelibrary.org/doi/abs/10.1061/9780784479896.216>

**Title: ARIMA-based decoupled time series forecasting of electric vehicle charging demand for stochastic power system operation**

**Author:** Amini, M. Hadi, Amin Kargarian, and Orkun Karabasoglu

**Abstract:** Large-scale utilization of electric vehicles (EVs) affects the total electricity demand considerably. Demand forecast is usually designed for the seasonally changing load patterns. However, with the high penetration of EVs, daily charging demand makes traditional forecasting methods less accurate. This paper presents an autoregressive integrated moving average (ARIMA) method for demand forecasting of conventional electrical load (CEL) and charging demand of EV (CDE) parking lots simultaneously. Our EV charging demand prediction model takes daily driving patterns and distances as an input to determine the expected charging load profiles. The parameters of the ARIMA model are tuned so that the mean square error (MSE) of the forecaster is minimized. We improve the accuracy of ARIMA forecaster by optimizing the integrated and auto-regressive order parameters. Furthermore, due to the different seasonal and daily pattern of CEL and CDE, the proposed decoupled demand forecasting method provides significant improvement in terms of error reduction. The impact of EV charging demand on the accuracy of the proposed load forecaster is also analyzed in two approaches: (1) integrated forecaster for CEL + CDE, and (2) decoupled forecaster that targets CEL and CDE independently. The forecaster outputs are used to formulate a chance-constrained day-ahead scheduling problem. The numerical results show the effectiveness of the proposed forecaster and its influence on the stochastic power system operation.

**Subject Areas:** Demand forecasting; Charging demand; Electric vehicle parking lots; Autoregressive integrated moving average (ARIMA); Chance-constrained security-constrained unit commitment

**Availability:** Amini, M. Hadi, Amin Kargarian, and Orkun Karabasoglu. "ARIMA-based decoupled time series forecasting of electric vehicle charging demand for stochastic power system operation." *Electric Power Systems Research* (2016).

<http://www.sciencedirect.com/science/article/pii/S0378779616302115>

## **Title: Smart Deregulated Grid Frequency Control in Presence of Renewable Energy Resources by EVs Charging Control**

**Author:** Falahati, Saber, S. Abbas Taher, and Mohammad Shahidehpour

**Abstract:** Nowadays, due to the increasing price of fossil fuels and its decreasing resources on the one hand and environmental pollutions on the other hand, use of electric vehicles (EVs) has been increased. Charging EVs has imposed new loads on power systems. These new and major loads along with the deregulation of power systems, which introduces new uncertainties to grid, have caused new challenges for the frequency control and stability of power systems. Use of EVs as moving batteries is one of the ways for dealing with this problem. In this method, EV charging is controlled and, when necessary, EV battery is discharged in grid. This concept is so-called vehicle to grid (V2G). V2G concept is employed in this study for the control of a smart deregulated grid frequency. For this purpose, an optimized fuzzy controller is used to control EVs. Using the proposed method, charging or discharging batteries is carried out with respect to grid frequency and battery state of charge (SOC). To investigate the proposed approach, a modified IEEE 39-bus system in the presence of renewable energy resources is assumed. Then, this system is converted into a three area system in order for the frequency analysis. Investigating the performance of the proposed method for the charging of EVs is done in another part of paper. Simulations are carried out in MATLAB/SIMULINK environment and their results illustrate good performance of the proposed method in the frequency control of deregulated system and EV charging.

**Subject Areas:** Batteries, Charging stations, Contracts, Frequency control, Power system stability, Renewable energy sources

**Availability:** Falahati, Saber, S. Abbas Taher, and Mohammad Shahidehpour. "Smart Deregulated Grid Frequency Control in Presence of Renewable Energy Resources by EVs Charging Control." [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7486139](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7486139)

**Title:** Two-layer optimization methodology for wind distributed generation planning considering plug-in electric vehicles uncertainty: A flexible active-reactive power approach

**Author:** Ahmadian A, Sedghi M, Aliakbar-Golkar M, Fowler M, Elkamel A.

**Abstract:** With increasing the penetration of wind power, the voltage regulation becomes a more important problem in active distribution networks. In addition, as an uncertain load Plug-in Electric Vehicles (PEVs) will introduce a new concern in voltage adjustment of future distribution networks. Hence, this paper presents a flexible active-reactive power based Wind Distributed Generation (WDG) planning procedure to address the mentioned challenges. The uncertainties related to WDGs, load demand as well as PEVs load have been handled using the Point Estimate Method (PEM). The distribution network under study is equipped to on-load tap-changer and, as a conventional voltage control component, the Capacitor Banks (CBs) will be planned simultaneously with WDGs. The planning procedure has been considered as a two-loop optimization problem that is solved using Particle Swarm Optimization (PSO) and Tabu Search (TS) algorithms. The tap position and power factor of WDGs are taken into account as stochastic variables with practical limitations. The proposed methodology is applied to a typical distribution network and several scenarios are considered and analyzed. Simulation results show that the standard deviation of power factor depends on PEVs penetration that highlights the capability curve of WDGs. The optimal penetration of wind power increases nonlinearly versus increasing of PEVs connected to the distribution network, however the fixed CBs are required to increase the optimal penetration of WDGs. The proposed Modified PSO (MPSO) is compared with the conventional PSO in numerical studies that show MPSO is more efficient than the conventional algorithm for this analysis.

**Subject Areas:** Wind energy; Flexible active-reactive power; Distribution network; Plug-in electric vehicles

**Availability:** Ahmadian, Ali, et al. "Two-layer optimization methodology for wind distributed generation planning considering plug-in electric vehicles uncertainty: A flexible active-reactive power approach." *Energy Conversion and Management* 124 (2016): 231-246.

<http://www.sciencedirect.com/science/article/pii/S0196890416306033>

**Title: Risk management of smart grids based on plug-in hybrid electric vehicles' charging considering transformers' hottest spot temperature-dependent aging failures**

**Author:** Hamzeh M, Hashemi-Dezaki H, Abyaneh HA, Gharehpetian GB, Vahidi B.

**Abstract:** This paper introduces a stochastic reliability evaluation methodology for quantifying the impact of unmanaged plug-in hybrid electric vehicles (PHEVs) charging on the transformers' hottest spot temperature (HST)-dependent aging failures. Further, a novel PHEVs' charging management method has been proposed from the distribution transformers' dynamic thermal modeling perspective. The proposed reliability evaluation method provided the precise stochastic model corresponding to the PHEV owners' behavior. The introduced reliability evaluation methodology has been applied to an actual distribution system of the Hormozgan Regional Electrical Company in Iran under various PHEVs' charging scenarios. The numerical results imply that the distribution transformers' failures are adversely affected due to unmanaged PHEVs charging. The system under study has been simulated during a 10-year-period. The test results show that the transformers' HST-dependent failures due to the PHEVs' charging demand load exponentially increased as a function of system age. As revealed by the results, the proposed PHEVs' charging management methodology mitigates the aggregated peak load and transformers' HST by deferring the peak charging load to midnight.

**Subject Areas:** Plugin hybrid vehicles, Optical microcavities, Batteries, Smart grid, Self organized systems

**Availability:** Hamzeh M, Hashemi-Dezaki H, Abyaneh HA, Gharehpetian GB, Vahidi B. Risk management of smart grids based on plug-in hybrid electric vehicles' charging considering transformers' hottest spot temperature-dependent aging failures. *Journal of Renewable and Sustainable Energy*. 2016 May 1;8(3):034102.  
<http://scitation.aip.org/content/aip/journal/jrse/8/3/10.1063/1.4948929>

**Title: A Multi-Period Framework for Coordinated Dispatch of Plug-in Electric Vehicles**

**Author:** Huang Y, Guo C, Ding Y, Wang L, Zhu B, Xu L.

**Abstract:** Coordinated dispatch of plug-in electric vehicles (PEVs) with renewable energies has been proposed in recent years. However, it is difficult to achieve effective PEV dispatch with a win-win result, which not only optimizes power system operation, but also satisfies the requirements of PEV owners. In this paper, a multi-period PEV dispatch framework, combining day-ahead dispatch with real-time dispatch, is proposed. On the one hand, the day-ahead dispatch is used to make full use of wind power and minimize the fluctuation of total power in the distribution system, and schedule the charging/discharging power of PEV stations for each period. On the other hand, the real-time dispatch arranges individual PEVs to meet the charging/discharging power demands of PEV stations given by the day-ahead dispatch. To reduce the dimensions of the resulting large-scale, non-convex problem, PEVs are clustered according to their travel information. An interval optimization model is introduced to obtain the problem solution of the day-ahead dispatch. For the real-time dispatch, a priority-ordering method is developed to satisfy the requirements of PEV owners with fast response. Numerical studies demonstrate the effectiveness of the presented framework.

**Subject Areas:** plug-in electric vehicles (PEVs); day-ahead dispatch; real-time dispatch; interval optimization; PEV-clustered model; priority-ordering method

**Availability:** Huang, Yinuo, et al. "A Multi-Period Framework for Coordinated Dispatch of Plug-in Electric Vehicles." *Energies* 9.5 (2016): 370. <http://www.mdpi.com/1996-1073/9/5/370/htm>

**Title:** Multi-Objective Supervisory Controller for Hybrid Electric Vehicles

**Author:** Marelli, Stefano, and Simona Onori

**Abstract:** In this article, we address the problem of energy management control design in hybrid electric vehicles (HEVs) to achieve minimum fuel consumption while optimally limiting battery degradation. We use Pontryagin's minimum principle (PMP) to solve the optimal control problem. To the end of controlling battery aging to guarantee battery performances over 150,000 miles, a battery capacity loss reference trajectory is defined and a battery aging model is used by the optimizer. The resulting optimal supervisory control strategy is able to regulate both state of charge and capacity loss to their reference values. Simulation results conducted on a pre-transmission HEV show that the battery capacity loss can be regulated to achieve the long-term objective without sacrificing much fuel economy.

**Subject Areas:** Electric vehicles – Supervisory control – Multi-objective

**Availability:** Marelli, Stefano, and Simona Onori. "Multi-Objective Supervisory Controller for Hybrid Electric Vehicles." *Automotive Air Conditioning*. Springer International Publishing, 2016. 167-215. [http://link.springer.com/chapter/10.1007/978-3-319-33590-2\\_9](http://link.springer.com/chapter/10.1007/978-3-319-33590-2_9)

**Title: Integrating EV Charging Stations as Smart Loads for Demand Response Provisions in Distribution Systems**

**Author:** Hafez, Omar, and Kankar Bhattacharya

**Abstract:** This paper presents a mathematical model for representing the total charging load at an electric vehicle charging station (EVCS) in terms of controllable parameters; the load model developed using a queuing model followed by a neural network (NN). The queuing model constructs a data set of plug-in electric vehicle (PEV) charging parameters which are input to the NN to determine the controllable EVCS load model. The queuing model considers arrival of PEVs as a non-homogeneous Poisson process, while the service time is modeled considering detailed characteristics of battery. The smart EVCS load is a function of number of PEVs charging simultaneously, total charging current, arrival rate, and time; and various class of PEVs. The EVCS load is integrated within a distribution operations framework to determine the optimal operation and smart charging schedules of the EVCS. Objective functions from the perspective of the local distribution company (LDC) and EVCS owner are considered for studies. A 69-bus distribution system with an EVCS at a specific bus, and smart load model is considered for the studies. The performance of a smart EVCS vis-à-vis an uncontrolled EVCS is examined to emphasize the demand response (DR) contributions of a smart EVCS and its integration into distribution operations.

**Subject Areas:** Artificial neural networks, Batteries, Charging stations, Electric vehicles, Indexes, Load modeling, Mathematical model

**Availability:** Hafez O, Bhattacharya K. Integrating EV Charging Stations as Smart Loads for Demand Response Provisions in Distribution Systems.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7485859](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7485859)



**Title: Scalable Electric Vehicle Charging Protocols****Author:** Liang Zhang; Vassilis Kekatos; Georgios B. Giannakis

**Abstract:** Although electric vehicles are considered a viable solution to reduce greenhouse gas emissions, their uncoordinated charging could have adverse effects on power system operation. Nevertheless, the task of optimal electric vehicle charging scales unfavorably with the fleet size and the number of control periods, especially when distribution grid limitations are enforced. To this end, vehicle charging is first tackled using the recently revived Frank-Wolfe method. The novel decentralized charging protocol has minimal computational requirements from vehicle controllers, enjoys provable acceleration over existing alternatives, enhances the security of the pricing mechanism against data attacks, and protects user privacy. To comply with voltage limits, a network-constrained EV charging problem is subsequently formulated. Leveraging a linearized model for unbalanced distribution grids, the goal is to minimize the power supply cost while respecting critical voltage regulation and substation capacity limitations. Optimizing variables across grid nodes is accomplished by exchanging information only between neighboring buses via the alternating direction method of multipliers. Numerical tests corroborate the optimality and efficiency of the novel schemes.

**Subject Areas:** Frank-Wolfe algorithm, Linearized distribution, flow model, alternating direction method of multipliers

**Availability:** Zhang, Liang, Vassilis Kekatos, and Georgios B. Giannakis. "Scalable Electric Vehicle Charging Protocols." <http://ieeexplore.ieee.org/document/7496921/>

**Title: Impact of EV Charging Station on the Electric Distribution Grid**

**Author:** Dwaramakki Nataraj Ga, Harinarayanan M.

**Abstract:** Over the past few years, Electric vehicles have become a very important part of the automotive industry as we try to look for a future less dependent on fossil fuels. A lot of research and development has taken place in this field to improve the existing technology and to develop efficient ones. This continued emphasis on research and development has resulted in great improvements in the technology of Electric vehicles.

In this thesis, we discuss about the features of Electric Vehicles, the existing protocols to charge the battery systems, the battery management system (BMS), the different standards used in various parts of the world and about the infrastructure that is needed to charge the Electric Vehicles and about the different modes of charging.

In the next part of the thesis, we have focussed on the Electric Vehicle and its relationship with the Electric Distribution Grid. Aspects related to PHEV characteristics, Load growth, PHEV Penetration level are looked into. The essence of this thesis is to learn about the Impact of the EV Charging Station on the Electric Distribution Grid. Research papers regarding the impact study of EV Charging station on the Milan Electric Distribution network is considered and discussed.

Finally, we look at the Optimisation of EV charging stations which helps in the overall efficiency of the charging process and lessens its impact on the Electric Distribution Grid. In this study we discuss about various control strategies of battery management, charging and the control of inverters.

**Subject Areas:** Smart grid; EV; distribution; battery management

**Availability:** Dwaramakki Nataraj Ga, Harinarayanan M. Impact of EV charging station on the electric distribution grid.

[https://www.politesi.polimi.it/bitstream/10589/120624/1/Thesis\\_LM.pdf](https://www.politesi.polimi.it/bitstream/10589/120624/1/Thesis_LM.pdf)

**Title: Risk Assessment of Distribution Networks Considering the Charging-Discharging Behaviors of Electric Vehicles**

**Author:** Yang J, Hao W, Chen L, Chen J, Jin J, Wang F.

**Abstract:** Electric vehicles (EVs) have received wide attention due to their higher energy efficiency and lower emissions. However, the random charging and discharging behaviors of substantial numbers of EVs may lead to safety risk problems in a distribution network. Reasonable price incentives can guide EVs through orderly charging and discharging, and further provide a feasible solution to reduce the operational risk of the distribution network. Considering three typical electricity prices, EV charging/discharging load models are built. Then, a Probabilistic Load Flow (PLF) method using cumulants and Gram-Charlier series is proposed to obtain the power flow of the distribution network including massive numbers of EVs. In terms of the risk indexes of node voltage and line flow, the operational risk of the distribution network can be estimated in detail. From the simulations of an IEEE-33 bus system and an IEEE 69-bus system, the demonstrated results show that reasonable charging and discharging prices are conducive to reducing the peak-valley difference, and consequently the risks of the distribution network can be decreased to a certain extent.

**Subject Areas:** electric vehicles; charging or discharging load; vehicle to grid; time-of-use price; probabilistic load flow; risk assessment

**Availability:** Yang, Jun, et al. "Risk Assessment of Distribution Networks Considering the Charging-Discharging Behaviors of Electric Vehicles." *Energies* 9.7 (2016): 560.  
<http://www.mdpi.com/1996-1073/9/7/560/htm>

**Title: Probabilistic congestion management using EVs in a smart grid with intermittent renewable generation**

**Author:** Romero-Ruiz J, Pérez-Ruiz J, Martin S, Aguado JA, De la Torre S.

**Abstract:** This paper presents a probabilistic model to reduce the probability of line congestions and voltage violations in a smart grid located in a radial distribution network. Renewable distributed resources and a high penetration of Electric Vehicles (EVs) are considered. The uncertain parameters taken into account are: power demand, power generated by wind and solar photovoltaic generators, and the behavior of the EVs that do not participate in the congestion procedure. A probabilistic power flow based on the point estimate method is firstly used to compute the distribution functions of the line flows and node voltages. Next, a congestion management strategy is proposed in order to keep the line flows and node voltages within the appropriate range at a given confidence level. The strategy is based on the sensitivity distribution factors: Power Transfer Distribution Factors (PTDFs) and Voltage Distribution Factors (VDFs). The control variables to carry out the corrective actions are the active and reactive power injections from a subset of EVs or their charging points. It is assumed that these controlled EVs are able to inject power into the network using Vehicle to Grid (V2G) capabilities. To illustrate the method, a distribution grid based on a modified version of the IEEE-37 Node Test Feeder is tested.

**Subject Areas:** Smart grid; V2G; Congestions management; PEM; PTDFs; VDFs

**Availability:** Romero-Ruiz J, Pérez-Ruiz J, Martin S, Aguado JA, De la Torre S. Probabilistic congestion management using EVs in a smart grid with intermittent renewable generation. *Electric Power Systems Research*. 2016 Aug 31;137:155-62.  
<http://www.sciencedirect.com/science/article/pii/S0378779616300621>

## **Title: Smart Charging of Plug-in Electric Vehicles in Distribution Systems Considering Uncertainties**

**Author:** Mehboob, Nafeesa

**Abstract:** Distribution feeders and equipment are designed to serve peak loads, and in the absence of Plug-in Electric Vehicle (PEV) loads, day-ahead dispatch of feeders is typically performed by optimizing feeder controls for forecasted load profiles. However, due to climate change concerns, the market share of PEVs is expected to increase, and consequently, utilities expect an increase in demand due to these loads charging from the grid. Uncontrolled charging of PEVs may lead to new peaks in distribution feeders, which would require expensive infrastructure and equipment upgrades. Furthermore, PEV loads will represent new sources of uncertainty, temporal and spatial, which will pose a challenge for the centralized control and optimal operation of the grid. In practice, these uncertainties arise as a result of variability in factors such as the number of PEVs connected to the grid for charging, the arrival and departure times of PEVs, and the initial battery State-of-Charge (SoC). Hence, the integration of PEVs into the existing distribution system, without significant infrastructure upgrades, will be possible only through smart charging of these loads, while properly accounting for these uncertainties. The elasticity of PEVs provides a level of flexibility that can be used by utilities or Local Distribution Companies (LDC) to ensure efficient feeder operation, while providing fair and efficient charging to PEV customers. This thesis presents a novel two-step approach for the fair charging of PEVs in a primary distribution feeder, accounting for the uncertainty associated with PEVs, considering the perspectives of both the LDC and the PEV customer. In the first step of the proposed approach, the mean daily feeder peak demand and corresponding hourly feeder control schedules, such as taps and switched capacitor set points, are determined hourly, while minimizing the daily peak demand, taking the existence of PEVs into account. As an alternative to the conventional Monte Carlo Simulations (MCS), a nonparametric Bootstrap technique is used in conjunction with a Genetic Algorithm (GA)-based optimization model, to account for variations in the arrival and departure times, and the initial battery SoC of PEVs, at each node. In the second step, the maximum possible power that can be given to the charging PEVs at each node, while maintaining the peak demand value and corresponding feeder dispatch schedules defined in the first step, is computed every few minutes and shared fairly among the PEVs. The proposed technique is validated using the IEEE 13-bus test feeder as well as the distribution feeder model of an actual primary feeder in Ontario, considering significant PEV penetration levels. The potential gain in PEV charging efficiency is quantified for the proposed Bootstrap feeder control schedule with respect to the base schedule (without PEVs). The presented optimization approach is also compared with the current industry practice in Ontario, and a sensitivity-based heuristic technique, demonstrating the advantages and feasibility of the presented technique. The results show that the proposed approach could be implemented in practice due to its reasonable computational burden, and its ability to charge PEV loads better than the current industry practice, or a popular heuristic method, while satisfying feeder and peak demand constraints.

**Subject Areas:** PEVs; SoC; electric grid; Monte Carlo Simulations; Genetic Algorithm

**Availability:** Mehboob, Nafeesa. "Smart Charging of Plug-in Electric Vehicles in Distribution Systems Considering Uncertainties." (2016).  
<https://uwspace.uwaterloo.ca/handle/10012/10445>

**Title:** Optimization model for a microgrid with fuel cell vehicles

**Author:** Shinoda K, Lee EP, Nakano M, Lukszo Z.

**Abstract:** Vehicle-to-Grid and a microgrid are emerging concepts which are expected to replace the conventional energy and transportation systems with more efficient and flexible ones. There have been research on the integration of these technologies, but a microgrid with fuel cell vehicles (FCVs) have hardly been studied at the moment in spite of the several technical advantages of FCVs as generating units. This paper therefore presents the mathematical model of a microgrid which includes FCVs, on-site hydrogen stations, solar photovoltaic systems and a wind turbine. The optimal scheduling of hydrogen production, hydrogen refueling to FCVs and electricity supply from FCVs which minimizes the power imported from the main grid is obtained by solving a mixed integer linear programming problem. The computation results of a test case indicate that the model can be used for identifying a bottleneck in the energy flow of a microgrid. The presented model can be extended by including important factors to consider for further research on the integration of microgrids and FCVs.

**Subject Areas:** Hydrogen, Mathematical model, Microgrids, Optimization, Production, Vehicles, Wind turbines

**Availability:** Shinoda K, Lee EP, Nakano M, Lukszo Z. Optimization model for a microgrid with fuel cell vehicles. In 2016 IEEE 13th International Conference on Networking, Sensing, and Control (ICNSC) 2016 Apr 28 (pp. 1-6). IEEE.

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7479027](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7479027)

**Title: ???- Aware Charging of Lithium-Ion Battery Cells**

**Author:** He L, Kim E, Shin KG.

**Abstract:** Lithium-ion cells are widely used in various platforms, such as electric vehicles (EVs) and mobile devices. Complete and fast charging of cells has always been the goal for sustainable system operation. However, fast charging is not always the best solution, especially in view of a new finding that cells need to rest/relax after being charged with high current to avoid accelerated capacity fading. Fast charging for its typical Charge-and-Go scenario does not allow this needed relaxation. In this paper, we propose \*-Aware, a novel charging algorithm which maximizes the charged capacity within the user-specified available charging time (i.e., user-awareness) while ensuring enough relaxation (i.e., cell-awareness). We motivate and evaluate \*-Aware via extensive measurements over 10 months. \*-Aware is shown to improve the charged capacity by 6.9-50.5% over other charging algorithms that also ensure relaxation, and by almost 3x in some extreme cases. Furthermore, \*-Aware slows down the capacity fading by 49.55% when compared to fast charging.

**Subject Areas:** Acceleration, Batteries, Battery charge measurement, Current measurement, Fading channels, Mobile handsets, Systems operation

**Availability:** He L, Kim E, Shin KG. ???-Aware Charging of Lithium-Ion Battery Cells. In 2016 ACM/IEEE 7th International Conference on Cyber-Physical Systems (ICCPS) 2016 Apr 11 (pp. 1-10). IEEE. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7479067](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7479067)



**Title: Robust Scheduling of EV Charging Load with Uncertain Wind Power Integration**

**Author:** Huang Q, Jia QS, Guan X.

**Abstract:** In some micro grids, the charging of electric vehicles (EVs) and the generation of wind power may partially cancel each other. This is an effective way to reduce the variation of the wind power to the state grid. Due to the forecasting error, it is of great practical interest to schedule the EV charging demand under the worst-case scenario of the wind power generation. We consider this important robust scheduling problem in this paper and make three major contributions. First, we formulate this robust scheduling problem as a robust stochastic shortest path problem where the objective function is a weighted sum of the wind power utilization and the total charging cost. Second, a robust simulation-based policy improvement method is developed to improve the performance of a base policy in the worst case. This improvement is mathematically shown under mild assumptions. Third, the performance of this method is numerically demonstrated based on real wind and EV data.

**Subject Areas:** Wind energy, electric vehicle, approximate dynamic, programming, robust Markov decision process.

**Availability:** Huang Q, Jia QS, Guan X. Robust Scheduling of EV Charging Load with Uncertain Wind Power Integration. <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7500118>

**Title: Fuzzy Linear Programming Method For Optimizing Charging Schedules In Unidirectional Vehicle-To-Grid Systems**

**Author:** Ansari, Muhammad Abdul Hafeez, Al-awami, Ali Taleb, Abido, Mohammad Ali

**Abstract:** The fuzzy linear programming method for optimizing charging schedules in unidirectional vehicle-to-grid systems is a computerized fuzzy linear programming method for an electric vehicle (EV) aggregator that coordinates the provision of ancillary services, such as regulation and spinning reserves, to electricity markets using unidirectional vehicle-to-grid (V2G). The fuzzy optimization incorporates uncertainties while maintaining the tractability of the problem size since, in fuzzy optimization, there is no need to represent each stochastic parameter by a number of scenarios. This allows for optimizing the charging of all EVs simultaneously, as well as taking market aspects into account, guaranteeing maximization of aggregator profits, and further considering electricity market uncertainties, such as ancillary service prices and ancillary service deployment signals.

**Subject Areas:** patent fuzzy linear programming

**Availability:** Ansari, Muhammad Abdul Hafeez, Al-awami, Ali Taleb, Abido, Mohammad Ali *Fuzzy Linear Programming Method For Optimizing Charging Schedules In Unidirectional Vehicle-To-Grid Systems* United States Patent Application 20160140449 Transportation Research Part A: Policy and Practice 88 (2016): 40-57. <http://www.freepatentsonline.com/y2016/0140449.html>

**Title:** Comparing high-end and low-end early adopters of battery electric vehicles

**Author:** Hardman, Scott, Eric Shiu, and Robert Steinberger-Wilckens

**Abstract:** Battery electric vehicle adoption research has been on going for two decades. The majority of data gathered thus far is taken from studies that sample members of the general population and not actual adopters of the vehicles. This paper presents findings from a study involving 340 adopters of battery electric vehicles. The data is used to corroborate some existing assumptions made about early adopters. The contribution of this paper, however, is the distinction between two groups of adopters. These are high-end adopters and low-end adopters. It is found that each group has a different socio-economic profile and there are also some psychographic differences. Further they have different opinions of their vehicles with high-end adopters viewing their vehicles more preferentially. The future purchase intentions of each group are explored and it is found that high-end adopters are more likely to continue with ownership of battery electric vehicles in subsequent purchases. Finally reasons for this are explored by comparing each adopter group's opinions of their vehicles to their future purchase intentions. From this is it suggested that time to refuel and range for low-end battery electric vehicles should be improved in order to increase chances of drivers continuing with BEV ownership.

**Subject Areas:** Electric vehicle; Marketing; Early adopters; Consumers

**Availability:** Hardman, Scott, Eric Shiu, and Robert Steinberger-Wilckens. "Comparing high-end and low-end early adopters of battery electric vehicles." *Transportation Research Part A: Policy and Practice* 88 (2016): 40-57.

<http://www.sciencedirect.com/science/article/pii/S0965856416302208>

## **Title: Extended Range Electric Vehicle Powertrain Simulation and Comparison with Consideration of Fuel Cell and Metal-air Battery**

**Author:** Caixia Wang

**Abstract:** The automotive industry has been in a period of energy transformation from fossil fuels to a clean energy economy due to the economic pressures resulting from the energy crisis and the need for stricter environmental protection policies. Among various clean energy systems are electric vehicles, with lithium-ion batteries have the largest market share because of their stable performance and they are a relatively mature technology. However, two disadvantages limit the development of electric vehicles: charging time and energy density. In order to mitigate these challenges, vehicle Original Equipment Manufacturers (OEMs) have developed different vehicle architectures to extend the vehicle range, including the Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), and Extended Range Electric Vehicle (EREV).

In this project, two advanced EREV powertrains have been modeled and simulated by using a lithium-ion battery as the primary energy source, with the combination of a fuel cell (FCV) or zinc-air battery as the range extenders. These two technologies were chosen as potential range extenders because of their high energy density and low life cycle emissions. The objective of this project is to compare the combined energy system (zinc-air and lithium-ion battery, fuel cell and lithium-ion battery) powered vehicles with gasoline powered vehicles (baseline vehicle, ICE engine extended range electric vehicle) and battery electric vehicles (BEV) in dimensions of energy consumption, range, emissions, cost, and customer acceptance. In order to achieve this goal, a unique zinc-air battery model was developed in this work with consideration of research data and current market status, and a control logic of the dual energy systems powertrain was created in the vehicle modeling software.

A 2015 Chevrolet Camaro had been chosen as the vehicle architecture platform, with modelling of the five vehicle powertrains being built within Autonomie. This vehicle modeling software, developed by Argonne National Laboratory, runs with MATLAB & Simulink, and contains embedded drive cycles and analysis tools needed to perform the necessary simulations. Since the emission analysis in the Autonomie model only considers the vehicle in energy consumption and tailpipe emissions, therefore a Well-to-Wheel analysis method is introduced to evaluate the energy life cycle. This method takes into account the emissions from the energy production and considers the vehicle tailpipe emission.

After finished all the simulations, a decision matrix was developed to compare these five powertrains from the metrics of energy consumption, emissions, customer acceptance, and life cycle cost. Three substantial conclusions were obtained from the comparison: The powertrains without use engine and gasoline as the power source have the lower tailpipe emissions and greenhouse gas emissions. The powertrains based on battery power alone, i.e. metal air extended range electric vehicle (MA-EREV) and battery electric vehicle (BEV) are not able to achieve the total range target, likely because of the relative high vehicle mass caused by the weight of the battery pack. However MA-EREV got the highest marks compared to other

powertrains. However, metal-air battery is a new technology, and there are no prototypes of the technology, thus full commercialization is expected to take some time.

**Subject Areas:** clean energy; EV; battery

**Availability:** Wang, Caixia. "Extended Range Electric Vehicle Powertrain Simulation and Comparison with Consideration of Fuel Cell and Metal-air Battery." (2016).  
<https://uwspace.uwaterloo.ca/handle/10012/10372>

**Title: Electric vehicle charging in China's power system: Energy, economic and environmental trade-offs and policy implications**

**Author:** Li Y, Davis C, Lukszo Z, Weijnen M.

**Abstract:** This work investigates different scenarios for electric vehicle (EV) deployment in China and explores the implications thereof with regard to energy portfolio, economics and the environment. Specifically, we investigate how to better deliver the value of EVs by improving designs in the power system and charging strategies, given expected developments by 2030 in both the power system and EV penetration levels.

The impact of EV charging is quantified by applying an integrated transportation-power system model on a set of scenarios which represent uncertainties in charging strategies. We find that deploying EVs essentially shifts the use of gasoline to coal-fired power generation in China, thus leading to more coal consumption and CO<sub>2</sub> emissions of the power system. Economically, EVs outperform gasoline-powered vehicles in terms of average fueling costs. However, the impact of EVs in terms of CO<sub>2</sub> emissions at the national level largely depends on the charging strategy. Specifically, controlled charging results in more CO<sub>2</sub> emissions associated with EVs than uncontrolled charging, as it tends to feed EVs with electricity produced by cheap yet low-efficiency coal power plants located in regions where coal prices are low. Still, compared with uncontrolled charging, controlled charging shows absolute advantages in: (1) mitigating the peak load arising from EV charging; (2) facilitating RES generation; and (3) reducing generation costs and EV charging costs. Hence, in light of this trade-off of controlled charging with the goals of energy security, economic efficiency and reducing environmental impacts, policy interventions in the Chinese power system should opt for controlled charging strategies in order to best realize the benefits of EVs. Accordingly, this paper proposes that increasing the use of cleaner forms of electricity generation, such as RES power and gas power, and establishing energy efficiency and CO<sub>2</sub> emission regulations in power dispatch are critical for China. Lastly, this work illustrates what the optimized charging profiles from the power system perspective look like for different regions. These results can inform Chinese policy makers in creating a better integration of the transportation and the power system.

**Subject Areas:** Electric vehicles; Charging; Power system; Energy-economic-environmental implications; China

**Availability:** Li Y, Davis C, Lukszo Z, Weijnen M. Electric vehicle charging in China's power system: Energy, economic and environmental trade-offs and policy implications. *Applied Energy*. 2016 Jul 1;173:535-54. <http://www.sciencedirect.com/science/article/pii/S0306261916304858>

**Title:** Smart Grid: Networking, Data Management, and Business Models

**Author:** Xavier Fernando

**Abstract:** Chapter 13 Electric Vehicles: The Mobile Portion of the Smart Grid

**Subject Areas:** EV; power; battery charging

**Availability:** Sheppard, Colin, Andrew Harris, and Anand Gopal. "Cost-Effective Siting of Electric Vehicle Charging Infrastructure with Agent-Based Modeling."

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7439861](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7439861)

**Title:** Electricity-price arbitrage with plug-in hybrid electric vehicle: Gain or loss?

**Author:** Shang DR, Sun G.

**Abstract:** Customers, utilities, and society can gain many benefits from distributed energy resources (DERs), including plug-in hybrid electric vehicles (PHEVs). Using battery on PHEV to arbitrage electricity price is one of the potential benefits to PHEV owners. There is, however, disagreement on the magnitude of such profit. This study uses a stochastic optimization model to estimate the potential profit from electricity price arbitrage of two types of PHEVs (PHEV-10, and PHEV-40) under three scenarios with variant electricity tariff and PHEV owners over a five-year period. The simulation results indicate that under current market structure, even with significant improvement in battery technologies (e.g., higher efficiency, lower cost), the PHEV owners can't achieve a positive arbitrage profit. This finding implies that expected arbitrage profit solely is not a viable option to engage PHEVs larger adoption. Subsidy and combining PHEV arbitraging with alternative PHEV services are required

**Subject Areas:** Distributed energy resources; Plug-in hybrid electric vehicle; Battery storage arbitrage; Smart grid

**Availability:** Shang DR, Sun G. Electricity-price arbitrage with plug-in hybrid electric vehicle: Gain or loss?. Energy Policy. 2016 Aug 31;95:402-10.

<http://www.sciencedirect.com/science/article/pii/S0301421516302506>



**Title: Cost-Effective Siting of Electric Vehicle Charging Infrastructure with Agent-Based Modeling**

**Author:** Sheppard, Colin, Andrew Harris, and Anand Gopal

**Abstract:** Plug-in electric vehicles (PEVs) represent a significant opportunity for governments to reduce emissions of both air pollutants and greenhouse gases, in addition to reducing their dependency on foreign sources of energy. Comprehensive planning analysis prior to the rollout of electric vehicle charging stations (EVCS) can ensure that charging stations are effectively sited, providing the best returns on investment while also meeting critical service requirements. We present a detailed description of the Plug-in Electric Vehicle Infrastructure (PEVI) Model, a spatially explicit agent-based microsimulation model that represents charging infrastructure, charging behavior, competition for scarce EVCS, and driver adaptation. A differential evolution and a heuristic optimization scheme are compared in their ability to find a cost-effective distribution of EVCS. In addition, several key assumptions of the model are tested for their impact on critical outcomes. Results are presented from a case study in Delhi, India that highlight the spatial distribution of chargers of different levels, the impact of several technical and policy trends on the need for EVCS, the spatiotemporal distribution of charging demand, and the technical potential for load shifting PEV demand.

**Subject Areas:** Battery Chargers, Modeling, Optimization Methods, Transportation, Vehicles

**Availability:** Sheppard, Colin, Andrew Harris, and Anand Gopal. "Cost-Effective Siting of Electric Vehicle Charging Infrastructure with Agent-Based Modeling."

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7439861](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7439861)

**Title: Assessing the stationary energy storage equivalency of vehicle-to-grid charging battery electric vehicles**

**Author:** Tarroja B, Zhang L, Wifvat V, Shaffer B, Samuelsen S.

**Abstract:** Electric vehicles, including both PEVs and PHEVs have been recently interested to a large extent in global markets due to their capabilities. These plug-in vehicles are able to absorb/inject power from/to the electric grid that turns them into an interesting solution for the power systems. However, large numbers of such plug-in vehicles can be a threaten to power systems. In this regard, it seems necessary to investigate the problems caused by the uncertain driving nature of such electric vehicles. On the other hand, the opportunities provided by the presence of a large fleet of plug-in vehicles as mobile storage/load should be discussed. For this end, this paper reviews the challenges and the problems caused by charging/discharging of PHEV/PEVs in large numbers and investigates their capabilities as a solution to integrate the RESs and demand response programs in power systems.

**Subject Areas:** Electric vehicles; electric grid;

**Availability:** Tarroja B, Zhang L, Wifvat V, Shaffer B, Samuelsen S. Assessing the stationary energy storage equivalency of vehicle-to-grid charging battery electric vehicles. Energy. 2016 Jul 1;106:673-90. <http://www.sciencedirect.com/science/article/pii/S0360544216303383>

**Title: Evaluation of Achievable Vehicle-to-Grid Capacity Using Aggregate PEV Model**

**Author:** Zhang H, Hu Z, Xu Z, & Song Y.

**Abstract:** Large-scale plug-in electric vehicles (PEVs) utilizing vehicle-to-grid (V2G) technology can collectively behave as a storage system under the control of an aggregator, e.g., arbitraging in the energy market and providing ancillary services to the grid. Quantitatively evaluating V2G capacity, i.e., charging and discharging power ranges, for a PEV fleet utilizing V2G technology (which is referred to as a V2G fleet in this paper) ahead of time is of fundamental importance for V2G implementation. However, because of the stochastic characteristics of PEV driving behaviors, charging demands are difficult to forecast, which makes evaluating V2G capacity technically difficult. This paper first establishes an aggregate model of a V2G fleet that employs aggregated parameters to represent energy and power constraints of the entire V2G fleet, and therefore reduces the difficulty of forecasting. Then, an evaluation method for V2G capacity of large-scale PEVs is developed based on the proposed aggregate model. To make the V2G capacity evaluated in advance achievable while guaranteeing charging demands during realtime operation, a heuristic smart charging strategy is designed. The application of the evaluation method in optimal charge and discharge scheduling for a V2G fleet providing power reserves is illustrated. Numerical simulations are conducted to validate the proposed method.

**Subject Areas:** Electric vehicles; electric grid; V2G

**Availability:** Zhang, Hongcai, et al. "Evaluation of Achievable Vehicle-to-Grid Capacity Using Aggregate PEV Model." [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7463483](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7463483)

**Title: Modeling Electrical Daily Demand in Presence of PHEVs in Smart Grids with Supervised Learning**

**Author:** Pellegrini, Marco, and Farshad Rassaei

**Abstract:** Replacing a portion of current light duty vehicles (LDV) with plug-in hybrid electric vehicles (PHEVs) offers the possibility to reduce the dependence on petroleum fuels together with environmental and economic benefits. The charging activity of PHEVs will certainly introduce new load to the power grid. In the framework of the development of a smarter grid, the primary focus of the present study is to propose a model for the electrical daily demand in presence of PHEVs charging. Expected PHEV demand is modeled by the PHEV charging time and the starting time of charge according to real world data. A normal distribution for starting time of charge is assumed. Several distributions for charging time are considered: uniform distribution, Gaussian with positive support, Rician distribution and a non-uniform distribution coming from driving patterns in real-world data. We generate daily demand profiles by using real-world residential profiles throughout 2014 in the presence of different expected PHEV demand models. Support vector machines (SVMs), a set of supervised machine learning models, are employed in order to find the best model to fit the data. SVMs with radial basis function (RBF) and polynomial kernels were tested. Model performances are evaluated by means of mean squared error (MSE) and mean absolute percentage error (MAPE). Best results are obtained with RBF kernel: maximum (worst) values for MSE and MAPE were about  $2.89 \cdot 10^{-8}$  and 0.023, respectively.

**Subject Areas:** Energy demand, plug-in hybrid electric vehicle, (PHEV), smart grids, support vector machines.

**Availability:** Pellegrini, Marco, and Farshad Rassaei. "Modeling Electrical Daily Demand in Presence of PHEVs in Smart Grids with Supervised Learning." arXiv preprint arXiv:1604.04213 (2016). <http://arxiv.org/abs/1604.04213>

**Title:** Robust Frequency Regulation Capacity Scheduling Algorithm for Electric Vehicles

**Author:** Yao E, Wong VW, Schober R. Robust

**Abstract:** Electric vehicles, including both PEVs and PHEVs have been recently interested to a large extent in global markets due to their capabilities. These plug-in vehicles are able to absorb/inject power from/to the electric grid that turns them into an interesting solution for the power systems. However, large numbers of such plug-in vehicles can be a threaten to power systems. In this regard, it seems necessary to investigate the problems caused by the uncertain driving nature of such electric vehicles. On the other hand, the opportunities provided by the presence of a large fleet of plug-in vehicles as mobile storage/load should be discussed. For this end, this paper reviews the challenges and the problems caused by charging/discharging of PHEV/PEVs in large numbers and investigates their capabilities as a solution to integrate the RESs and demand response programs in power systems.

**Subject Areas:** Electric vehicles; frequency regulation; robust optimization; scheduling algorithm

**Availability:** Yao E, Wong VW, Schober R. Robust Frequency Regulation Capacity Scheduling Algorithm for Electric Vehicles. [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7422803](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7422803)

**Title: A new optimization algorithm based on teacher learning algorithm for optimal operation of electric grids**

**Author:** Bahmani-Firuzi, Bahman, and Reza Khorshidi

**Abstract:** The future smart grids will contain a high number of Plug-in Electric Vehicles (PEVs) that will move in the grid widely. The high penetration of these devices will bring new challenges regarding the optimal operation and management of the system. In this way, this paper proposes a realistic framework to first model PEVs movements in the grid and second schedule their movement for minimizing the costs. The cost function consists of the total network cost for supplying the electric loads and PEVs for 24 hour time horizon. According to the high complexities of the problem, a new optimization framework based on teacher learning algorithm (TLO) with a new modification method is proposed to search the problem space thoroughly. The feasibility and satisfying performance of the proposed optimization framework are examined on the IEEE test system.

**Subject Areas:** Plug-in Electric Vehicle (PEV), Vehicle-to-Grid (V2G), Modified Teacher Learning Optimization (MTLO)

**Availability:** Bahmani-Firuzi, Bahman, and Reza Khorshidi. "A new optimization algorithm based on teacher learning algorithm for optimal operation of electric grids." *Journal of Intelligent & Fuzzy Systems* Preprint: 1-8. <http://content.iospress.com/articles/journal-of-intelligent-and-fuzzy-systems/ifs2145>

**Title: A probability load modeling method for the charging demand of large-scale PEVs accounting users' charging willingness**

**Author:** Xu H, Ouyang F, Liu H, Miao S, Tang H, Liang W, Li H, Shi D.

**Abstract:** This paper presents a new strategy in order to model the charging power demand due to large-scale plug-in electric vehicles (PEVs) as realistic a fashion as possible and analyze their impact on the residential power distribution system. The strategy takes the charging willingness of PEV users into consideration, and accounts for the difference in charging frequencies among users. A detailed classification, derived from the historical data on users' driving patterns, on PEV users is conducted in order to ensure that users in the same user set have the same charging properties. Seven probability load models for PEV charging are established for these user sets, and each model accounts the inherent randomness in the usages and recharges of PEVs. After the consideration of charging willingness, the charging demand differs among weekdays. The aggregated charging demand from a user set on each weekday is calculated based on the Law of Large Numbers, and the total charging demand from all PEVs on each weekday can be obtained by accumulating the aggregated charging demand of the user sets with charging willingness. The strategy can ensure a high utilization of the battery capacity, and the aggregated charging demand resulted is more rational and credible. The proposed charging load modeling strategy is finally applied on the electric load profile on a winter day in Manitoba.

**Subject Areas:** Plug-in electric vehicle; Charging demand; Residential distribution system; Charging willingness; User set; Probabilistic load model

**Availability:** Xu H, Ouyang F, Liu H, Miao S, Tang H, Liang W, Li H, Shi D. A probability load modeling method for the charging demand of large-scale PEVs accounting users' charging willingness. *International Journal of Electrical Power & Energy Systems*. 2016 Nov 30;82:331-8. <http://www.sciencedirect.com/science/article/pii/S0142061516303775>

**Title: Co-Optimization of Distribution Transformer Aging and Energy Arbitrage Using Electric Vehicles**

**Author:** Sarker, Mushfiqur R., Daniel Julius Olsen, and Miguel A. Ortega-Vazquez

**Abstract:** The advent of electric vehicles (EVs) will bring forth increases in power transmitted over longer periods of time through the distribution power grid. Such an effect will result in accelerated loss-of-life of distribution grid assets including pole-top transformers. As preventive and corrective measures, the charging of the set of EVs connected to a particular pole-top transformer can be centrally managed (e.g., by a distribution system operator or independent aggregator). This paper proposes a centralized model to co-optimize the transformer loss-of-life with the benefits for EVs' owners on charging/discharging management. The proposed model is compared against a decentralized optimization model in which EVs' owners optimize their benefits, while ignoring the effect on the transformer. Results show the benefit of the centralized strategy in maintaining the grid assets, while modestly reducing consumers' arbitrage benefits.

**Subject Areas:** Electric vehicles, aggregator, transformer

**Availability:** Sarker, Mushfiqur R., Daniel Julius Olsen, and Miguel A. Ortega-Vazquez. "Co-Optimization of Distribution Transformer Aging and Energy Arbitrage Using Electric Vehicles." [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7433462](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7433462)



**Title: Do Natural Gas Vehicles Change Vehicle Miles Traveled? An Aggregate Time-Series Analysis**

**Author:** Soltani-Sobh A, Heaslip K, Bosworth R, Barnes R, Song Z.

**Abstract:** This paper examines the relationship between automobile use and the projected share of natural gas vehicles due to changes in fuel prices, which may provide motivation for people change to a natural gas vehicle. The Vehicle Miles Traveled (VMT) model is developed using aggregated annual time series data from Washington State. Additional analysis is performed to exclude the effect of population growth on VMT trend by modeling the VMT per capita. The share of natural gas vehicles is forecasted under various price conditions using a model based on the joint distribution of household VMT and fuel efficiency (MPG) in the 2009 NHTS. Results indicate that in a high adoption rate scenario, in which 60% of the fleet is natural gas vehicles, VMT and VMT per capita at 2031 will have 10% and 19% increment respectively. This implies that NGV adoption is unlikely to have a large influence on aggregated VMT and VMT per capita. The results in Washington State are applicable to trends seen nationwide in VMT growth and VMT per capita decline.

**Subject Areas:** Fuel consumption; Fuels; Natural gas vehicles; Time series analysis; Vehicle miles of travel

**Availability:** Soltani-Sobh, Ali, et al. "Do Natural Gas Vehicles Change Vehicle Miles Traveled? An Aggregate Time-Series Analysis." Transportation Research Board 95th Annual Meeting. No. 16-0192. 2016. <https://trid.trb.org/view.aspx?id=1392266>

**Title: Contribution of Plug-in Hybrid Electric Vehicles in power system uncertainty management**

**Author:** Aghaei J, Nezhad AE, Rabiee A, & Rahimi E.

**Abstract:** Electric vehicles, including both PEVs and PHEVs have been recently interested to a large extent in global markets due to their capabilities. These plug-in vehicles are able to absorb/inject power from/to the electric grid that turns them into an interesting solution for the power systems. However, large numbers of such plug-in vehicles can be a threaten to power systems. In this regard, it seems necessary to investigate the problems caused by the uncertain driving nature of such electric vehicles. On the other hand, the opportunities provided by the presence of a large fleet of plug-in vehicles as mobile storage/load should be discussed. For this end, this paper reviews the challenges and the problems caused by charging/discharging of PHEV/PEVs in large numbers and investigates their capabilities as a solution to integrate the RESs and demand response programs in power systems.

**Subject Areas:** Plug-in Hybrid Electric Vehicle (PHEVs); Uncertainty; Demand response (DR); Wind intermittency

**Availability:** Aghaei J, Nezhad AE, Rabiee A, Rahimi E. Contribution of Plug-in Hybrid Electric Vehicles in power system uncertainty management. Renewable and Sustainable Energy Reviews. 2016 Jun 30;59:450-8.

<http://www.sciencedirect.com/science/article/pii/S1364032115015907>

**Title: Electricity costs for an electric vehicle fueling station with Level 3 charging**

**Author:** Robert J. Flores, Brendan P. Shaffer, Jacob Brouwer

**Abstract:** Three major perceived disadvantages of plug-in electric vehicles are limited driving range, slow recharge time, and availability of charging infrastructure. While increasing PEV range through larger and more efficient batteries may assuage concerns, public PEV charging infrastructure is required to increase the feasibility of widespread PEV adoption. In particular, Level 3 electric vehicle supply equipment (EVSE) can refuel a depleted PEV battery to 80% state of charge in half an hour. This work examines details of exact electric utility costs incurred by the operator of a public Level 3 EVSE used to refuel PEVs that perform two of the most common types of travel: driving to work and driving to shop. Both 44 kW and 120 kW EVSE refueling rates are considered. Utility rate models for Southern California are used to determine the cost of electricity. Cooperative game theory is then used to determine of the electrical demand charge incurred by each individual PEV that is charged. Results show that approximately 28–38% of typical travel results in a battery state of charge low enough to be eligible for Level 3 refueling. At low PEV total use, electric utility demand charges comprise an extremely high portion of electricity costs. Increasing PEV total use decreases demand charge contributions to the electricity costs, but must be coupled with parking management, such as valet parking, when dwell time at the destination is long (e.g., at work). Total energy costs to operate 44 kW Level 3 EVSE exceed \$1 per kW h at low PEV use, but decrease as PEV use increases. The lowest costs occurred at the highest level of PEV use examined, resulting in a total energy cost of approximately \$0.20 per kW h during the summer and \$0.13 per kW h during the winter. Parking management may be avoided if multiple EVSE are installed, which is particularly effective in improving access for travel with a short dwell time (e.g., while shopping). Increasing EVSE refueling rate improves access to PEV refueling only if parking management is implemented, but always increases demand charges.

**Subject Areas:** Electric vehicle; Fast charging; Utility costs; Demand charges

**Availability:** Flores, Robert J., Brendan P. Shaffer, and Jacob Brouwer. "Electricity costs for an electric vehicle fueling station with Level 3 charging." *Applied Energy* 169 (2016): 813-830.

<http://scitation.aip.org/content/aip/journal/jrse/8/1/10.1063/1.4940406>

**Title: Modeling operation of electric vehicles aggregator with energy storage system in reserve services market**

**Author:** Gitizadeh, Mohsen, and Habibalah Kheradmand Khanekehndani

**Abstract:** An electric vehicles aggregator is in fact an intermediate between electric vehicles and the operator of the power grid. The Electric Vehicles (EVs) aggregator is responsible for the management of EVs in order to supply the owners with their orders and also for maximizing the profit of the power grid in the electricity market. In this study, an optimization model was developed for the operation of the EVs aggregator with an energy storage system in the reserve services market of the distribution network. In the proposed model, the reserve services market was formed after termination of the energy market. In this paper, the markets were created 24 h earlier.

**Subject Areas:** Electric vehicles, Batteries, Networks, Vehicle energy storage, Energy use

**Availability:** Gitizadeh, Mohsen, and Habibalah Kheradmand Khanekehndani. "Modeling operation of electric vehicles aggregator with energy storage system in reserve services market." *Journal of Renewable and Sustainable Energy* 8.1 (2016): 015702.

<http://scitation.aip.org/content/aip/journal/jrse/8/1/10.1063/1.4940406>

**Title: Optimal Charging of Electric Vehicles for Load Shaping: a Dual Splitting Framework with Explicit Convergence Bounds**

**Author:** Caroline Le Floch, Francois Belletti, Scott Moura

**Abstract:** This paper proposes a tailored distributed optimal charging algorithm for Plug-in Electric Vehicles (PEVs). If controlled properly, large PEV populations can enable high penetration of renewables by balancing loads with intermittent generation. The algorithmic challenges include scalability, computation, uncertainty, and constraints on driver mobility and power system congestion. This article addresses computation and communication challenges via a scalable distributed optimal charging algorithm. Specifically, we exploit the mathematical structure of the aggregated charging problem to distribute the optimization program, using duality theory. Explicit bounds of convergence are derived to guide computational requirements. Two variations of the dual-splitting algorithm are also presented, which enable privacy preserving properties. Constraints on both individual mobility requirements and power system capacity are also incorporated. We demonstrate the proposed dual-splitting framework on a load shaping case study for the so-called California “Duck Curve” with mobility data generated from the Vehicle-to-Grid Simulator.

**Subject Areas:** Communication system operations and management, Distributed Algorithms, Optimization methods, Large-scale systems, Load shedding

**Availability:** Le Floch, Caroline, Francois Belletti, and Scott Moura. "Optimal Charging of Electric Vehicles for Load Shaping: a Dual Splitting Framework with Explicit Convergence Bounds."  
[http://ecal.berkeley.edu/pubs/TTE\\_DualSplittingEVsDuckCurve.pdf](http://ecal.berkeley.edu/pubs/TTE_DualSplittingEVsDuckCurve.pdf)

**Title: System State Estimation Considering EV Penetration With Unknown Behavior Using Quasi-Newton Method**

**Author:** Nie, Yongquan, C. Y. Chung, and N. Z. Xu

**Abstract:** The growing population of electric vehicles (EVs) is resulting in the aggregate stochastic charging demand which puts additional pressure on the peak load. Therefore, the importance of having an accurate system state estimation (SSE) arises as some EV user behavior is unknown. In this paper, a new approach is proposed for forecasting EV charging load with both predictable and unknown user behaviors. The forecast charging load is then integrated with predictable base power load (load without EVs) and converted into system state forecast. An effective SSE algorithm based on quasi-Newton (QN) method is proposed to obtain a faster, more accurate and yet more reliable state estimation under potential forecast and measurement errors. The efficiency of the proposed approach is assessed with IEEE 14-bus and 30-bus systems using actual travel survey statistics and base load records. Finally, the estimation accuracy and computation time required are compared with weighted least square (WLS) method and extended Kalman filter (EKF) method. It is shown that the proposed QN method has the best performance under most scenarios.

**Subject Areas:** Electric vehicle, quasi-Newton method, system state estimation, unknown user behavior

**Availability:** Nie, Yongquan, C. Y. Chung, and N. Z. Xu. "System State Estimation Considering EV Penetration With Unknown Behavior Using Quasi-Newton Method."

[http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7390105&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D7390105](http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7390105&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D7390105)

**Title:** A model for electric vehicle charging load forecasting based on trip chains

**Author:** Chen, L., Y. Nie, and Q. Zhong

**Abstract:** Electric vehicles (EVs) will be large-scale applications in the future, which may have an important impact on the power grid. Electric vehicle charging load forecasting is based on the analysis of V2G. However, there is no mature forecasting method. In this paper, a novel EV load forecasting model is formulated to investigate the effects of stochastic charging behavior on the local power grid. Firstly, several geographically distinct areas are assumed according to travel purposes. Based on Markov Chain, the interrelationship of the multiple trips in one day is investigated to give a detailed roadmap of daily routes. Secondly, the influence of external conditions on energy consumption is taken into account and the charging criterion is determined. Then, the overall daily charging load forecast at different places is then obtained by Monte Carlo simulation. Calculation results show that electric vehicle charging loads have seasonal and holiday characteristics, and the charging load makes the maximum load of the power grid increase to a certain extent.

**Subject Areas:** Charging load, Electric vehicle, Monte Carlo, National household travel survey (NHTS), Trip chains

**Availability:** Chen, L., Y. Nie, and Q. Zhong. "A model for electric vehicle charging load forecasting based on trip chains." *Diangong Jishu Xuebao/Transactions of China Electrotechnical Society* (2015). <http://ira.lib.polyu.edu.hk/handle/10397/11869>

**Title:** System for Optimizing Electricity Use from an Electric Grid and Related Method

**Author:** Zhang, Li; Jabbari, Faryar; Samuelsen, Scott

**Abstract:** United States Patent Application 20160009192 : A method of optimizing electricity use from an electric grid is disclosed. The method includes formulating a target load using a cost function for the electric grid, broadcasting a cost signal to the electric device based on the target load, receiving a charging profile from the electric device based on the cost signal, aggregating a demand profile for the electricity use based on the charging profile, determining an updated cost signal based on the demand profile, and broadcasting the updated cost signal to another electric device. The electric device is chargeable electric device, such as a plug-in electric vehicle (PEV). The electric device determines the charging profile only once based on the cost signal, and is charged at maximum power.

**Subject Areas:** Patent, electricity use, electric grid

**Availability:** <http://www.freepatentsonline.com/y2016/0009192.html>



**Title: Development of V2G and G2V Power Profiles and Their Implications on Grid Under Varying Equilibrium of Aggregated Electric Vehicles**

**Author:** Prateek Jain & Trapti Jain

**Abstract:** The objective of this paper is to examine the vehicle-to-grid (V2G) power capability of aggregated electric vehicles (EV) in the manner that they are being adopted by the consumers with their growing infiltration in the vehicles market. The proposed modeling of V2G and grid-to-vehicle (G2V) energy profiles blends the heterogeneous attributes namely, driven mileages, arrival and departure times, travel and parking durations, and speed dependent energy consumption of mobility trends. Three penetration percentages of 25 %, 50 % and 100 % resulting in varied compositions of battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) in the system, as determined by the consumers' acceptance, have been considered to evaluate the grid capacity for V2G. Distinct charge-discharge powers have been selected as per charging standards to match contemporary vehicles and infrastructure requirements. Charging and discharging approaches have been devised to replicate non-linear characteristics of Li-ion battery. Effects of simultaneous conjunction of V2G and G2V power curves with daily conventional load profile are quantified drawn upon workplace-discharging home-charging scheme. Results demonstrated a marked drop in load and hence in market price during morning hours which is hurriedly overcompensated by the hike during evening hours with rising penetration level and charge-discharge power.

**Subject Areas:** vehicle-to-grid; grid-to-vehicle; charging/discharging power level; market price; utility factor (UF)

**Availability:** Jain, Prateek, and Trapti Jain. "Development of V2G and G2V Power Profiles and Their Implications on Grid Under Varying Equilibrium of Aggregated Electric Vehicles."

International Journal of Emerging Electric Power Systems 17.2 (2016): 101-115.

<http://www.degruyter.com/view/j/ijeeps.ahead-of-print/ijeeps-2015-0201/ijeeps-2015-0201.xml>

**Title: Systems And Methods For Random-Access Power Management Using Packetization**

**Author:** Frolik, Jeff & Hines, Paul

**Abstract:** Systems and methods for distributing electric energy in discrete power packets of finite duration are presented. Systems may include an aggregator for providing power packets to one or more nodes. An aggregator may receive requests for power packets from nodes. In other embodiments, an aggregator may transmit status broadcasts and nodes may receive power packets based on the status broadcasts.

**Subject Areas:** Patent, electric control, power distribution

**Availability:** <http://www.freepatentsonline.com/y2015/0380936.html>

**Title: Placement of EV Charging Stations--Balancing Benefits Among Multiple Entities**

**Author:** Luo C, Huang YF, Gupta V.

**Abstract:** This paper studies the problem of multistage placement of electric vehicle (EV) charging stations with incremental EV penetration rates. A nested logit model is employed to analyze the charging preference of the individual consumer (EV owner) and predict the aggregated charging demand at the charging stations. The EV charging industry is modeled as an oligopoly where the entire market is dominated by a few charging service providers (oligopolists). At the beginning of each planning stage, an optimal placement policy for each service provider is obtained through analyzing strategic interactions in a Bayesian game. To derive the optimal placement policy, we consider both the transportation network graph and the electric power network graph. A simulation software--the EV Virtual City 1.0--is developed using Java to investigate the interactions among the consumers (EV owner), the transportation network graph, the electric power network graph, and the charging stations. Through a series of experiments using the geographic and demographic data from the city of the San Pedro District of Los Angeles, CA, USA, we show that the charging station placement is highly consistent with the heatmap of the traffic flow. In addition, we observe a spatial economic phenomenon that service providers prefer clustering instead of separation in the EV charging market.

**Subject Areas:** Bayesian game, Electric vehicle, charging station placement, consumer behavior, nested logit model, oligopoly

**Availability:** Luo, Chao, Yih-Fang Huang, and Vijay Gupta. "Placement of EV Charging Stations--Balancing Benefits Among Multiple Entities."

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7368203](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7368203)

**Title:** Distributed Convex Optimization for Electric Vehicle Aggregators

**Author:** Rivera, Jose, Christoph Goebel, and Hans-Arno Jacobsen

**Abstract:** One of the main challenges for electric vehicle (EV) aggregators is the definition of a control infrastructure that scales to large EV numbers. This paper proposes a new optimization framework for achieving computational scalability based on the alternating directions method of multipliers, which allows for distributing the optimization process across several servers/cores. We demonstrate the performance and versatility of our framework by applying it to two relevant aggregator objectives: 1) valley filling; and 2) cost-minimal charging with grid capacity constraints. Our results show that the solving time of our approach scales linearly with the number of controlled EVs and outperforms the centralized optimization benchmark as the fleet size becomes larger.

**Subject Areas:** ADMM, Optimization, distributed computing, electric vehicles, smart grid

**Availability:** Rivera, Jose, Christoph Goebel, and Hans-Arno Jacobsen. "Distributed Convex Optimization for Electric Vehicle Aggregators."

[http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=7372473](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=7372473)

**Title: Impact of PEV Charging Loads on Distribution System Operations and Optimal Siting and Sizing of PEV Charging Stations**

**Author:** Shubhalakshmi Shetty

**Abstract:** Smart grid has emerged as a promising paradigm to promote and deliver a clean, modern and efficient electricity grid to all customers, and it allows Local Distribution Companies (LDC) to integrate renewable sources more reliably, efficiently, safely and economically. Smart grid realizes Plug-in Electric Vehicles (PEVs) as a potential solution to reduce greenhouse gas (GHG) emissions. However, large scale penetration of PEVs can significantly impact distribution system operations.

This thesis first presents an extensive study of PEV characteristics such as, owner driving behavior, mobility trends of the system as a whole, battery capacity, State of Charge (SOC), different charging levels and energy required for charging the battery. The US National Household Travel Survey (NHTS) 2009 data set is explored to model the PEV load characteristics by representing customers' charging behavior in close to reality. This includes the study of the number of trips covered each day, during weekdays and weekends, over different seasons, the miles traveled, and the home arrival and departure times. Using the developed PEV load profiles, distribution system impact analysis and optimal operational studies are carried out to examine how the LDC can accommodate such loads.

The NHTS data set is also used to develop probability density functions (pdfs) of certain mobility patterns such as initial SOC and starting time of charging. Using these pdfs, a Stochastic Distribution Optimal Power Flow (SDOPF) model with various objectives such as minimization of feeder loss, minimization of energy drawn and minimization of PEV charging cost, subject to feeder operational constraints is presented. Various scenarios of uncontrolled and smart charging are studied. In the uncontrolled charging case, the worst case scenarios are discussed. The smart charging scenarios provides with the optimal charging schedules which result in flattening the load profile.

This thesis further presents an approach to optimally siting and sizing of Electric Vehicle Charging Stations (EVCS). Various aspects in identifying the optimal location of EVCS, from both the LDC's and customers' perspectives are discussed. A new approach to modeling the initial SOC of PEVs considering the travel distance from home to EVCS in relation to the feeder sections' electrical parameters is presented. A heuristic approach to determine the optimal siting and sizing of EVCS considering minimum feeder loss, peak demand and customer charging cost is proposed.

**Subject Areas:** smart grid; PEV; probability density function; charging stations

**Availability:** Shetty, Shubhalakshmi. "Impact of PEV Charging Loads on Distribution System Operations and Optimal Siting and Sizing of PEV Charging Stations." (2016).

<https://uwspace.uwaterloo.ca/handle/10012/10113>

**Title: Probabilistic quantification of voltage unbalance and neutral current in secondary distribution systems due to plug-in battery electric vehicles charging**

**Author:** Gray, M. K., and W. G. Morsi

**Abstract:** The work of this paper investigates the expected impact of level 1 plug-in battery electric vehicle charging on increasing voltage unbalance, undervoltage violations, and neutral current within secondary distribution systems. Plug-in battery electric vehicles charging have been probabilistically modeled using a Monte Carlo simulation, which determines the expected impact on a secondary system extending from the IEEE 34 bus test distribution system. The impact of electric vehicle charging is compared for different penetration levels, different charging methods, and different proportions of electric vehicles charging on either split phase in the secondary system. Results of the Monte Carlo simulation show voltage unbalance and neutral currents are greater when electric vehicle charging is biased to one split phase as opposed to equally distributed amongst both split phases. Furthermore, voltage unbalance is found to increase the number of undervoltage violations experienced in the secondary system.

**Subject Areas:** Monte Carlo; Power quality; Voltage unbalance

**Availability:** Gray, M. K., and W. G. Morsi. "Probabilistic quantification of voltage unbalance and neutral current in secondary distribution systems due to plug-in battery electric vehicles charging." *Electric Power Systems Research* 133 (2016): 249-256.

<http://www.sciencedirect.com/science/article/pii/S0378779615003995>

## 4. Environment

**Title:** Study of particulate matter and gaseous emissions in gasoline direct injection engine using on-board exhaust gas fuel reforming

**Author:** Bogarra M, Herreros JM, Tsolakis A, York AP, Millington PJ.

**Abstract:** Gasoline Direct Injection (GDI) engines provide advantages over preceding spark ignition engine technologies in terms of reduced fuel consumption, increased power output and CO<sub>2</sub> depletion. However, the main drawback is the increased level of Particulate Matter (PM) emissions, which is associated with the adverse effects on human health and the environment. GDI engine's fuel economy can further be enhanced by exhaust gas fuel reforming, a thermochemical recovery technique, which utilizes the engine exhaust gas heat, CO<sub>2</sub> and H<sub>2</sub>O to produce a hydrogen-rich gas named reformat. Furthermore, additional benefits in gaseous emissions can be achieved through the combustion of reformat. In this investigation, a prototype on-board fuel reformer has been employed in a GDI engine to study the effects of reformat combustion as a supplementary fuel to gasoline on PM and gaseous emissions. Between 5% and 6% reduction in the engine fuel consumption was achieved by using the fuel reformer. The different effects (i.e. dilution, thermal, chemical, etc.) of the reformat combustion on the PM nature and gaseous emissions has been identified. It was found that the reformat combustion can decrease notably the engine PM emissions, however, the reduction is dependent on the PM nature. Reformat combustion was found to remove soot cores more efficiently than the volatile PM. The study has shown that the three-way catalytic converter (TWC) can reduce PM emissions. The possible interactions between the reformat and the TWC operation have also been analyzed. For the studied conditions, fuel reforming technology has not shown significant detrimental influence on the TWC operation.

**Subject Area:** GDI; PM characterization; EGR; REGR; Hydrogen; TWC; Gaseous emissions

**Availability:** Bogarra M, Herreros JM, Tsolakis A, York AP, Millington PJ. Study of particulate matter and gaseous emissions in gasoline direct injection engine using on-board exhaust gas fuel reforming. *Applied Energy*. 2016 Oct 15;180:245-55.

<http://www.sciencedirect.com/science/article/pii/S0306261916310455>

**Title:** A Companion to the Anthropology of Environmental Health

**Author:** Merrill Singer

**Abstract:** Chapter 22 Private Cars as Environmental Health Hazards: The Critical Need for Public Transit in the Era of Climate Change

**Subject Area:** Climate Change; Transit; Environmental Health

**Availability:** Singer, Merrill, ed. A Companion to the Anthropology of Environmental Health. John Wiley & Sons, 2016. <https://dlib.lib.washington.edu/researchworks/handle/1773/35569>



**Title:** A comprehensive model of regional electric vehicle adoption and penetration

**Author:** Javid, Roxana J., and Ali Nejat

**Abstract:** This study focused on the adoption of Plug-in Electric Vehicles (PEVs) as a policy towards having a more sustainable transportation with lower Greenhouse Gas (GHG) emissions. The current paper aimed to explore potential factors that can be attributed to purchasing PEVs in order to estimate their penetration in 58 California counties. A Multiple Logistic Regression Analysis was applied to the 2012 California Household Travel Survey dataset, which includes both PEV and conventional car buyers' information, as well as some other secondary data sources. The model developed a broad set of factors including demographic and travel-related characteristics, socioeconomic variables, and infrastructural and regional specifications. The results identified that a household's income, maximum level of education in the household, the buyer's car sharing status, charging stations density, and gas price in the region can significantly impact PEV adoption. The model was validated using data from the 2012 Household Travel Survey conducted in the Delaware Valley region. With sufficient data availability, the methodology can be applied to evaluate changes in vehicle fleet composition and the levels of emissions in response to transportation policies. The model is believed to have a wide range of applications in electricity utilizing, gasoline/diesel retailing, and battery and automotive manufacturing. Additionally, the model can assist policy makers and transportation planners to optimize their infrastructural investments by identifying counties where the response of drivers to added charging station would be maximized, implying that larger benefits can be achieved.

**Subject Area:** Plug-in electric vehicles; Adoption behavior modeling; Regional penetration level; Sustainable transportation; Charging stations; Socioeconomic factors

**Availability:** Javid, Roxana J., and Ali Nejat. "A comprehensive model of regional electric vehicle adoption and penetration." *Transport Policy* 54 (2017): 30-42.

<http://www.sciencedirect.com/science/article/pii/S0967070X16303584>

**Title:** Individual transport emissions and the built environment: A structural equation modelling approach

**Author:** Song, Siqi, Mi Diao, and Chen-Chieh Feng

**Abstract:** Increasing CO2 emissions from the transport sector have raised substantial concerns among researchers and policy makers. This research examines the impact of the built environment on individual transport emissions through two mediate variables, vehicle usage and vehicle type choice, within a structural equation modelling (SEM) framework. We find that new-urbanism-type built environment characteristics, including high density, mixed land use, good connectivity, and easy access to public transport systems help reduce transport CO2 emissions. Such mitigating effect is achieved largely through the reduced vehicle miles travelled (VMT) and is enhanced slightly by the more efficient vehicles owned by individuals living in denser and more diverse neighborhoods, all else being equal. Our research findings provide some new evidence that supports land use policies as an effective strategy to reduce transport CO2 emissions.

**Subject Area:** Transport CO2 emissions; Built environment; Vehicle usage; Vehicle type choice

**Availability:** Song, Siqi, Mi Diao, and Chen-Chieh Feng. "Individual transport emissions and the built environment: A structural equation modelling approach." *Transportation Research Part A: Policy and Practice* 92 (2016): 206-219.

<http://www.sciencedirect.com/science/article/pii/S0965856415302548>

**Title: Assessment of the Electrification of the Road Transport Sector on Net System Emissions**

**Author:** Szibbo, Nicola A.

**Abstract:** LEED® for Neighborhood Development has been rapidly adopted as the de-facto green neighborhood standard and is now used to measure the sustainability of neighborhood design in North America and around the world. Similar to previous LEED® green building rating systems, LEED®ND is heavily reliant on physical & environmental design criteria (such as compact urban form and transit accessibility), and is based on an expert-generated point system. LEED®ND excels at measuring 'environmental sustainability' through its stringent criteria; however, it fails to critically address important livability factors, namely socio-cultural and socio-economic factors. Furthermore, no study has critically examined how LEED®ND could better incorporate these missing factors through post-occupancy analysis. In fact, very little research at all has been done that examines the role of livability and social sustainability in LEED-ND neighborhoods. This paper assesses livability in four North American neighborhoods: two LEED®ND and two control suburban New Urbanist cases. This article also provides a series of recommendations for the rating system based on key survey findings.

**Subject Area:** livability, urban design, sustainable neighborhoods, landscape architecture, sustainable development, LEED-ND, Pacific Northwest

**Availability:** Szibbo, Nicola A. "Assessing Neighborhood Livability: Evidence from LEED® for Neighborhood Development and New Urbanist Communities." *Articulo-Journal of Urban Research* 14 (2016). <http://articulo.revues.org/3120>

**Title:** Outdoor Environment and Pediatric Asthma: an Update on the Evidence from North America

**Author:** Pollock, Jenna, and Lu Shi

**Abstract:** Introduction: Asthma is a disease known to be associated with outdoor environment, though the evidence about the association between asthma symptoms and specific factors in the outdoor environment has been inadequate for certain outdoor allergens. Even less is known about how these associations could vary across different seasons and climate regions. We reviewed the recent literature for research related to outdoor environmental factors and their associated influence on pediatric asthma outcomes, with special attention to spatial-temporal variations of these associations. Method: We conducted our review by searching the PubMed search engine. We included all indexed scientific literature between years 2010 and 2015, on outdoor environmental factors and asthma among children. Results: Our literature search resulted in 33 manuscripts that meet all inclusion criteria including being conducted in North America. Recent studies about the link between pediatric asthma and traffic-related air pollutants (TRAP) consistently confirmed the correlation between TRAP and asthma. For general air pollution (not specifically TRAP), there was a consistent association between Particulate Matter<sub>2.5</sub> (PM<sub>2.5</sub>) and pediatric asthma. The association between pediatric asthma and carbon monoxide (CO) was consistent in different studies. The link between pediatric asthma and Ozone (O<sub>3</sub>) varies across different seasons. Regional variation has been found in the association between pediatric asthma and sulfur dioxide (SO<sub>2</sub>) The link between pollen and asthma has been consistent across different seasons, whereas polycyclic aromatic hydrocarbon's association with asthma was found to be less consistent. Discussion: Although recent studies have strengthened the evidence about the roles of PM<sub>2.5</sub>, TRAP, CO and pollen in pediatric asthma, the evidence for roles of PM<sub>10-2.5</sub>, PM<sub>10</sub>, O<sub>3</sub>, nitrogen dioxide (NO<sub>2</sub>), SO<sub>2</sub> and polycyclic aromatic hydrocarbon in asthma has been less consistent. The link between an outdoor environment and childhood asthma has not been adequately studied with regard to the regional and temporal variation of the environment. Spatial-temporal details of the environment are needed in future studies of asthma and environment, especially if researchers want to examine the hypothesized impact of climate change on asthma.

**Subject Area:** outdoor environment, pollution, climate change, aeroallergens, asthma in children, pediatric asthma

**Availability:** Pollock, Jenna, and Lu Shi. "Outdoor Environment and Pediatric Asthma: an Update on the Evidence from North America."

<https://dlib.lib.washington.edu/researchworks/handle/1773/35569>

**Title:** Concentration dynamics of coarse and fine particulate matter at and around signalised traffic intersections

**Author:** Kumar, Prashant, and Anju Goel

**Abstract:** The understanding of rapidly evolving concentrations of particulate matter (PMC) at signalised traffic intersections (TIs) is limited, but it is important for accurate exposure assessment. We performed “mobile” and “fixed-site” monitoring of size-resolved PMCs in the 0.25–34  $\mu\text{m}$  range at TIs. On-road mobile measurements were made inside a car under five different ventilation settings on a 6 km long round route, passing through 10 different TIs. Fixed-site measurements were conducted at two types (3- and 4-way) of TIs. The aims were to assess the effects of different ventilation settings on in-vehicle PMCs and their comparison during delay conditions at the TIs with those experienced by pedestrians while crossing these TIs. We also estimated the zone of influence (Zoi) for PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> under different driving conditions and fitted the probability distribution functions to fixed-site data to understand the concentration and exposure dynamics of coarse and fine particles around the studied (3- and 4-way) TIs. The fine particles (PM<sub>2.5</sub>) showed a strong positive exponential correlation with the air exchange rates under different ventilation settings compared with coarse particles (PM<sub>2.5–10</sub>) showing an opposite trend. This suggested that the ventilation system of the car was relatively more efficient in removing coarse particles from the incoming outside air. On-road median PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> during delays at the TIs were ~40%, 16% and 17% higher, respectively, compared with free-flow conditions on the rest of the route. About 7% of the average commuting time spent during delay conditions over all the runs at the TIs corresponded to 10, 7 and 8% of the total respiratory deposition dose (RDD) for PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub>, respectively. The maximum length of the Zoi for PM<sub>2.5</sub> and PM<sub>1</sub> was highest at the 4-way TI and the maximum length of the Zoi for PM<sub>10</sub> was highest at the 3-way TI. The on-road average RDD rate of PM<sub>10</sub> inside the cabin when windows were fully open was up to ~7-times that for pedestrians at the TIs.

**Subject Area:** particulate matter; signalized traffic intersections;

**Availability:** Kumar, Prashant, and Anju Goel. "Concentration dynamics of coarse and fine particulate matter at and around signalised traffic intersections." *Environmental Science: Processes & Impacts* 18.9 (2016): 1220-1235. <http://pubs.rsc.org/-/content/articlehtml/2016/em/c6em00215c>

**Title:** Urban form and last-mile goods movement: Factors affecting vehicle miles travelled and emissions

**Author:** Wygonik, E., & Goodchild, A. V.

**Abstract:** There are established relationships between urban form and passenger travel, but less is known about urban form and goods movement. The work presented in this paper evaluates how the design of a delivery service and the urban form in which it operates affects its performance, as measured by vehicle miles travelled, CO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub> emissions.

This work compares simulated amounts of VMT, CO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub> generated by last mile travel in a number of different development patterns and in a number of different goods movement structures, including various warehouse locations. Last mile travel includes personal travel or delivery vehicles delivering goods to customers. Regression models for each goods movement scheme and models that compare sets of goods movement schemes were developed. The most influential variables in all models were measures of roadway density and proximity of a service area to the regional warehouse.

These efforts will support urban planning for goods movement, inform policies designed to mitigate the impacts of goods movement vehicles, and provide insights into achieving sustainability targets, especially as online shopping and goods delivery become more prevalent.

**Subject Areas:** Urban form; passenger travel; VMT; emissions

**Availability:** Wygonik, E., & Goodchild, A. V. (2016). Urban form and last-mile goods movement: Factors affecting vehicle miles travelled and emissions. *Transportation Research Part D: Transport and Environment*.

<http://www.sciencedirect.com/science/article/pii/S1361920916300025>

**Title:** Optimizing plug-in electric vehicle and vehicle-to-grid charge scheduling to minimize carbon emissions

**Author:** Hoehne, Christopher G., and Mikhail V. Chester

**Abstract:** Electric vehicles are an emerging technology with significant potential for reducing carbon dioxide emissions. Yet strategies to minimize carbon dioxide emissions by strategically charging during different times of day have not been rigorously explored. To identify possibilities for minimizing emissions from plug-in electric vehicle use, daily optimized charging strategies over each electricity reliability region of the United States are explored. Optimized schedules of plug-in electric vehicle charging for standard and vehicle-to-grid use were compared with pre-timed charging schedules to characterize the potential for carbon dioxide emission reductions across charging characteristics, regional driving, and marginal energy generation trends. It was found that optimized charging can reduce carbon dioxide emissions over pre-timed charging by as much as 31% for standard use and 59% for vehicle-to-grid use. However, some scenarios of vehicle-to-grid participation were found to increase carbon dioxide emissions by up to 396 g carbon dioxide per mile by displacing stored energy from more carbon-intense energy generation periods. Results also indicate that plug-in electric vehicle charging emissions can vary widely for a given energy efficiency rating. Current energy efficiency ratings may lead to incorrect assumptions of plug-in electric vehicles emissions compared to conventional gasoline vehicles due to varying regional and temporal emissions. To coincide with the push for lower greenhouse gas emissions from transportation, charging times for plug-in electric vehicles should target periods where charging promotes carbon dioxide reductions, and electric vehicle energy efficiency ratings should be reconsidered in order to promote sustainable plug-in electric vehicle use moving forward.

**Subject Area:** Plug-in electric vehicle; Vehicle-to-grid; Charging; Optimization; Carbon; Emissions

**Availability:** Hoehne, Christopher G., and Mikhail V. Chester. "Optimizing plug-in electric vehicle and vehicle-to-grid charge scheduling to minimize carbon emissions." *Energy* 115 (2016): 646-657. <http://www.sciencedirect.com/science/article/pii/S0360544216312981>

**Title:** Episodic air quality impacts of plug-in electric vehicles

**Author:** Razeghi G, Carreras-Sospedra M, Brown T, Brouwer J, Dabdub D, Samuelsen S.

**Abstract:** In this paper, the Spatially and Temporally Resolved Energy and Environment Tool (STREET) is used in conjunction with University of California Irvine – California Institute of Technology (UCI-CIT) atmospheric chemistry and transport model to assess the impact of deploying plug-in electric vehicles and integrating wind energy into the electricity grid on urban air quality. STREET is used to generate emissions profiles associated with transportation and power generation sectors for different future cases. These profiles are then used as inputs to UCI-CIT to assess the impact of each case on urban air quality.

The results show an overall improvement in 8-h averaged ozone and 24-h averaged particulate matter concentrations in the South Coast Air Basin (SoCAB) with localized increases in some cases. The most significant reductions occur northeast of the region where baseline concentrations are highest (up to 6 ppb decrease in 8-h-averaged ozone and 6  $\mu\text{g}/\text{m}^3$  decrease in 24-h-averaged PM<sub>2.5</sub>). The results also indicate that, without integration of wind energy into the electricity grid, the temporal vehicle charging profile has very little to no effect on urban air quality. With the addition of wind energy to the grid mix, improvement in air quality is observed while charging at off-peak hours compared to the business as usual scenario.

**Subject Area:** Air quality; Plug-in electric vehicles; Emissions; Renewable integration

**Availability:** Razeghi G, Carreras-Sospedra M, Brown T, Brouwer J, Dabdub D, Samuelsen S. Episodic air quality impacts of plug-in electric vehicles. *Atmospheric Environment*. 2016 Jul 31;137:90-100. <http://www.sciencedirect.com/science/article/pii/S1352231016303144>



**Title: Future of Carbon Capture: Materials and Strategies****Author:** Sotomayor, Francisco Javier Sotomayor

**Abstract:** Emissions of greenhouse gases into the atmosphere represent a long-term social and environmental challenge. Fossil fuels, which are the main source of these emissions, will likely continue to be used in energy production and transportation for the foreseeable future. In order to mitigate these emissions and prevent the worst potential effects of climate change, carbon capture technologies will need to achieve widespread use across various industries. To inform further development of next-generation carbon capture systems, two potential technologies were explored.

The first technology, flexible metal-organic frameworks, represent alternative materials for carbon capture. A group of flexible frameworks known as elastic layer-structured metal organic frameworks (ELMs) were chosen as a representative class. These crystalline materials have exotic “gated” isotherms which show abrupt reversible transitions from nonporous structures to porous structures through cooperative adsorption of guest molecules between layer planes. These unique materials show potential for selective CO<sub>2</sub> capture combined with energy efficient adsorbent regeneration.

Two aspects of CO<sub>2</sub> capture using ELMs were investigated in detail. First, the ability of ELMs to maintain their structure and capture performance in the presence of unwanted trace species present in flue gas streams, such as NO<sub>x</sub>, SO<sub>x</sub>, and water vapor, was analyzed using both experimental and computational techniques. It was found that ELMs can be tailored for robust performance through careful choice of framework components, such as metal ion or counter ion substitution. Second, the breakthrough performance of ELMs was explored using a combination of experimental breakthrough curves and theoretical treatment. ELMs show a “stepped” breakthrough curve not seen in rigid adsorbents. These “stepped” curves are representative of the breakthrough curves of flexible frameworks and pose a potential hurdle to their use in carbon capture applications.

The second technology, mobile carbon capture, represents an alternative strategy for mitigating emissions from the transportation sector. Using a combination of techniques, the potential costs and design trade-offs associated with implementing a mobile carbon capture scheme were explored. It was found that mobile carbon capture could greatly reduce transportation emissions while being cheaper to implement than competing direct air capture schemes, which suffer from significant thermodynamic penalties.

**Subject Area:** carbon capture; transportation emissions; mobile capture; airgreenhouse gas; carbon capture

**Availability:** Sotomayor, Francisco Javier. Future of Carbon Capture: Materials and Strategies. Diss. University of Michigan, 2016. <https://deepblue.lib.umich.edu/handle/2027.42/133406>

**Title:** Most of London and New York air pollution comes from outside

**Author:** Christian Nordqvist

**Abstract:** Most of the air pollution in London and New York comes from outside the city – the South East of England and New York Tri-State respectively, says Dr. Caralampo Focas, from the Transport Studies Unit at the University of Oxford’s School of Geography and the Environment.

**Subject Area:** air pollution; NYC; London

**Availability:** Christian Nordqvist, marketbusinessnews.com. *Most of London and New York air pollution comes from outside* February 29, 2016 <http://marketbusinessnews.com/most-of-london-and-new-york-air-pollution-comes-from-outside/126771>

**Title:** US vehicle fuel-efficiency choices: demographic, behavioral, and cultural factors

**Author:** Timmons, David, and Andrew Perumal

**Abstract:** In the United States, a large proportion of greenhouse gas emissions are from personal vehicle use, and there are large differences in emissions between the most and least efficient vehicles. We use data from 2009 US National Household Travel Survey to characterize consumers who drive the most and least efficient vehicles. We calculate personal fleet efficiency based on all vehicles owned, reflecting the behavioral aspect of vehicle-use choices by owners. Though higher incomes provide the means to purchase more efficient vehicles, we find those with higher incomes more likely to drive low-efficiency vehicles. Higher education levels correlate with greater vehicle efficiency. While some efficiency differences are based on consumer characteristics such as family size, we find large differences that we attribute mostly to cultural preferences as observed by race, region, etc. From a policy perspective, these differences are of particular interest since they may be amenable to change.

**Subject Area:** fuel economy, consumer vehicle choice, carbon emissions, MPG, NHTS

**Availability:** Timmons, David, and Andrew Perumal. "US vehicle fuel-efficiency choices: demographic, behavioral, and cultural factors." *Journal of Environmental Planning and Management* (2016): 1-19.

<http://www.tandfonline.com/doi/abs/10.1080/09640568.2015.1131675>

**Title:** A socio-ecological exploration into urban form: The environmental costs of travel

**Author:** Kotval-K Z, & Vojnovic I.

**Abstract:** Into the 21st century, with the world population becoming urban, and with wealth and consumption continuing to concentrate in cities—and particularly in wealthy countries—increasing interest has been placed on the socio-economic dimensions of expanding urban metabolisms and their environmental burdens (McGranahan and Satterthwaite, 2002; Rees, 1992; Vojnovic, 2014; Wackernagel and Rees, 1996). The relationship between income, consumption and environmental degradation began receiving particular attention after the publication of the World Commission on Environment and Development's (WCED) *Our Common Future* (1987). In response to the WCED, considerable political effort began to focus on framing a more socio-ecologically balanced global economy. This is partly evident in the over 10,000 cities and towns, across 113 countries, which have adopted Local Agenda 21 programs focused on mitigating negative anthropogenic impacts on the natural environment (Brugmann, 2013).

**Subject Area:** pollution; environmental burden

**Availability:** Kotval-K Z, Vojnovic I. A socio-ecological exploration into urban form: The environmental costs of travel. *Ecological Economics*. 2016 Aug 31;128:87-98.

<http://www.sciencedirect.com/science/article/pii/S092180091530567X>

**Title:** Impacts of Estimated Travel Activity on Air Pollutant Concentrations and Human Exposures in the Tampa Region

**Author:** Sashikanth Gurram, Amy L. Stuart, Abdul R. Pinjari

**Abstract:** (presentation)

**Subject Area:** air pollutants

**Availability:** Sashikanth Gurram, Amy L. Stuart, Abdul R. Pinjari. *Impacts of Estimated Travel Activity on Air Pollutant Concentrations and Human Exposures in the Tampa Region* August 4, 2016 Presentation [https://www.trbairquality.org/files/2016/08/32ppt\\_SashiGurram\\_Impacts-of-Est-Travel-Activity.pdf](https://www.trbairquality.org/files/2016/08/32ppt_SashiGurram_Impacts-of-Est-Travel-Activity.pdf)

**Title:** Development Of A 24-Hour Transportation Network And Emission Modelling System For Halifax

**Author:** Mahbubur Rahman

**Abstract:** The objectives of this study is to develop a 24-hour transportation network model for Halifax, to estimate emission by using the modeling system and to evaluate alternate transit infrastructure projects. A regional transportation network model was developed and validated. Emissions from GHG, GHG, CO, NO<sub>x</sub>, THC, VOC, PM<sub>10</sub>, and PM<sub>2.5</sub> were estimated. Model results reveals that annual per capita GHG emission was found 3.09 ton in 2011 and forecasted 3.41 ton for 2021. The results also suggests that emission polluting power and pollution experienced demonstrates difference for instance, suburban and rural areas experiencing more emission than they generate. Study results suggests that modal shift from auto to transit or active transportation would help to reduce emissions, for example, 3.81% less emission for a 5% shift towards transit. Alternative transit infrastructure evaluation concludes that rail and BRT would decrease auto ridership and emission whereas BRT would reduce travel time.

**Subject Area:** transportation network model; Halifax; emissions; BRT; mode shift

**Availability:** Rahman, Mahbubur. "Development Of A 24-Hour Transportation Network And Emission Modelling System For Halifax." (2016).

<https://dalspace.library.dal.ca/bitstream/handle/10222/72120/Rahman-Mahbubur-MASc-CIVL-August-2016.pdf?sequence=1&isAllowed=y>

**Title:** Decarbonized Demand Response for Residential Plug-in Electric Vehicles in Smart Grids

**Author:** Farshad Rassaei, Wee-Seng Soh and Kee-Chaing Chua

**Abstract:** Recently, in Paris, the world has reached an agreement whereby many countries commit to bolster their efforts about reducing adverse climate changes. Hence, we can expect that decarbonization will even attract more attention in different energy sectors in near future. In particular, both generation side and consumption side are required to be run more congruently and environmentally friendly. Thus, employing the renewables at the generation side along with our proposed decarbonized demand response (DDR) at the consumption side could significantly reduce deleterious impacts on the climate. Such ambition, at the consumption side, necessitates symbiosis and synergy between the customers and the retailer, and among customers, respectively. In other words, there should be some incentive-based collaboration between customers and the retailer as well as coordination among customers to make the objective be achieved successfully. In this paper, we present such matching demand response (DR) algorithm for residential users owning vehicle-to-grid (V2G) enabled plug-in electric vehicles (PEVs) who obtain electricity from a common retailer. The retailer itself is connected to the wholesale electricity market to purchase and sell electricity. Furthermore, we explain the details of the existing symbiosis and synergy in our system. Our simulation results illustrate that substantial cost savings can be achieved along with pollution reduction by our proposed technique.

**Subject Area:** Climate change, demand response (DR), electricity retailer, plug-in electric vehicles (PEVs), power demand elasticity, residential load, smart grids, vehicle-to-grid (V2G).

**Availability:** Rassaei, Farshad, Wee-Seng Soh, and Kee-Chaing Chua. "Decarbonized Demand Response for Residential Plug-in Electric Vehicles in Smart Grids." arXiv preprint arXiv:1604.00812 (2016). <http://arxiv.org/pdf/1604.00812.pdf>

**Title:** Evaluating the life cycle CO<sub>2</sub> emissions and costs of thermoelectric generators for passenger automobiles: a scenario analysis

**Author:** Kishita Y, Ohishi Y, Uwasu M, Kuroda M, Takeda H, Hara K.

**Abstract:** A thermoelectric generator (TEG) is a device used for energy harvesting that enables electricity generation from waste heat. Among the various types of energy harvesting technologies developed for achieving a low-carbon society, the TEG is characterized by its ability to recover energy from heat sources with temperatures as low as 200–300 °C. However, for economic and technological reasons, the TEG market has not yet been developed. With the goal of clarifying the performance required in order for TEGs to be practical and widely available in society, this paper analyzes several life cycle scenarios from both environmental and economic viewpoints. We herein focus on passenger automobiles, because the temperature of their exhaust gas is suitable for TEGs. A case study is carried out in which TEGs are installed in passenger automobiles in Suita City, Osaka, Japan. By applying a scenario planning method, we describe four scenarios that differ according to the technological performance of the TEGs and the driving pattern, under which the life cycle CO<sub>2</sub> emissions (LCCO<sub>2</sub>) and costs of each scenario are evaluated. Comparison of the four scenarios reveals that improving the thermoelectric figure-of-merit by a factor of 1.9 is necessary in order to reduce the LCCO<sub>2</sub> to zero while assuming the average driving pattern in Suita City. In addition, in order to make TEGs profitable over their life cycle, the price of TEGs must be reduced to approximately 10–40% of their current price.

**Subject Area:** Thermoelectric generator; Energy harvesting; Scenario analysis; Life cycle scenario; Automobile; CO<sub>2</sub> emission

**Availability:** Kishita, Yusuke, et al. "Evaluating the life cycle CO<sub>2</sub> emissions and costs of thermoelectric generators for passenger automobiles: a scenario analysis." *Journal of Cleaner Production* 126 (2016): 607-619.

<http://www.sciencedirect.com/science/article/pii/S0959652616300336>



**Title:** Consequential life cycle air emissions externalities for plug-in electric vehicles in the PJM interconnection

**Author:** Allison Weis, Paulina Jaramillo and Jeremy Michalek

**Abstract:** We perform a consequential life cycle analysis of plug-in electric vehicles (PEVs), hybrid electric vehicles (HEVs), and conventional gasoline vehicles in the PJM interconnection using a detailed, normative optimization model of the PJM electricity grid that captures the change in power plant operations and related emissions due to vehicle charging. We estimate and monetize the resulting human health and environmental damages from life cycle air emissions for each vehicle technology. We model PJM using the most recent data available (2010) as well as projections of the PJM grid in 2018 and a hypothetical scenario with increased wind penetration. We assess a range of sensitivity cases to verify the robustness of our results. We find that PEVs have higher life cycle air emissions damages than gasoline HEVs in the recent grid scenario, which has a high percentage of coal generation on the margin. In particular, battery electric vehicles with large battery capacity can produce two to three times as much air emissions damage as gasoline HEVs, depending on charge timing. In our future 2018 grid scenarios that account for predicted coal plant retirements, PEVs would produce air emissions damages comparable to or slightly lower than HEVs.

**Subject Area:** PEV; HEV; electricity grid; emission

**Availability:** Weis, Allison, Paulina Jaramillo, and Jeremy Michalek. "Consequential life cycle air emissions externalities for plug-in electric vehicles in the PJM interconnection." *Environmental Research Letters* 11.2 (2016): 024009. <http://iopscience.iop.org/article/10.1088/1748-9326/11/2/024009>

**Title:** Light-duty electric vehicles to improve the integrity of the electricity grid through Vehicle-to-Grid technology: Analysis of regional net revenue and emissions savings

**Author:** Noori M, Zhao Y, Onat NC, Gardner S, Tatari O

**Abstract:** Vehicle to Grid technologies utilize idle EV battery power as a grid storage tool to meet fluctuating electric power demands. Vehicle to Grid systems are promising substitutes for traditional gas turbine generators, which are relatively inefficient and have high emissions impacts. The purpose of this study is to predict the future net revenue and life cycle emissions savings of Vehicle to Grid technologies for use in ancillary (regulation) services on a regional basis in the United States. In this paper, the emissions savings and net revenue calculations are conducted with respect to five different Independent System Operator/Regional Transmission Organization regions, after which future EV market penetration rates are predicted using an Agent-Based Model designed to account for various uncertainties, including regulation service payments, regulation signal features, and battery degradation. Finally, the concept of Exploratory Modeling and Analysis is used to estimate the future net revenue and emissions savings of integrating Vehicle to Grid technology into the grid, considering the inherent uncertainties of the system. The results indicate that, for a single vehicle, the net revenue of Vehicle to Grid services is highest for the New York region, which is approximately \$42,000 per vehicle on average. However, the PJM region has an approximately \$97 million overall net revenue potential, given the 38,200 Vehicle to Grid-service-available electric vehicles estimated to be on the road in the future in the PJM region, which is the highest among the studied regions.

**Subject Area:** Vehicle to Grid; Emissions; Net revenue; Agent-Based Modeling; Exploratory Modeling and Analysis; Planning and forecasting

**Availability:** Noori M, Zhao Y, Onat NC, Gardner S, Tatari O. Light-duty electric vehicles to improve the integrity of the electricity grid through Vehicle-to-Grid technology: Analysis of regional net revenue and emissions savings. *Applied Energy*. 2016 Apr 15;168:146-58. <http://www.sciencedirect.com/science/article/pii/S0306261916300101>

**Title:** Damages and Expected Deaths Due to Excess NO<sub>x</sub> Emissions from 2009 to 2015 Volkswagen Diesel Vehicles

**Author:** Holland SP, Mansur E, Muller N, Yates A.

**Abstract:** We estimate the damages and expected deaths in the United States due to excess emissions of NO<sub>x</sub> from 2009 to 2015 Volkswagen diesel vehicles. Using data on vehicle registrations and a model of pollution transport and valuation, we estimate excess damages of \$430 million and 46 excess expected deaths. Accounting for uncertainty about emissions gives a range for damages from \$350 million to \$500 million, and a range for excess expected deaths from 40 to 52. Our estimates incorporate significant local heterogeneity: for example, Minneapolis has the highest damages despite having fewer noncompliant vehicles than 13 other cities. Our estimated damages greatly exceed possible benefits from reduced CO<sub>2</sub> emissions due to increased fuel economy.

**Subject Area:** Volkswagen diesel, death, CO<sub>2</sub> emissions, pollution; noncompliance;

**Availability:** Holland, Stephen P., et al. "Damages and expected deaths due to excess NO<sub>x</sub> emissions from 2009-2015 Volkswagen diesel vehicles." *Environmental Science & Technology* (2015). <http://pubs.acs.org/doi/abs/10.1021/acs.est.5b05190>

**Title:** Time-based life-cycle assessment for environmental policymaking: Greenhouse gas reduction goals and public transit

**Author:** Chester, Mikhail V., and Alex Cano

**Abstract:** As decision-makers increasingly embrace life-cycle assessment (LCA) and target transportation services for regional environmental goals, it becomes imperative that outcomes from changes to transportation infrastructure systems are accurately estimated. Greenhouse gas (GHG) reduction policies have created interest in better understanding how public transit systems reduce emissions. Yet the use of average emission factors (e.g., grams CO<sub>2</sub>e per distance traveled) persists as the state-of-the-art masking the variations in emissions across time, and confounding the ability to accurately estimate the environmental effects from changes to transit infrastructure and travel behavior. An LCA is developed of the Expo light rail line and a competing car trip (in Los Angeles, California) that includes vehicle, infrastructure, and energy production processes, in addition to propulsion. When results are normalized per passenger kilometer traveled (PKT), life-cycle processes increase energy use and GHG emissions up to 83%, and up to 690% for smog and respiratory impact potentials. However, the use of a time-independent PKT normalization obfuscates a decision-maker's ability to understand whether the deployment of a transit system reduces emissions below a future year policy target (e.g., 80% of 1990 emissions by 2050). The year-by-year marginal effects of the decision to deploy the Expo line are developed including reductions in automobile travel. The time-based marginal results provide clearer explanations for how environmental effects in a region change and the critical life-cycle processes that should be targeted to achieve policy targets. It shows when environmental impacts payback and how much reduction is achieved by a policy-specified future year.

**Subject Area:** Life cycle assessment; Greenhouse gas emissions; Transit; Light rail; Energy; Environment; Policymaking

**Availability:** Chester, Mikhail V., and Alex Cano. "Time-based life-cycle assessment for environmental policymaking: Greenhouse gas reduction goals and public transit." *Transportation Research Part D: Transport and Environment* 43 (2016): 49-58. <http://www.sciencedirect.com/science/article/pii/S1361920915002138>

**Title:** Pay-to-Save Transportation Pricing Strategies and Comparative Greenhouse Gas Reductions : Responding to Final Federal Rule for Existing Electric Utility Generating Units

**Author:** Greenberg, Allen, and John Evans

**Abstract:** Converting fixed driving costs to variable per mile charges—and offering cash savings in lieu of parking for bundled or otherwise free parking—encourages voluntary curtailment of driving and related decreases in greenhouse gas (GHG) emissions, air pollution, congestion, and crashes. This research explores a potential regulatory approach to help achieve goals for the reduction of GHGs by setting transportation efficiency targets that are based on simultaneously deploying (a) pay-as-you-drive-and-you-save car insurance, (b) parking cash-out, and (c) conversion of state and local sales taxes on newly purchased vehicles to mileage taxes designed to raise equivalent revenue. Through a best-estimate price elasticity of  $-0.30$  (and the testing of others), a year 2030 comparison is made between projected state-level and national reductions in GHG emissions of the proposed transportation policy bundle and projected reductions from the U.S. Environmental Protection Agency (EPA) final rule for existing electric utility sources. The transportation policies would yield nationwide reductions in GHG emissions of 257 million metric tons (MMT) of carbon dioxide equivalent (CO<sub>2</sub>e) or 68.6% of those of the final electric utility rule (above those of that final rule, called the most significant U.S. government action ever for reducing GHG emissions) and would generate reductions greater than those calculated for the electric utility rule in 24 states plus the District of Columbia.

**Subject Area:** Life cycle assessment; Greenhouse gas emissions; Transit; Light rail; Energy; Environment; Policymaking

**Availability:** Greenberg, Allen, and John Evans. "Pay-to-Save Transportation Pricing Strategies and Comparative Greenhouse Gas Reductions: Responding to Final Federal Rule for Existing Electric Utility Generating Units." *Transportation Research Record: Journal of the Transportation Research Board* 2530 (2015): 114-123.  
<http://trrjournalonline.trb.org/doi/abs/10.3141/2530-14>

## 5. Policy and Mobility

**Title:** Accessibility, mobility, and realized travel behavior: Assessing transport disadvantage from a policy perspective

**Authors:** Pyrialakou, V. Dimitra, Konstantina Gkritza, and Jon D. Fricker

**Abstract:** Limited accessibility and mobility can result in decreased quality of life and well-being, as well as social exclusion. In the United States (U.S.), rural and small urban communities suffer from transport disadvantage due to a lack of transit and a low density of employment, education, recreation, and other opportunities. While the international literature has produced a number of methods and frameworks to assess transport disadvantage and its impacts, the U.S. has lagged behind in providing pertinent studies. The objective of this paper is to establish comprehensive measures that can support the identification, evaluation, and quantification of transport disadvantage in U.S. rural and small urban communities, considering both data availability and the unique characteristics of the U.S. The concept of transport disadvantage in this paper denotes the disadvantage of a specific population group or area that results from a difficulty accessing transportation and/or opportunities. To achieve this objective, this paper develops a spatial multi-perspective approach to account for the three essential elements of transport disadvantage: accessibility, mobility, and realized travel behavior.

The developed approach provides an assessment of transport needs and need gaps that can be of benefit to small urban and rural communities and their planning practices, as well as to transport providers. The analysis in this paper suggests that—from a policy perspective—a combination of measures that account for all three essential elements of transport disadvantage should be considered, because the results of each measure complement those of the others. This paper illustrates the proposed approach using a case study of Indiana. The findings suggest that a great part of rural and small urban Indiana presents a low density of opportunities and that transport-disadvantaged residents of such areas might experience the impacts of low transit supply as well. In addition, the findings suggest that residents of rural and small urban areas travel longer distances on their day-to-day activities.

This paper attempts to advance the national research pertaining to transport disadvantage and provide a framework that can support planning and policy decisions at the community as well as at the state level.

**Subject Area:** Transport disadvantage; Accessibility; Mobility; Spatial approach

**Availability:** Pyrialakou, V. Dimitra, Konstantina Gkritza, and Jon D. Fricker. "Accessibility, mobility, and realized travel behavior: Assessing transport disadvantage from a policy perspective." *Journal of Transport Geography* 51 (2016): 252-269.

<http://www.sciencedirect.com/science/article/pii/S0966692316000144>

## **Title: Essays on Policy Evaluation from an Environmental and a Regional Perspective**

**Authors:** M. Taha Kasim

**Abstract:** This dissertation consists of three essays, which explore how public policies influence household and firm behavior, and the impact policies could have on environmental outcomes. The essays examine how households respond to price-based policies, the impact information disclosure policies could have on environmental outcomes, and finally the influence of normative appeals and non-pecuniary strategies on behavioral outcomes. Understanding these adjustments in the behavior of the agents is particularly important for policy design and for legislators who intend maximize societal benefit.

The first essay, titled *Matchmaking Between Vehicle Miles Traveled and Fuel Economy: the Role of Gasoline Prices*, studies a potential effect of gasoline prices that has been overlooked in the literature. Due to heterogeneity in demand for vehicle miles traveled (VMT), when gasoline prices increase, the increased cost of operating an inefficient vehicle are greater for households that drive more. Thus, in equilibrium, after an increase in the gasoline prices there should be a stronger matching from households, based on their VMT, to the fuel economy of the cars they own. Potentially, this matching effect could save 15% of US gasoline consumption, even with no effect on individual VMT and no effect on the vehicle fleet. Using confidential data from the National Highway Transportation Survey, the effect of higher gasoline prices on such assortative matching is estimated using a variety of econometric models. For all the different model specifications, the matching effect is significant and quite robust. This is the first study to analyze this re-allocation or matching effect. The second essay, titled *Evaluating the Effectiveness of an Environmental Disclosure Policy: an Application to New South Wales*, examines the impact of an environmental information disclosure policy on environmental outcomes. The main purpose of introducing an environmental information disclosure strategy is to reduce informational asymmetries and put pressure on firms to reduce emissions. This paper studies the impact of such a policy on air quality in New South Wales, Australia. A regression discontinuity design is employed and the results show that the pollutant concentration levels were not significantly affected after the implementation of the policy. Empirically, the estimates of the effects under the discontinuity-based Ordinary Least Squares (OLS) model have the opposite sign for some of the pollutants relative to the estimates from the basic OLS model. Therefore, basing conclusions on the OLS results will engender incorrect inference. Discontinuity-based results are robust to different model specifications.

The third essay, titled *What Determines Citizen Trust: Evaluating the Impact of Campaigns Highlighting Government Reforms in Pakistan* explores how normative appeals and awareness campaigns could influence societal and political trust. This project is in collaboration with Musharraf Cyan and Michael K. Price. The purpose of this study is two-fold. Firstly, the impacts of exposure to violence and conflict on general levels of trust, measures of life-satisfaction, and attitudes towards formal and informal institutions are examined in the province of Khyber Pakhtunkhwa (KPK), Pakistan. Secondly, the impacts of targeted messages, which were designed to inform the citizens regarding new government reforms (aimed at increasing transparency, protecting and strengthening private property rights, and improving service delivery), on general levels of trust and attitudes towards institutions are studied. For

the analysis an in-person survey was designed, which was conducted in randomly selected villages throughout KPK. Empirical results show that exposure to violence has a negative impact on trust and measures of life-satisfaction and has positive effects on formal institutions. The results also suggest that the awareness campaigns affected trust levels and perceptions about the quality of public services positively. Moreover when the effects are allowed to differ based on exposure to conflict, important heterogeneity is identified. The results are robust to different model specifications.

**Subject Area:** public policy; environment

**Availability:** Kasim, M. Taha, "Essays on Policy Evaluation from an Environmental and a Regional Perspective." Dissertation, Georgia State University, 2016.  
[http://scholarworks.gsu.edu/econ\\_diss/121](http://scholarworks.gsu.edu/econ_diss/121)



**Title: A Bayesian sampling approach to measuring the price responsiveness of gasoline demand using a constrained partially linear model**

**Authors:** Chen, Haotian, Russell Smyth, and Xibin Zhang

**Abstract:** Partial linear models provide an intuitively appealing way to examine gasoline demand because one can examine how response to price varies according to the price level and people's income. However, despite their intuitive appeal, partial linear models have tended to produce implausible and/or erratic price effects. Blundell et al. (2012) propose a solution to this problem that involves using Slutsky shape restrictions to improve the precision of the nonparametric estimate of the demand function. They propose estimating a constrained partially linear model through three steps, where the weights are optimized by minimizing an objective function under the Slutsky constraint, bandwidths are selected through least squares cross-validation, and linear coefficients are estimated using profile least squares. A limitation of their three-step estimation method is that bandwidths are selected based on pre-estimated parameters. We improve on the Blundell et al. (2012) solution in that we derive a posterior and develop a posterior simulation algorithm to simultaneously estimate the linear coefficients, bandwidths in the kernel estimator and the weights imposed by the Slutsky condition. With our proposed sampling algorithm, we estimate a constrained partially linear model of household gasoline demand employing household survey data for the United States for 1991 and 2001 and find plausible price effects.

**Subject Area:** Kernel estimator; Markov chain Monte Carlo; Price elasticity; Slutsky condition; Smoothness

**Availability:** Chen, Haotian, Russell Smyth, and Xibin Zhang. "A Bayesian sampling approach to measuring the price responsiveness of gasoline demand using a constrained partially linear model." (2016).

[https://www.researchgate.net/profile/Russell\\_Smyth/publication/306887816\\_A\\_Bayesian\\_sampling\\_approach\\_to\\_measuring\\_the\\_price\\_responsiveness\\_of\\_gasoline\\_demand\\_using\\_a\\_constrained\\_partially\\_linear\\_model/links/57bfb5bc08aeb95224d11d14.pdf](https://www.researchgate.net/profile/Russell_Smyth/publication/306887816_A_Bayesian_sampling_approach_to_measuring_the_price_responsiveness_of_gasoline_demand_using_a_constrained_partially_linear_model/links/57bfb5bc08aeb95224d11d14.pdf)

**Title: Gasoline Prices: The Role Of Assortative Matching Between Households And Automobiles**

**Authors:** Banzhaf, H. S., & Kasim, T.

**Abstract:** Many countries have set a goal to reduce gasoline consumption. Two ways to do this are through a gas tax or through performance-based policies mandating fuel economy. As shown in the literature, both types of policies have a compositional effect, pushing the fleet to more fuel-efficient vehicles. Only the gas tax has the desirable utilization effect, as it incentivizes less driving. However, the literature has missed a third effect: a matching effect, in which high-utilization households are matched to fuel-efficient vehicles in equilibrium. The effect is potentially large: holding constant both every individual's utilization and the composition of the fleet, more assortative matching could save up to 15% of US gasoline consumption. Using a simple theoretical model, we show that higher gas prices should lead to stronger assortative matching. Empirical estimates using micro-level US data is consistent with this hypothesis.

**Subject Area:** gasoline consumption; gas tax; fuel economy; matching effect

**Availability:** Banzhaf, H. S., & Kasim, T. (2016). Gasoline Prices: The Role Of Assortative Matching Between Households And Automobiles.

<https://wpcarey.asu.edu/sites/default/files/uploads/department-economics/banzhaf-kasim-gasolineprices-theroleofassortativematchingbetweenhouseholdsandautomobile.pdf>

**Title: Measuring the Short-run Demand for Gasoline by Hybrid Vehicle Households**

**Authors:** Lanlan Chu

**Abstract:** Using household-level data from the 2009 National Household Travel Survey (NHTS), this paper investigates the short-run gasoline demand for households with hybrid vehicles and its corresponding price elasticities. In particular, the price elasticities of gasoline demand for households with and without hybrid vehicles are compared. The endogenous switching regression model is adopted and indicates that the price elasticity of gasoline demand is of significant variance across households, with an estimated value of -0.161 for hybrid-vehicle households, and -0.043 for households with traditional vehicles. Such an elasticity disparity is complemented and verified by other models, including the regular OLS, the instrumental variables method and the propensity score matching technique. The short-run household responses to gasoline prices are further explored by decomposing the traditional gasoline demand elasticity into the elasticity of demand for vehicle miles traveled (VMT), and the elasticity of demand for household composite fuel efficiency (MPG). Results suggest that the change in MPG of hybrid vehicle households contributes of 44% to the change in gasoline demand, whereas it accounts for 4% of non-hybrid-vehicle households. This might be attributable to the fact that on average a hybrid-vehicle household is more capable of driving fuel-efficient vehicles to bring up its composite MPG when gasoline prices increase, either by switching vehicles within the family or sharing the fuel-efficient vehicle for the same trip. These findings imply that an increasing use in hybrid vehicles could be one cause of the current shortage of gasoline tax revenue, and a vehicle mileage tax might be a feasible solution to this issue.

**Subject Area:** Hybrid Vehicle; Gasoline Demand; Switching Regression; Propensity Scoring Match

**Availability:** Lanlan Chu, Department of Economics, Texas Tech University, Lubbock, Texas, [lanlan.chu@ttu.edu](mailto:lanlan.chu@ttu.edu) JEL codes: D12; Q41; R41

**Title: The Potential Effects of the 2017-2025 EPA/NHTSA GHG/Fuel Economy Mandates on the U.S. Economy**

**Authors:** McAlinden, S. P., Chen, Y., Schultz, M., & Andrea, D. J.

**Abstract:** This study conducted by the Center for Automotive Research (CAR) constitutes an economic cost benefit analysis of the national standards for light duty vehicle fuel economy and greenhouse gas emissions (GHG) set by the U.S. National Highway Traffic Safety Administration (NHTSA) and the Environmental Protection Agency (EPA) for the years 2017-2025. Past CAFE standards mandated an increase in fuel economy from 18.0 MPG in 1978 to 27.5 MPG by 1990 for passenger cars. Passenger car standards were 36.5 MPG in 2015 and are mandated to reach a projected 54.5 MPG by 2025. The analysis estimates the net value of the fuel economy improvements to the consumer that are mandated by the federal government during 2016-2025. The study also estimates the likely net benefits or costs to the new vehicle buyer of the technologies needed to meet the higher fuel economy mandates in 2025 and the effects of net fuel economy benefits on consumer purchases of total vehicles. For evaluation purposes, a baseline forecast for the U.S. motor vehicle market and industry in terms of sales, production, and employment through the year 2025 is presented that assumes the standards are not in place for 2017-2025. The study analysis, then, measures the effect of higher fuel economy mandates and the adoption of related expensive technologies on U.S. motor vehicle market, production, and automotive manufacturing and automotive dealership employment in the year 2025. Finally, this study discusses other effects of the mandates on the U.S. economy and contains CAR's policy recommendations pertaining to the mid-term review of the national standards for 2022-2025.

**Subject Area:** fuel economy; GHG; NHTSA;

**Availability:** McAlinden, S. P., Chen, Y., Schultz, M., & Andrea, D. J. The Potential Effects of the 2017-2025 EPA/NHTSA GHG/Fuel Economy Mandates on the US Economy. Ann Arbor, 1001, 48108. [http://www.autoevolution.com/pdf/news\\_attachments/study-says-fuel-economy-rules-for-2025-threaten-11-million-jobs-in-america-111481.pdf](http://www.autoevolution.com/pdf/news_attachments/study-says-fuel-economy-rules-for-2025-threaten-11-million-jobs-in-america-111481.pdf)

**Title: An Aggregate Time Series Analysis to Investigate Effect of Compressed Natural Gas (CNG) Vehicles on Vehicle Miles Traveled (VMT)**

**Author:** Soltani-Sobh, A., Heaslip, K., Bosworth, R., & Song, Z.

**Abstract:** Understanding the sensitivity of VMT (vehicle miles travelled) to changes in the adoption rate of natural gas vehicles has important implications for policy makers. This paper examines the relationship between automobile use and the projected share of CNG (compressed natural gas) vehicles due to changes in fuel prices, which may provide motivation for people change to CNG vehicles. The VMT model is developed using aggregated annual time series data from Washington State. Additional analysis is performed to exclude the effect of population growth on VMT trend by modeling the VMT per capita. The share of CNG vehicles is forecasted under various price conditions using a model based on the joint distribution of household VMT and fuel efficiency-Mile per Gallon (MPG) in the 2009 NHTS. Results indicate that in a high adoption rate scenario, in which 60% of the fleet is CNG vehicles, VMT and VMT per capita at 2031 will have 10% and 19% increment respectively. This implies that CNG vehicle adoption is unlikely to have a large influence on aggregated VMT and VMT per capita. The results in Washington State are applicable to trends seen nationwide in VMT growth and VMT per capita decline.

**Subject Areas:** Natural gas, CNG (compressed natural gas) vehicles, VMT (vehicle miles travelled), fuel price, time series regression

**Availability:** Soltani-Sobh, A., Heaslip, K., Bosworth, R., & Song, Z. (2016). An Aggregate Time Series Analysis to Investigate Effect of Compressed Natural Gas (CNG) Vehicles on Vehicle Miles Traveled (VMT). *Int. J. Mech. Eng. Autom*, 3(10), 399-413.

[https://www.researchgate.net/profile/Ali\\_Soltani\\_Sobh/publication/310079525\\_An\\_Aggregate\\_Time\\_Series\\_Analysis\\_to\\_Investigate\\_Effect\\_of\\_Compressed\\_Natural\\_Gas\\_CNG\\_Vehicles\\_on\\_Vehicle\\_Miles\\_Traveled\\_VMT/links/5828af6708ae5c0137f1139e.pdf](https://www.researchgate.net/profile/Ali_Soltani_Sobh/publication/310079525_An_Aggregate_Time_Series_Analysis_to_Investigate_Effect_of_Compressed_Natural_Gas_CNG_Vehicles_on_Vehicle_Miles_Traveled_VMT/links/5828af6708ae5c0137f1139e.pdf)

**Title: Reforms in the Regulation of Public Bus Service in Israel**

**Author:** Ida, Yoram, and Gal Talit

**Abstract:** Regulation of public bus services in fixed routes is common worldwide. This article presents regulatory reforms instituted in Israel from 2000 to 2014, in which part of the public bus services are being provided through competitive tendering. The results generally indicate relative success in most of the variables examined: the average cost per vehicle kilometer, the level of service, fares and the number of passengers. However, the reform has also been accompanied by fairly frequent changes in the characteristics of the tenders. These changes may reflect difficulties in imposing regulation on the operators. The findings indicate that the existing regulation in Israel should be changed, both structurally and in terms of the organizations involved in the process. In addition, it is recommended that a new measure be developed to examine the quality of passenger service provided, which should also be included as a significant criterion in the selection of operators.

**Subject Areas:** Regulatory structure; Service quality index; Self-regulation

**Availability:** Ida, Yoram, and Gal Talit. "Reforms in the Regulation of Public Bus Service in Israel." *Case Studies on Transport Policy* (2016).

<http://www.sciencedirect.com/science/article/pii/S2213624X16301109>

**Title: Fuel Consumption and Gasoline Prices: The Role of Assortative Matching between Households and Automobiles**

**Author:** Banzhaf, H. Spencer, and Taha Kasim

**Abstract:** Understanding the extent to which people substitute activities across time is important to evaluating behavior and welfare impacts in many contexts including assessing the damages caused by oil spills and climate change impacts. This paper develops a partially dynamic structural model that explicitly focuses on intertemporal substitution and incorporates time constraints on behavior. Modeling how individuals allocate activities across time is closely related to how individuals value their time and constraints on the use of time. To address these issues, the paper also implements a flexible, individualized approach to measuring how people value their leisure time and how substitutable time is between periods. The model is estimated in an empirical application using revealed and stated preference data from recreational fishermen in the Gulf of Mexico. The results demonstrate how getting the value of time 'right' is important for assessing welfare impacts of policies with large intertemporal substitution effects. The paper further shows that people value their time substantially differently from their implied wage rate and that the value of time differs by time of year. These findings raise concerns with the common practice of only using labour market information to value people's leisure time.

**Subject Areas:** Intertemporal substitution, Value of time, Demand system

**Availability:** Banzhaf, H. Spencer, and Taha Kasim. Fuel Consumption and Gasoline Prices: The Role of Assortative Matching between Households and Automobiles. No. w22983. National Bureau of Economic Research, 2016. <http://www.nber.org/papers/w22983>

**Title: Fuel Consumption and Gasoline Prices: The Role of Assortative Matching between Households and Automobiles**

**Author:** Banzhaf, H. Spencer, and Taha Kasim

**Abstract:** Analyses of policies to reduce gasoline consumption have focused on two effects, a compositional effect on the fuel economy of the automotive fleet and a utilization effect on how much people drive. However, the literature has missed a third effect: a matching effect, in which high-utilization households are matched to fuel-efficient vehicles in equilibrium. We show that higher gas prices should lead to stronger assortative matching. Empirical estimates using US micro-level data are consistent with this hypothesis. We find the effect of a gas tax through the matching effect is larger than the compositional effect, with a \$1 tax saving 1.7% of gas consumption.

**Subject Areas:** gas consumption; fuel economy; utilization effect; compositional effect

**Availability:** Banzhaf, H. Spencer, and Taha Kasim. Fuel Consumption and Gasoline Prices: The Role of Assortative Matching between Households and Automobiles. No. w22983. National Bureau of Economic Research, 2016. <http://www.nber.org/papers/w22983>



**Title: Energy Efficiency Standards Are More Regressive Than Energy Taxes: Theory and Evidence**

**Author:** Arik Levinson

**Abstract:** Economists promote energy taxes as cost-effective. But policymakers raise concerns about their regressivity, or disproportional burden on poorer families, preferring to set energy efficiency standards instead. I first show that in theory, regulations targeting energy efficiency are more regressive than energy taxes, not less. I then provide an example in the context of automotive fuel consumption in the United States: taxing gas would be less regressive than regulating the fuel economy of cars if the two policies are compared on a revenue-equivalent basis.

**Subject Areas:** energy efficiency; energy taxes;

**Availability:** Levinson, Arik. Energy Efficiency Standards Are More Regressive Than Energy Taxes: Theory and Evidence. No. w22956. National Bureau of Economic Research, 2016.  
<http://www.nber.org/papers/w22956>

**Title: Urban accessibility: Balancing land use and transportation**

**Author:** Duranton, Gilles, and Erick Guerra

**Abstract:** In this paper, we examine the importance, theoretical understanding, and empirical measurement of urban accessibility. Drawing on examples from poor, rich, and intermediate-income cities, we argue that accessibility is the main urban quantity to consider from a resource allocation standpoint since it links land use and transportation, the two primary urban consumption goods. Despite the importance of accessibility, a sparsity of empirical knowledge about accessibility and a disconnect between policymaking and accessibility outcomes have led many researchers to retreat into narrow areas of expertise—such as land use, housing, or transportation treated in isolation—and many urban policymakers to ignore accessibility altogether. Even when data are good, the politics of land use and transportation decisions rarely favors accessibility as an important policy outcome. As a result, urban policies often fail to allocate land use or transportation either efficiently or equitably.

Throughout the paper, we make two basic calls. The first is to put accessibility more squarely at the center of the study of urban development. The second is to focus urban policymaking more directly on specific problems, such as congestion, pollution, and traffic fatalities. Despite the need for better knowledge and practice, we argue for a modest change of course, rather than a radical shift in how cities are studied and managed, however. The externalities associated with transportation and urban development are subtle and interact with each other through many feedback mechanisms. Doing nothing to improve urban accessibility is not a desirable option, but doing something is hard. Nevertheless, we are hopeful that a better balance for research and a better balance for policy practice will bring urban research and practice closer together. The remainder of this executive summary briefly touches on the key elements of each section of the paper.

**Subject Areas:** urban accessibility, cities; urban development

**Availability:** Duranton, Gilles, and Erick Guerra. "Urban accessibility: Balancing land use and transportation." [http://usj.sagepub.com/content/early/2016/11/10/0042098016675093.abstr](http://usj.sagepub.com/content/early/2016/11/10/0042098016675093.abstract)  
ct

**Title:** Traffic congestion, accessibility to employment, and housing prices: A study of single-family housing market in Los Angeles County

**Author:** Hou, Yuting

**Abstract:** This study mainly addresses two main questions: (1) whether traffic congestion negatively affects single-family house price by constraining accessibility to jobs; (2) whether congestion effects and accessibility effects vary by income groups within a metropolitan area. This study uses a multilevel hedonic price model to estimate the marginal price of accessibility while controlling for other neighbourhood attributes and the correlation of proximal housing sales. The congestion effects are identified by comparing the implicit price of accessibility between congested-flow and free-flow. The results show that the accessibility measured with congested time yields higher marginal price, suggesting that households are willing to pay more to avoid locations with high congestion delays and accessibility loss. The results also suggest that accessibility effects are more valued by homebuyers in middle-income neighbourhoods, compared with those in the lowest or highest income neighbourhoods.

**Subject Areas:** accessibility to employment; housing prices; multilevel linear model; traffic congestion

**Availability:** Hou, Yuting. "Traffic congestion, accessibility to employment, and housing prices: A study of single-family housing market in Los Angeles County." *Urban Studies* (2016): 0042098016675093.

<http://usj.sagepub.com/content/early/2016/11/10/0042098016675093.abstract>

**Title: On the Association between Travel Distance and Treatment Choice for Low-Risk Prostate Cancer: Results from a Rural State**

**Author:** Hellekson, C., Larson, G., Poswilko, S., Beal, J., Sahnoun, A., & Russo, J. K.

**Abstract:** Background: Evidence suggests that cancer patients with increased travel burden to treatment centers may have limited treatment options. Purpose: To investigate the association between travel distance to a treatment facility and initial treatment choice among young men with low-risk prostate cancer in a rural state. Methods: A retrospective medical charts review was conducted of young men (65 years or younger) newly diagnosed with low-risk prostate cancer from January 1, 2005 through December 31, 2014 who were treated with either active surveillance, radical prostatectomy, or brachytherapy at either of the two major hospital systems in Bismarck, ND, USA. Results: Information on a random sample of 242 patients was studied. The majority of patients (66%) received radical prostatectomy. Patients who received radical prostatectomy were significantly younger ( $p$ -value  $< 0.001$ ). PSA at diagnosis, clinical stage, and Gleason score were not associated with treatment choice ( $p$ -value = 0.06;  $p$ -value = 0.1794; and  $p$ -value = 1.00; respectively). Adjusting for age at diagnosis, PSA at diagnosis, and treatment facility, treatment choice was not associated with travel distance ( $p$ -value = 0.309). Patients treated at St. Alexius facility were more likely to undergo radical prostatectomy than Sanford health patients ( $p$ -value  $< 0.0001$ ). Conclusions: We found no association between travel distance and treatment choice for low-risk prostate cancer. Treatment choice was associated with institution which may suggest institutional bias in patterns of care.

**Subject Areas:** Low-Risk, Prostate Cancer, Rural, Brachytherapy, Prostatectomy, Young Men, Travel Distance

**Availability:** Hellekson, C., Larson, G., Poswilko, S., Beal, J., Sahnoun, A., & Russo, J. K. (2016). On the Association between Travel Distance and Treatment Choice for Low-Risk Prostate Cancer: Results from a Rural State. *Journal of Cancer Therapy*, 7(09), 656.  
<http://www.scirp.org/journal/PaperInformation.aspx?paperID=70734>

**Title: Are Energy Efficiency Standards Less Regressive Than Energy Taxes?**

**Authors:** Arik Levinson

**Abstract:** Economists promote energy taxes as cost-effective. But policymakers raise concerns about their regressivity, or disproportional effect on poorer families, preferring to set energy efficiency standards instead. I first show that in theory we should expect regulations targeting energy efficiency to be more regressive than energy taxes, not less. I then provide an example in the context of automotive fuel consumption in the U.S.: taxing gas would be less regressive than regulating the fuel economy of cars, so long as the two policies are compared on a revenue-equivalent basis. Finally, I provide supporting evidence that energy efficiency standards might also be more regressive than energy taxes for appliances and residential construction.

**Subject Area:** energy tax; energy efficiency standards; regressivity; appliances and residential construction

**Availability:** Levinson, Arik. "Are Energy Efficiency Standards Less Regressive Than Energy Taxes?". October 17, 2016

"<https://www.aae.wisc.edu/events/papers/DeptSem/2016/levinson.11.04.pdf>

**Title: The Self-Sufficiency Standard for Wyoming**

**Authors:** Diana Pearce

**Abstract:** In July 2004, Governor Dave and First Lady Nancy Freudenthal introduced the creation of Wyoming's Self-Sufficiency Standard. A Self-Sufficiency Advisory Committee was formed to oversee the compilation of the report and develop implementation strategies for Wyoming's Standard. The committee is comprised of representatives from the Equality State Policy Center; Laramie County Community College Transitional Services; Our Families, Our Future; the Wyoming Business Council; the Wyoming Children's Action Alliance; the Wyoming Departments of Administration and Information, Corrections, Employment, Family Services, Health, and Workforce Services; the Wyoming Student Loan Corporation; and the Wyoming Women's Foundation. This report was prepared with financial assistance from the Wyoming Departments of Corrections and Family Services, and the Wyoming Governor's Office.

**Subject Area:** innovation diffusion model, three-dimensional innovation diffusion model, Cobb–Douglas production function

**Availability:** Diana Pearce; prepared for the State of Wyoming, Office of the Governor in conjunction with Wider Opportunities for Women Family Economic Self-Sufficiency Project; <http://depts.washington.edu/selfsuff/drupal/sites/default/files/selfsuff/docs/WY2005.pdf>

**Title: Behavioral Response To Environmental Taxation: Evidence From The Transportation Sector**

**Authors:** Cerruti D.

**Abstract:** This dissertation analyzes how individuals respond to the introduction of taxation aimed to reduce vehicle pollution, greenhouse gases and traffic. The first chapter analyzes a vehicle registration tax based on emissions of carbon dioxide (CO<sub>2</sub>), a major greenhouse gas, adopted in the UK in 2001 and subject to major changes in the following years. I identify the impact of the policy on new vehicle registrations and carbon emissions, compared to alternative measures. Results show that consumers respond to the tax by purchasing cleaner cars, but a carbon tax generating the same revenue would further reduce carbon emissions. The second chapter looks at a pollution charge (polluting vehicles pay to enter the city) and a congestion charge (all vehicles pay) adopted in 2008 and 2011 in Milan, Italy, and how they affected the concentration of nitrogen dioxides (NO<sub>x</sub>). I use data from pollution monitoring stations to measure the change between areas adopting the tax and other areas. Results show that in the first quarter of their introduction, both policies decreased NO<sub>x</sub> concentration in a range of -8% and -5%, but the effect declines over time, especially in the case of the pollution charge. The third chapter examines a trial conducted in 2005 in the Seattle, WA, area, in which vehicle trips by 276 volunteer households were recorded with a GPS device installed in their vehicles. Households received a monetary endowment which they used to pay a toll for each mile traveled: the toll varied with the time of the day, the day of the week and the type of road used. Using information on driving behavior, I show that in the first week a \$0.10 toll per mile reduces the number of miles driven by around 7%, but the effect lasts only few weeks at most. The effect is mainly driven by a reduction in highway miles during trips from work to home, and it is strongly influenced by past driving behavior, income, the size of the initial endowment and the number of children in the household.

**Subject Area:** vehicle pollution; greenhouse gases; taxation; vehicle registration; carbon tax

**Availability:** Cerruti D. Behavioral Response to Environmental Taxation: Evidence from the Transportation Sector (Doctoral dissertation). Univ. of MD 2016

[http://drum.lib.umd.edu/bitstream/handle/1903/18798/Cerruti\\_umd\\_0117E\\_17479.pdf?sequence=1&isAllowed=y](http://drum.lib.umd.edu/bitstream/handle/1903/18798/Cerruti_umd_0117E_17479.pdf?sequence=1&isAllowed=y)

## **Title: Nudging People Towards more Sustainable Residential Choice Decisions: An Intervention Based on Focalism and Visualization**

**Authors:** Bhattacharyya, A., Jin, W., Le Floch, C., Chatman, D. G., & Walker, J. L.

**Abstract:** There have been numerous behavior change studies focused on sustainable travel mode choices. In this study we focused on the residential choices that in turn influence travel habits. We designed and implemented two interventions, which we term the “focalism” and “visualization” interventions, based on literature in psychological economics. The focalism intervention was motivated by literature that suggests people make suboptimal choices when looking for a new home. While focus is given to immediately tangible features like the quality of the house, important but less tangible factors like access to transportation are relatively overlooked. The visualization intervention was based on literature showing that providing information at decision points when long-ingrained habits are vulnerable to change, such as at the time of a residential move, can be influential on choices. We designed both interventions to be interactive so that the intervention was “discovered” by respondents rather than presented directly as information. With the focalism intervention, we pointed out differences in how respondents ranked their search priorities for new housing and neighborhoods, versus how they ranked what they reported makes them happy. With the visualization intervention, we explained to respondents that moving is an opportunity to make changes in one’s life, and we prompted them to think through what they desired to change. We evaluated the influence of these interventions on residential housing decisions by surveying respondents about their priorities in residential search before and after the interventions, and by collecting information about their housing, neighborhoods, travel patterns, and reported well-being. The surveys were web-based, with one survey conducted before respondents moved and a second survey conducted afterward. Participants were randomly assigned to a focalism treatment group, a visualization treatment group, or a control group. 380 respondents answered the pre-move survey, and 184 of these answered the post-move survey. In the pre-move survey, we found that both the focalism and visualization interventions resulted in a significant increase in the fraction of people who planned to travel more sustainably relative to the control group. More importantly, we found that after the post-move survey, respondents in the focalism group, but not the visualization group, significantly reduced their travel time to work and increased their cycling, walking, carpooling, carsharing and transit use in comparison to the control group. Meanwhile, those in the visualization treatment group had significantly higher reported well-being after the move; those in the focalism treatment group also improved their stated well-being, though less significantly; and there was no change in the control group. These results suggest that it might be relatively easy to nudge residential choices towards both more sustainable travel and greater well-being.

**Subject Area:** residential choice; travel habits; web survey

**Availability:** Bhattacharyya, A., Jin, W., Le Floch, C., Chatman, D. G., & Walker, J. L. Nudging People Towards more Sustainable Residential Choice Decisions: An Intervention Based on



Focalism and Visualization.

[http://www.joanwalker.com/uploads/3/6/9/5/3695513/iatbr\\_bhattacharyya\\_et\\_al\\_2016.pdf](http://www.joanwalker.com/uploads/3/6/9/5/3695513/iatbr_bhattacharyya_et_al_2016.pdf)

**Title: Vehicle attribute trade-offs to meet the 2025 CAFE fuel economy target**

**Authors:** Luk, Jason M., Bradley A. Saville, and Heather L. MacLean

**Abstract:** The literature analyzes changes in vehicle attributes that can improve fuel economy to meet Corporate Average Fuel Economy (CAFE) standards. However, these analyses exclude either vehicle price, size, acceleration or technology advancement. A more comprehensive examination of the trade-offs among these attributes is needed, this case study focuses on technically feasible modifications to a reference 2012 vehicle to meet the 2025 fuel economy target. Scenarios developed to examine uncertainty in technology advancement indicate that expected technology cost reductions over time will be insufficient to offset the costs of additional fuel efficiency technologies that could be used to meet the 2025 fuel economy target while maintaining other vehicle attributes. The mid-price scenario results show the targeted 66% increase in fuel economy from 2012 to 2025 can be achieved with (i) a 10% (\$2070) vehicle price increase (lightweight hybrid electric vehicle), (ii) a 31% (2.9 second) increase in the 0–97 km/h (60 mph) acceleration time (smaller engine), or (iii) a 17% (700 L) decrease in interior volume (smaller body) while maintaining other vehicle attributes. These results are consistent with those obtained using methods that generalize the US light-duty vehicle fleet, but are not a forecast of future vehicle attributes because combinations of less perceptible changes to vehicle price, acceleration and size would also be feasible. This study shows there are numerous ways that 2025 fuel economy targets can be met; therefore, the trade-offs quantified provide important insights on the implications of future CAFE standards.

**Subject Area:** CAFE; fuel economy

**Availability:** Luk, Jason M., Bradley A. Saville, and Heather L. MacLean. "Vehicle attribute trade-offs to meet the 2025 CAFE fuel economy target." *Transportation Research Part D: Transport and Environment* 49 (2016): 154-171.

<http://www.sciencedirect.com/science/article/pii/S1361920915302959>

**Title: Poverty: Beyond the Urban Core, Policy Brief**

**Authors:** Aaron Lauer

**Abstract:** Access to transportation is a fundamental component in escaping poverty. Without adequate transportation, individuals and families cannot access what is necessary to escape poverty, such as employment, education, health care, and human services. Transportation allows people to take advantage of opportunities not only in their own communities but in the broader regions in which they live.

**Subject Area:** poverty; transportation; accessibility

**Availability:** Lauer, Aaron with contributions from Moe Coleman and Karlie Haywood; Poverty Beyond the Urban Core, policy brief; University of Pittsburgh Institute of Politics Health and Human Services Committee; September 2016

<http://www.iop.pitt.edu/documents/Policy%20briefs/Poverty%20Beyond%20the%20Urban%20Core.pdf>

**Title: Importance of Recognizing Locational Differences in Assessing the Impact of a Road User Charge** *Oregon Case Study*

**Authors:** McMullen, B. Starr, Yue Ke, and Haizhong Wang

**Abstract:** Oregon Senate Bill 810 created a program that allows drivers to pay a flat-mileage road user charge (RUC) of 1.5 cents per mile rather than the 30 cents per gallon state fuel tax. Major concerns about the adoption of this RUC are that it could increase costs for rural households relative to urban households and that the costs would fall disproportionately on lower-income groups. Further, it has been suggested that significant differences in the impact of the RUC could arise from locational distinctions beyond the urban–rural split alone. Earlier studies analyzed the regional impacts of an RUC only at the statewide level or only with the use of a broad urban–rural distinction. The newly available Oregon Households Activity Survey (OHAS) data provide detailed household location information, which permits impacts to be assessed with regional and geographic definitions relevant to policy makers in Oregon. Results with the use of OHAS data showed that, on average, statewide households would pay 5 cents more daily under the RUC than they did under the fuel tax because the 1.5 cents per mile RUC actually will produce more gross revenue than the fuel tax. However, the price increase in rural regions will be less than the statewide average, whereas more urban regions will pay slightly more than the statewide average. Further, the distributional impact of the flat 1.5 cents RUC on all households in the OHAS data set differed, depending on the region of the state examined.

**Subject Area:** road user charge; Oregon Households Activity Survey;

**Availability:** McMullen, B. Starr, Yue Ke, and Haizhong Wang. "Importance of Recognizing Locational Differences in Assessing the Impact of a Road User Charge: Oregon Case Study." *Transportation Research Record: Journal of the Transportation Research Board* 2597 (2016): 75-81. <http://trrjournalonline.trb.org/doi/abs/10.3141/2597-10>

**Title:** An innovation diffusion model for consumer durables with three parameters

**Authors:** Sachdeva, Nitin, P. K. Kapur, and Ompal Singh

**Abstract:** Strategic innovation diffusion converts newly created knowledge into increasing a firm's value primarily through innovative product offerings. In this paper, we present a time-based adoption pattern with pricing and promotional expenditure as a three-dimensional innovation diffusion model (3D-IDM). In our proposed 3D-IDM, we assume that value of the product plays a crucial role of being the major driver of diffusion, and is classified into the following three main factors: (1) continuation time of the product in the market – representing goodwill of the product; (2) price of the product – indicating consumers' buying behaviour; and (3) marketing efforts of the firm. A special form of the Cobb–Douglas production function is used to design the three-dimensional framework. An empirical study is performed on number of consumer-durable sales data to validate and compare the proposed model. Various performance measures are treated uniquely using the Mahalanobis distance-based approach (DBA) to determine the relative strength of each model.

**Subject Area:** innovation diffusion model, three-dimensional innovation diffusion model, Cobb–Douglas production function

**Availability:** Sachdeva, Nitin, P. K. Kapur, and Ompal Singh. "An innovation diffusion model for consumer durables with three parameters." *Journal of Management Analytics* 3.3 (2016): 240-265. <http://www.tandfonline.com/doi/abs/10.1080/23270012.2016.1197052>

**Title:** Track Time and Monetary Costs of Transportation as a Comprehensive Performance Measure: Development and Application of Transportation Cost Index

**Authors:** Wang, Liming

**Abstract:** Presentation

**Subject Area:** performance measure

**Availability:** Wang, Liming, "Track Time and Monetary Costs of Transportation as a Comprehensive Performance Measure: Development and Application of Transportation Cost Index" (2016). TREC Friday Seminar Series. Book 5.  
[http://pdxscholar.library.pdx.edu/trec\\_seminar/5](http://pdxscholar.library.pdx.edu/trec_seminar/5)

**Title: “Where the Sidewalk Ends”: Sustainable Mobility in Atlanta's Cascade Community**

**Authors:** Ender Demir & Giray Gozgor

**Abstract:** Roughly one third of U.S. greenhouse gas emissions are travel-related, and much of these are from routine, short trips that can be controlled by individual consumers. Because of this, sustainability advocates encourage greater use of alternative transportation modes such as mass transit and non-motorized transport to help limit carbon dioxide emissions. However, the efficacy of such prescriptions is contingent upon the social and physical context of a given place, that is, how these recommendations are received or put into practice by the intended audiences. This case study of Atlanta, Georgia's mostly African American Cascade community examines the influence of the broader social context of consumption as social practice and the built environment as factors influencing decisions about sustainable mobility (i.e., mass transit use and neighborhood walking), both inside and outside of Cascade. Not surprisingly, lower income residents routinely use mass transit, while middle- and upper-income earners are reluctant users of Atlanta's mass transit system (MARTA). Lack of use by those with higher incomes is due mainly to the availability of personal automobiles and inefficiencies in system design attributable to a history of racial politics that restricts MARTA to just two of metropolitan Atlanta's twenty-eight counties. Neighborhood walkability is encumbered by the lack of sidewalk space for higher income individuals and fear of crime for those with lower incomes. The social practice of status signaling via automobile purchasing may also inhibit African Americans' use of mass transit. [Climate Change; African American Communities; Atlanta, GA]

**Subject Area:** Atlanta, Cascade; transit; GHG

**Availability:** JOHNSON GAITHER CA, Himmelfarb D, Hitchner S, Schelhas J, SHEPHERD J, KC B. “Where the Sidewalk Ends”: Sustainable Mobility in Atlanta's Cascade Community. *City & Society*. 2016 Aug 1;28(2):174-97. <http://onlinelibrary.wiley.com/doi/10.1111/ciso.12077/full>

**Title: The Impact Of Economic Policy Uncertainty On The Vehicle Miles Traveled (Vmt) In The U.S.**

**Authors:** Ender Demir & Giray Gozgor

**Abstract:** This paper examines the impact of the economic policy uncertainty (EPU) on the vehicle miles traveled (VMT) in the United States (U.S.) over the period of January 1978 to October 2014. We estimate an empirical model based on a travel demand-analysis. It is found that an increase in economic policy uncertainty leads to a decrease in vehicle miles traveled. This negative relationship is also observed when different model types, various control variables, and the sub-indexes of the EPU are considered in the model.

**Subject Area:** Vehicle Miles Traveled, Travel Demand, U.S. Economy, Economic Policy Uncertainty

**Availability:** Eurasian Journal of Business and Management, 4(3), 2016, 39-48 DOI: 10.15604/ejbm.2016.04.03.004); <http://eurasianpublications.com/Eurasian-Journal-of-Business-and-Management/Vol.4-No.3-2016/EJBM-4.pdf>



**Title: Playing 'Telephone' with Transportation Data**

**Authors:** Steven Polzin

**Abstract:** In this paper we take a fresh look at the job matching process within local labor markets in Germany. Drawing on smaller geographic units than the previous literature, we estimate regional matching functions on NUTS 3 level for the years 2000 to 2010. The elasticity between matches and unemployment ranges between 0.4 and 0.5 with 75% of this effect being driven by the impact that unemployment has on matches in neighboring regions. The effect of vacancies on matches is substantially smaller but also robustly positive. Bayesian model comparison tests suggest that spillovers from unemployment and vacancies are confined to local labor markets, which are best approximated by geographical distance rather than by present or past infrastructure or commuter numbers. Spillovers from unemployment arise exclusively after a series of major labor market reforms ('Hartz Reforms') have been implemented between 2003 and 2005, indicating that the reforms have contributed to an increased spatial mobility of the unemployed.

**Subject Area:** data sharing

**Availability:** Playing 'Telephone' with Transportation Data *The transportation policy debate regularly falls victim to incorrect or incomplete "facts" getting passed around like the game of telephone.* Planetizen blog post, July 11, 2016;  
<http://www.planetizen.com/node/87288/playing-telephone-transportation-data>

**Title:** Job search and hiring in local labor markets: Spillovers in regional matching functions

**Authors:** Haller, Peter, and Daniel F. Heuermann

**Abstract:** In this paper we take a fresh look at the job matching process within local labor markets in Germany. Drawing on smaller geographic units than the previous literature, we estimate regional matching functions on NUTS 3 level for the years 2000 to 2010. The elasticity between matches and unemployment ranges between 0.4 and 0.5 with 75% of this effect being driven by the impact that unemployment has on matches in neighboring regions. The effect of vacancies on matches is substantially smaller but also robustly positive. Bayesian model comparison tests suggest that spillovers from unemployment and vacancies are confined to local labor markets, which are best approximated by geographical distance rather than by present or past infrastructure or commuter numbers. Spillovers from unemployment arise exclusively after a series of major labor market reforms ('Hartz Reforms') have been implemented between 2003 and 2005, indicating that the reforms have contributed to an increased spatial mobility of the unemployed.

**Subject Area:** Local labor markets; Matching function; Commuting; Transport infrastructure

**Availability:** Haller, Peter, and Daniel F. Heuermann. "Job search and hiring in local labor markets: Spillovers in regional matching functions." *Regional Science and Urban Economics* 60 (2016): 125-138. <http://www.sciencedirect.com/science/article/pii/S0166046216300667>

**Title: Optimal Spatiotemporal Resource Allocation in Public Health and Renewable Energy**

**Authors:** Meyers, Lauren A., Surya Santoso, and John J. Hasenbein

**Abstract:** Optimizing the spatiotemporal allocation and distribution of a limited number of critical resources is a pervasive problem, concerning both government agencies and private companies. This challenge is complicated by mismatches between supply and demand over time and also by uncertainty in demand and/or supply. We study such problems in public health and in renewable energy. Public health resources, such as antiviral medications and vaccines, are often in limited availability at the start of an influenza pandemic. Government agencies need to make balanced policy decisions, accounting for regional equity while maintaining an efficient distribution to mitigate spread of the influenza virus. In the absence of good initial information regarding the demand, resource allocation decisions need to encompass a variety of demand scenarios. On the renewable energy side, we seek to provide a fixed supply of energy from a system which includes a highly variable renewable source, such as wind power. Here, we must commit to a decision before the stochastic supply is realized. When bidding into the electricity market to buy or sell energy, an added difficulty concerning the prices of energy arises. We study five specific problems in these contexts.

**Subject Area:** public health, renewable energy; wind power

**Availability:** Meyers, Lauren A., Surya Santoso, and John J. Hasenbein. "Optimal Spatiotemporal Resource Allocation in Public Health and Renewable Energy."

[https://www.researchgate.net/profile/Bismark\\_Singh/publication/307887765\\_Optimal\\_Spatiotemporal\\_Resource\\_Allocation\\_in\\_Public\\_Health\\_and\\_Renewable\\_Energy/links/57d07fe308ae5f03b4891053.pdf](https://www.researchgate.net/profile/Bismark_Singh/publication/307887765_Optimal_Spatiotemporal_Resource_Allocation_in_Public_Health_and_Renewable_Energy/links/57d07fe308ae5f03b4891053.pdf)

**Title: Urban Design Vision: Vista Del Sol Development Proposal**

**Authors:** G. Castro

**Abstract:** The idea of this project arose from the lack of development on the site. The site is centrally located in the downtown area in the City of Coachella. The site is important because it is the gateway to the City's historic, but un-popular, downtown. A vision for this specific site is needed to encourage development that fits the needs of the community and will also contribute positively to the overall appearance of the City of Coachella.

As a Coachella resident, I have lived through the various stages of development to adjacent sites, and along with many residents, I am not pleased by what has been developed. This project focuses on the corner of 6th St. and Harrison (or Highway 86); the western portion of the Downtown that consists of vacant land. The project is intended to bring business and life back to the historic downtown, and also enhance the quality of life for residents of the City, neighbors, and visitors as well. The goal is to create a gathering place for retail, commercial, dining, and entertainment activity for residents, businesses, and visitors throughout the area, while developing neighborhood serving commercial uses and residential units. To achieve such goals, the project envisions to incorporate smart growth elements such as pedestrian-friendly design, multi-modal transportation and mixed-use development.

**Subject Area:** Urban Design; Coachella

**Availability:** Castro G. Urban Design Vision for the Vista Del Sol Development. June 2016  
<http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1166&context=crpsp>

**Title:** Economic assessment of phase reconfiguration to mitigate the unbalance due to plug-in electric vehicles charging

**Authors:** Gray, Matthew K., and Walid G. Morsi

**Abstract:** This paper investigates the economic feasibility of a phase reconfiguration approach to mitigate the unbalance impact of plug-in electric vehicles using split-phase Level 1 charging on the secondary distribution system. The impact resulting from plug-in battery electric vehicles charging as single-phase loads in terms of reliability and power quality are quantified using a Monte Carlo Simulation. The cost-effectiveness of introducing phase reconfiguration in the secondary system is evaluated after mathematically formulating the phase reconfiguration as an optimization problem. The results have shown that the application of phase reconfiguration may result in a significant reduction in unbalance experienced by the system due to high penetration of plug-in battery electric vehicles taking into consideration the time of use pricing.

**Subject Area:** Distribution system; Power quality; Unbalance

**Availability:** Gray, Matthew K., and Walid G. Morsi. "Economic assessment of phase reconfiguration to mitigate the unbalance due to plug-in electric vehicles charging." *Electric Power Systems Research* (2016).

<http://www.sciencedirect.com/science/article/pii/S0378779616302164>

**Title: Factors affecting the gas price elasticity of travel demand: Implications for transportation emissions policy**

**Authors:** Kreycik, Philip W.

**Abstract:** This thesis explores the possibility of reducing transportation emissions by reducing the growth of demand for travel in the United States light-duty vehicle fleet. Many government agencies seek to reduce the environmental and social ills associated with excess travel demand (e.g. congestion, reduced safety during travel, local pollution and noise, energy consumption, and climate change). These agencies have many tools at their disposal to reduce vehicle miles traveled (VMT) per capita - including encouraging compact mixed-use development, providing alternatives to single occupancy vehicle travel such as transit and biking and walking infrastructure, and restricting/regulating driving alone for instance by providing less parking. But the fastest way to reduce travel demand is through higher pricing that accounts for the externalities that drivers impose upon each other and society more broadly. The degree to which higher pricing can reduce travel demand is a function of two interrelated factors: 1) how high of a price increase is politically feasible to implement, and 2) the degree to which the driving public responds to the higher cost of driving. Both these factors vary over time. Given that carbon pricing and/or higher gas taxes are likely to take years to gain broader political acceptability, the future price elasticities of travel demand are just as relevant as today's elasticities. Therefore, this thesis focuses on the variability of price elasticity, the factors that explain this variation, and how these factors might change in the future. Using a diverse set of methods including literature review, semi-structured interviews, and odometer data, I find evidence that the magnitude of price elasticity is lower for vehicles of higher fuel economy, for vehicles further from the urban center, and for vehicles in lower income zipcodes. This is the first analysis I am aware of that evaluates the variation of the price elasticity of travel demand within a metro area, an approach that is important to the understanding the political feasibility of pricing and as a lens to the future effectiveness of pricing. It suggests that gas price increases will affect certain households in very different ways, with the most inelastic households simply paying more to maintain their lifestyle and the most elastic households pushed to make significant changes to their daily travel patterns and opportunities. These two types of impact may lead to different types of resistance to the policy. As for the future, the findings regarding fuel economy and distance to the urban center are particularly relevant, as we foresee society continues to become more metropolitan and the vehicle fleet is increasingly comprised of high fuel economy vehicles. Finally, the magnitude of price response suggested by both my interviews and my odometer data analysis suggests that price is still a significant determining factor in distance driven; therefore, policy that increases the cost of driving remains an important emissions reduction strategy.

**Subject Area:** Urban Studies and Planning.

**Availability:** Kreycik, Philip W. Factors affecting the gas price elasticity of travel demand: implications for transportation emissions policy. Diss. Massachusetts Institute of Technology, 2016. <http://dspace.mit.edu/handle/1721.1/103265>

**Title: Assessing Transportation Management Associations (TMAs) In Rural Maine As An Approach To Increase Transportation Option**

**Authors:** Vicki L. Rusbult

**Abstract:** Maine has the distinction of being a beautiful state defined by natural forests, crystal clear lakes, and a landscape unblemished by the usual marks of the densely populated regions of the U.S. The downside to this rural beauty is the remoteness of the sparsely populated communities which present challenges to residents who are unable to drive themselves to procure basic services because of physical, legal, or economic conditions.

Many rural residents are unable to rely on personally-owned, single driver vehicles. According to the Maine Department of Transportation Bureau of Planning (2013), the Eastern Maine region has an estimated unmet need (number of trips needed compared to available services) of 75% (Penobscot County) and 84% (Piscataquis County). The recent reduction in the cost of gasoline has made travel more affordable, but the reality is that many can't afford the purchase price tag, insurance, and/or maintenance costs to keep their vehicle on the road. The funding trends at the state and local levels will not support an expansion of public transportation to bring rural residents to hub centers for social services, healthcare, school, employment or other destination points. As noted in the Maine Department of Transportation Final Strategic Plan 2025 (2015, p. 13), federal funding in rural regions has remained at 2012 levels, and there is little local funding support for rural transit systems operating outside the more urban cities of Bangor and Ellsworth. A review of the literature on transportation challenges and barriers, particularly in respect to the sparsely populated region of Eastern Maine, provided the basis for this grounded theory qualitative study. A series of thirteen interviews were performed with study participants living in Eastern Maine who were characterized by one or more of the following traits: Low-income; elderly; medically restricted; student; and commuting worker. The results of the study provide insight into factors contributing to the gap, and whether a transportation management association (TMA) and rideshare boards represent reasonable solutions. The study also suggests methods to encourage use of alternative solutions to get Eastern Maine residents to their destinations.

**Subject Area:** Maine; commute; TMA; vehicle ownership

**Availability:** Rusbult, Vicki L., "Assessing Transportation Management Associations (TMAs) In Rural Maine As An Approach To Increase Transportation Options" (2016). All Theses And Dissertations. Paper 65.

<http://dune.une.edu/cgi/viewcontent.cgi?article=1064&context=theses>

**Title: Opening the Window of Opportunity for Active Transportation Policies**

**Authors:** Zwald, Marissa L.; Eyler, Amy; Moreland-Russell, Sarah

**Abstract:** We explored factors that influence Metropolitan Planning Organizations' (MPOs) prioritization of active transportation (AT) policies. Methods: MPO staff and partnering advocacy organizations across 6 metropolitan areas were interviewed. Data were analyzed using a priori codes guided by the Multiple Streams Framework. Results: Emergence of AT as a priority by MPOs was the result of the problem, policy, and political streams converging. Policy entrepreneurs who made AT policy a personal mission and were willing to invest resources were vital to creating a window of opportunity. Conclusions: MPOs play an important role in supporting AT. Our findings demonstrate how transportation professionals within other MPOs can increase AT prioritization and have important implications for public health professionals seeking to engage in transdisciplinary collaborations to advance AT policies.

**Subject Area:** Active Transportation; Multiple Streams Framework; Physical Activity; Policy Entrepreneurs

**Availability:** Zwald ML, Eyler A, Moreland-Russell S. Opening the Window of Opportunity for Active Transportation Policies. Health Behavior and Policy Review. 2016 Jul 1;3(4):293-303. <http://www.ingentaconnect.com/contentone/psp/hbpr/2016/00000003/00000004/art00001>



**Title: Assessing the impact of policy interventions on the adoption of plug-in electric vehicles: An agent-based model**

**Authors:** Silvia, Chris, and Rachel M. Krause

**Abstract:** Heightened concern regarding climate change and energy independence has increased interest in plug-in electric vehicles as one means to address these challenges and governments at all levels have considered policy interventions to encourage their adoption. This paper develops an agent-based model that simulates the introduction of four policy scenarios aimed at promoting electric vehicle adoption in an urban community and compares them against a baseline. These scenarios include reducing vehicle purchase price via subsidies, expanding the local public charging network, increasing the number and visibility of fully battery electric vehicles (BEVs) on the roadway through government fleet purchases, and a hybrid mix of these three approaches. The results point to the effectiveness of policy options that increased awareness of BEV technology. Specifically, the hybrid policy alternative was the most successful in encouraging BEV adoption. This policy increases the visibility and familiarity of BEV technology in the community and may help counter the idea that BEVs are not a viable alternative to gasoline-powered vehicles.

**Subject Area:** Public policy; Plug-in electric vehicles; Technology adoption; Agent-based model

**Availability:** Silvia, Chris, and Rachel M. Krause. "Assessing the impact of policy interventions on the adoption of plug-in electric vehicles: An agent-based model." *Energy Policy* 96 (2016): 105-118. <http://www.sciencedirect.com/science/article/pii/S0301421516302695>

**Title: U.S. Federal Government Telework Management Strategies**

**Authors:** Blaine Edward Mills

**Abstract:** The Telework Enhancement Act of 2010 dramatically increased teleworking opportunities for federal employees. The increase in the number of teleworking employees presented numerous challenges for federal managers attempting to establish social networks, teamwork, and organizational commitment for their employees. This study used the case study design with a socio-technical conceptual framework as the basis to explore the strategies managers used. Data were collected via semistructured interviews with federal managers of teleworkers located in the Midwest region of the United States. A coding strategy was employed to organize the transcripts from the interviews into themes, and methodological triangulation was utilized by comparing the interview data with data from federal teleworking documents. From these analyses, 10 themes emerged: group meetings, knowledge-sharing networks, management of teleworkers, teleworker agreements, teleworker equipment, challenge of team building, telework as a reward, limitation on days teleworked, training, and flexibility of teleworkers. Managers incorporating these themes into best practices could have the tools and strategies to effectively implement and manage teleworking programs by helping to improve organizational commitment, teamwork, and socialization. The strategies could also help alleviate the isolation that some federal teleworkers experience. Widespread adoption of these strategies by managers could lead to increased teleworking opportunities for employees, thereby saving energy, reducing greenhouse gases, and reducing traffic congestion.

**Subject Area:** telework; federal employees

**Availability:** Mills, Blaine Edward. "US Federal Government Telework Management Strategies." Diss. (2016). Walden University  
<http://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=3370&context=dissertations>

**Title: School Factors Associated With the Percentage of Students Who Walk or Bike to School, School Health Policies and Practices Study, 2014**

**Authors:** Sherry Everett Jones, PhD, JD, MPH; Sarah Sliwa, PhD

**Abstract:** Introduction: Active school transport, such as by walking or biking, increases physical activity levels, which has health and academic benefits for children. We examined school demographic and other characteristics to determine their association with the percentage of students who walk or bike to school. Methods: We analyzed data from the Centers for Disease Control and Prevention's 2014 School Health Policies and Practices Study. The response rate for the module containing questions about transportation was 70% (N = 577). Multivariate logistic regression models examined whether certain school characteristics were associated with a school having 26% or more of students who walk or bike to school in the morning on an average school day. Results: In most (61.5%) schools, 10% or fewer students walked or biked to school in the morning on an average school day; in 22.7% of schools, 26% or more students did so. Although having crossing guards (adjusted odds ratio [AOR] = 3.3; 95% confidence interval [CI], 1.9–6.0), having bicycle racks (AOR = 2.7; 95% CI, 1.2–5.8), and providing promotional materials to students or families on walking or biking to school (AOR = 2.9; 95% CI, 1.7–5.1) were associated with having 26% or more students who walk or bike to school, only 47.7% of schools had crossing guards, 62.4% had bicycle racks, and 33.3% provided promotional materials. Conclusion: Several low-cost or no-cost strategies were associated with having 26% or more students who walked or biked to school, but these strategies are not commonly used in schools.

**Subject Area:** active transport, school transport strategies

**Availability:** Everett Jones S, Sliwa S. School Factors Associated With the Percentage of Students Who Walk or Bike to School, School Health Policies and Practices Study, 2014. *Prev Chronic Dis* 2016;13:150573. DOI: <http://dx.doi.org/10.5888/pcd13.150573>.

**Title: Sugar-Sweetened Beverages: Closing The Nutrition Knowledge Gap With Innovative Front-Of-Package Labeling And Strategically Placed Educational Signage**

**Authors:** Jack Aaron Reeves

**Abstract:** There is a growing body of evidence that front-of-package (FOP) labeling on pre-packaged foods and sugar-sweetened beverages may be an effective method of helping consumers make healthier dietary choices. On the other hand, there is also growing evidence that the current industry standard Facts-Up-Front FOP label design by the Grocery Manufacturers Association (GMA) is not effective. For my thesis, I wanted to address this disparity by creating a set of visual label guidelines to assist future policymakers in their efforts to stem the increasing tide of obesity. To accomplish this, I used a mixed methods approach. First, I completed a regression analysis using the California Health Interview Survey dataset to understand the relationship between an individual's level of nutritional knowledge and his or her consumption of sugar-sweetened beverages. By using education level as a stand-in for nutritional knowledge, I find that the more nutritional knowledge an individual has, the fewer SSBs he or she will consume. Considering this relationship between knowledge, consumption, and the potential effectiveness of FOPs, I next develop a framework from which to analyze the current industry standard FOP label. From this framework, and an analysis of current literature, I find that the industry standard is not effective at influencing consumers' consumption patterns of SSBs because it lacks four visual characteristics; clarity, color, context, and novelty. Finally, I will present a set of policy recommendations for both the Food and Drug Administration and the State of California.

**Subject Area:** FOP; pre-packaged foods; FDA; consumption patterns

**Availability:** Reeves JA. Sugar-Sweetened Beverages: Closing The Nutrition Knowledge Gap With Innovative Front-Of-Package Labeling And Strategically Placed Educational Signage (Doctoral dissertation, California State University, Sacramento).  
<http://www.csus.edu/ppa/thesis-project/bank/2016/reeves.pdf>

## **Title: Reflecting The Interaction Between Activity-Travel Engagement And Subjective Well-Being In Activity-Based Travel Model Systems**

**Authors:** Pendyala RM, Garikapati VM, You D.

**Abstract:** People derive satisfaction or feelings of well-being from their daily activity-travel patterns (Ettema et al, 2010). Not all activities provide the same level of well-being and there may be some activities that reduce feelings of well-being, but are pursued because they must be undertaken. Despite the clear connections between well-being and activity-travel engagement, the profession has seen very limited attempts at bringing the notion of well-being into activity-based travel demand forecasting model systems. Although there is research that demonstrates a connection between activity-travel participation, time use allocation, and feelings of subjective well-being, these exercises have largely remained theoretical and exploratory in nature (Archer et al, 2013; Duarte et al, 2010). The connections between activity-travel, time use, and wellbeing have not been incorporated in operational models of activity-travel demand. The complexity of the interaction between activity-travel engagement and feelings of subjective well-being, the difficulty in measuring and quantifying feelings of subjective well-being, and the difficulty in forecasting measures of well-being for a horizon year present considerable challenges in any attempt to incorporate the notion of well-being in operational activity-based travel demand models. Although it is possible to view well-being as the ultimate outcome (result) of human activity-travel engagement patterns, it may also be conjectured that feelings of well-being that people intrinsically attach to various activities (purposes) and travel influence the daily activity agenda and duration of time allocated to various activities. So, workaholics (who presumably derive feelings of well-being from work) spend more time at work; shopaholics (who are likely to derive feelings of well-being from shopping because they enjoy the activity) spend more at shopping activities; those who enjoy outdoor sports and recreation will allocate more time to such activities; and so on. In other words, there is a two-way relationship between activity-travel engagement patterns and feelings of well-being. On the one hand, well-being is influenced by activity travel engagement and time use patterns; but on the other hand, the amount of time that people allocate to various activities is probably influenced by the feelings of well-being that individuals attach or associate with various activity categories. How can such a two-way relationship be represented and incorporated in operational activity-based travel demand models? This is the question that this research intends to address. The motivation behind this research is that the notion of well-being is likely to be central to human activity-travel behavior, and yet virtually no progress has been made in bringing operational paradigms or frameworks that connect activity-travel patterns and feelings of well-being into activity-based travel demand modeling systems. The objectives of the research are to identify and quantify the relationships between activity-travel patterns (time use) and well-being, and then incorporate those relationships in an operational framework that can be integrated in activity-based travel model systems.

**Subject Area:** daily travel patterns; activity-based travel models/patterns; well-being

**Availability:** Pendyala RM, Garikapati VM, You D. Reflecting The Interaction Between Activity-Travel Engagement And Subjective Well-Being In Activity-Based Travel Model Systems. GIT 2016

**Title:** Speed

**Authors:** Couture, Victor, Gilles Duranton, and Matthew A. Turner

**Abstract:** We investigate the determinants of driving speed in large us cities. We first estimate city level supply functions for travel in an econometric framework where both the supply and demand for travel are explicit. These estimations allow us to calculate a city level index of driving speed and to rank cities by driving speed. Our data suggest that a congestion tax of, on average, about 1.5 cents per kilometer yields welfare gains of about 30 billion dollars per year, that centralized cities are slower, that cities with ring roads are faster, and that the provision of automobile travel in cities is subject to decreasing returns to scale.

**Subject Area:** roads, vehicle kilometers traveled, public transport, congestion, travel time.

**Availability:** Couture, Victor, Gilles Duranton, and Matthew A. Turner. "LIEPP Working Paper." (2016). <http://spire.sciencespo.fr/hdl:/2441/5h955p9lcb808of8er6b8b8ck9/resources/liepp-wp51-couture-duranton-turner.pdf>

**Title: Is HUD housing affordable? New FAU study says not when you factor in costs to commute**

**Authors:** Hamidi, Shima, Reid Ewing, and John Renne

**Abstract:** This article assesses the affordability of U.S. Department of Housing and Urban Development (HUD) rental assistance properties from the perspective of transportation costs. HUD housing is, by definition, affordable from the standpoint of housing costs due to limits on the amounts renters are required to pay. However, there are no such limitations on transportation costs, and common sense suggests that renters in remote locations may be forced to pay more than 15% of income, a nominal affordability standard, for transportation costs. Using household travel models estimated with data from 15 diverse regions around the United States, we estimated and summed automobile capital costs, automobile operating costs, and transit fare costs for households at 8,857 HUD rental assistance properties. The mean percentage of income expended on transportation is 15% for households at the high end of the eligible income scale. However, in highly sprawling metropolitan areas, and in suburban areas of more compact metropolitan areas, much higher percentages of households exceed the 15% ceiling. This suggests that locational characteristics of properties should be considered for renewal when HUD contracts expire for these properties, based on location and hence on transportation affordability.

**Subject Area:** Affordable housing, HUD rental assistance program, transportation costs, affordability

**Availability:** Hamidi, Shima, Reid Ewing, and John Renne. "How Affordable Is HUD Affordable Housing?." *Housing Policy Debate* 26.3 (2016): 437-455.

<http://www.tandfonline.com/doi/abs/10.1080/10511482.2015.1123753>



**Title: A SEM Analysis of the Impact of Urban Form and Gasoline Prices on Vehicle Use: An Application to Southern California**

**Authors:** Dillon, Harya S., Jean-Daniel Saphores, and Marlon Boarnet

**Abstract:** This paper relies on generalized structural equation modeling (SEM) to explore the relationship between land use, gasoline prices, and driving. The authors analyze data from the Southern California subsample of the 2009 National Household Travel Survey (NHTS), which has a quasi-experimental nature thanks to large exogenous variations in gasoline prices during the conduct of the NHTS. The authors' joint models of residential urban form, vehicle efficiency choice, and vehicle use account for residential self-selection and endogeneity of vehicle preferences in order to explain vehicle miles traveled (VMT) for both work and non-work trips. Residential urban form is treated as a latent construct that reflects variables such as population density, land use diversity and distance to employment centers. The authors' results suggest that in the short run, households drive 0.15% less for non-work trips when gas prices increase by 1%, while work trips are not responsive to gasoline price changes. Moreover, the direct effect of residential urban form on driving is statistically significant for total and non-work VMT, but it has no impact on work trips. The authors also find that owners of more fuel efficient vehicles tend to be more educated, Asian and younger (under 30). Moreover, households in low density neighborhoods are more likely to have a higher income, to be older than 65 and Caucasian. Finally, the results show that accounting for the nature of trips is important for understanding the short term price elasticity of travel.

**Subject Area:** Demographics; Driving; Fuel conservation; Gasoline; Land use; Prices; Structural equation modeling; Trip purpose; Urban areas

**Availability:** Dillon, Harya S., Jean-Daniel Saphores, and Marlon Boarnet. "A SEM Analysis of the Impact of Urban Form and Gasoline Prices on Vehicle Use: An Application to Southern California." Transportation Research Board 95th Annual Meeting. No. 16-6365. 2016. <https://trid.trb.org/view.aspx?id=1394388>

**Title:** Evaluating policies to reduce greenhouse gas emissions from private transportation

**Authors:** Liu, Yan, and Cinzia Cirillo

**Abstract:** This paper proposes a model system to forecast household greenhouse gas emissions (GHGEs) from private transportation. The proposed model combines an integrated discrete-continuous car ownership model with MOVES 2014. Four modeling components are calibrated and applied to the calculation of GHGEs: vehicle quantity, vehicle type and vintage, miles traveled, and rates of GHGEs. The model is applied to the Washington D.C. Metropolitan Area. Three tax schemes are evaluated: vehicle ownership tax, purchase tax and fuel tax. We calculate that the average GHGEs per vehicle is 5.15 tons of carbon dioxide-equivalent (CO<sub>2</sub>E) gases. Our results show that: (a) a fuel tax is the most effective way to reduce vehicle GHGEs, especially for households with fewer vehicles; (b) a purchase tax reduces vehicle GHGEs mainly by decreasing vehicle quantity for households with more vehicles; and (c) an ownership tax reduces vehicle GHGEs by decreasing both vehicle quantity and miles traveled.

**Subject Area:** Discrete–continuous car ownership models; Vehicle type choice; Vehicle miles traveled (VMT); Motor Vehicle Emission Simulator (MOVES); Greenhouse gas emissions; Taxation policy

**Availability:** Liu, Yan, and Cinzia Cirillo. "Evaluating policies to reduce greenhouse gas emissions from private transportation." *Transportation Research Part D: Transport and Environment* 44 (2016): 219-233. <http://www.sciencedirect.com/science/article/pii/S1361920916000274>

**Title: Equity in Regional Public Transit Finance: Tradeoffs between Social and Geographic Equity**

**Authors:** Iseki, Hiroyuki

**Abstract:** This study examines equity in public transit finance for transit service among nine cities and townships that formed a consortium for regional transit service in Toledo, Ohio, in 2006. The main data for the analysis—operating and financial data of fixed-route bus and demand-responsive services and data on local property tax receipts—were obtained from the transit agency, as well as the National Transit Database. The analysis results show that the distribution of costs and benefits of transit subsidy was progressive among sociodemographic groups while it exhibited geographic inequity, and suggest that it is inevitable to find a conflict between social equity and geographic equity in public transit finance within urban areas where transit dependents remain in inner cities while regional transit funding has to rely more on taxes provided by affluent suburban communities. The shrinking role of federal and state governments in public transit assistance exacerbated this conflicting situation by reducing funding that could be used to enhance transit service in each community.

**Subject Area:** Public transit finance, Transit equity, Local transit finance, Regional transit planning

**Availability:** Iseki, Hiroyuki. "Equity in Regional Public Transit Finance: Tradeoffs between Social and Geographic Equity." *Journal of Urban Planning and Development* (2016): 04016010. [http://ascelibrary.org/doi/abs/10.1061/\(ASCE\)UP.1943-5444.0000328](http://ascelibrary.org/doi/abs/10.1061/(ASCE)UP.1943-5444.0000328)

**Title:** Managing excessive car use: what's the low hanging fruit?

**Authors:** Alan Davies

**Abstract:** A study of urban form in the US concludes that increasing the density of population and employment is a slow way to significantly reduce car use compared to directly pricing driving

**Subject Area:** pricing driving; reducing car use

**Availability:** Davies, Alan. [blogs.crikey.com.au/theurbanist](http://blogs.crikey.com.au/theurbanist) Managing excessive car use: what's the low hanging fruit? General Transport, March 2, 2016  
<http://blogs.crikey.com.au/theurbanist/2016/03/02/managing-excessive-car-use-whats-the-low-hanging-fruit/>

**Title: Development Of A Tool For Estimation Of Total Cost Of Commute In Austin**

**Authors:** Kelsey Ann McElduff

**Abstract:** While intelligent consumers aim to investigate all costs and benefits prior to making travel mode decisions, much of the information needed is not readily available to them. There is even less knowledge of the costs and benefits to society that reflect those decisions. If there were a tool for transportation users to see the actual cost of their commute they would be able to make more informed decisions about travel. The purpose of this research is to create the background information for a tool in the form of a web application that will enable users to visualize the individual and societal costs and benefits of their own commutes. The information will materialize in the form of eight equations for estimating internal and external cost by four different modes of travel.

**Subject Area:** cost benefit analysis; commute

**Availability:** McElduff, Kelsey Ann. Development of a tool for estimation of total cost of commute in Austin. Univ. Texas at Austin Diss. 2016.

**Title: High Transportation Costs Make a Lot of HUD Housing Unaffordable**

**Authors:** Angie Schmitt

**Abstract:** Rental assistance from HUD isn't enough to make the cost of living affordable when the subsidies go toward housing in car-dependent areas, according to a new study by researchers from the University of Texas and the University of Utah. The study evaluated transportation costs for more than 18,000 households that receive HUD rental subsidies, estimating that nearly half of recipients have to spend more than 15 percent of their household budgets on transportation.

**Subject Area:** HUD; rent; cost of living; transportation costs

**Availability:** Schmitt, Angie. [usa.streetsblog.org](http://usa.streetsblog.org) High Transportation Costs Make a Lot of HUD Housing Unaffordable Feb. 29, 2016 <http://usa.streetsblog.org/2016/02/29/high-transportation-costs-make-a-lot-of-hud-housing-unaffordable/>

**Title: How Affordable Is HUD Affordable Housing?**

**Authors:** Ewing, Reid, and Shima Hamidi

**Abstract:** This article assesses the affordability of U.S. Department of Housing and Urban Development (HUD) rental assistance properties from the perspective of transportation costs. HUD housing is, by definition, affordable from the standpoint of housing costs due to limits on the amounts renters are required to pay. However, there are no such limitations on transportation costs, and common sense suggests that renters in remote locations may be forced to pay more than 15% of income, a nominal affordability standard, for transportation costs. Using household travel models estimated with data from 15 diverse regions around the United States, we estimated and summed automobile capital costs, automobile operating costs, and transit fare costs for households at 8,857 HUD rental assistance properties. The mean percentage of income expended on transportation is 15% for households at the high end of the eligible income scale. However, in highly sprawling metropolitan areas, and in suburban areas of more compact metropolitan areas, much higher percentages of households exceed the 15% ceiling. This suggests that locational characteristics of properties should be considered for renewal when HUD contracts expire for these properties, based on location and hence on transportation affordability.

**Subject Area:** Automobile travel; Costs; Housing; Income; Metropolitan areas; Public transit; Travel demand; Urban sprawl

**Availability:** Ewing, Reid, and Shima Hamidi. "How Affordable Is HUD Affordable Housing?." Transportation Research Board 95th Annual Meeting. No. 16-1166. 2016.  
<http://www.tandfonline.com/doi/abs/10.1080/10511482.2015.1123753>

**Title: Alternative Fuel Vehicle Adoption Increases Fleet Gasoline Consumption and Greenhouse Gas Emissions under United States Corporate Average Fuel Economy Policy and Greenhouse Gas Emissions Standards**

**Authors:** Jenn, Alan, Inês ML Azevedo, and Jeremy J. Michalek

**Abstract:** The United States Corporate Average Fuel Economy (CAFE) standards and Greenhouse Gas (GHG) Emission standards are designed to reduce petroleum consumption and GHG emissions from light-duty passenger vehicles. They do so by requiring automakers to meet aggregate criteria for fleet fuel efficiency and carbon dioxide (CO<sub>2</sub>) emission rates. Several incentives for manufacturers to sell alternative fuel vehicles (AFVs) have been introduced in recent updates of CAFE/GHG policy for vehicles sold from 2012 through 2025 to help encourage a fleet technology transition. These incentives allow automakers that sell AFVs to meet less-stringent fleet efficiency targets, resulting in increased fleet-wide gasoline consumption and emissions. We derive a closed-form expression to quantify these effects. We find that each time an AFV is sold in place of a conventional vehicle, fleet emissions increase by 0 to 60 t of CO<sub>2</sub> and gasoline consumption increases by 0 to 7000 gallons (26,000 L), depending on the AFV and year of sale. Using projections for vehicles sold from 2012 to 2025 from the Energy Information Administration, we estimate that the CAFE/GHG AFV incentives lead to a cumulative increase of 30 to 70 million metric tons of CO<sub>2</sub> and 3 to 8 billion gallons (11 to 30 billion liters) of gasoline consumed over the vehicles' lifetimes – the largest share of which is due to legacy GHG flex-fuel vehicle credits that expire in 2016. These effects may be 30–40% larger in practice than we estimate here due to optimistic laboratory vehicle efficiency tests used in policy compliance calculations.

**Subject Area:** CAFE; GHG emission standards; CO<sub>2</sub>; AFVs; policy

**Availability:** Jenn, Alan, Inês ML Azevedo, and Jeremy J. Michalek. "Alternative fuel vehicle adoption increases fleet gasoline consumption and greenhouse gas emissions under United States corporate average fuel economy policy and greenhouse gas emissions standards." *Environmental science & technology* 50.5 (2016): 2165-2174.  
<http://pubs.acs.org/doi/abs/10.1021/acs.est.5b02842?journalCode=esthag>



**Title:** Modeling the relation between income and commuting distance

**Authors:** Carra G, Mulalic I, Fosgerau M, Barthelemy M.

**Abstract:** We discuss the distribution of commuting distances and its relation to income. Using data from Great Britain, US and Denmark, we show that the commuting distance is (i) broadly distributed with a tail decaying typically as  $1=r$  with 3 and (ii) an average growing slowly as a power law with an exponent less than one that depends on the country considered. The classical theory for job search is based on the idea that workers evaluate potential jobs on the wage as they arrive sequentially through time. Extending this model with space, we obtain predictions that are strongly contradicted by our empirical findings. We then propose an alternative model that is based on the idea that workers evaluate potential jobs based on a quality aspect and that workers search for jobs sequentially across space. We assume that the density of potential jobs depends on the skills of the worker and decreases with the wage. The predicted distribution of commuting distances decays as  $1=r^3$  and is independent of the distribution of the quality of jobs. We find our alternative model to be in agreement with our data. This type of approach opens new perspectives for the modeling of urban phenomena.

**Subject Area:** Statistical Physics | Urban economics | Mobility | Job-search | Modeling

**Availability:** Carra G, Mulalic I, Fosgerau M, Barthelemy M. Modeling the relation between income and commuting distance. arXiv preprint arXiv:1602.01578. 2016 Feb 4.  
<http://arxiv.org/abs/1602.01578>

**Title:** Concepts in Urban Transportation Planning: The Quest for Mobility Sustainability and Quality of Life

**Authors:** Mintesnot G. Woldeamanuel

**Abstract:** n/a

**Subject Area:** Urban planning, mobility

**Availability:** Woldeamanuel, Mintesnot G. Concepts in Urban Transportation Planning: The Quest for Mobility, Sustainability and Quality of Life. McFarland, 2016.

**Title: Innovation Sticks: The Limited Case for Penalizing Failures to Innovate**

**Authors:** Ayres, Ian and Kapczynski, Amy

**Abstract:** When policymakers and academics think about designing optimal innovation incentives, they almost exclusively limit their considerations to alternative types of reward incentives. But in this article, we show that under specific circumstances innovation sticks – potential penalties for failure to innovate – can play a valuable role in our innovation policy, either alone or in conjunction with innovation carrots. What’s more, we provide examples of several innovation sticks that already have been used with apparent success, including the Federal Corporate Average Fuel Economy (CAFE) standards. Finally, we apply our approach to a new area to which we think innovation sticks may be well-suited: the problem of car fatalities. Our model suggests that a relatively simple system of yardstick penalties could help reduce national auto fatalities by as much 20%, simply by bringing laggard entities (companies and states) up to the median.

**Subject Area:** fatalities; penalties; innovation

**Availability:** Ayres, Ian and Kapczynski, Amy, Innovation Sticks: The Limited Case for Penalizing Failures to Innovate (August 19, 2014). Yale Law & Economics Research Paper No. 507. Available at SSRN: <http://ssrn.com/abstract=2483310>

**Title: Rethinking Auto Fuel Economy Policy: Technical and Policy Suggestions for the 2016-17 Midterm Reviews**

**Authors:** Sanya Carley, Denvil Duncan, Dan Esposito, John D. Graham, Saba Siddiki, and Nikolaos Ziropiannis

**Abstract:** In 2012 the federal government issued regulations that require automakers to meet progressively more stringent fuel economy and greenhouse gas standards (GHG) for the 2017-2025 period. Separately, the State of California and nine other states have required automakers, during the same time period, to sell an increasing percentage of zero-emission vehicles (ZEVs). Both the federal government and the State of California recognize that these regulatory requirements could have a significant impact not only on the environment but also on the economy as a whole. Thus, midterm reviews of the regulatory requirements will be undertaken by both the State of California (2016-2017) and the federal government (2017-2018), with an emphasis on meeting the requirements for the 2022-2025 period. This preliminary report offers technical suggestions and policy options for consideration during the midterm reviews. The primary focus of the report is the potential macroeconomic impact of the regulatory requirements as mediated through impacts on the rate of sales of new passenger vehicles.

**Subject Area:** auto fuel economy; greenhouse gas standards

**Availability:** Carley, Sanya, et al. "Rethinking Auto Fuel Economy Policy." (2016).  
<https://spea.indiana.edu/doc/research/working-groups/fuel-economy-policy-022016.pdf>

**Title: Optimization of incentive policies for plug-in electric vehicles**

**Authors:** Nie YM, Ghamami M, Zockaie A, Xiao F.

**Abstract:** High purchase prices and the lack of supporting infrastructure are major hurdles to the adoption of plug-in electric vehicles (PEVs). It is widely recognized that the government could help break these barriers through incentive policies, such as offering rebates to PEV buyers or funding charging stations. The objective of this paper is to propose a modeling framework that can optimize the design of such incentive policies. The proposed model characterizes the impact of the incentives on the dynamic evolution of PEV market penetration over a discrete set of time intervals, by integrating a simplified consumer vehicle choice model and a macroscopic travel and charging model. The optimization problem is formulated as a nonlinear and non-convex mathematical program and solved by a specialized steepest descent direction algorithm. We show that, under mild regularity conditions, the KKT conditions of the proposed model are necessary for local optimum. Results of numerical experiments indicate that the proposed algorithm is able to obtain satisfactory local optimal policies quickly. These optimal policies consistently outperform the alternative policies that mimic the state-of-the-practice by a large margin, in terms of both the total savings in social costs and the market share of PEVs. Importantly, the optimal policy always sets the investment priority on building charging stations. In contrast, providing purchase rebates, which is widely used in current practice, is found to be less effective.

**Subject Area:** Plug-in electric vehicles; Charging stations; Incentive policies; Vehicle choice; KKT conditions

**Availability:** Nie, Yu Marco, et al. "Optimization of incentive policies for plug-in electric vehicles." *Transportation Research Part B: Methodological* 84 (2016): 103-123.  
<http://www.sciencedirect.com/science/article/pii/S0191261515002726>

**Title:** Optimal Energy Taxation in Cities

**Authors:** Borck, Rainald, and Jan K. Brueckner

**Abstract:** This paper presents the first investigation of the effects of optimal energy taxation in an urban spatial setting. Rather than exploring the effects of a carbon tax, our approach is to derive counterparts to existing taxes that are needed to support the social optimum. We then analyze the effects of these taxes on urban spatial structure. Emissions are generated by housing consumption and commute trips, and the optimal tax structure has a tax on commuting, housing floor space, and land. These taxes reduce the extent of commuting and the level of housing consumption while increasing building heights, generating a more-compact city with a lower level of emissions per capita.

**Subject Area:** energy tax; emissions

**Availability:** Borck, Rainald, and Jan K. Brueckner. Optimal Energy Taxation in Cities. No. 5711. CESifo Group Munich, 2016. [http://www.socsci.uci.edu/~jkbrueck/energy\\_taxation.pdf](http://www.socsci.uci.edu/~jkbrueck/energy_taxation.pdf)

## 6. Special Population Groups

**Title:** Mobility characteristics of the elderly: A case for Seoul Metropolitan Area

**Author:** Choo, Sangho, Dongwook Sohn, and Minyoung Park

**Abstract:** The ageing population is accelerating around the world. There exists the increasing need for transportation policies and strategies focusing on the mobility of the elderly. This paper analyzed mobility characteristics of the elderly using the 2010 Household Travel Survey data in Seoul Metropolitan Area. In particular, ordered probit models for trip frequencies are developed to identify key factors influencing elderly's travel, considering socio-demographic as well as land use variables. Then, the model results were compared between the elderly and non-elderly groups, and among the distinct three elderly groups (65-69, 70-74, and 75+). Overall, we found distinctively different socio-demographic variables such as household size, car ownership, age, gender, employment status, and occupation affecting total trips, work trips, and non-work trips between the elderly and non-elderly groups. In addition, land use variables showed significant impacts on elderly's travel. Among them, social welfare facilities, sports facilities, and medical facilities were positively related to non-work trips of the elderly.

**Subject Area:** Ageing society – travel behavior of the elderly – ordered probit model – mobility characteristics – land use

**Availability:** Choo, Sangho, Dongwook Sohn, and Minyoung Park. "Mobility characteristics of the elderly: A case for Seoul Metropolitan Area." *KSCE Journal of Civil Engineering* 20.3 (2016): 1023-1031. <http://link.springer.com/article/10.1007/s12205-016-0651-x>

**Title: Active Travel to School: Findings From the Survey of US Health Behavior in School-Aged Children, 2009-2010**

**Author:** Yang Y, Ivey SS, Levy MC, Royne MB, Klesges LM

**Abstract:** BACKGROUND: Whereas children's active travel to school (ATS) has confirmed benefits, only a few large national surveys of ATS exist. METHODS: Using data from the Health Behavior in School-aged Children (HBSC) 2009-2010 US survey, we conducted a logistic regression model to estimate the odds ratios of ATS and a linear regression model to estimate the adjusted mean differences of the percentage of ATS within a school. RESULTS: Overall, 21.4% of children engaged in at least one way of active travel to or from school. ATS was less common for trips to school than from school. Greater distance to school was a major barrier preventing children from ATS. Children living in large cities were more likely to engage in ATS, and schools located in a large city had higher proportions of ATS rate. Children having lower family satisfaction, or engaging in a greater number of physically active days during the past week were all more likely to engage in ATS. CONCLUSIONS: Although ATS is low among US children, significant variation exists. HBSC is a promising data source for an ATS study. As the first study to explore the variation of ATS at school level, this research contributes uniquely to current knowledge.

**Subject Area:** Health Behavior in School-aged Children survey; active travel to school; child health; physical activity

**Availability:** Yang Y, Ivey SS, Levy MC, Royne MB, Klesges LM. Active Travel to School: Findings From the Survey of US Health Behavior in School - Aged Children, 2009 - 2010. Journal of school health. 2016 Jun 1;86(6):464-71. <http://www.ncbi.nlm.nih.gov/pubmed/27122146>



**Title: Estimating potential increases in travel with autonomous vehicles for the non-driving, elderly and people with travel-restrictive medical conditions**

**Authors:** Harper, C. D., Hendrickson, C. T., Mangones, S., & Samaras, C.

**Abstract:** Automated vehicles represent a technology that promises to increase mobility for many groups, including the senior population (those over age 65) but also for non-drivers and people with medical conditions. This paper estimates bounds on the potential increases in travel in a fully automated vehicle environment due to an increase in mobility from the non-driving and senior populations and people with travel-restrictive medical conditions. In addition, these bounding estimates indicate which of these demographics could have the greatest increases in annual vehicle miles traveled (VMT) and highlight those age groups and genders within these populations that could contribute the most to the VMT increases. The data source is the 2009 National Household Transportation Survey (NHTS), which provides information on travel characteristics of the U.S. population. The changes to light-duty VMT are estimated by creating and examining three possible travel demand wedges. In demand wedge one, non-drivers are assumed to travel as much as the drivers within each age group and gender. Demand wedge two assumes that the driving elderly (those over age 65) without medical conditions will travel as much as a younger population within each gender. Demand wedge three makes the assumption that working age adult drivers (19–64) with medical conditions will travel as much as working age adults without medical conditions within each gender, while the driving elderly with medical any travel-restrictive conditions will travel as much as a younger demographic within each gender in a fully automated vehicle environment. The combination of the results from all three demand wedges represents an upper bound of 295 billion miles or a 14% increase in annual light-duty VMT for the US population 19 and older. Since traveling has other costs besides driving effort, these estimates serve to bound the potential increase from these populations to inform the scope of the challenges, rather than forecast specific VMT scenarios.

**Subject Areas:** Automated vehicles; Elderly travel patterns; Vehicle miles traveled; 2009 NHTS

**Availability:** Harper, C. D., Hendrickson, C. T., Mangones, S., & Samaras, C. (2016). Estimating potential increases in travel with autonomous vehicles for the non-driving, elderly and people with travel-restrictive medical conditions. *Transportation Research Part C: Emerging Technologies*, 72, 1-9. <http://www.sciencedirect.com/science/article/pii/S0968090X16301590>

**Title: Results From the United States of America's 2016 Report Card on Physical Activity for Children and Youth**

**Authors:** Peter T. Katzmarzyk, Kara D. Denstel, Kim Beals, Christopher Bolling, Carly Wright, Scott E. Crouter, Thomas L. McKenzie, Russell R. Pate, Brian E. Saelens, Amanda E. Staiano, Heidi I. Stanish, and Susan B. Sisson

**Abstract:** Background: The 2016 United States (U.S.) Report Card on Physical Activity for Children and Youth provides a comprehensive evaluation of physical activity levels and factors influencing physical activity among children and youth. Methods: The report card includes 10 indicators: Overall Physical Activity, Sedentary Behavior, Active Transportation, Organized Sport Participation, Active Play, Health-related Fitness, Family and Peers, School, Community and the Built Environment, and Government Strategies and Investments. Nationally representative data were used to evaluate the indicators using a standard grading rubric. Results: Sufficient data were available to assign grades to 7 of the indicators, and these ranged from B- for Community and the Built Environment to F for Active Transportation. Overall Physical Activity received a grade of D- due to the low prevalence of meeting physical activity guidelines. A grade of D was assigned to Health-related Fitness, reflecting the low prevalence of meeting cardiorespiratory fitness standards. Disparities across age, gender, racial/ethnic and socioeconomic groups were observed for several indicators. Conclusions: Continued poor grades suggest that additional work is required to provide opportunities for U.S. children to be physically active. The observed disparities indicate that special attention should be given to girls, minorities, and those from lower socioeconomic groups when implementing intervention strategies.

**Subject Areas:** adolescent, exercise, fitness, sedentary, surveillance

**Availability:** Peter T. Katzmarzyk, Kara D. Denstel, Kim Beals, Christopher Bolling, Carly Wright, Scott E. Crouter, Thomas L. McKenzie, Russell R. Pate, Brian E. Saelens, Amanda E. Staiano, Heidi I. Stanish, and Susan B. Sisson *Results From the United States of America's 2016 Report Card on Physical Activity for Children and Youth* Journal of Physical Activity and Health, 2016, 13 (Suppl 2), S307 -S313 <http://dx.doi.org/10.1123/jpah.2016-0321>

**Title:** Three dangerous school zones in Santa Monica

**Authors:** Marina Andalon

**Abstract:** n/a

**Subject Areas:** safe routes to school; santa monica

**Availability:** Andalon, Marina. *Three Dangerous School Zones in Santa Monica* December 19, 2016 <http://smdp.com/three-dangerous-school-zones-in-santa-monica/159036>

**Title: Making Invisible Riders Visible: Motivations for Bicycling and Public Transit Use among Latino Immigrants**

**Authors:** Jesus Miguel Barajas

**Abstract:** Immigrants now comprise the largest share of the population of the United States since 1850, with continued increases projected into the foreseeable future. Most foreign-born residents come from Latin America and other developing countries. Nationwide, they tend to travel by cheaper and more sustainable modes of transportation upon arrival, gradually adopting American habits of driving over time. A challenge for planners concerned with reducing the impact of automobile travel and providing an equitable transportation system is to understand and capitalize on the motivations for immigrant travel that would allow them to meet their travel needs without relying on cars. In this mixed-methods dissertation, I investigate three questions about the nature of how immigrants travel in the San Francisco Bay Area, a fairly transit- and bicycle-friendly metropolitan region, with these sustainability and equity questions in mind: 1. How do travel patterns differ between low-income immigrants and other population subgroups? 2. What influences cycling among immigrants and non-immigrants? More specifically, to what extent do individual factors, the social environment, and the built environment predict bicycling, and how do their effects differ between immigrants and non-immigrants? 3. What factors contribute to the cycling experience for low-income Latino immigrants?

**Subject Areas:** bicycle; public transit use; latino immigrants

**Availability:** Barajas, Jesus Miguel. Making Invisible Riders Visible: Motivations for Bicycling and Public Transit Use among Latino Immigrants. Diss. University of California, Berkeley, 2016.

<http://www.jmbarajas.com/wp->

[content/uploads/2016/08/Barajas\\_Dissertation\\_FINAL\\_20160808.pdf](http://www.jmbarajas.com/wp-content/uploads/2016/08/Barajas_Dissertation_FINAL_20160808.pdf)

**Title: How do children travel to school in urban India? A cross-sectional study of 5,842 children in Hyderabad**

**Author:** Tetali, Shailaja, P. Edwards, and GVS Murthy I. Roberts

**Abstract:**

**Background:** Millions of children travel to school every day in India, yet little is known about this journey. We examined the distribution and determinants of school travel in Hyderabad, India.

**Methods:** We conducted a cross-sectional survey using a two-stage stratified cluster sampling design. School travel questionnaires were used to collect data from children aged 11–14 years, attending private, semi-private and government funded schools in Hyderabad. We used Google Earth to estimate the distance from home to school for each child and modelled the relationship between distance to school and mode of travel, adjusting for confounders.

**Results:** Forty five of the 48 eligible schools that were selected agreed to participate, providing a total sample of 5842 children. The response rate was 99 %. Most children walked (57 %) or cycled (6 %) to school but 36 % used motorised transport (mostly bus). The proportion using motorised transport was higher in children attending private schools (41 %) than in those attending government schools (24 %). Most (90 %) children lived within 5km of school and 36 % lived within 1km. Greater distance to school was strongly associated with the use of motorised transport. Children living close to school were much more likely to walk or cycle.

**Conclusions:** Most children in Hyderabad walk (57 %) or cycle (6 %) to school. If these levels are to be maintained, there is an urgent need to ensure that walking and cycling are safe and pleasant. Social policies that decrease distances to school could have a large impact on road traffic injuries, air pollution, and physical activity levels.

**Subject Area:** Walking – Cycling – Children – Travel – School – India

**Availability:** Tetali, Shailaja, P. Edwards, and GVS Murthy I. Roberts. "How do children travel to school in urban India? A cross-sectional study of 5,842 children in Hyderabad." BMC public health 16.1 (2016): 1099.

<https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-016-3750-1>

**Title: Motives and Barriers for Physical Activity among Low-Income Black Single Mothers**

**Author:** Dlugonski, D., Martin, T. R., Mailey, E. L., & Pineda, E.

**Abstract:** Physical activity is associated with positive health outcomes, yet previous evidence suggests that single mothers, Black women, and those with low-income levels have low rates of physical activity. The purpose of the present study was to examine health status, as well as barriers and motives for physical activity, among low-income, Black single mothers from an intersectionality framework. Participants (n = 32) in this cross-sectional, mixed methods study completed questionnaires to assess physical activity, health status, stress, and barriers to physical activity and then participated in one of six focus groups to explore physical activity motives and barriers. Although participants reported many risk factors for disease including obesity, stress, and family disease history, most participants were not engaging in behaviors that would improve health such as regular leisure-time physical activity. Participants cited being a role model, stress relief, and weight loss as motives for physical activity that were connected to their social identities as low-income, Black single mothers. Chronic stress and stressors, responsibilities associated with single motherhood, and lack of social and community supports were described as barriers to physical activity. Future researchers and practitioners should consider these specific motives and barriers when designing interventions to increase physical activity among low-income, Black single mothers. We recommend that these programs focus on: promoting motives for physical activity that are meaningful and specific to this subpopulation of mothers, reducing stress, and enhancing affordable physical activity opportunities in the community for single mothers and their children.

**Subject Area:** Social identity, Health disparities, Health behaviors, Focus groups, Intersectionality, Social support

**Availability:** Dlugonski, D., Martin, T. R., Mailey, E. L., & Pineda, E. Motives and Barriers for Physical Activity among Low-Income Black Single Mothers. *Sex Roles*, 1-14.  
<http://link.springer.com/article/10.1007/s11199-016-0718-7>

**Title: Millennials, built form, and travel insights from a nationwide typology of U.S. neighborhoods**

**Author:** Ralph, K., Voulgaris, C. T., Taylor, B. D., Blumenberg, E., & Brown, A. E.

**Abstract:** We examine the relationship between the built environment and the travel of Millennials in the United States. We develop a neighborhood typology to characterize the built environment and transportation networks in almost every U.S. census tract, allowing us to identify possible synergistic and/or threshold effects on travel. We measure travel behavior in two ways: (1) using a multi-faceted traveler typology created using latent class analysis, and (2) by measuring the vehicle miles of travel among people in each of these traveler types. This dual approach allows us to distinguish between the built environment changes needed to encourage travel by modes other than driving, and those needed to reduce vehicle miles traveled among drivers. Using a multinomial logistic regression, we find that travel patterns are relatively stable along much of the urban-rural continuum, everything else equal. Driving was substantially lower only in “Old Urban” neighborhoods, where densities, job access, and transit service are dramatically higher than in all other neighborhood types. This finding implies that dramatic changes in the built environment—doubling or even tripling development density or transit service—may do little to get young people out of their cars when initial densities or transit services are low, as they are in most of the U.S. Conversely, reducing vehicle miles traveled among drivers appears to require more modest built form changes, a finding that offers some room for optimism among those concerned with auto dependence.

**Subject Area:** Travel behavior; Built environment; Millennial; Neighborhood type

**Availability:** Ralph, K., Voulgaris, C. T., Taylor, B. D., Blumenberg, E., & Brown, A. E. (2016). Millennials, built form, and travel insights from a nationwide typology of US neighborhoods. *Journal of Transport Geography*, 57, 218-226.

<http://www.sciencedirect.com/science/article/pii/S0966692316306093>

**Title: Multimodal Millennials? The Four Traveler Types of Young People in the United States in 2009**

**Author:** Ralph K.

**Abstract:** Are young Americans embracing a mix of travel modes? This article identifies four types of travelers to answer that question. Drivers travel almost exclusively by automobile; Long-distance Trekkers drive great distances; Multimodals use a mix of modes; and the Car-less rely on nonautomobile modes and make very few trips. Multimodals were exceedingly rare and eight in ten Millennials used an automobile for nearly every trip as a Driver or Long-distance Trekker. By incorporating multiple facets of travel into a single variable, this research provides valuable information for addressing twenty-first-century policy challenges such as encouraging multimodality and alleviating transportation disadvantage.

**Subject Area:** Millennials, travel behavior, transportation disadvantage, demographic analysis

**Availability:** Ralph, Kelcie M. "Multimodal Millennials? The Four Traveler Types of Young People in the United States in 2009." *Journal of Planning Education and Research* (2016): 0739456X16651930.

<http://jpe.sagepub.com/content/early/2016/06/08/0739456X16651930.abstract>



**Title: Who knows about kids these days? Analyzing the determinants of youth and adult mobility in the U.S. between 1990 and 2009**

**Author:** Blumenberg, E., Ralph, K., Smart, M., & Taylor, B. D.

**Abstract:** The 2000s was a decade of transitions for teens and young adults. In comparison with previous generations of youth, those living in the developed world (i) faced the harshest economic climate in decades, (ii) lived with their parents longer and were more likely to return back home as young adults, (iii) used information and communication technologies (ICTs) extensively, and (iv) in the U.S., were subject to increasingly stringent graduated driver's licensing (GDL) regulations. All were dramatic societal changes to be sure, but how did they affect youth travel behavior? Some argue dramatically and enduringly, but usually with fragmentary evidence. We examine data from the three most recent U.S. national travel surveys and find that, with one exception, after controlling for personal, household, locational, and travel factors, the effects of factors associated with various societal trends on person-kilometers traveled (PKT) are surprisingly muted. The exception is that decreased employment is associated with substantially lower PKT; however, this effect is 32% greater among older (ages 27–61) than younger (ages 20–26) adults, suggesting that economic factors, rather than changes in youth travel preferences, were at the root of declines in personal travel in the U.S. during the 2000s.

**Subject Area:** Travel behavior; Millennials; Teens; Young adults; Mobility

**Availability:** Blumenberg, Evelyn, et al. "Who knows about kids these days? Analyzing the determinants of youth and adult mobility in the US between 1990 and 2009." *Transportation Research Part A: Policy and Practice* 93 (2016): 39-54.

**Title: Does Burden of Travel to Health Care Predict Survival among Chicagoans with Colorectal Cancer?**

**Author: Emma Boylan**

**Abstract:** A study of the effect of travel burden on colorectal cancer prognosis was carried out in a retrospective cohort of Chicago residents diagnosed from 2006 to 2008. Potential travel between patients' homes and diagnosing facilities were modeled and scores were generated for use in logistic and proportional hazards models to assess whether potential difficulty of traveling to care is associated with colorectal cancer stage at diagnosis and survival in urban residents.

Burden of travel to cancer care is associated with colorectal cancer stage at diagnosis and colorectal cancer-specific survival. Increased travel burden score is associated with improved colorectal cancer-specific survival. Both transit and driving burden perform similarly in predicting stage at diagnosis. However, transit burden score is associated with colorectal cancer survival while driving burden score is not. Burden of travel to diagnosing facility is associated with increased odds of advanced stage at diagnosis in men, and decreased odds of advanced stage in women. Burden of travel to care does not interact with patient sex or race/ethnicity in predicting survival. Combining the components of travel burden into a single score improves model performance and coefficient interpretability.

Although travel burden is associated with stage at colorectal cancer diagnosis and transit burden is associated with survival, increased burden of travel to health care does not appear to account for racial/ethnic disparities in colorectal cancer prognosis among urban residents.

**Subject Area:** health care; colorectal cancer; travel burden

**Availability:** Boylan, Emma. Does Burden of Travel to Health Care Predict Survival among Chicagoans with Colorectal Cancer?. Diss. University of Illinois at Chicago, 2016.

<http://indigo.uic.edu/handle/10027/21220>

**Title: What Affects Millennials' Mobility? PART I: Investigating the Environmental Concerns, Lifestyles, Mobility-Related Attitudes and Adoption of Technology of Young Adults in California**

**Author:** Ralph K, Turley Voulgaris C, Taylor BD, Blumenberg E, Brown A.

**Abstract:** How do "millennials" make their mobility choices? What factors (e.g. lifestyles and personal preferences) affect their mobility-related choices? What are their future aspirations to purchase and use a vehicle vs. to use other means of transportation? How will millennials' behaviors shape future transportation demand and affect planning needs in the 21st Century? Young adults (often referred to as "millennials" or "Generation Y") are increasingly reported to have different lifestyles and travel behavior from previous generations at the same stage in life.

**Subject Area:** millennials, survey, behavior, attitude, Gen X

**Availability:** Ralph, Kelcie, et al. "Youth, Travel, and the Built Environment: Insights from Typecasting Places and Younger Travelers." Transportation Research Board 95th Annual Meeting. No. 16-4639. 2016. <https://trid.trb.org/view.aspx?id=1393735>

**Title: LPPT-VMT: A Simulation Tool for Measuring Transportation Use in an Aging City**

**Author:** Choi S, CTP A, Hung D, Vo T, Seo JH, Wen F, Hu HH

**Abstract:** LPPT-VMT better informs and educates planners and/or transportation modelers about the importance of factoring demographic change into VMT forecasts. This application is capable of estimating and projecting city-level VMT figures as they relate to population, age and sex.

**Subject Area:** VMT, GHG emissions; planning implications

**Availability:** Choi S, CTP A, Hung D, Vo T, Seo JH, Wen F, Hu HH. LPPT-VMT: A Simulation Tool for Measuring Transportation Use in an Aging City.

[http://register.extension.iastate.edu/images/events/TPAQ/presentations/27\\_Choi.pdf](http://register.extension.iastate.edu/images/events/TPAQ/presentations/27_Choi.pdf)

**Title: Youth, Travel, and the Built Environment: Insights from Typecasting Places and Younger Travelers**

**Author:** Ralph K, Turley Voulgaris C, Taylor BD, Blumenberg E, Brown A.

**Abstract:** This paper contributes to the built environment and transportation literature through two parallel innovations. First, the authors use a neighborhood typology to characterize the built environment, allowing us to identify possible synergistic and/or threshold effects. Second, they characterize the diverse patterns of trip-making, mobility, and travel mode with four distinct traveler types. They focus on young people ages 16 to 36 in the United States. Using a multinomial logistic regression of neighborhood types and traveler types, they find that travel patterns are relatively stable along much of the urban-rural continuum. In all but one neighborhood type, the vast majority (74 to 90%) of young people relied on a car for nearly every trip as a Driver or a Long-distance Trekker. Driving was only substantially lower in Old Urban neighborhoods, where densities, job access, and transit service are multiple times higher than in other neighborhoods. For policymakers, this implies that dramatic changes in the built environment—doubling or even quadrupling density or transit service, for example—may do little to change travel behavior if the initial densities or transit service are low, as they are in most of the United States.

**Subject Area:** Adolescents; Built environment; Mobility; Mode choice; Travel patterns; Travelers

**Availability:** Ralph, Kelcie, et al. "Youth, Travel, and the Built Environment: Insights from Typecasting Places and Younger Travelers." Transportation Research Board 95th Annual Meeting. No. 16-4639. 2016. <https://trid.trb.org/view.aspx?id=1393735>

**Title: Travel mode choice among same-sex couples**

**Author:** Klein, Nicholas J., and Michael J. Smart

**Abstract:** Same-sex partnered individuals are far more likely to use transit, walk, and cycle, and to a lesser extent, use carpools than are people in straight couples. As society becomes more tolerant, gay and lesbian populations are an increasingly visible social group, yet they have received scant attention by transportation scholars. This paper builds on this nascent literature by documenting and attempting to explain these dramatic differences by controlling for factors known to influence mode choice.

We perform two separate analyses employing two distinct datasets. The first analysis examines journey-to-work data from the American Community Survey. The second analysis focuses in specifically on non-motorized (walking, biking) travel using use self-reported walk and bike frequency from the 2009 National Household Travel Survey. In both, we find that characteristics of the neighborhoods in which gays and lesbians live, as well characteristics of the individuals themselves, only explain part of the increased propensity to use “alternative” modes of transportation; a strong residual effect remains.

**Subject Area:** Travel behavior; Demographics; Neighborhoods; Gay and lesbian

**Availability:** Klein, Nicholas J., and Michael J. Smart. "Travel mode choice among same-sex couples." *Transportation Research Part A: Policy and Practice* 90 (2016): 1-13.

<http://www.sciencedirect.com/science/article/pii/S0965856416304098>

**Title: Exploring Bicycle and Public Transit Use by Low-Income Latino Immigrants: A Mixed-Methods Study in the San Francisco Bay Area**

**Author:** Barajas, Jesus M., Daniel G. Chatman, and Asha W. Agrawal

**Abstract:** Latin American immigrants will continue to make up a large share of transit ridership, bicycling and walking in the United States for the foreseeable future, but there is relatively little research about them. This mixed-methods study compares the travel patterns of low-income immigrants living in the San Francisco Bay Area with that of other groups and investigates the barriers and constraints faced by low-income immigrants when taking transit and bicycling. Much of the previous work on immigrant travel has relied on national surveys and qualitative analysis, which underrepresent disadvantaged population groups and slower modes of travel, or are unable to speak to broader patterns in the population. We conducted interviews with 14 low-income immigrants and a paper-based intercept survey of 2,078 adults. Interviewees revealed five major barriers that made public transit use difficult for them, including safety, transit fare affordability, discrimination, system legibility, and reliability. Although crime was the most prominent issue in interviews, the survey results suggest transit cost is the most pressing concern for low-income immigrants. Low-income immigrants were less likely than those with higher-incomes to have access to a motor vehicle, and were less likely than higher-income immigrants or the U.S.-born of any income to have access to a bicycle or bus pass. Finally, although most barriers to public transit use were the same regardless of nativity or household income, low-income immigrants were much less willing to take public transit when they had the option to drive and less willing to bicycle for any purpose. The prevalence of concerns about transit affordability, crime, and reliability suggest transit agencies should consider income-based fare reductions, coordinated crime prevention with local law enforcement, and improved scheduling.

**Subject Area:** Immigrants; Public transit; Bicycles; Travel behavior; Surveys

**Availability:** Barajas, Jesus M., Daniel G. Chatman, and Asha W. Agrawal. "Exploring Bicycle and Public Transit Use by Low-Income Latino Immigrants: A Mixed-Methods Study in the San Francisco Bay Area." (2016).

[http://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=1212&context=mti\\_publications](http://scholarworks.sjsu.edu/cgi/viewcontent.cgi?article=1212&context=mti_publications)

**Title: Length of Residence and Vehicle Ownership in Relation to Physical Activity Among U.S. Immigrants**

**Author:** Terasaki, Dale, and Brian Saelens

**Abstract:** Physical activity among U.S. immigrants over time is not well understood. Transportation may affect this trajectory. Using a survey of documented immigrants (N = 7240), we performed simple, then multivariable logistic regression to calculate ORs and 95 % CIs between length of residence (LOR) and both light-to-moderate (LPA) and vigorous (VPA) activity. We adjusted for demographic variables, then vehicle ownership to assess changes in ORs. Compared to new arrivals, all four LOR time-intervals were associated with lower odds of LPA and higher odds of VPA in simple analysis. All ORs for LPA remained significant after including demographics, but only one remained significant after adding vehicle ownership. Two ORs for VPA remained significant after including demographics and after adding vehicle ownership. Immigrants lower their light-to-moderate activity the longer they reside in the U.S., partly from substituting driving for walking. Efforts to maintain walking for transportation among immigrants are warranted.

**Subject Area:** Immigrants – Physical activity – Length of residence – Transportation

**Availability:** Terasaki, Dale, and Brian Saelens. "Length of residence and vehicle ownership in relation to physical activity among US immigrants." *Journal of Immigrant and Minority Health* (2016): 1-5. <http://link.springer.com/article/10.1007/s10903-016-0361-y>



**Title: Socioeconomic inequalities in children's accessibility to food retailing: Examining the roles of mobility and time**

**Author:** Ravensbergen L, Buliung R, Wilson K, Faulkner G.

**Abstract:** Childhood overweight and obesity rates in Canada are at concerning levels, more apparently so for individuals of lower socioeconomic status (SES). Accessibility to food establishments likely influences patterns of food consumption, a contributor to body weight. Previous work has found that households living in lower income neighbourhoods tend to have greater geographical accessibility to unhealthy food establishments and lower accessibility to healthy food stores. This study contributes to the literature on neighbourhood inequalities in accessibility to healthy foods by explicitly focusing on children, an understudied population, and by incorporating mobility and time into metrics of accessibility. Accessibility to both healthy and unhealthy food retailing is measured within children's activity spaces using Road Network and Activity Location Buffering methods. Weekday vs. weekend accessibility to food establishments is then compared. The results suggest that children attending lower SES schools had almost two times the density of fast food establishments and marginally higher supermarket densities in their activity spaces. Children attending higher SES schools also had much larger activity spaces. All children had higher supermarket densities during weekdays than on weekend days.

**Subject Area:** Canada; Food accessibility; Socioeconomic status; Activity space; Mobility; Children; Health

**Availability:** Ravensbergen L, Buliung R, Wilson K, Faulkner G. Socioeconomic Inequalities in Children's Accessibility to Food Retailing: Examining the Roles of Mobility and Time. *Social Science & Medicine*. 2016 Jan 22.

<http://www.sciencedirect.com/science/article/pii/S0277953616300314>

**Title: The Drive to Work: The Relationship between Transportation Access, Housing Assistance, and Employment among Participants in the Welfare to Work Voucher Program**

**Author:** Blumenberg, Evelyn, and Gregory Pierce

**Abstract:** Transportation enables low-income individuals to find and travel to employment. This article analyzes the relationship between access to automobiles and public transit and employment outcomes of low-income households. We use longitudinal survey data from participants in the Welfare to Work Voucher Program, which was conducted in five US metropolitan areas between 1999 and 2005. Multinomial logistic regression shows that baseline access to automobiles has a strong positive relationship to follow-up employment but public transit access and receipt of housing assistance do not. Our findings suggest that enhancing car access will notably improve employment outcomes among very-low-income adults, but other assistance will have, at best, marginal effects.

**Subject Area:** welfare to work; automobile ownership; public transit access; housing mobility

**Availability:** Blumenberg, Evelyn, and Gregory Pierce. "The Drive to Work The Relationship between Transportation Access, Housing Assistance, and Employment among Participants in the Welfare to Work Voucher Program." *Journal of Planning Education and Research* (2016): 0739456X16633501.

<http://jpe.sagepub.com/content/early/2016/03/16/0739456X16633501.abstract>

**Title: Trips to medical care among persons with disabilities: Evidence from the 2009 National Household Travel Survey**

**Author:** Brucker, Debra L., and Nicholas G. Rollins

**Abstract:** Background: Persons with disabilities experience multiple barriers to obtaining necessary medical care. Problems with access to transportation and provider choice could lead to longer travel distances and longer travel times to medical appointments.

Objective/hypothesis: 1) Persons with disabilities travel further distances to receive necessary care, holding other variables constant. 2) Travel to medical appointments takes a longer amount of time for persons with disabilities, controlling for distance, mode of transportation and other factors. 3) Disability is the key factor influencing access to transportation options, holding other variables constant. Methods: The 2009 National Household Travel Survey (NHTS) is used to examine travel patterns of persons with disabilities as they access medical care.

Logistic regressions are run on distance to medical appointments, time taken for travel to medical appointments, and access to private vehicle. Results: There is no difference in the distance traveled, but trips to medical care by persons with disabilities take longer amounts of time than trips taken by persons without disabilities, holding other variables constant. Access to private transportation is similar for both persons with and without disabilities. Conclusions: Persons with disabilities experience longer travel times to receive medical care, despite traveling similar distances and having similar access to private vehicles.

**Subject Area:** disability, Transportation, Access to health care

**Availability:** Brucker, Debra L., and Nicholas G. Rollins. "Trips to medical care among persons with disabilities: Evidence from the 2009 National Household Travel Survey." *Disability and Health Journal* (2016). <http://www.sciencedirect.com/science/article/pii/S1936657416000030>

**Title: Does an Older Adult's Mobility Differ by the Size of the Metropolitan Area in Which They Live? An Analysis of NHTS Data**

**Author:** Duncan MD, Horner MW, Valdez-Torres Y, Stansbury C, Wood BS.

**Abstract:** Understanding the transportation needs of older populations has become very important as the percent of the population over 65 years old continues to grow. Further, the older population in different metropolitan contexts will likely have different needs. This paper seeks to elucidate the variation in the mobility of older groups across these different contexts. The authors use the National Household Travel Survey (NHTS) to compare basic characteristics of travel and housing choices among younger adults (age 21-64) and different cohorts of older adults (age 65-74, age 75-84, and age 85+) in Florida metropolitan areas of different sizes. They find that the relative differences in travel behavior among the older and younger groups remain consistent across different types of metros. In all areas, the older population tends to make shorter trips, rely more heavily on being driven rather than driving, and make more shopping and medical trips. However, they also find that the travel patterns of the older population does differ across areas of different sizes in parallel with younger adults. In large metropolitan areas, older and younger groups alike make shorter trips and rely less on auto travel than similarly aged groups in smaller areas. This indicates that effective transportation planning for the older population will likely require strategies tailored to a given context.

**Subject Area:** Aged; Metropolitan areas; Mobility; Mode choice; Travel patterns; Trip purpose

**Availability:** Duncan, Michael D., et al. "Does an Older Adult's Mobility Differ by the Size of the Metropolitan Area in Which They Live? An Analysis of NHTS Data." Transportation Research Board 95th Annual Meeting. No. 16-1735. 2016. <https://trid.trb.org/view.aspx?id=1392620>

**Title: Rethinking the Future of Alternative Transportation to Work in Light of Millennial Usage**

**Author:** Case, Robert B., and Seth T. Schipinski

**Abstract:** It has been written that Millennials (born 1982-2000) use cars less often and alternative modes (bike, walk, public transit) more often than those of previous generations. Most travel mode data covers work trips. Therefore, this analysis seeks to determine—in light of current higher Millennial usage of alternative transportation to work—whether we should plan for an increase in demand for alternative transportation to work in the future in the U.S. To answer this question, the Hampton Roads Transportation Planning Organization (HRTPO) staff isolated the effects on usage of alt-trans-to-work of seven (7) factors (generation, age, era, income, gender, Metropolitan Statistical Area (MSA) status, Urbanized Area status) by compiling and regressing a dataset of National Household Travel Survey (NHTS) records from three different years: 1983, 1995, and 2008/2009. The analysis revealed highly significant relationships between alternative mode usage for commuting and nearly all of the independent variables selected, allowing the authors to forecast—under stated assumptions—an increase in usage of alternative transportation for commuting in the U.S., from 8.2% in 2010 to 8.8% in 2050.

**Subject Area:** Age groups; Commuting; Forecasting; Gender; Income; Mode choice; Regression analysis; Transportation modes; Travel demand; Work trips

**Availability:** Case, Robert B., and Seth T. Schipinski. "Rethinking the Future of Alternative Transportation to Work in Light of Millennial Usage." Transportation Research Board 95th Annual Meeting. No. 16-4116. 2016. <https://trid.trb.org/view.aspx?id=1393540>

**Title: Street crossing behavior in younger and older pedestrians: an eye- and head-tracking study**

**Author:** G. A. Zito, D. Cazzoli, L. Scheffler, M. Jäger, R. M. Müri, U. P. Mosimann, T. Nyffeler, F. W. Mast and T. Nef

**Abstract:** Background: Crossing a street can be a very difficult task for older pedestrians. With increased age and potential cognitive decline, older people take the decision to cross a street primarily based on vehicles' distance, and not on their speed. Furthermore, older pedestrians tend to overestimate their own walking speed, and could not adapt it according to the traffic conditions. Pedestrians' behavior is often tested using virtual reality. Virtual reality presents the advantage of being safe, cost-effective, and allows using standardized test conditions. Methods: This paper describes an observational study with older and younger adults. Street crossing behavior was investigated in 18 healthy, younger and 18 older subjects by using a virtual reality setting. The aim of the study was to measure behavioral data (such as eye and head movements) and to assess how the two age groups differ in terms of number of safe street crossings, virtual crashes, and missed street crossing opportunities. Street crossing behavior, eye and head movements, in older and younger subjects, were compared with non-parametric tests. Results: The results showed that younger pedestrians behaved in a more secure manner while crossing a street, as compared to older people. The eye and head movements analysis revealed that older people looked more at the ground and less at the other side of the street to cross. Conclusions: The less secure behavior in street crossing found in older pedestrians could be explained by their reduced cognitive and visual abilities, which, in turn, resulted in difficulties in the decision-making process, especially under time pressure. Decisions to cross a street are based on the distance of the oncoming cars, rather than their speed, for both groups. Older pedestrians look more at their feet, probably because of their need of more time to plan precise stepping movement and, in turn, pay less attention to the traffic. This might help to set up guidelines for improving senior pedestrians' safety, in terms of speed limits, road design, and mixed physical-cognitive trainings. **Subject Areas:** transit perception; demographic groups; neighborhood

**Subject Area:** Eye- and head-tracking technology – Older pedestrians – Street crossing behavior – Virtual reality

**Availability:** Zito, G. A., et al. "Street crossing behavior in younger and older pedestrians: an eye-and head-tracking study." *BMC geriatrics* 15.1 (2015): 1.  
<http://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-015-0175-0>

## 7. Survey, Data Synthesis, and Other Applications

**Title:** Poisson and Negative Binomial Regression Models Application to Model the Factors of Car Ownership in Akure, South West, Nigeria

**Authors:** Oyedepo, Joseph O., and Japheth E. Etu

**Abstract:** Increase in number of cars without commensurate increase in the number of transport facilities and infrastructures has led to diverse traffic problems in many Nigerian cities like Akure. Factors which contribute to increase in the numbers of cars owned in Akure metropolis were investigated in this study. The study area was divided into three density zones namely High, Medium and Low while, data was collected using well-structured household questionnaire survey distributed amongst residents; with the survey yielding a return of 1002 questionnaire out of the 1181 distributed. Results from field findings gave the average number of cars owned per household in the study area as 0.62. Results of the Poisson Regression Model show that a change in the number of employed household members will decrease the number of cars owned in the study area by 9% while, a unit increase in the number of driver's license holders in the household, academic qualification and average monthly income of the household will increase the number of cars owned by 60%, 26% and 30% respectively. The negative binomial model indicates that a change in the number of employed household members will decrease the number of cars owned by 10% whereas a change in the number of driver's license holders in the household and monthly income will lead to an increase in the number of cars owned by 101% and 24% respectively. The test of model effects affirm that all the predictor variables are statistically significant indicating a good fit for the model predicted. Out of the two models, Poisson regression model is found to be a superior model due to a higher log likelihood ratio Chi Square and improved statistically significant variables. The findings in this research will assist government agencies to plan future transportation infrastructure development.

**Subject Areas:** Poisson, Binomial, Regression, Model, Household, Factors

**Availability:** Oyedepo, Joseph O., and Japheth E. Etu. "Poisson and Negative Binomial Regression Models Application to Model the Factors of Car Ownership in Akure, South West, Nigeria." *Journal of Applied Science & Process Engineering* 3.2 (2016): 72-82.  
<http://publisher.unimas.my/ojs/index.php/JASPE/article/view/309>

**Title: Association Between Electronic Cigarette Marketing Near Schools and E-cigarette Use Among Youth**

**Authors:** Giovenco, D. P., Casseus, M., Duncan, D. T., Coups, E. J., Lewis, M. J., & Delnevo, C. D

**Abstract:** Purpose: Electronic cigarettes (e-cigarettes) are now the most popular tobacco product among youth. Little is known about the relationship between exposure to e-cigarette marketing at the point-of-sale and youth e-cigarette use.

Methods: Research staff collected data on e-cigarette availability and promotion in tobacco retailers within a half-mile of 41 schools participating in the 2014 New Jersey Youth Tobacco Survey. These data were linked with participant responses from the New Jersey Youth Tobacco Survey (n = 3,909) and log-Poisson regression models estimated adjusted prevalence ratios for ever and past-month e-cigarette use.

Results: Nearly a quarter of high school students in New Jersey have tried e-cigarettes (24.1%) and 12.1% were past-month users. Prevalence was highest among males, non-Hispanic whites, and students who have used other tobacco products. After controlling for covariates and the clustered nature of the data, e-cigarette retailer density around schools was positively associated with ever and past-month use of e-cigarettes ( $p < .05$ ). E-cigarette advertising volume significantly increased the probability of being a past-month e-cigarette user (adjusted prevalence ratio: 1.03,  $p = .031$ ).

Conclusions: This study suggests that the point-of-sale environment around schools may contribute to e-cigarette use among youth. Policy efforts to restrict tobacco promotion at the point-of-sale may play a role in reducing the use of e-cigarettes.

**Subject Areas:** E-cigarettes, Vaping, Tobacco, Point-of-sale, Youth

**Availability:** Giovenco, D. P., Casseus, M., Duncan, D. T., Coups, E. J., Lewis, M. J., & Delnevo, C. D. (2016). Association between electronic cigarette marketing near schools and e-cigarette use among youth. *Journal of Adolescent Health*. [http://www.jahonline.org/article/S1054-139X\(16\)30249-X/abstract](http://www.jahonline.org/article/S1054-139X(16)30249-X/abstract)



**Title: Cooperative Multiple Dynamic Object Tracking on Moving Vehicles based on Sequential Monte Carlo Probability Hypothesis Density Filter**

**Authors:** Gan, Jonathan, Milos Vasic, and Alcherio Martinoli

**Abstract:** This paper proposes a generalized method for tracking of multiple objects from moving, cooperative vehicles – bringing together an Unscented Kalman Filter for vehicle localization and extending a Sequential Monte Carlo Probability Hypothesis Density filter with a novel cooperative fusion algorithm for tracking. The latter ensures that the fusion of information from cooperating vehicles is not limited to a fully overlapping Field Of View (FOV), as usually assumed in popular distributed fusion literature, but also allows for a perceptual extension corresponding to the union of the vehicles' FOV. Our method hence allows for an overall extended perception range for all cooperative vehicles involved, while preserving same or improving the accuracy in the overlapping FOV. This method also successfully mitigates noisy sensor measurement and clutter, as well as localization inaccuracies of tracking vehicles using Global Navigation Satellite Systems (GNSS). Finally, we extensively evaluate our method using a high-fidelity simulator for vehicles of varying speed and trajectories.

**Subject Areas:** Kalman; Sequential Monte Carlo Probability Hypothesis Density; GNSS; FOV

**Availability:** Gan, Jonathan, Milos Vasic, and Alcherio Martinoli. "Cooperative Multiple Dynamic Object Tracking on Moving Vehicles based on Sequential Monte Carlo Probability Hypothesis Density Filter." Proceedings of the IEEE International Conference on Intelligent Transportation Systems. No. EPFL-CONF-221384. 2016.

<https://pdfs.semanticscholar.org/1633/5e2722c9cdde20883a63dd3a7a42727111d8.pdf>

**Title: Estimating motorized travel mode choice using classifiers: An application for high-dimensional multicollinear data**

**Authors:** Lindner, Anabele, Cira Souza Pitombo, and André Luiz Cunha

**Abstract:** Studies in the field of discrete choice analysis are crucial for transportation planning. Generally, travel demand models are based on the maximization of the random utility and straightforward mathematical functions, such as logit models. These assumptions lead to a continuous model that presents constraints concerning fitting the data. Artificial Neural Networks (ANN) and Classification Trees (CT) are classification techniques that can be applied to discrete choice models. These techniques can overcome some disadvantages of traditional modeling, especially the drawback of not being able to model high-dimensional multicollinear data. This research paper compares the performance of estimating motorized travel mode choice through ANN and CT with a binary logit in a multicollinear study case (aggregated and disaggregated covariates). The dataset refers to an Origin-Destination Survey carried out in São Paulo Metropolitan Area, Brazil in 2007. Classification techniques have shown a good ability to forecast (approximately 80% match rate), as well as to recognize travel behavior patterns. Furthermore, by using the classifier application, the most important covariates within all the datasets can be selected. These covariates can be related to households, as well as to Traffic Analysis Zones.

**Subject Areas:** Artificial Neural Networks; Decision tree algorithms; Travel mode choice; Multicollinear data

**Availability:** Lindner, Anabele, Cira Souza Pitombo, and André Luiz Cunha. "Estimating motorized travel mode choice using classifiers: An application for high-dimensional multicollinear data." *Travel Behaviour and Society* 6 (2017): 100-109.  
<http://www.sciencedirect.com/science/article/pii/S2214367X16300291>

**Title: Local Area Transportation Characteristics for Households**

**Authors:** BTS

**Abstract:** The purpose of the project was to develop estimates of average weekday household person trips, vehicle trips, person miles traveled, and vehicle miles traveled, for all census tracts in the United States. The estimates were made using national travel data collected in the 2009 National Household Travel Survey (NHTS), sponsored by the Federal Highway Administration, and applied to individual census tracts using the 2005 to 2009 American Community Survey (ACS) estimates from the Bureau of Census.

**Subject Areas:** local estimates of Household travel

**Availability:** Bureau of Transportation Statistics; Local Area Transportation Characteristics for Households

[https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject\\_areas/national\\_household\\_travel\\_survey/about](https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/national_household_travel_survey/about)

**Title: An integrated agent-based approach for modeling disease spread in large populations to support health informatics**

**Authors:** Bissett K, Cadena J, Khan M, Kuhlman CJ, Lewis B, Telionis PA

**Abstract:** Disease spread has a much broader impact on public health than the important issues of illnesses and deaths. Among these are chronic health problems, reductions in national wealth, government instability, and crime. Here, we describe an integrated approach for computational health informatics that includes individual-based population construction, and agent-based modeling of dynamics. We restrict dynamics modeling to epidemiology. We itemize technical challenges and provide a case study of the Ebola outbreak in Monrovia, Liberia, with discussion of mobile treatment centers.

**Subject Areas:** Agent-based modeling, Algorithm design and analysis, Diseases, Informatics Sociology, Statistics

**Availability:** Bissett, Keith, et al. "An integrated agent-based approach for modeling disease spread in large populations to support health informatics." 2016 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI). IEEE, 2016.

[http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7455977&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D7455977](http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7455977&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D7455977)

## **Title: Development of a Virtual City Model for Urban Land Use and Transport Planning**

**Authors:** Liu, Lu

**Abstract:** Travel demand in person transport is the result of decisions of individuals. These travel related decisions are subject to the characteristics of individuals (age, employment status and car ownership), the characteristics of the land use structure (distribution of land uses) and of transport supply (road network and public transport lines). Measures in land use planning and transport planning can have an impact on the land use structure and the transport supply. For a better understanding of the influences of land use structure and transport supply on travel demand, a virtual city model (VCM) is developed in this work.

A VCM is a travel demand model of a synthetically designed city that replicates the same characteristics of travel demand as a real city. The VCM in this work is embedded in a tour-based travel demand model (VISEM) and is developed with the software VISUM from PTV Group. The travel demand model of Region Stuttgart is the reference model for VCM. Three areas, i.e. city, region and rest of the world, are modelled in VCM on the different aggregation levels. Trips within and between these three areas are correspondingly modelled with different methods.

The three substantial inputs of VCM, i.e. transport supply, land use structure and behavioural pattern, should have comparable characteristics as the reference model. The modelling of these three inputs in VCM is listed in the following:

- Transport supply is represented by network models for both private and public transport. The road network is generated with the help of a network generator tool.
- Land use structure is defined by distribution of residents per person groups and activity locations per activity. The land use structure in the reference model is transferred to VCM applying different methods for the city area, the region area and for commuting trips.
- The behavioural pattern is modelled by parameters in sub-models of the travel demand model, such as generation rates and parameters in utility functions. These parameters are taken directly from the reference model.

In order to obtain characteristics of the travel demand (e.g. number of trips and person kilometre per modes) in VCM comparable to the reference model, the network model and the land use structure in VCM are calibrated with different methods. For example, adjusting detour factors of links for travel distance, and considering topography for travel time by bike. After the process of calibration, VCM is able to generate comparable characteristics as the reference model. Certain simplifications, such as the highly aggregated zones in the region area of VCM, are responsible for the result that not all of the characteristics can be calibrated, as for instance the frequency distribution of travel time for trips within the region area. The usability of the calibrated VCM is examined again through the process of validation. In this process, a series of changes on transport supply (e.g. free-flow speed on roads in the city area) and land use structure (e.g. residential density) are implemented in the same way to both VCM and the reference model. The influences on travel demand in both models are investigated and

compared. VCM is adjusted until it is able to generate the same change on characteristics of the travel demand with the same modification of inputs as the reference model.

After the processes of calibration and validation VCM can be applied for studying influences of measures in urban land use planning and transport planning on travel demand. This work gives some application examples of VCM. Influences of the following scenarios are experimented with VCM:

- Function-separated land use distribution,
- Ideal mixture of land uses,
- New developments located in different areas,
- Ideal scenario of no congestion on the roads in the city area,
- Improvement of PuT service in the city area.

The methodological processes can be applied to develop a new virtual city model (e.g. with another network form or with a new reference model). The VCM generated from this work is available for further research in urban land use and transport planning.

**Subject Areas:** travel demand model; VCM; land use planning

**Availability:** Liu, Lu. "Development of a virtual city model for urban land use and transport planning." Diss. (2016). [http://elib.uni-stuttgart.de/bitstream/11682/8899/3/Dissertation\\_Lu\\_Liu.pdf](http://elib.uni-stuttgart.de/bitstream/11682/8899/3/Dissertation_Lu_Liu.pdf)

## **Title: Statistical Methods For Advanced Econometric Models With Applications To Vehicle Holding And Speed Quantiles Distribution**

**Authors:** Jean-Michel Tremblay

**Abstract:** This dissertation proposes statistical methods to formulate, estimate and apply complex transportation models. Two main problems are part of the analyses conducted and presented in this dissertation. The first method solves an econometric problem and is concerned with the joint estimation of models that contain both discrete and continuous decision variables. The use of ordered models along with a regression is proposed and their effectiveness is evaluated with respect to unordered models. Procedure to calculate and optimize the log-likelihood functions of both discrete-continuous approaches are derived, and difficulties associated with the estimation of unordered models explained. Numerical approximation methods based on the Genz algorithm are implemented in order to solve the multidimensional integral associated with the unordered modeling structure. The problems deriving from the lack of smoothness of the probit model around the maximum of the log-likelihood function, which makes the optimization and the calculation of standard deviations very difficult, are carefully analyzed. A methodology to perform out-of-sample validation in the context of a joint model is proposed. Comprehensive numerical experiments have been conducted on both simulated and real data. In particular, the discrete-continuous models are estimated and applied to vehicle ownership and use models on data extracted from the 2009 National Household Travel Survey. The second part of this work offers a comprehensive statistical analysis of free-flow speed distribution; the method is applied to data collected on a sample of roads in Italy. A linear mixed model that includes speed quantiles in its predictors is estimated. Results show that there is no road effect in the analysis of free-flow speeds, which is particularly important for model transferability. A very general framework to predict random effects with few observations and incomplete access to model covariates is formulated and applied to predict the distribution of free-flow speed quantiles. The speed distribution of most road sections is successfully predicted; jack-knife estimates are calculated and used to explain why some sections are poorly predicted. Eventually, this work contributes to the literature in transportation modeling by proposing econometric model formulations for discrete-continuous variables, more efficient methods for the calculation of multivariate normal probabilities, and random effects models for free-flow speed estimation that takes into account the survey design. All methods are rigorously validated on both real and simulated data.

**Subject Areas:** free-flow speed distribution; transportation models;

**Availability:** Bissett, Keith, et al. "An integrated agent-based approach for modeling disease spread in large populations to support health informatics." 2016 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI). IEEE, 2016.

[http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7455977&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs\\_all.jsp%3Farnumber%3D7455977](http://ieeexplore.ieee.org/xpl/abstractKeywords.jsp?tp=&arnumber=7455977&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxppls%2Fabs_all.jsp%3Farnumber%3D7455977)

**Title: The TimeGeo modeling framework for urban mobility without travel surveys**

**Authors:** Jiang, Shan, Yingxiang Yang, Siddharth Gupta, Daniele Veneziano, Shounak Athavale, and Marta C. González

**Abstract:** Well-established fine-scale urban mobility models today depend on detailed but cumbersome and expensive travel surveys for their calibration. Not much is known, however, about the set of mechanisms needed to generate complete mobility profiles if only using passive datasets with mostly sparse traces of individuals. In this study, we present a mechanistic modeling framework (TimeGeo) that effectively generates urban mobility patterns with resolution of 10 min and hundreds of meters. It ties together the inference of home and work activity locations from data, with the modeling of flexible activities (e.g., other) in space and time. The temporal choices are captured by only three features: the weekly home-based tour number, the dwell rate, and the burst rate. These combined generate for each individual: (i) stay duration of activities, (ii) number of visited locations per day, and (iii) daily mobility networks. These parameters capture how an individual deviates from the circadian rhythm of the population, and generate the wide spectrum of empirically observed mobility behaviors. The spatial choices of visited locations are modeled by a rank-based exploration and preferential return (r-EPR) mechanism that incorporates space in the EPR model. Finally, we show that a hierarchical multiplicative cascade method can measure the interaction between land use and generation of trips. In this way, urban structure is directly related to the observed distance of travels. This framework allows us to fully embrace the massive amount of individual data generated by information and communication technologies (ICTs) worldwide to comprehensively model urban mobility without travel surveys.

**Subject Area:** human mobility; urban model; mobile phone data; networks; urban planning

**Availability:** Jiang, Shan, et al. "The TimeGeo modeling framework for urban motility without travel surveys." *Proceedings of the National Academy of Sciences* (2016): 201524261.  
<http://www.pnas.org/content/113/37/E5370.abstract>



**Title: Discrete choice with spatial correlation: A spatial autoregressive binary probit model with endogenous weight matrix (SARBP-EWM)**

**Authors:** Zhou, Y., Wang, X., & Holguín-Veras, J.

**Abstract:** Discrete choice modeling is widely applied in transportation studies. However, the need to consider correlation between observations creates a challenge. In spatial econometrics, a spatial lag term with a pre-defined weight matrix is often used to capture such a correlation. In most previous studies, the weight matrix is assumed to be exogenous. However, this assumption is invalid in many cases, leading to biased and inconsistent parameter estimates. Although some attempts have been made to address the endogenous weight matrix issue, none has focused on discrete choice modeling. This paper fills an existing gap by developing a Spatial Autoregressive Binary Probit Model with Endogenous Weight Matrix (SARBP-EWM). The SARBP-EWM model explicitly considers the endogeneity by using two equations whose error terms are correlated. Markov Chain Monte Carlo (MCMC) method is used to estimate the model. Model validation with simulated data shows that the model parameters can converge to their true values and the endogenous weight matrix can be reliably recovered. The model is then applied to a simplified firm relocation choice problem, assuming that similar size firms influence one another. The model quantifies the peer effect, and takes into consideration other independent variables including industry type and population density. The estimation results suggest that peer influence among firms indeed affect their relocation choices. The application results offer important insights into business location choice and can inform future policy making. The sample size for applying the model is currently limited to hundreds of observations. This paper contributes to the existing literature on discrete choice modeling and spatial econometrics. It provides a new tool to discover spatial correlations that are hidden in a wide range of transportation issues, such as land development, location choice, and various travel behavior. Those hidden spatial correlations are otherwise difficult to identify and estimation results may be biased. Establishing a new model that explicitly considers endogenous weight matrix and applying the model to a real life transportation issue represent a significant contribution to the body of literature.

**Subject Areas:** Bayesian MCMC; Probit model; Endogenous weight matrix; Choice behavior

**Availability:** Zhou, Y., Wang, X., & Holguín-Veras, J. (2016). Discrete choice with spatial correlation: A spatial autoregressive binary probit model with endogenous weight matrix (SARBP-EWM). *Transportation Research Part B: Methodological*, 94, 440-455.  
<http://www.sciencedirect.com/science/article/pii/S0191261516300960>

**Title: An Application of Fuzzy Logic Controller Renewable Energy Storage System**

**Authors:** Varsha, R. Dyuthi, and D. Narasimha Rao

**Abstract:** Background/Objectives: Embedded generation are futuristic energy system that penetrates in the conventional power system in a rapid manner. The wind energy system is which a typical non-conventional energy source faces the problem of stochastic nature which makes it not suitable to all energy applications. Methods/Statistical Analysis: The Electric vehicles are the novel energy transportations systems owing to their mobility and easy power transfer to the power drought areas. Findings: The stochastic control algorithm is used for scheduling of electric vehicles which effectively meets the grid requirements as well as meeting the energy requirements. The fuzzy logic controller is used in the energy storage system which is relatively advantageous compared to conventional PI controller. Application/Improvements: The control strategy is demonstrated from side to side model simulation swot up the results conform the significance of the control methodology incorporated in the paper.

**Subject Areas:** Fuzzy Logic Controller, Renewable Energy, Vehicle to Grid, Wind Power

**Availability:** Varsha, R. Dyuthi, and D. Narasimha Rao. "An Application of Fuzzy Logic Controller Renewable Energy Storage System." Indian Journal of Science and Technology 9.32 (2016). <http://www.indjst.org/index.php/indjst/article/view/94240>

**Title: Advantages of Online Methods in Planning Research Capturing Walking Habits in Different Built Environments**

**Authors:** Wieters, K. Meghan

**Abstract:** This article examines the effectiveness of using online survey methods in planning research. This study measured travel behavior and physical activity of office workers over a month period. An online travel diary, pedometer, and online survey were used to assess walking levels and transportation habits for office workers. A subset of the sample used a paper travel diary, which was used for comparison. Analysis of missing data was performed to explore implications of using online survey methods. Using online travel diaries and surveys to assess objective and subjective data can help to reduce recall bias, missing data, and greater flexibility survey administration.

**Subject Areas:** behavioral sciences, research methods, social sciences, urban planning, transportation, surveying, physical activity, ecological momentary assessment

**Availability:** Wieters, K. Meghan. "Advantages of Online Methods in Planning Research." SAGE Open 6.3 (2016): 2158244016658082.

<http://sgo.sagepub.com/content/6/3/2158244016658082.abstract>

**Title: Multi-preference Time Dependent Routing****Authors:** Hendawi AM, Rustum A, Hazel DO, Teredesai A, Ali M.

**Abstract:** Map based navigation and routing has become central to modern life across the world. Existing routing frameworks recommend shortest-path routes based on travel-time or distance with some flexibility on user-options (avoid tolls, highways, and so on). Interestingly, time saving is not the only dominant factor for commuters in the modern-age. Opportunities for personalization may enable selecting a route with less car accidents, or one that is more scenic, or perhaps a straight and flat route. Such personalization requires a data management framework that goes beyond a static road network graph. The proposed PreGo system is a novel attempt to develop a preference learning dynamic routing system. Key component of PreGo is a new data-structure termed Attribute Time Aggregated Graph (ATAG) that accommodates a variety of information sources ranging from user generated GPS traces, crime statistics, accident reports, and open-access maps to name a few. PreGo then supplements ATAG with ability to store, retrieve, and perform probabilistic inference of values depending on time of day of routing queries. In this paper we describe the PreGo system, the ATAG data-structure, and the accompanying Time Parameterized Multi-Preference Shortest Path (TP\_SP) algorithm to process multi-preference routing queries through a single traverse of the ATAG structure. We evaluate the utility of TP\_SP algorithm to find best path(s) based on user specified start time and prove PreGo system's efficiency and answer optimality. To further reduce the response latency, we introduce the bidirectional TP\_SP algorithm that processes the query from the two ends at the same time. Detailed experimental evaluation using real and synthetic data demonstrate the efficiency and scalability of the PreGo system.

**Subject Areas:** map navigation and routing; PreGo; ATAG; TP\_SP**Availability:** Hendawi AM, Rustum A, Hazel DO, Teredesai A, Ali M. Multi-preference Time Dependent Routing.<https://pdfs.semanticscholar.org/16bd/c9f28f79ad3fe0815ad68eb92deb94cb5c2b.pdf>

**Title: Integrating Behavior and Microsimulation Models**

**Authors:** Nidhi Parikh, Madhav Marathe, and Samarth Swarup

**Abstract:** Microsimulations focus on modeling routine activities of individuals and have been used for modeling and planning urban systems like transportation, energy demand, and epidemiology. On the other hand, planning for emergency situations (e.g., disasters) needs to account for human behavior which is not routine or pre-planned but depends upon the current situation like the amount of physical damage or safety of family. Here, we focus on modeling the aftermath of a hypothetical detonation of an improvised nuclear device in Washington DC. We review various behavior models from the literature and provide motivation for our model which is conceptually based on the formalism of decentralized semi-Markov decision processes with communication, using the framework of options. We describe our approach for integrating behavior and microsimulation models where the behavior model species context-dependent behaviors (like looking for family members, sheltering, evacuation, and search and rescue) and the synthetic population provides information about demographics and infrastructures. We present results from a number of simulation runs.

**Subject Areas:** Behavior models, Disaster modeling, Microsimulations

**Availability:** Parikh, Nidhi, Madhav Marathe, and Samarth Swarup. "Integrating Behavior and Microsimulation Models."

[http://staff.vbi.vt.edu/swarup/papers/parikh\\_etal\\_abmus2016\\_behavior.pdf](http://staff.vbi.vt.edu/swarup/papers/parikh_etal_abmus2016_behavior.pdf)

**Title:** Updating origin–destination matrices with aggregated data of GPS traces

**Authors:** Ge, Qian, and Daisuke Fukuda

**Abstract:** The practice of estimating origin–destination (OD) demand usually requires large-scale travel surveys. To reduce the cost and time spent on surveys, individual trajectory data obtained from mobile devices has been used as an alternative dataset since the last two decades for OD estimation but also constrained in practice in some countries. To estimate OD matrices while protecting privacy, this study uses aggregated data of mobile phone traces to estimate work-related trips. The proposed approach is a sequential updater based on the maximum entropy principle. Trip production and attraction are firstly calculated by a non-linear programming problem followed by a matrix fitting problem to distribute trips to each OD pair. Numerical study shows that updated values are much closer to the synthesized real values than the referred ones. The case study in Tokyo further demonstrates that the proposed updating approach can track the change of travel pattern.

**Subject Areas:** Coarse-grained travel data; Mobile phone data; Travel survey; Origin–destination trip matrix estimation; Maximum entropy

**Availability:** Ge, Qian, and Daisuke Fukuda. "Updating origin–destination matrices with aggregated data of GPS traces." *Transportation Research Part C: Emerging Technologies* 69 (2016): 291-312. <http://www.sciencedirect.com/science/article/pii/S0968090X16300705>

**Title:** Simulation, numerical approximation and closed forms for joint discrete continuous models with an application to household vehicle ownership and use

**Authors:** Cirillo, Cinzia, Yangwen Liu, and Jean-Michel Tremblay

**Abstract:** Integrated models for multiple decision variables, not necessarily from the same family, are becoming possible thanks to the advances in econometrics and in the estimation techniques. Recently, probit type models have been proposed to model joint decisions for the flexibility offered by the multivariate normal to capture correlations across the different dependent 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, we compare results obtained from unordered probit models estimated with simulation and numerical computation to those obtained from ordered discrete–continuous probit. The analysis is performed on household decisions concerning vehicle holding and mileage travelled and using data extracted from the 2009 National Household Travel Survey. Estimation results show that discrete–continuous unordered probit are superior to ordered structures in terms of goodness of fit, but produce comparable results when applied to predict behavioral changes. Model applications for policy analysis also reveal that income and density only affects marginally vehicle holding decisions and annual miles driven, while driving cost has a more significant effect on annual household mileage.

**Subject Areas:** Discrete–continuous model – Ordered mechanism – Unordered mechanism – Vehicle ownership – Vehicle miles travelled

**Availability:** Cirillo, Cinzia, Yangwen Liu, and Jean-Michel Tremblay. "Simulation, numerical approximation and closed forms for joint discrete continuous models with an application to household vehicle ownership and use." *Transportation*: 1-21.  
<http://link.springer.com/article/10.1007/s11116-016-9696-4>

**Title: Traffic Congestion, Polycentricity, And Intraurban Firm Location Choices: A Nested Logit Model For The Los Angeles Metropolitan Area**

**Authors:** Hou, Yuting

**Abstract:** This study empirically investigates traffic congestion effects on agglomeration through the lens of firm location decisions. A discrete choice model is applied to examine new establishments' location choices within the Los Angeles metropolitan area. Employment centers are defined as the choice set to explore the nature and role of intraurban agglomerations. The results show that metro-wide congestion negatively affects the location choices of firms in the high-order office-related activities, while local congestion have positive impacts on those firms' location decisions. In contrast, firms in production-related activities are positively influenced by regional congestion but are negatively affected by local congestion levels.

**Subject Areas:** congestion

**Availability:** Hou, Yuting. "Traffic Congestion, Polycentricity, And Intraurban Firm Location Choices: A Nested Logit Model For The Los Angeles Metropolitan Area." *Journal of Regional Science* (2016). <http://onlinelibrary.wiley.com/doi/10.1111/jors.12267/abstract>



**Title:** An efficient protocol for authenticated and secure message delivery in vehicular ad hoc networks

**Authors:** Liu, Yangwen, and Cinzia Cirillo

**Abstract:** A national model of vehicle ownership and use is developed for the USA. Decisions about the number of cars owned by households and the annual miles traveled are jointly modeled using a discrete–continuous probit model, which has been estimated on the 2009 National Household Travel Survey (NHTS) data. The model system covers four Census Regions (Northeast, Midwest, South and West) and three area types (urbanized area, urban clusters and rural). Models' estimates have been applied to data extracted from the American Community Survey (ACS) to forecast household vehicle demand at county level. Results show that the national models are transferable to small areas with different geographical and socio-demographic characteristics.

**Subject Areas:** Vehicle ownership; VMT; Discrete–continuous model; Transferability; NHTS; ACS

**Availability:** Liu, Yangwen, and Cinzia Cirillo. "Small area estimation of vehicle ownership and use." *Transportation Research Part D: Transport and Environment* 47 (2016): 136-148.  
<http://www.sciencedirect.com/science/article/pii/S1361920916302498>

**Title:** An efficient protocol for authenticated and secure message delivery in vehicular ad hoc networks

**Authors:** Lim, Kiho, and D. Manivannan

**Abstract:** In Vehicular Ad hoc Networks (VANETs), anonymity of the nodes sending messages should be preserved, while at the same time the law enforcement agencies should be able to trace the messages to the senders when necessary. It is also necessary that the messages sent are authenticated and delivered to the vehicles in the relevant areas quickly. In this paper, we present an efficient protocol for fast dissemination of authenticated messages in VANETs. It ensures the anonymity of the senders and also provides mechanism for law enforcement agencies to trace the messages to their senders, when necessary.

**Subject Areas:** transport survey methods

**Availability:** Lim, Kiho, and D. Manivannan. "An efficient protocol for authenticated and secure message delivery in vehicular ad hoc networks." *Vehicular Communications* 4 (2016): 30-37. <http://www.sciencedirect.com/science/article/pii/S2214209616000115>

**Title: A Rasterization based Line Segment Intersection Algorithm for Urban Mobility Simulations**

**Authors:** Hernández, Benjamín, and Cheng Liu

**Abstract:** We propose a fast GPGPU solution that uses OpenGL 4 rasterization, per-pixel linked lists and almost zero driver overhead functions to find intersections in Road Networks for Urban Mobility Simulations. Results show our solution offers a speed up of 87x over traditional methods.

**Subject Areas:** Rasterization, Urban Mobility Simulations

**Availability:** Hernández, Benjamín, and Cheng Liu. "A Rasterization based Line Segment Intersection Algorithm for Urban Mobility Simulations." Poster, GPU Technology Conference [http://on-demand.gputechconf.com/gtc/2016/posters/GTC\\_2016\\_Algorithms\\_AL\\_03\\_P6345\\_WEB.pdf](http://on-demand.gputechconf.com/gtc/2016/posters/GTC_2016_Algorithms_AL_03_P6345_WEB.pdf)

**Title:** The effect of time interval of bus location data on real-time bus arrival estimations

**Authors:** Rahman, Md Matiur, S. C. Wirasinghe, and Lina Kattan

**Abstract:** One of the key components of real-time bus information systems is knowledge of bus locations in real time. With recent advancements in sensing and communication technologies, location data can be obtained frequently and incorporated into the estimation models. One important issue is determining the suitable time interval at which location data should be chosen as input for estimation models. This paper explores the impact of the time interval of real-time bus location data on the accuracy of bus arrival estimation. It also examines by how much, and at what distance, real-time arrival information can outperform information provided from a static schedule for a given estimation technique. This study also investigates the 'cutoff horizon,' the threshold horizon beyond which real-time information no longer outperforms information based on a particular static schedule, and how the cutoff horizon changes with the time interval of bus location data.

**Subject Areas:** Real-time, location interval, bus arrival, estimation, prediction

**Availability:** Rahman, Md Matiur, S. C. Wirasinghe, and Lina Kattan. "The effect of time interval of bus location data on real-time bus arrival estimations." *Transportmetrica A: Transport Science* (2016): 1-21. <http://www.tandfonline.com/doi/abs/10.1080/23249935.2016.1166159>

**Title: A comparison of multiple behavior models in a simulation of the aftermath of an improvised nuclear detonation**

**Authors:** Parikh N, Hayatnagarkar HG, Beckman RJ, Marathe MV, Swarup S.

**Abstract:** We describe a large-scale simulation of the aftermath of a hypothetical 10kT improvised nuclear detonation at ground level, near the White House in Washington DC. We take a synthetic information approach, where multiple data sets are combined to construct a synthesized representation of the population of the region with accurate demographics, as well as four infrastructures: transportation, healthcare, communication, and power. In this article, we focus on the model of agents and their behavior, which is represented using the options framework. Six different behavioral options are modeled: household reconstitution, evacuation, healthcare-seeking, worry, shelter-seeking, and aiding & assisting others. Agent decision-making takes into account their health status, information about family members, information about the event, and their local environment. We combine these behavioral options into five different behavior models of increasing complexity and do a number of simulations to compare the models.

**Subject Areas:** Social simulation – Behavior modeling – Disaster modeling

**Availability:** Parikh, Nidhi, et al. "A comparison of multiple behavior models in a simulation of the aftermath of an improvised nuclear detonation." *Autonomous Agents and Multi-Agent Systems* (2016): 1-27. <http://link.springer.com/article/10.1007/s10458-016-9331-y>

**Title: Transport Survey Methods: Best Practice for Decision Making**

**Authors:** Zmud, Johanna

**Abstract:** n/a

**Subject Areas:** transport survey methods

**Availability:** Zmud, Johanna. Transport survey methods: Best practice for decision making. Emerald Group Publishing, 2013. "Index" In Transport Survey Methods: Best Practice for Decision Making. Published online: 08 Feb 2016; 781-798.  
<http://www.emeraldinsight.com/doi/pdf/10.1108/9781781902882-044>

**Title: Extracting And Modeling Commuting Networks From Social Media Communication**

**Authors:** Mota DD, José OT

**Abstract:** Commuting networks describe the flows of individuals from one location to another. These networks are present in many different application scenarios, including traffic modeling, infrastructure planning, and epidemic simulation. Traditionally, commuting networks are created using data from costly and outdated surveys. This dissertation shows how individual's location information can be data mined from social media communication and be used to build commuting networks. Some of the problems discussed in this dissertation include the quality aspects of location information obtained from social media and the lack of representation of social media users in the overall general population. Two models for commuting networks, the gravity model and the radiation model, are described and evaluated. This dissertation also presents GeoDigger, a tool that can be used to help researchers collect location information from Twitter, one of the most popular online social networks. GeoDigger can exclude non-human social activity based on a machine learning technique adapted to work with imbalanced data.

**Subject Areas:** commuting networks; social media communication; geodigger

**Availability:** Mota DD, José OT. Extracting and modeling commuting networks from social media communication (Doctoral dissertation, Colorado School of Mines).

**Title: What Matters Most in Transportation Demand Model Specifications: A Comparison of Outputs in a Mid-size Network**

**Authors:** Chen, T. Donna, Kara M. Kockelman, and Yong Zhao

**Abstract:** This paper examines the impact of travel demand modeling (TDM) disaggregation techniques in the context of medium-sized communities. Specific TDM improvement strategies are evaluated for predictive power and flexibility with case studies based on the Tyler, Texas, network. Results suggest that adding time-of-day disaggregation, particularly in conjunction with multi-class assignment, to a basic TDM framework has the most significant impacts on outputs. Other strategies shown to impact outputs include adding a logit mode choice model and incorporating a congestion feedback loop. For resource-constrained communities, these results show how model output and flexibility vary for different settings and scenarios.

**Subject Areas:** Household travel survey; Add-on program; NHTS uses

**Availability:** Chen, T. Donna, Kara M. Kockelman, and Yong Zhao. "What Matters Most in Transportation Demand Model Specifications: A Comparison of Outputs in a Mid-size Network." A Message from the JTRF Co-General Editors 3 54.2 (2015): 71.  
<http://www.trforum.org/journal/downloads/2015v54n2.pdf#page=73>



## 8. Traffic Safety

**Title:** Driving performance while using a mobile phone: A simulation study of Greek professional drivers

**Authors:** Papadakaki M, Tzamalouka G, Gnardellis C, Lajunen TJ, Chliaoutakis J.

**Abstract:** Purpose: The current study aims to assess the driving performance of professional drivers while using a mobile phone. Material and methods: A sample of 50 male professional drivers participated in the study. The sample was drawn conveniently from the professional drivers' registries and the main taxi ranks. The inclusion criteria were: (a) age above 18 years, (b) possession of a driving license, (c) sufficient reading, writing, and communicating skills, (d) informed consent prior to participation. Laboratory tests were conducted using the VS500M driving simulator manufactured by Virage Simulation Inc. The intervention involved different tasks/assignments: (a) driving without using a mobile phone (Control time), (b) driving while having a conversation on the mobile phone, (Task\_1), (c) driving while reading out loud text messages (Task\_2) and, (d) driving while texting (Task\_3). Differences in the driving performance between the control time and the time with assignments, were examined. The participants were evaluated on the followings outcome measures: (a) variation of the steering position per second, (b) following distance per second, (c) variation of the lateral lane position per second, and (d) sum of squared acceleration per second. Results: The analysis indicated that "variation of the steering position per second" was significantly affected by "text-message reading" [ $t(50) = -5.443$ ;  $p < 0.0001$ ] and "texting" [ $t(50) = -5.442$ ;  $p < 0.0001$ ]. A significant main effect was observed in terms of the "following distance per second" and the "variation of the lateral lane position per second" for all the three mobile phone assignments. Lastly, the "sum of squared acceleration per second" was significantly decreased during conversation on the phone [ $t(50) = 2.713$ ;  $p = 0.009$ ] as well as during texting [ $t(50) = 3.428$ ;  $p = 0.001$ ] as compared with the control time. Conclusions: The study is among the few existing experimental studies in a country with one of the highest road fatalities in Europe but with limited evidence on road traffic behaviour. This study could guide the design of large-scale simulation studies aiming to explore the impact of mobile phone on driving behaviour.

**Subject Areas:** Simulation; Professional drivers; Mobile phone; Texting; Text-message reading; Performance

**Availability:** Papadakaki, Maria, et al. "Driving performance while using a mobile phone: a simulation study of Greek professional drivers." *Transportation research part F: traffic psychology and behaviour* 38 (2016): 164-170.

<http://www.sciencedirect.com/science/article/pii/S1369847816000267>

**Title: Compliance With and Enforcement of Graduated Driver Licensing Restrictions**

**Authors:** Curry, A. E., Pfeiffer, M. R., & Elliott, M. R.

**Abstract:** Introduction: Graduated Driver Licensing (GDL) is the most effective strategy to reduce the burden of young driver crashes, but the extent to which young intermediate (newly licensed) drivers comply with, and police enforce, important GDL passenger and night-time restrictions is largely unknown. Population-level rates of intermediate drivers' compliance were estimated as well as police enforcement among crash-involved drivers who were noncompliant.

Methods: New Jersey's statewide driver licensing and crash databases were individually linked. The quasi-induced exposure method's fundamental assumption—that nonresponsible young intermediate drivers in clean (i.e., only one responsible driver) multivehicle crashes are reasonably representative of young intermediate drivers on the road—was borrowed. Incidence was then estimated among the 9,250 nonresponsible intermediate drivers who were involved in clean multivehicle crashes from July 2010 through June 2012. The proportion of crash-involved noncompliant intermediate drivers who were issued a GDL citation, by crash responsibility, was calculated. Data were collected in 2013 and analyzed in 2015.

Results: Overall, 8.3% (95% CI=7.8%, 8.9%) of intermediate drivers' trips were noncompliant with New Jersey's passenger restriction and 3.1% (95% CI=2.8%, 3.5%) with its night-time restriction; compliance was significantly lower among those residing in low-income and urban areas, among male drivers, on weekends, and in summer months. The proportion of crash-involved noncompliant intermediate drivers who were issued a GDL citation was low (nonresponsible drivers, 10.3%; responsible drivers, 19.0%).

Conclusions: The vast majority of intermediate driver trips are in compliance with GDL restrictions. Outreach activities should consider focusing on higher-risk situations and groups with higher noncompliance rates

**Subject Areas:** crash; GDL Graduated Driver's License

**Availability:** Curry, A. E., Pfeiffer, M. R., & Elliott, M. R. (2016). Compliance with and enforcement of graduated driver licensing restrictions. *American journal of preventive medicine*. <http://dx.doi.org/10.1016/j.amepre.2016.08.024>

**Title: Evaluation of the Population Distribution of VSLs by Combining New Vehicle Safety Estimates with a Model of Vehicle Choice**

**Authors:** Sheehan-Connor, Damien

**Abstract:** Many of the studies estimating the value of statistical life (VSL) use labor market estimates that may apply best to a subset of the population that is relatively homogeneous in terms of income and other characteristics. Since many households choose to own automobiles, the safety implications of this choice can be used to estimate the distribution of VSLs and its correlation with income and other demographic variables using broad support in the explanatory variables. A recently developed model of automotive safety (Economic Inquiry 53(3): 1606-29) uses Fatality Analysis Reporting System (FARS) data to estimate the level of safety of vehicles at the model by model year level. Specifically, the probability of someone dying in a particular vehicle over the course of a year is calculated. This probability is a complex function of vehicle weight, class, manufacturer, vehicle age, mean number of vehicle occupants, age of vehicle occupants, and number of miles driven in a year. The safety estimates are combined with information on vehicle costs and data from the National Household Travel Survey (NHTS) to calculate the marginal cost of saving a statistical life for each vehicle type for a particular household. The NHTS provides data from a random selection of households about household characteristics, the vehicle(s) owned by those households, and the way in which these vehicles are used. The safety cost variable is included in a regression model of vehicle choice with a rich set of control variables to impute a VSL for each household in the NHTS. The resulting distribution of VSLs provides evidence about the variation in risk preferences within the population and the correlation of these preferences with income and other demographic variables of interest.

**Subject Areas:** value of statistical life

**Availability:** Sheehan-Connor, Damien. "Evaluation of the Population Distribution of VSLs by Combining New Vehicle Safety Estimates with a Model of Vehicle Choice." 6th Biennial Conference of the American Society of Health Economists. Ashecon, 2016.  
<https://ashecon.confex.com/ashecon/2016/webprogram/Paper4051.html>

## **Title: A Safety Analysis of Spatial Phenomena about the Residences of Drivers Involved in Crashes**

**Authors:** Kweku Tekyi Brown

**Abstract:** This research was conducted to assist in transportation safety planning at both a macro (statewide) and micro (neighborhood) level of geography. Addressing safety issues at high crash incidence locations through crash countermeasures or better geometric design helps to make our roadways safer; however, the most influential and ever-present factor in most crashes, the human factor, is not directly addressed. Therefore, the primary goal of this research was to identify and analyze phenomena about the residences of drivers involved in crashes using spatial and statistical methods. These phenomena include socioeconomic and demographic characteristics of neighborhoods where these drivers live and the proximity of crashes to driver residences. Understanding the correlation between the densities of drivers involved in crashes and characteristics of neighborhoods where they live may help to optimize expenditure of scarce safety funds on safety programs that better target current and future high risk drivers. To add to this goal, a more focused probe into young driver behavior was done through an investigation into teen driver crash involvement within South Carolina public high school districts. Also, an investigation into the proximity of traffic crashes from driver residences was done to identify any relationships or possible correlations with trip lengths.

The residential locations of drivers involved in crashes in South Carolina, found using 9-digit zip codes acquired from the South Carolina Department of Motor Vehicles (SCDMV), were crucial to the success of this research. Other important data elements needed for this research were: spatially accurate crash data, census socio-demographic data and boundaries at a relatively fine scale (block group level), high school attendance zone statistics and boundaries, routable street networks, and statewide grid cells at one square mile resolution. A combination of spatial analysis techniques (crash location coordinate geocoding, driver residential 9-digit zip code geocoding, block group aggregation, cluster analysis, grid cell aggregation, and network analysis) and statistical analysis methods (odds ratio, risk ratio, correlation analysis, multiple linear regression and Chi-square tests) were used in this research.

The results of the spatial and statistical analyses conducted in this research demonstrate the significance of relationships between high and low density clusters of drivers involved in fatal and injury crashes (at-risk drivers) and the socio-economic and demographic characteristics of the residential areas where these at-risk drivers live. For example, the median household income and educational attainment (at least college degree attained) variables showed a negative correlation to the at-risk driver clusters, meaning that areas with high median household income and high educational attainment were more likely to have fewer at-risk drivers than other areas. Also, the regression estimates suggest that public high school zones with high graduation rates, high overall enrollment, and less money spent per student (low poverty index) have a lower rate of young driver involvement in fatal and injury crashes compared to zones with low graduation rates, low enrollment, and more dollars spent per student (high poverty index). Although the proximity analysis results suggest that approximately 35% of crashes occur within 5 miles of the driver's residence, the risk ratio analysis shows that considering only trip length, the probability of being involved in a fatal or injury crash is lower for trips closer to home when normalized based on the number of actual

trip lengths. Lastly, the one square mile grid aggregation of both at-risk drivers and crashes of specific contributing factors help zero in on areas to be concentrated on from a safety program implementation and enforcement standpoint.

This research could potentially assist the decisions of state officials with regard to selecting and implementing transportation safety programs and strategies for the safety emphasis areas in South Carolina's current strategic highway safety plan, 'Target Zero'. Overall, a more holistic approach to transportation safety would be to encourage transportation professionals and state policy makers to consider the approach taken in this research where drivers are made the focus of transportation safety in combination with the more traditional methods of addressing safety through countermeasure implementation and better geometric design, thus optimizing the use of limited state funds and resources.

**Subject Areas:** crash, safety, neighborhood characteristics

**Availability:** Brown, Kweku Tekyi. "A Safety Analysis of Spatial Phenomena about the Residences of Drivers Involved in Crashes." (2016).  
[http://tigerprints.clemson.edu/all\\_dissertations/1746/](http://tigerprints.clemson.edu/all_dissertations/1746/)

**Title: The role of intersection and street design on severity of bicycle-motor vehicle crashes**

**Authors:** Asgarzadeh, M., Verma, S., Mekary, R. A., Courtney, T. K., & Christiani, D. C.

**Abstract:** Background Safety concerns are a major barrier to cycling. Intersection and street design variables such as intersection angles and street width might contribute to the severity of crashes and the safety concerns. In this study we examined whether these design variables were associated with bicycle-motor vehicle crashes (BMVC) severity.

**Methods** Using the geographical information system and latitudes/longitudes recorded by the police using a global positioning device, we extracted intersection angles, street width, bicycle facilities, posted speed limits and annual average daily traffic from 3266 BMVC data from New York City police records. Additional variables about BMVC, including age and sex of the bicyclist, time of the day, road surface conditions, road character, vehicle type and injury severity, were obtained from police reports. Injury severity was classified as severe (incapacitating or killed) or non-severe (non-incapacitating, possible injury). The associations between injury severity and environment design variables were examined using multivariate log-binomial regression model.

**Findings** Compared with crashes at orthogonal intersections, crashes at non-orthogonal intersections had 1.37 times (95% CI 1.05 to 1.80) and non-intersection street segments had 1.31 times (95% CI 1.01 to 1.70) higher risk of a severe injury. Crashes that involved a truck or a bus were twice as likely to result in a severe injury outcome; street width was not significantly associated with injury severity.

**Conclusion** Crashes at non-orthogonal intersections and non-intersection segments are more likely to result in higher injury severity. The findings can be used to improve road design and develop effective safety interventions.

**Subject Areas:** bicycle safety; vehicle crash severity;

**Availability:** Asgarzadeh, M., Verma, S., Mekary, R. A., Courtney, T. K., & Christiani, D. C. (2016). The role of intersection and street design on severity of bicycle-motor vehicle crashes. *Injury Prevention*, injuryprev-2016.

<http://injuryprevention.bmj.com/content/early/2016/11/09/injuryprev-2016-042045.abstract>

**Title: Research topics and implementation trends on automotive head-up display systems**

**Authors:** Betancur, J. A., Villa-Espinal, J., Osorio-Gómez, G., Cuéllar, S., & Suárez, D.

**Abstract:** For about 5 years, production of automobiles equipped with head-up display (HUD) systems has continuously grown and this trend will remain for at least three years more from 2014 [7, 19]. Therefore, looking for clarifying how to orientate future efforts in developing these systems, a systematic analysis approach has been implemented for identifying best design practises, common characteristics, gaps, implementation trends and research topics on automotive HUD systems. The proposed approach is conducted on two areas, firstly exploring the current scientific literature to find the most relevant research topics and understanding how these are evolving. Secondly, a competitive intelligence analysis was conducted compiling patents related to automotive HUD systems. This analysis was specially oriented towards determining, currently and in the near future, basic product design implementation trends in automotive HUD systems. Finally, the results obtained from both scientific and technological points of view were compared and commented, looking for determining common, converging or diverging, evolution parameters in automotive HUD systems. In this way, the results exposed the distraction as an outstanding research topic for these systems, becoming even more crucial if they are mixed with augmented reality projections, advanced driver assistance systems (ADAS) or infotainment systems.

**Subject Areas:** Head-up display, Human-machine interface, Product architecture, Bibliometrics, Patent activity, Academic activity

**Availability:** Betancur, J. Alejandro, et al. "Research topics and implementation trends on automotive head-up display systems." *International Journal on Interactive Design and Manufacturing (IJIDeM)* (2016): 1-16. <http://link.springer.com/article/10.1007/s12008-016-0350-3>

**Title:** Sharing the Road: Safety Tips for Drivers and Cyclists

**Authors:** Sara Cline

**Abstract:** n/a

**Subject Areas:** bicycle safety; driver awareness

**Availability:** Cline, Sara. Nov. 26, 2106 Sharing the Road: Safety Tips for Drivers and Cyclists  
<http://www.tauntingazette.com/news/20161126/sharing-road-safety-tips-for-drivers-and-cyclists>



**Title: Recent Trends in Driver Safety Monitoring Systems: State of the Art and Challenges**

**Authors:** Koesdwiady, A., Soua, R., Karray, F., & Kamel, M. S.

**Abstract:** Driving in busy highways and roads is becoming complex and challenging as more cars are hitting our roads. Safe driving requires attentive drivers, quality perception of the environment, awareness of the situation and critical decision making to react properly in emergency situations. This paper provides an overview on driver safety monitoring systems. We study various driver sources of inattention while providing a comprehensive taxonomy. Then, different safety systems, that tackle driver inattention, are reported. Furthermore, we present the new generation of driver monitoring systems within the context of Internet of Cars. Thus, we introduce the concept of integrated safety where smart cars collect information from the driver, the car, the road and most importantly the surrounding cars to build an efficient environment for the driver. We conclude by highlighting issues and emerging trends envisioned by the research community.

**Subject Areas:** integrated safety, Driver states monitoring systems, driver distraction, driver fatigue

**Availability:** Koesdwiady, A., Soua, R., Karray, F., & Kamel, M. S. (2016). Recent Trends in Driver Safety Monitoring Systems: State of the Art and Challenges. IEEE Transactions on Vehicular Technology. <http://ieeexplore.ieee.org/abstract/document/7752938/>

**Title:** Accidental Poisoning Deaths—Mostly Drug Overdoses—Exceed Homicides of U.S. Young Adults

**Authors:** Beth Jarosz and Alicia VanOrman

**Abstract:** While mortality rates from both suicide and accidental poisoning increased among young adults over the past 15 years, the overall young adult mortality rate fell, partly due to declines in homicide and motor vehicle accidents.

**Subject Areas:** motor vehicle accidents

**Availability:** Jarosz, Beth, and Alicia VanOrman. "Population Reference Bureau." Feb. 2016  
<http://www.prb.org/Publications/Articles/2016/young-adult-suicide>

**Title: Joint Modeling Of Traffic Related Crashes: A Copula Based Approach**

**Authors:** Tammam Nashad

**Abstract:** The study contributes to safety literature on transportation safety by employing copula based models for count frequency analysis at a macro-level. Most studies in the transportation safety area identify a single count variable (such as vehicular, pedestrian or bicycle crash counts) for a spatial unit and study the impact of exogenous variables. While the traditional count models perform adequately in the presence of a single count variable, it is necessary to modify these approaches to examine multiple dependent variables for each study unit. To that extent, the current research effort contributes to literature by developing two multivariate models based on copula methodology. First, a copula based bivariate negative binomial model for pedestrian and bicyclist crash frequency analysis is developed. Second, a multivariate negative binomial model for crashes involving non-motorized road users, passenger cars, vans, light trucks and heavy trucks is proposed. The proposed approaches also accommodate for potential heterogeneity (across zones) in the dependency structure. The formulated models are estimated using traffic crash count data at the Statewide Traffic Analysis Zone (STAZ) level for the state of Florida for the years 2010 through 2012. The STAZ level variables considered in our analysis include exposure measures, socio-economic characteristics, road network characteristics and land use attributes. A policy analysis is also conducted along with a representation of hotspot identification to illustrate the applicability of the proposed model for planning purposes. The development of such spatial profiles will allow planners to identify high risk zones for screening and treatment purposes.

**Subject Areas:** safety; copula based methods;

**Availability:** Nashad, Tammam. "Joint modeling of traffic related crashes: a Copula based approach." Thesis UCF

<http://stars.library.ucf.edu/cgi/viewcontent.cgi?article=5874&context=etd>

**Title: Epidemiology of injuries sustained by rear-seat passengers in frontal motor vehicle crashes**

**Authors:** Bose, D., Crandall, J., Forman, J., Longhitano, D., & Arregui-Dalmases, C.

**Abstract:** Objective: Advanced occupant protection systems in motor-vehicles (e.g., seat belts and airbags), while widely adopted for front-seat passengers, are either absent or offer disproportionately lower safety to rear-seat passengers in similar crashes. Optimization of advanced restraint systems for the rear-seat environment will require a detailed understanding of epidemiology and associated risk factors for injuries sustained by rear-seat passengers. Thus, the objective of the study is to use national level motor-vehicle travel and crash data to quantify rear-seat travel exposure, and determine the descriptive characteristics and the injury outcomes for rear-seat passengers involved in frontal collisions.

Methods: While U.S. travel data from the 2009 National Household Travel Survey was used to determine rear-seat travel estimates, crash data from 2001 to 2010 National Automotive Sampling System Crash Worthiness Data System was used to enroll rear-seat passengers injured in a frontal crash. The descriptive epidemiology of rear-seat crash victims was separately done for the three age-groups: children (8–15 years old), adults (16–59 years old), and senior adults (60+).

Results: The study indicated that senior adults in rear-seats were associated with a significantly higher rate of sustaining fatal (6%) and severe injuries (16% for MAIS 3+ injuries) in comparison to the younger cohorts. The distribution of severe injuries further indicated that the thorax was the most frequently injured region across all age groups irrespective of the belt-use status.

Conclusions: Findings of the study conclude that while rear-seat travel in the U.S. is still very low and improving belt usage is a primary concern among rear-seat passengers; however, the epidemiology supports the need for adapting rear-seat restraint performance for effective protection for all groups of rear-seat passengers.

**Subject Areas:** Rear seat passenger; Seat belt; Motor vehicle crash; Airbag; Frontal crash; Optimized restrain systems

**Availability:** Bose, D., Crandall, J., Forman, J., Longhitano, D., & Arregui-Dalmases, C. (2016). Epidemiology of injuries sustained by rear-seat passengers in frontal motor vehicle crashes. *Journal of Transport & Health*.

<http://www.sciencedirect.com/science/article/pii/S221414051630175X>

**Title: Association of Graduated Driver Licensing With Driver, Non-Driver, and Total Fatalities Among Adolescents**

**Authors:** Zhu M, Zhao S, Long DL, Curry AE.

**Abstract:** Introduction: Graduated driver licensing systems typically require an extended learner permit phase, and create night-time driving or passenger restrictions for adolescent drivers. Restricted driving might increase the use of alternative transportation to replace driving and consequently increase crashes and injuries for passengers, bus riders, pedestrians, and bicyclists. This study examined whether graduated driver licensing increases non-driver fatalities among adolescents, and whether it reduces total traffic fatalities combining drivers and non-drivers. Methods: Longitudinal analyses were conducted using data from the 1995–2012 U.S. Fatality Analysis Reporting System. Adjusted rate ratios were estimated for being fatally injured in a crash according to: (1) presence/absence of a graduated driver licensing system; and (2) four levels of graduated driver licensing systems (absent, weak, medium, strong). Analyses were conducted in 2015. Results: Among adolescents aged 16 years, graduated driver licensing was not associated with increased passenger fatalities (adjusted rate ratio, 0.96; 95% CI=0.90, 1.03) or pedestrian and bicyclist fatalities (adjusted rate ratio, 1.09; 95% CI=0.85, 1.39), but was associated with an 11% reduction in total traffic fatalities. Among those aged 17 years, graduated driver licensing was not associated with increased fatalities as passengers, pedestrians, or bicyclists, and was not associated with reduced total traffic fatalities. Conclusions: In general, graduated driver licensing systems were not associated with increased fatalities as passengers, pedestrians, bicyclists, and bus riders. Graduated driver licensing systems were associated with reduced total fatalities of adolescents aged 16 years.

**Subject Areas:** graduated driver licensing systems; fatalities;

**Availability:** Zhu M, Zhao S, Long DL, Curry AE. Association of graduated driver licensing with driver, non-driver, and total fatalities among adolescents. American journal of preventive medicine. 2016 Apr 5.

**Title: Driver Distraction Using Visual-Based Sensors and Algorithms**

**Authors:** Fernández, A., Usamentiaga, R., Carús, J. L., & Casado, R.

**Abstract:** Driver distraction, defined as the diversion of attention away from activities critical for safe driving toward a competing activity, is increasingly recognized as a significant source of injuries and fatalities on the roadway. Additionally, the trend towards increasing the use of in-vehicle information systems is critical because they induce visual, biomechanical and cognitive distraction and may affect driving performance in qualitatively different ways. Non-intrusive methods are strongly preferred for monitoring distraction, and vision-based systems have appeared to be attractive for both drivers and researchers. Biomechanical, visual and cognitive distractions are the most commonly detected types in video-based algorithms. Many distraction detection systems only use a single visual cue and therefore, they may be easily disturbed when occlusion or illumination changes appear. Moreover, the combination of these visual cues is a key and challenging aspect in the development of robust distraction detection systems. These visual cues can be extracted mainly by using face monitoring systems but they should be completed with more visual cues (e.g., hands or body information) or even, distraction detection from specific actions (e.g., phone usage). Additionally, these algorithms should be included in an embedded device or system inside a car. This is not a trivial task and several requirements must be taken into account: reliability, real-time performance, low cost, small size, low power consumption, flexibility and short time-to-market. The key points for the development and implementation of sensors to carry out the detection of distraction will also be reviewed. This paper shows a review of the role of computer vision technology applied to the development of monitoring systems to detect distraction. Some key points considered as both future work and challenges ahead yet to be solved will also be addressed.

**Subject Areas:** driver distraction detection; visual-based sensors; image processing

**Availability:** Fernández, A., Usamentiaga, R., Carús, J. L., & Casado, R. (2016). Driver distraction using visual-based sensors and algorithms. *Sensors*, 16(11), 1805. <http://www.mdpi.com/1424-8220/16/11/1805/htm>

**Title: Changes in Driving Performance Following Shoulder Arthroplasty**

**Authors:** Hasan, Saqib, Alan McGee, Garret Garofolo, Mathew Hamula, Cheongeun Oh, Young Kwon, and Joseph Zuckerman

**Abstract:** Background: With this study, we sought to quantify perioperative changes in driving performance among patients who underwent anatomic or reverse shoulder arthroplasty.

Methods: Using a driving simulator, 30 patients (20 anatomic and 10 reverse total shoulder arthroplasties) were tested preoperatively and at 2 weeks (PO2), 6 weeks (PO6), and 12 weeks (PO12) postoperatively. The total number of collisions, centerline crossings, and off-road excursions (when the vehicle traversed the lateral road edge), and scores on a visual analog scale (VAS) for pain and the Shoulder Pain and Disability Index (SPADI) were recorded at each driving trial.

Results: The mean number of collisions increased from 5.9 preoperatively to 7.4 at PO2 and subsequently decreased to 5.6 at PO6 and 4.0 at PO12 ( $p = 0.0149$ ). In addition, the number of centerline crossings decreased from 21.4 preoperatively to 16.3 at PO12 ( $p < 0.05$ ). Multivariate analysis of the data demonstrated that increased VAS for pain scores, older age, and less driving experience had a negative impact on driving performance.

Conclusions: Driving performance returned to preoperative levels at 6 weeks after shoulder arthroplasty. By 12 weeks postoperatively, patients demonstrated improved driving performance compared with preoperative performance. On the basis of our findings, clinicians can suggest a window of 6 to 12 weeks postoperatively for the gradual return to driving. However, for patients of older age, with less driving experience, or with greater pain, a return to driving at closer to 12 weeks postoperatively should be recommended.

**Subject Areas:** reverse shoulder arthroplasty; shoulder pain and disability index; driver performance

**Availability:** Hasan, Saqib, et al. "Changes in driving performance following shoulder arthroplasty." *J Bone Joint Surg Am* 98.17 (2016): 1471-1477.

[http://jbjs.org/content/98/17/1471?utm\\_source=carousel&utm\\_medium=homepage&utm\\_term=pos1&utm\\_campaign=jbjs-content-2016](http://jbjs.org/content/98/17/1471?utm_source=carousel&utm_medium=homepage&utm_term=pos1&utm_campaign=jbjs-content-2016)

**Title: Investigating Relationship between Driving Patterns and Traffic Safety using Smartphones Based Mobile Sensor Data**

**Authors:** Cetin, Mecit

**Abstract:** In spite of various advancements in vehicle safety technologies and improved roadway design practices, roadway crashes remain a major challenge. While certain hotspots may be unsafe primarily due to the geometric features of these locations, in many cases the safety risk seems to be an outcome of the unsafe driving patterns along the roadway stretching downstream and/or upstream of the actual crash locations. Even though there is plenty of research on correlating safety measures to roadway characteristics and some elements of traffic flow (e.g., exposure, speed), there is no significant literature on analyzing the correlation between high-resolution speed and acceleration data and crash risks along highway segments. Collecting such high-resolution data is now feasible with the mobile consumer devices such as smartphones. Smartphones are now equipped with sensors capable of recording vehicle performance data at a very fine temporal resolution in a cost-effective way. The current project used this mobile sensor data to identify unsafe driving patterns and quantified the relationship between these driving patterns and traffic crash incidences. The models with microscopic traffic measures were shown to be statistically better than traditional models that only control for roadway geometry and traffic exposure variables. Also, from a methodological standpoint, generalized count models that provide more flexibility through spatial dependency, heterogeneous dispersion, and random parameter heterogeneity were found to perform better than standard Poisson and Negative Binomial models.

**Subject Areas:** Mobile sensors, crash frequency, speed, acceleration, count models, Poisson, Negative Binomial, generalized ordered response

**Availability:** Cetin, Mecit. "Investigating Relationship between Driving Patterns and Traffic Safety using Smartphones Based Mobile Sensor Data." (2016). [http://www.matsutc.org/wp-content/uploads/2014/07/MobileSensorsProject\\_FinalReport.pdf](http://www.matsutc.org/wp-content/uploads/2014/07/MobileSensorsProject_FinalReport.pdf)



**Title: A Visual Search Model for In-Vehicle Interface Design**

**Authors:** Lee, Ja Young, Joonbum Lee, and John D. Lee

**Abstract:** As in-vehicle infotainment systems gain new functionality, their potential to distract drivers increases. Searching for an item on interface is a critical concern because a poorly designed interface that draws drivers' attention to less important items can extend drivers' search for items of interest and pull attention away from roadway events. This potential can be assessed in simulator-based experiments, but computational models of driver behavior might enable designers to assess this potential and revise their designs more quickly than if they have to wait weeks to compile human subjects data. One such model, reported in this paper, predicts the sequence of eye fixations of drivers based on a Boolean Map-based Saliency model augmented with top-down feature bias. Comparing the model predictions to empirical data shows that the model can predict search time, especially in cluttered scenes and when a target item is highlighted. We also describe the integration of this model into a web application (<http://distraction.engr.wisc.edu/>) that can help assess the distraction potential of interface designs.

**Subject Areas:** infotainment systems; Boolean map-based Saliency

**Availability:** Lee, Ja Young, Joonbum Lee, and John D. Lee. "A Visual Search Model for In-Vehicle Interface Design." Proceedings of the Human Factors and Ergonomics Society Annual Meeting. Vol. 60. No. 1. SAGE Publications, 2016. <http://pro.sagepub.com/content/60/1/1874.short>

**Title: Evaluation of the Population Distribution of VSLs by Combining New Vehicle Safety Estimates with a Model of Vehicle Choice**

**Authors:** Damien Sheehan-Connor

**Abstract:** Many of the studies estimating the value of statistical life (VSL) use labor market estimates that may apply best to a subset of the population that is relatively homogeneous in terms of income and other characteristics. Since many households choose to own automobiles, the safety implications of this choice can be used to estimate the distribution of VSLs and its correlation with income and other demographic variables using broad support in the explanatory variables. A recently developed model of automotive safety (Economic Inquiry 53(3): 1606-29) uses Fatality Analysis Reporting System (FARS) data to estimate the level of safety of vehicles at the model by model year level. Specifically, the probability of someone dying in a particular vehicle over the course of a year is calculated. This probability is a complex function of vehicle weight, class, manufacturer, vehicle age, mean number of vehicle occupants, age of vehicle occupants, and number of miles driven in a year. The safety estimates are combined with information on vehicle costs and data from the National Household Travel Survey (NHTS) to calculate the marginal cost of saving a statistical life for each vehicle type for a particular household. The NHTS provides data from a random selection of households about household characteristics, the vehicle(s) owned by those households, and the way in which these vehicles are used. The safety cost variable is included in a regression model of vehicle choice with a rich set of control variables to impute a VSL for each household in the NHTS. The resulting distribution of VSLs provides evidence about the variation in risk preferences within the population and the correlation of these preferences with income and other demographic variables of interest.

**Subject Areas:** VSL; FARS;

**Availability:** Sheehan-Connor D. Evaluation of the Population Distribution of VSLs by Combining New Vehicle Safety Estimates with a Model of Vehicle Choice. In 6th Biennial Conference of the American Society of Health Economists 2016 Jun 14. Ashecon.

<https://ashecon.confex.com/ashecon/2016/webprogram/Paper4051.html>

**Title: Prefrontal Cortex Activation and Young Driver Behaviour: A fNIRS Study****Authors:** Foy, Hannah J., Patrick Runham, and Peter Chapman

**Abstract:** Driving is a task mainly reliant on the visual system. Most of the time, while driving, our eyes are constantly focusing and refocusing between the road and the dashboard or near and far traffic. Thus, prolonged driving time should produce visual fatigue. Here, for the first time, we investigated the effects of driving time, a common inducer of driver fatigue, on two ocular parameters: the accommodative response (AR) and the intraocular pressure (IOP). A pre/post-test design has been used to assess the impact of driving time on both indices. Twelve participants (out of 17 recruited) completed the study (5 women,  $24.42 \pm 2.84$  years old). The participants were healthy and active drivers with no visual impairment or pathology. They drove for 2 h in a virtual driving environment. We assessed AR and IOP before and after the driving session, and also collected subjective measures of arousal and fatigue. We found that IOP and AR decreased (i.e., the accommodative lag increased) after the driving session ( $p = 0.03$  and  $p < 0.001$ , respectively). Moreover, the nearest distances tested (20 cm, 25 cm, and 33 cm) induced the highest decreases in AR (corrected  $p$ -values  $< 0.05$ ). Consistent with these findings, the subjective levels of arousal decreased and levels of fatigue increased after the driving session (all  $p$ -values  $< 0.001$ ). These results represent an innovative step towards an objective, valid, and reliable assessment of fatigue-impaired driving based on visual fatigue signs.

**Subject Areas:** young male; prefrontal cortex activation; overtaking

**Availability:** Foy, Hannah J., Patrick Runham, and Peter Chapman. "Prefrontal cortex activation and young driver behaviour: a fNIRS study." PLoS one 11.5 (2016): e0156512.  
<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0156512>

**Title: Driving time modulates accommodative response and intraocular pressure**

**Authors:** Vera J, Diaz-Piedra C, Jiménez R, Morales JM, Catena A, Cardenas D, Di Stasi LL.

**Abstract:** Driving is a task mainly reliant on the visual system. Most of the time, while driving, our eyes are constantly focusing and refocusing between the road and the dashboard or near and far traffic. Thus, prolonged driving time should produce visual fatigue. Here, for the first time, we investigated the effects of driving time, a common inducer of driver fatigue, on two ocular parameters: the accommodative response (AR) and the intraocular pressure (IOP). A pre/post-test design has been used to assess the impact of driving time on both indices. Twelve participants (out of 17 recruited) completed the study (5 women,  $24.42 \pm 2.84$  years old). The participants were healthy and active drivers with no visual impairment or pathology. They drove for 2 h in a virtual driving environment. We assessed AR and IOP before and after the driving session, and also collected subjective measures of arousal and fatigue. We found that IOP and AR decreased (i.e., the accommodative lag increased) after the driving session ( $p = 0.03$  and  $p < 0.001$ , respectively). Moreover, the nearest distances tested (20 cm, 25 cm, and 33 cm) induced the highest decreases in AR (corrected  $p$ -values  $< 0.05$ ). Consistent with these findings, the subjective levels of arousal decreased and levels of fatigue increased after the driving session (all  $p$ -values  $< 0.001$ ). These results represent an innovative step towards an objective, valid, and reliable assessment of fatigue-impaired driving based on visual fatigue signs.

**Subject Areas:** Fatigue; Neuroergonomics; Ocular biomarkers; Road safety; Sleepiness; Time-on-task

**Availability:** Vera, Jesús, et al. "Driving time modulates accommodative response and intraocular pressure." *Physiology & behavior* 164 (2016): 47-53.  
<http://www.sciencedirect.com/science/article/pii/S0031938416303110>

**Title: Oh Deer! Analyzing the Impact of RIT Expansion and Development on White-tailed Deer (Odocoileus Virginianus) and Vehicle Collisions from 1993-2014**

**Authors:** De Naples, Gina

**Abstract:** Increases in both human and deer populations, combined with habitat loss, habitat fragmentation, and decreased predation, have led to increases in deer-vehicle collisions (DVCs). The development of RIT over the past 20 years mimics typical urban/suburban development patterns, with documented deer-vehicle collisions. This research examines deer-vehicle collisions in regards to campus development, notably Park Point, to determine whether collisions are increasing or decreasing and to evaluate landscape variables that might be contributing factors. Data from 1993-2014, contributed by the RIT Campus Safety Office and the Monroe County Sheriff Office are modelled using ArcGIS software. This research builds on a previous research project and includes data collection via a social media survey. Findings show that strike counts are down, and that the areas of focus have shifted more toward the south. People are currently seeing more deer toward the south side of campus, indicating that the deer are possibly shifting their habitat preferences toward the south side of campus, which identifies several potential focus areas for RIT. It is recommended that RIT's Facilities Management Services consider adding speed bumps or an alternative method such as flashing lights to alert drivers when deer are in the area along the southern loop to reduce driver speed and reduce the possibility of a deer strike in this area.

**Subject Areas:** deer-vehicle collision; RIT

**Availability:** De Naples, Gina. "Oh Deer! Analyzing the Impact of RIT Expansion and Development on White-tailed Deer (Odocoileus Virginianus) and Vehicle Collisions from 1993-2014." (2016).

**Title: Too Close to Home? An Investigation into Crash Proximity Relative to Driver Residences in South Carolina**

**Authors:** Brown, Kweku, Wayne A. Sarasua, and Jennifer H. Ogle

**Abstract:** A national survey by a major insurance company on 11,000 policy holders in 2001 found that over 50% of crashes polled occurred within 5 miles from the residences of those involved in the crash. This paper investigates the proximity of traffic crashes from driver residences and how this relationship correlates with trip lengths. The lack of academic literature with regard to crash proximity to homes is one of the primary motivations for this paper. Previous studies identified in the literature were based on Euclidean distance rather than network distance. The 2001 insurance survey relied on self-reported distance data which could be either over-estimated or under-estimated. This research takes advantage of the network and spatial analysis capabilities of a geographic information system (GIS) to analyze crash location proximity to drivers' residences. Driver data from nearly 700,000 crashes in South Carolina from 2007 to 2012 are used in the analysis. The analysis results suggest that approximately 35% of crashes occur within 3.5 miles of the driver's residence. This percentage varies significantly from the survey results reported in 2001 which indicate that over 50% of crashes occur within 5 miles of the driver's residence. The crash proximity distributions do not vary based on severity, gender, year, or fault. At 5 miles or less from home, the frequency distribution of crash proximity is lower compared to the National Household Travel Survey (NHTS) auto trip frequency distribution. At 20 and 30 miles from home, risk ratios for women are 10% and 41% greater than risk ratios for men. Overall, the findings of this research suggest that, considering only trip length, the probability of being involved in a fatal or injury crash is lower for trips closer to home. Future research could possibly identify factors that contribute to the lower probability of crashes occurring closer to home.

**Subject Areas:** Crash injuries; Fatalities; Geographic information systems; Network analysis (Planning); Residential location; Spatial analysis; Traffic crashes; Trip length

**Availability:** Brown, Kweku, Wayne A. Sarasua, and Jennifer H. Ogle. "Too Close to Home? An Investigation into Crash Proximity Relative to Driver Residences in South Carolina." Transportation Research Board 95th Annual Meeting. No. 16-6874. 2016. <https://trid.trb.org/view.aspx?id=1394523>

## 9. Transit Planning

**Title:** Quantifying the impacts of horizontal and vertical equity in transit route planning

**Authors:** Camporeale, R., Caggiani, L., Fonzone, A., & Ottomanelli, M.

**Abstract:** Equity refers to a fair sharing of costs or resources. Horizontal equity concerns distribution among individuals or groups with the same necessities, whereas vertical equity should be considered in situations with different levels of needs. This paper deals with transit service, looking at how to make it equitable from a spatial and social point of view. Traditionally equity has been neglected in transit planning, being in the best cases an afterthought during service provision. Hence, we propose a methodology to plan and design public transport routes, which meets the needs of communities fostering equitable accessibility. In this paper we put forward a method to incorporate horizontal and vertical equity goals in a Transit Network Design Problem. We study how the costs of the system change with the attained level of equity and found that higher overall costs may be born if more equitable service provision has to be pursued.

**Subject Area:** Accessibility, equity network design, transit planning

**Availability:** Camporeale, R., Caggiani, L., Fonzone, A., & Ottomanelli, M. (2016). Quantifying the impacts of horizontal and vertical equity in transit route planning. *Transportation Planning and Technology*, 1-17. <http://www.tandfonline.com/doi/abs/10.1080/03081060.2016.1238569>

**Title: Guest column | ST3: Too much money, not enough riders**

**Authors: Rowan Hinds**

**Abstract:** The key factor driving light-rail ridership is population density, and according to a U.S. Department of Transportation national household travel survey conducted in 2001, population densities above 10,000 people per square mile are needed before total transit (bus and light rail) ridership exceeds 5 percent of total daily trips. The results mirror similar studies in 1990 and 1995.

**Subject Area:** Light rail planning;

**Availability:** Hinds, Rowan, [www.theeastside.news](http://www.theeastside.news); Guest Column ST3: Too much money, not enough riders August 16, 2016

[http://www.theeastside.news/issaquah/opinion/contributors/guest-column-st-too-much-money-not-enough-riders/article\\_421fa6cc-63e9-11e6-ae70-fff545b099ed.html](http://www.theeastside.news/issaquah/opinion/contributors/guest-column-st-too-much-money-not-enough-riders/article_421fa6cc-63e9-11e6-ae70-fff545b099ed.html)



**Title: Public transportation adoption requires a paradigm shift in urban development structure**

Authors: Ercan, T., Onat, N. C., Tatari, O., & Mathias, J. D.

**Abstract:** Urban passenger transportation in the U.S. has been heavily dependent on car modes, mainly due to prevailing trends in urban development. However, transportation mode choice studies are currently limited to micro-level and regional-level boundaries, lacking of presenting a complete picture of the issues and the root causes associated with urban passenger transportation choices in the U.S. To this end, further analysis from a system perspective is required to investigate the interdependencies among system parameters more thoroughly, thus revealing the underlying mechanisms contributing or causing the low public transportation use in the U.S. Hence, system dynamics modeling approach is utilized to capture complex causal relationships among the critical system parameters affecting public transportation ridership in the U.S. as well as to identify possible policy areas to improve public transportation ridership rates. Considering the high degree of uncertainties inherent to the problem, multivariate sensitivity analysis is utilized to explore the effectiveness of existing and possible policy implications up to the year 2050 in the terms of their potential to increase transit ridership and locating critical parameters that influences the most on mode choice and emission rates. Transportation mode choice behavior is projected to change slightly and reach up to a maximum of 7.25% of public transportation ridership until 2050. Analysis results reveal that the effects of trip length and rate are by far the most influential factors. Both parameters are 99% sensitive compared to all other factors including the effects of fuel tax policies, federal funds for public transportation, use of alternative green bus technologies, increasing private vehicle occupancy rates, etc. on negative environmental, economic, and social impacts of transportation. This finding highlights how important urban structures are to secure the future of public transportation in the U.S. as the existing urban structures and the shared-idea in the minds of the society about how urban transportation should be (the prevailing paradigm) are the root causes of excessive trip generation and increasing average trip lengths. Thus a paradigm-shift, a radical change in the shared-idea in the minds of the society about existing urban structures, is needed.

**Subject Area:** Transportation mode choice; Urban development; System dynamics; Transportation emissions; Multivariate sensitivity analysis

**Availability:** Ercan, T., Onat, N. C., Tatari, O., & Mathias, J. D. (2016). Public transportation adoption requires a paradigm shift in urban development structure. *Journal of Cleaner Production*. <http://www.sciencedirect.com/science/article/pii/S0959652616319618>

**Title: The Impact of Light Rail Transit -Oriented Development on Residential Property Value in Seattle, WA**

**Authors: Ze Wang**

**Abstract:** University of Washington Abstract The Impact of Light Rail Transit-Oriented Development on Residential Property Value in Seattle, WA Ze Wang Chair of the Supervisory Committee: Professor Qing Shen Department of Urban Design and Planning The study seeks to investigate the impact of transit-oriented development (TOD) on residential property values using the case of Link light rail TOD in Seattle. While many previous studies decompose TOD impact into constituent parts, the study captures the integrated influence of TOD. Hedonic pricing method is employed and time-series analysis is conducted for three selected light rail station areas. Dummy variables are designed to reflect TOD proximity and relevant structural characteristics, locational conditions, as well as social-economic attributes are identified and controlled in regression models. Results demonstrate that TOD impact is different across time periods. In pre and during construction periods, TOD does not have statistical significant influence on the prices of residential properties; in after-construction period, TOD has significant positive impact on values of residential properties that are located within 0.25-0.50 mile from the light rail station.

**Subject Area:** Light rail planning;

**Availability:** Wang, Ze. The Impact of Light Rail Transit-Oriented Development on Residential Property Value in Seattle, WA. Diss. University of Washington, 2016.

[https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37259/Wang\\_washington\\_02500\\_16295.pdf?sequence=1&isAllowed=y](https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/37259/Wang_washington_02500_16295.pdf?sequence=1&isAllowed=y)

**Title:** An examination of recent trends in multimodal travel behavior among American motorists

**Authors:** Buehler, Ralph, and Andrea Hamre

**Abstract:** According to national statistics, 87% of all trips in the United States are by automobile and 90% of commuters typically get to work by car. Statistics for individual trips or the main mode of commuting do not capture variability in individual travel behavior over time. This article uses the 2001 and 2009 National Household Travel Surveys to analyze recent trends in the share of multimodal motorists who use a car and also walk, bicycle, or ride public transport during a day or week. This article identifies trends of multimodal behavior among car users in the United States and provides profiles of these multimodal motorists.

During a typical day about 14% of American car users make at least two trips by foot, bicycle, or public transport, while during a typical week about 25% of motorists make at least seven trips by means of transport other than the car. Results from a bivariate analysis and logistic regressions suggest significant shifts toward more multimodal behavior among motorists between 2001 and 2009. Multimodal motorists tend to be younger, educated beyond high school, in households without cars, and live in high-density neighborhoods with access to a rail system. Results suggest that planning for walking, cycling, and public transport benefits a larger proportion of the U.S. population than suggested by traditional trip-based analysis.

**Subject Area:** Multimodal car user, sustainable transport, travel behavior, trends 2001–2009, USA

**Availability:** Buehler, Ralph, and Andrea Hamre. "An examination of recent trends in multimodal travel behavior among American motorists." *International Journal of Sustainable Transportation* 10.4 (2016): 354-364.

<http://www.tandfonline.com/doi/abs/10.1080/15568318.2014.945672>

**Title: Willingness-to-pay for a bus fare reform: A contingent valuation approach with multiple bound dichotomous choices**

Authors: Chung, Yi-Shih, and Yu-Chiun Chiou

**Abstract:** The aims of this study are twofold: to measure travelers' willingness to pay (WTP) for bus travel under various travel distance for performing a bus fare reform, and to evaluate the reliability and validity of contingent valuation approach of dichotomous choice with multiple follow-up questions (DCm). To achieve so, this study designs triple-bound dichotomous choice contingent valuation scenarios, and employs multilevel interval regression to capture possible endogeneity within individuals. The estimated models using data with all three bounds, with the first two bounds, and with any specific single bound mostly gave consistent parameter significances and effect directions. However, the WTP estimated using the single third bound model demonstrated a different pattern from the other models, suggesting possible weariness effects. The analysis results also revealed yea-saying and free-riding effects, implying that respondents tended to say yes if their first two responses were yeses, and say no if their first two responses were noes. The yea-sayers had high income and low frequency in using public transit. On the other hand, the free riders significantly less supported the bus fare reform. Under well control of bound and path effects, WTP estimated by the proposed models was consistent with the WTP estimated with actual mode choice data, implying an anchor effect of current stage-based bus fares on travelers' WTP for future distance-based bus fare scheme. This study suggests that researchers who use DCm to evaluate WTP should investigate internally inconsistent responses caused by psychological and technical factors; DCm provides robust WTP estimates if the survey has been carefully designed with potential bound and path effects well controlled. More importantly, those internally inconsistent responses also provide information that is useful to fare reform.

**Subject Area:** Bus fare; Willingness to pay; Contingent valuation; Dichotomous choice

**Availability:** Chung, Yi-Shih, and Yu-Chiun Chiou. "Willingness-to-pay for a bus fare reform: A contingent valuation approach with multiple bound dichotomous choices." *Transportation Research Part A: Policy and Practice* 95 (2017): 289-304.

<http://scholarcommons.usf.edu/jpt/vol19/iss3/3/>

**Title: Characteristics Of Transit-Friendly Cities**

Authors: Sarah Doggett

**Abstract:** This thesis analyzes the relationships among the built environment, socioeconomics, and transit system attributes with respect to transit ridership in the 96 most populated urban areas in the United States. It concludes that the relative importance of these characteristics varies amongst several different types of city. After gathering extensive data on these characteristics for each of the 96 cities, a factor analysis, a cluster analysis, and a regression analysis were conducted to reveal patterns in the data. The analysis showed that the data could be grouped into underlying input and environment factors. These factors are used to identify like cities using cluster analysis. The thesis is divided into five sections: introduction, literature review, methodology, results, and conclusion.

**Subject Area:** transit ridership; cluster analysis

**Availability:** Doggett, Sarah. Characteristics of Transit-Friendly Cities. Diss. University of Delaware, 2016. <http://udspace.udel.edu/handle/19716/19589>

**Title: Exploring Passenger Assessments of Bus Service Quality Using Bayesian Networks**  
**Authors: Karner, Alex, Aaron Golub, and Celeste Chavis**

**Abstract:** Studies on public transit have emphasized the role of passenger satisfaction with service quality in travel choice decisions and indicated that satisfaction depends on various service attributes. Few studies have, however, systematically examined the underlying relationships among service attributes to assess their influence on passenger overall satisfaction. Therefore, to contribute to this rapidly-emerging literature, this paper applies Bayesian networks to quantify the influence of each service aspect on passenger overall satisfaction with regular bus service quality. This analysis involved 609 passengers who participated in a 2013 regular bus service survey in Nanjing, China. The derived Bayesian network shows the relationships among service attributes and passenger overall satisfaction graphically. In particular, service aspects such as running on schedule, acceptable waiting time, available seats, clean onboard environment, pleasant environment at stations, convenient design for transfers, and air-conditioning were the key determinants of overall satisfaction with bus service.

**Subject Area:** Passenger satisfaction; public transit; bus service quality; Bayesian networks

**Availability:** Wu, Jingxian, et al. "Exploring Passenger Assessments of Bus Service Quality Using Bayesian Networks." *Journal of Public Transportation* 19.3 (2016): 3.  
<http://scholarcommons.usf.edu/jpt/vol19/iss3/3/>

**Title: Regional Sky Transit II**

**Authors:** Brien A Seeley

**Abstract:** Regional Sky Transit (RST) is the name applied to a proposed system of ubiquitous, short-range, on-demand, affordable, point-to-point delivery of people by electrically-powered, autonomous, ultra-quiet Sky Taxis. The RST system relies upon easily accessible small, “pocket airparks” adequate for vertical or extremely short take off and landing (V/ESTOL) that allow the public to minimize ground travel time (GTT) on short trips within a highly populated mega-region. Regional Sky Transit was first presented in an AIAA paper at AVIATION 2015. That seminal paper has generated intense interest and inquiries leading to a number of follow-on explorations regarding RST’s viability, operational details, design requirements, and implementation plan. This paper presents those explorations along with an analysis of their significance.

**Subject Area:** sky taxi; autonomous; ground travel time

**Availability:** Brien A Seeley. "Regional Sky Transit II", 16th AIAA Aviation Technology, Integration, and Operations Conference, AIAA Aviation,

<http://dx.doi.org/10.2514/6.2016-3469>

**Title: Public Transit Equity Analysis at Metropolitan and Local Scales: A Focus on Nine Large Cities in the US**

**Authors:** Greg Phillip Griffin and Ipek Nese Sener

**Abstract:** Recent studies on transit service through an equity lens have captured broad trends from the literature and national-level data or analyzed disaggregate data at the local level. This study integrates these methods by employing a geostatistical analysis of new transit access and income data compilations from the Environmental Protection Agency. By using a national data set, this study demonstrates a method for income-based transit equity analysis and provides results spanning nine large auto-oriented cities in the US. Results demonstrate variability among cities' transit services to low-income populations, with differing results when viewed at the regional and local levels. Regional-level analysis of transit service hides significant variation through spatial averaging, whereas the new data employed in this study demonstrates a block-group scale equity analysis that can be used on a national-scale data set. The methods used can be adapted for evaluation of transit and other modes' transportation service in areas to evaluate equity at the regional level and at the neighborhood scale while controlling for spatial autocorrelation. Transit service equity planning can be enhanced by employing local Moran's I to improve local analysis.

**Subject Area:** Transit; equity; local Moran's I

**Availability:** Griffin, Greg P., and Ipek N. Sener. "Public Transit Equity Analysis at Metropolitan and Local Scales: A Focus on Nine Large Cities in the US." *Journal of Public Transportation* 19.4 (2016): 8. <http://scholarcommons.usf.edu/jpt/vol19/iss4/8/>



**Title:** How can public transit get people out of their cars? An analysis of transit mode choice for commute trips in Los Angeles

**Authors:** Chakrabarti, Sandip

**Abstract:** Transit has the potential to increase an individual's level of physical activity due to the need to walk or bike at the beginning and end of each trip. Consideration of these health benefits would allow transit proponents to better demonstrate its true costs and benefits. In light of transit's potential health-related impacts, this study contributes to the growing discussion in the emerging field of health and transportation by providing a review of the current level of understanding and evidence related to the physical activity implications of transit use and its associated health cost benefits. Findings from the review revealed that transit use is associated with increased levels of physical activity and improved health outcomes, but the magnitude of these effects is uncertain. There were few studies that estimated the health care cost savings of transit systems, and those that did tended to be imprecise and simplistic. Objective physical activity measures and frequency-based transit measures would allow for greater consistency across studies and help more directly attribute physical activity gains to transit ridership. Additionally, research in this area would benefit from disaggregate estimation techniques and more robust health datasets that can be better linked with existing transit data.

**Subject Area:** Public transportation; Physical activity; Health implications of transit; Health care cost; Transit cost savings

**Availability:** Chakrabarti, Sandip. "How can public transit get people out of their cars? An analysis of transit mode choice for commute trips in Los Angeles." *Transport Policy* (2016). <http://www.sciencedirect.com/science/article/pii/S0967070X16302876>

**Title: Potential health implications and health cost reductions of transit-induced physical activity**

**Authors:** Sener, Ipek N., Richard J. Lee, and Zachary Elgart.

**Abstract:** Transit has the potential to increase an individual's level of physical activity due to the need to walk or bike at the beginning and end of each trip. Consideration of these health benefits would allow transit proponents to better demonstrate its true costs and benefits. In light of transit's potential health-related impacts, this study contributes to the growing discussion in the emerging field of health and transportation by providing a review of the current level of understanding and evidence related to the physical activity implications of transit use and its associated health cost benefits. Findings from the review revealed that transit use is associated with increased levels of physical activity and improved health outcomes, but the magnitude of these effects is uncertain. There were few studies that estimated the health care cost savings of transit systems, and those that did tended to be imprecise and simplistic. Objective physical activity measures and frequency-based transit measures would allow for greater consistency across studies and help more directly attribute physical activity gains to transit ridership. Additionally, research in this area would benefit from disaggregate estimation techniques and more robust health datasets that can be better linked with existing transit data.

**Subject Area:** Public transportation; Physical activity; Health implications of transit; Health care cost; Transit cost savings

**Availability:** Sener, Ipek N., Richard J. Lee, and Zachary Elgart. "Potential health implications and health cost reductions of transit-induced physical activity." *Journal of Transport & Health* (2016). <http://www.sciencedirect.com/science/article/pii/S2214140516000128>

**Title: Exploring the Opinions of Passenger Rail Riders: Evidence From the Hoosier State Train**

**Authors:** Pyrialakou, V. Dimitra

**Abstract:** Ridership on Midwest passenger rail lines has been steadily increasing over the past two decades. Between 2005 and 2014, there has been a growth of more than 65 percent, much higher than the national average (approximately 30 percent for the same years). Nevertheless, a number of lines have discontinued their services or are in danger of discontinuance. For example, Kentucky Cardinal, operating between Chicago, Illinois and Louisville, Kentucky was discontinued in 2003, and the Three Rivers train, operating between Chicago, Illinois and New York, New York was discontinued in 2005. The Hoosier State train running between Indianapolis, Indiana and Chicago, Illinois would have faced the same fate recently, if not for the financial support that the state and communities have been providing since 2013. As of October 1, 2013, the State of Indiana, local communities, and Amtrak reached an agreement to support the Hoosier State line for the following fiscal year (2013–2014), and the agreement has continued ever since. In the meantime, the Indiana Department of Transportation (INDOT) was the first nationally to announce a Request for Proposals to seek competing solutions from independent providers, as allowed by the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), in order to obtain private-sector competitive bids for the operation of the Hoosier State train. Recently, after many unfruitful attempts and many obstacles, INDOT reached an agreement with Iowa Pacific Holdings. The company has been providing the locomotives for the line since August 2015, and collaborates with Amtrak to keep the train in service, with a shared vision to increase service frequency, improve speed and maintain a reliable schedule, and provide better on-board amenities. However, to ensure the financial viability of the system and support any improvement or expansion, an increase in ridership is necessary. To achieve this, it is essential that we understand the opinions of Indiana residents, passengers of the Hoosier State train, and advocates of the line towards passenger rail. This paper presents the results of a survey that was conducted on board the Hoosier State train to solicit information pertaining to the perceived ease of use and usefulness of the passenger rail services, riders' opinions, and other factors that might affect behavior toward passenger rail transportation, as well as factors that affect an individual's mode choice in general, such as habitual automobile behavior, or external impedance factors like schedule and route restrictions. The survey was endorsed by INDOT and approved by Amtrak and Iowa Pacific Holdings. In addition, this paper presents how opinions toward passenger rail differ among different groups based on socioeconomic and demographic characteristics, familiarity with passenger rail transportation in general and the Hoosier State train specifically, and usage. Furthermore, in order to prioritize service improvements that can foster an increase in the Hoosier State ridership, this paper explores mode choice decisions through the use of a multi-attribute attitude model.

**Subject Area:** Rails, Trains

**Availability:** Pyrialakou, V. Dimitra. "Exploring the Opinions of Passenger Rail Riders: Evidence From the Hoosier State Train." 2016 Joint Rail Conference. American Society of Mechanical Engineers, 2016.

<http://proceedings.asmedigitalcollection.asme.org/proceeding.aspx?articleid=2528485>

**Title:** Evaluating Significant Factors That Influence Public Transport Usage In Kerman, Iran

**Authors:** Bahreini A, Mirzaei H, Moeinaddini M, Asadi-Shekari Z, Shah MZ, Sultan Z.

**Abstract:** Although public transport is recommended to develop a sustainable transport system, the percentage of daily trips by public transport in Iran specifically in medium sized cities such as Kerman is very low. Currently, efforts are being made to indicate significant factors that prevent public transport usage in developed countries but few studies have been conducted in developing countries. Only a few studies have considered public transport usage in Iranian megacities and medium sized cities such as Kerman require more attention. Therefore, this study tries to identify effective factors that influence public transport usage in urban areas in developing countries like Iran and in medium sized cities like Kerman. In addition, this study tries to investigate various ways to increase public transport ridership. The people awareness regarding benefits of public transport usage is also tested in this study. This study uses questionnaire and observation to collect data. The descriptive analysis based on the collected data shows that most of the people are aware of public transport benefits. These benefits include environment protection, reduction in parking demand and traffic congestion, lower travel cost (compare with private vehicle), fewer mental stresses, more safety, and being more convenient. Although people are aware of public transport benefits, there are some issues that prevent them to use public transport properly. Insufficient information about public transport schedules, lack of attractive facilities and suitable waiting stations and inadequate reliability are examples of issues that discourage people to use public transport. The results show that some improvements such as providing suitable information about public transport schedules, considering comfortable facilities to increase attractiveness, improving waiting facilities and reliability can encourage people to use public transport.

**Subject Area:** Public transport; Medium sized cities; Developing countries; Suitable and attractive facilities; Public transport benefits; Public awareness

**Availability:** Bahreini A, Mirzaei H, Moeinaddini M, Asadi-Shekari Z, Shah Mz, Sultan Z. Evaluating Significant Factors That Influence Public Transport Usage In Kerman, Iran. Planning Malaysia Journal. 2016 Jul 30;14(4).

<http://www.planningmalaysia.org/index.php/pmj/article/view/151>

**Title: Long-Distance Trips and Mode Choice in Illinois**

**Authors:** Auld J, Karimi B, Pourabdollahi Z, Mohammadian AK, Kawamura K.

**Abstract:** Estimating demand for high speed rail systems in the U.S. is increasingly important as more resources and attention are given to the development of such systems. However, estimating the potential ridership poses unique challenges. Obtaining behavioral data to accurately predict potential customers' market responses to a new and unfamiliar product is of paramount importance. However, there is a limited amount of travel survey data regarding potential high speed rail usage. This data is typically the main source of information for estimating travel demand for long distance trips that extend beyond urban area boundaries or planning regions for metropolitan planning organizations. Therefore, in order to conduct a study of high speed rail demand requires both understanding both how individuals currently travel and how they would travel if the new system was available. The focus of this paper is on collecting such data for a hypothetical high-speed rail system in the state of Illinois. A new mixed-mode stated-choice intercept survey was designed and implemented as both a paper and pencil instrument (PAPI) for use when pre-trip intercept was possible, and as a combination screener and follow-up internet-based Computer Aided Self Interview (CASI) survey. The stated-choice survey was used to estimate hypothetical mode choice behavior. This was paired with a Computer-Aided Telephone Interview (CATI) personal travel survey, which is used to reveal respondents current long-distance travel characteristics.

**Subject Area:** Long-distance travel, Mode Choice, Travel Survey, Stated Choice Survey

**Availability:** Auld J, Karimi B, Pourabdollahi Z, Mohammadian AK, Kawamura K. Long-Distance Trips and Mode Choice in Illinois. In Transportation Research Board 95th Annual Meeting 2016 (No. 16-6679). <http://docs.trb.org/prp/16-6679.pdf>

**Title: Transportation needs of low income population: a policy analysis for the Washington D.C. metropolitan region**

**Authors:** Serulle, Nayel Urena, and Cinzia Cirillo

**Abstract:** Public transportation is part of the economic and social fabric of metropolitan areas, especially to low income individuals, whom are often totally dependent on this service for their daily activities. The role that transit plays on the connection between residential locations and employment opportunities is crucial in creating and implementing programs that will improve and maintain transit and vehicle ownership options viable for vulnerable segments of metropolitan residents. This study proposes the use of the logsum measure obtained from transportation demand models to assess the accessibility of a target population. In this sense, the Maryland State Travel model is used to evaluate the Washington Metropolitan area. This paper analyzes the socio-demographic characteristics of low income individuals, job availability, travel patterns and trip chaining and evaluates policies aiming at improving accessibility by car and public transport within the study area. The results show that policies promoting investment on public transportation would yield higher benefits to the low income population when compared to the ones that promote lowering vehicle operational cost. Interestingly, the results also highlight the fact that extremely low income households receive almost no benefit from these incentives, indicating that reasons other than lack of transportation means might be hindering them to reach job opportunities.

**Subject Area:** Mode Choice Model, Daily Travel Pattern, Public Transit, Low Income Household, Consumer Surplus, Job Accessibility, Local Economic Development, Transit Fare, Household Travel Survey, Trip Chain, Work Trip, Transportation Mode, Rail Transit System, In-vehicle Travel Time, Work Commute

**Availability:** Serulle, Nayel Urena, and Cinzia Cirillo. "Transportation needs of low income population: a policy analysis for the Washington DC metropolitan region." *Public Transport* 8.1 (2016): 103-123.

**Title: Associations of public transport accessibility with walking, obesity, metabolic syndrome and diabetes**

**Authors:** Barr A, Bentley R, Simpson JA, Scheurer J, Owen N, Dunstan D, Thornton L, Krnjacki L, Kavanagh A.

**Abstract:** Objective: To examine associations of public transport system accessibility with walking, obesity, metabolic syndrome and diabetes/impaired glucose regulation. Methods: Associations of public transport accessibility with self-reported walking for transport or recreation and measured biomarkers of chronic disease risk were estimated in 5241 adult residents of 42 randomly selected areas in Australia in 2004/05, drawn from the second wave of a population-based cohort study (AusDiab). Public transport accessibility was objectively measured using an adaptation of the Public Transport Accessibility Levels (PTAL) methodology, comprising both GIS derived spatial and temporal accessibility measures. Logistic regression models were adjusted for individual and environmental level covariates and clustering within areas. Results: Above median public transport accessibility was positively associated with a walking time of more than the median 90 min per week (OR=1.28, 95%CI 1.03, 1.60) and walking above the recommended 150 min per week (OR=1.35, 95%CI 1.11, 1.63). There were no associations of public transport accessibility with obesity (OR=1.05, 95%CI 0.85, 1.30), the metabolic syndrome (OR=1.09, 95%CI 0.91, 1.31) nor diabetes/impaired glucose regulation (OR=1.11, 95%CI 0.94, 1.30). Findings were similar for a subgroup reporting no vigorous recreational physical activity. Conclusions: In this Australian sample, public transport accessibility was positively associated with walking at recommended levels, including for people who are not otherwise vigorously active. Significance: Walking is crucial for increasing physical activity levels and population health, as well as maximising public transport system efficiency. Building evidence on public transport accessibility and walking will enable governments to exploit this important synergy.

**Subject Areas:** Public transport; Walking; Physical activity; Obesity; Metabolic syndrome; Diabetes

**Availability:** Barr A, Bentley R, Simpson JA, Scheurer J, Owen N, Dunstan D, Thornton L, Krnjacki L, Kavanagh A. Associations of public transport accessibility with walking, obesity, metabolic syndrome and diabetes. *Journal of Transport & Health*. 2016 Feb 11. <http://www.sciencedirect.com/science/article/pii/S2214140516000086>

**Title: Identifying Local Transit Resources for Evacuation**

**Authors:** Chester Wilmot, Ruijie Bian, Marlon Greensword, Alaa Shams

**Abstract:** The purpose of this project was to establish an inventory of transit vehicles used by special needs and human services organizations in coastal Louisiana, and to incorporate the information into a GIS that would allow queries on the data base. The data was collected by means of a mail out/mail back survey within the context of transportation needs in an emergency. Online ArcGIS was used to allow quick assessment of transit resources and transportation demand that will arise in an emergency. Transportation demand from the general public was estimated recognizing the daily migration of the population and their location at different times of the day. The study found that the organizations surveyed were, in general, not enthusiastic about establishing an inventory of special needs and human services transit resources (a survey response rate of only 12% was obtained). However, the vehicles they have at their disposal represent a substantial resource of specialized transportation. In addition, their drivers are a valuable resource in that they are generally well trained in catering to the special needs of their clients, and approximately one-half of them are prepared to provide their services in an emergency. The study concluded that means must be found to obtain greater participation of these organizations in establishing a full inventory and cooperating with each other during emergencies.

**Subject Areas:** inventory, transit, special needs, human services

**Availability:** Wilmot, Chester, et al. "Louisiana Transportation Research Center." (2015). [http://www.ltrc.lsu.edu/pdf/2015/FR\\_556.pdf](http://www.ltrc.lsu.edu/pdf/2015/FR_556.pdf)



## 10. Travel Behavior

### **Title: Declining Car Use In A Mega City Exploring The Drivers Of Peak Car Including Infrastructure Saturation**

**Author:** Fraser, Andrew, and Mikhail Chester

**Abstract:** There is increasing evidence that vehicle travel in developed countries may have peaked, contradicting many historical travel demand forecasts. The underlying causes of this peaking are still under debate and there has been a mobilization of research, largely focused at national scales, to study the explanatory drivers. There is, however, a dearth of research focused at the metropolitan scale where transportation policy and planning are frequently decided. Using Los Angeles County, California, as a case study, we investigate the Peak Car theory and whether social, economic, and technical factors, including roadways that have become saturated at times, may be contributing to changes in travel behavior. After peaking in 2002, vehicle travel in Los Angeles County declined by 3.4 billion (or 4.1%) by 2010. The effects of changing fuel prices, fuel economy, population growth, increased utilization of alternate transportation modes, changes in driver demographics, income, and freight are first assessed. It is possible, and likely, that these factors alone explain the reduction in travel. However, the growth in congestion raises questions of how a constricting supply of roadway network capacity may contribute to travel behavior changes. There have been no studies that have directly assessed how the maturing supply of infrastructure coupled with increasing demand affect travel behavior. We explore regional and urban factors in Los Angeles to provide insight into the drivers of Peak Car at city scales where the majority of travel occurs. The results show that a majority of the decline in VMT in Los Angeles can be attributed the rising fuel prices during the 2000s. While overall roadway network capacity is not yet a limiting factor for vehicle travel there is some evidence that suggests that congestion along certain corridors may be shifting some automobile travel to alternatives. The results also suggest that the relative impact of any factor on travel demand is likely to vary from one locale to another and Peak Car analysis across large geographic areas obscures the nuisances of travel behavior at a local scale.

**Subject Areas:** VMT; mega cities; capacity; peak car

**Availability:** Fraser, Andrew, and Mikhail Chester. "DECLING CAR USE IN A MEGA CITY." (2016). [http://ntc.umd.edu/sites/default/files/documents/Publications/NTC2015-SU-R-01\\_Chester.pdf](http://ntc.umd.edu/sites/default/files/documents/Publications/NTC2015-SU-R-01_Chester.pdf)

**Title:** Explaining the Evolution of Passenger Vehicle Miles Traveled in the United States

**Author:** Benjamin Leard, Joshua Linn, and Clayton Munnings

**Abstract:** After growing steadily for several decades, passenger vehicle miles traveled (VMT) in the United States unexpectedly leveled off in the 2000s. The growth rate of VMT has since rebounded, and determining the factors that explain these developments has implications for future US oil consumption and greenhouse gas emissions. We show that changes in the demographic and economic characteristics of households in the United States, rather than changes in driving habits, explain most of the recent dynamics. These results suggest that over the next decade, VMT in the United States will continue to grow roughly at historical rates, causing substantially higher oil consumption and greenhouse gas emissions than if persistent changes in household driving habits explained the recent changes in VMT.

**Subject Areas:** passenger vehicles, miles traveled, demographics, gasoline consumption, greenhouse gas emissions

**Availability:** Leard, Benjamin, Joshua Linn, and Clayton Munnings. "Explaining the Evolution of Passenger Vehicle Miles Traveled in the United States." (2016).

<http://www.rff.org/files/document/file/DP-16-38.pdf>

**Title:** How to cope with a spouse who travels for work

**Author:** Janice Neumann

**Abstract:** Feature story on family where mother is a flight attendant.

**Subject Areas:** work travel

**Availability:** Neumann, Janice. *How to Cope With a Spouse Who Travels for Work* Chicago

Tri<http://www.chicagotribune.com/lifestyles/travel/sc-traveling-spouse-family-1018-20161014-story.html>

**Title:** How to cope with a spouse who travels for work

**Author:** Janice Neumann

**Abstract:** Feature story on family where mother is a flight attendant.

**Subject Areas:** work travel

**Availability:** Neumann, Janice. *How to Cope With a Spouse Who Travels for Work* Chicago

Tribune reposted to myPalmBeachPost

<http://www.mypalmbeachpost.com/news/lifestyles/parenting/how-to-cope-with-a-spouse-who-travels-for-work/ns4gB/>

**Title: Investigating the influence of Trip Distance on Travel Behaviour of Non-Motorized Transport (NMT) users**

**Author:** Mondal, Swarup, Sudeshna Mitra, and Bandhan Bandhu Majumdar

**Abstract:** Non-Motorized Transport (NMT) modes can only be used for trips of relatively short lengths; hence it is essential to know the spatial extent of the trips taken by such modes and their variation in various land-use and geographic setup. For this exercise, good quality comprehensive data consisting of regions is a must; hence the choice of National Household Travel Survey (NHTS) data from United States. This data consists of household travel survey records from multiple urban and rural areas of all states of the United States for the year 2009 and has been used in this research. Using the mentioned dataset, this study seeks to answer the following research questions of interest: (1) How far users walk or use bicycle typically? (2) How the trip lengths varied across various populations sub-groups? and (3) How the trip lengths varied with variation of size of city, land-use and geography?

With these questions in mind, this paper analyses the nature of trips made by NMT modes and investigates the influence of trip length on travel behavior of NMT users' across various population sub-groups. To start with, the average trip lengths made by walk and bicycles across various geographic locations are estimated. Additionally, estimates of drop in trip patronage with increased trip lengths are obtained using the concept of distance-decay. These distance-decay functions are also estimated for different geographic locations with varying population and land uses, using which it is possible to obtain travel impedance or deterrence of walking and bicycling with increases trip lengths.

As expected the overall results reveal that with an increase in trip length, users are less willing to walk than bicycle with as estimated impedance or level of deterrence of 0.259 for bicycle and 0.687 for walk in urban area. Similarly, the impedance values of 0.254 and 0.679 are estimated for bicycle and walk respectively for rural area. The impedance caused by trip length is observed to vary significantly among different user groups for both pedestrians and bicycle users. For example, in urban area "Shopping" trips made by bicycle users are found to have the maximum impedance of 0.371 and bicycle trips made by users with "Professional, managerial, or technical" occupation are found to be least influenced by trip length with the lowest impedance of 0.136.

**Subject Areas:** Non-Motorized Transport (NMT), Distance-Decay, Impedance, Trip Length Frequency Distribution

**Availability:** Mondal, Swarup, Sudeshna Mitra, and Bandhan Bandhu Majumdar. "Investigating the influence of Trip Distance on Travel Behaviour of Non-Motorized Transport (NMT) users." [https://www.researchgate.net/profile/Bandhan\\_Majumdar/publication/288786922\\_Investigating\\_the\\_influence\\_of\\_Trip\\_Distance\\_on\\_Travel\\_Behaviour\\_of\\_Non-Motorized\\_Transport\\_NMT\\_users/links/57b2e8e808aeb2cf17c73b7f.pdf](https://www.researchgate.net/profile/Bandhan_Majumdar/publication/288786922_Investigating_the_influence_of_Trip_Distance_on_Travel_Behaviour_of_Non-Motorized_Transport_NMT_users/links/57b2e8e808aeb2cf17c73b7f.pdf)

**Title: Modeling household vehicle and transportation choice and usage**

**Author: Zhuo, C..**

**Abstract:** The use of personal vehicles for transportation has an enormous impact on air quality, fuel consumption, and congestion. Accordingly, it is a policy priority to try to reduce vehicle travel where feasible. One important component of that strategy is to try to reduce vehicle ownership (VO), since there is a well-established relationship between owning a car and using it. In this study, we investigate vehicle ownership and use in California through a set of models that were estimated using nationwide data from the 2009 National Household Travel Survey (NHTS). We weighted the NHTS data to represent the population of California on six dimensions of interest (household size, number of workers, number of household vehicles, household income, population density, and race and ethnicity). The modeling took place in several stages, to illuminate the incremental influence of particular blocks of variables: household demographics, income and mobility constraints, personal attitudes, and land use characteristics.

The study provides insights into ways to increase the share of households who have ZVO or less than expected VMT. For example, the results from the study support the principle that policies designed to improve public transit and expand high-density neighborhoods can successfully contribute to reducing vehicle ownership and VMT, although the specific results in terms of reduction of car use also depend on the characteristics of the household. And although bicycling infrastructure was not a basis for the land use segmentation we employed in this study, given that higher-density neighborhoods can shorten trip lengths and thereby make active transportation more competitive with the automobile for short trips, the study suggests that creating a more effective bicycling infrastructure, especially in higher-density neighborhoods, would also be effective in reducing VO and VMT. (Abstract shortened by ProQuest.)

**Subject Areas:** Vehicle ownership, VMT, personal vehicle

**Availability:** Zhuo, C. (2016). Modeling household vehicle and transportation choice and usage (Doctoral dissertation, UNIVERSITY OF CALIFORNIA, DAVIS).

<http://gradworks.umi.com/10/16/10165745.html>

**Title: Activities and Technology Usage while Driving: A Field Study with Private Short-Distance Car Commuters**

**Author:** Perterer, N., Moser, C., Meschtscherjakov, A., Krischkowsky, A., & Tscheligi, M.

**Abstract:** Despite its high costs and stressful traffic congestions, solo driving is still the number one commuting choice. In order to inform the development of safer or more enjoyable future automotive user interface designs, we need to understand what people do while commuting to and from work. In this paper, we present a contextual inquiry study with 13 private short-distance (PSD) car commuters in order to investigate their main activities in the car and what kind of technology they use. We were, especially, interested in strategies that may support or enhance activities while being caught in a traffic jam. Results show that most PSD car commuters had chosen a more relaxed and comfortable alternative instead of the fastest route, as well as took advantage of short waiting periods for collaborative activities.

**Subject Areas:** SOV driving; commuting; private short-distance; technology use

**Availability:** Perterer, N., Moser, C., Meschtscherjakov, A., Krischkowsky, A., & Tscheligi, M. (2016, October). Activities and Technology Usage while Driving: A Field Study with Private Short-Distance Car Commuters. In Proceedings of the 9th Nordic Conference on Human-Computer Interaction (p. 41). ACM. <http://dl.acm.org/citation.cfm?id=2971556>

**Title: Evaluation, Classification, and Influential Factors Analysis of Traffic Congestion in Chinese Cities Using the Online Map Data**

**Author:** Bian, C., Yuan, C., Kuang, W., & Wu, D.

**Abstract:** This study proposes a new method to describe, compare, and classify the traffic congestion states in 23 Chinese cities using the online map data and further reveals the influential factors that may affect them. First, the real-time traffic congestion information is obtained from the online map of AutoNavi in a 15-minute interval. Next, a new measuring index is introduced to describe the overall characterization of congestion patterns in each city based on online map data, which is named as the congestion ratio. The next analysis is the cluster analysis based on the temporal distribution of the congestion ratio, which helps to identify groups of the selected cities with similar traffic congestion states. These cities are categorized as four groups according to the severity of traffic congestion: severely congested, less severely congested, amble, and smooth cities. Lastly, multiple linear regression models are developed to identify the primary factors that affect the congestion ratio. The result shows that the influences of per capita road area, car ownership, and vehicle miles traveled (VMT) on the congestion ratio are significant. Sensitivity analyses are also implemented in order to reveal more effective policy measures in mitigating traffic congestion in urban areas.

**Subject Areas:** congestion ratio;

**Availability:** Bian, C., Yuan, C., Kuang, W., & Wu, D. (2016). Evaluation, Classification, and Influential Factors Analysis of Traffic Congestion in Chinese Cities Using the Online Map Data. *Mathematical Problems in Engineering*, 2016.

<https://www.hindawi.com/journals/mpe/2016/1693729/abs/>



**Title: Driver Behavior Modeling: Developments and Future Directions**

**Author:** Abou-zeid, Najah AbuAliand Hatem

**Abstract:** The advances in wireless communication schemes, mobile cloud and fog computing, and context- aware services boost a growing interest in the design, development, and deployment of Driver behavior models for emerging applications. Despite the progressive advancements in various aspects of Driver Behavior Modeling (DBM), only limited work can be found that reviews the growing body of literature, which only targets a subset of DBM. Thus a more general review of the diverse aspects of DBM, with an emphasis on the most recent developments is needed. In this paper, we provide an overview of advances of in-vehicle and Smartphone sensing capabilities, communication, recent applications and services of DBM, and emphasize research challenges and key future directions.

**Subject Areas:** Driver Behavior; ITS; Road condition; Lane Changing; Driver Profiling

**Availability:** Abou-zeid, Najah AbuAliand Hatem. "Driver Behavior Modeling: Developments and Future Directions." <http://downloads.hindawi.com/journals/ijvt/aip/6952791.pdf>

**Title: Modelling The Acquisition Of Travel Information And Its Influence On Travel Behaviour**

**Author:** Maréchal, Séverine

**Abstract:** This thesis contributes to the wider literature on the provision of travel information, and the associated response in travel patterns, by considering the acquisition of information sources as a choice, investigating its role in the choice of travel, and jointly modelling both behaviours. A novel conceptual framework is developed that considers both information and travel in a joint portfolio choice. An implementation framework is consequently formulated based on important assumptions, and two application contexts are defined. First, the strategic decision of acquiring information is considered for the first time as a consumption of a portfolio of information sources. Second, in disrupted travel conditions, the tactical decision to access information sources is conditioned in its choice set by alternatives that were strategically chosen. A revealed-preference survey instrument is innovatively developed to collect a rich and unique dataset about how travellers in the London public transport network acquire and use travel information and how they react to disrupted conditions on their usual commute. In the strategic context, results from the empirical study provide insights into individual's satiation with specific information sources based on the frequency of use, and the effect of cognitive costs. In the tactical context, the results highlight commuters' preferences for a combination of sources, in respect to the importance of delay amplitude and previous travel experience, the accuracy, and monetary and cognitive costs of sources, as well as the attitudinal motivation for seeking information. Travel responses are not demographic dependent, but are linked to corroboration of the information and the use of specific combinations of sources. Different applications of the models illustrate the impacts of those factors on travel behaviour and information acquisition. They emphasize useful contributions for service providers when envisaging information use, and for public transport operators and planners when predicting traveller response.

**Subject Areas:** travel information; travel patterns; service providers; attitudinal motivation

**Availability:** Maréchal, Séverine. Modelling The Acquisition Of Travel Information And Its Influence On Travel Behaviour. Diss. Imperial College London, 2016.

<http://www.sciencedirect.com/science/article/pii/S0166046216301016>

**Title: Shifts in Long-Distance Travel Mode Due to Automated Vehicles Statewide Mode-Shift Simulation Experiment and Travel Survey Analysis**

**Author:** LaMondia, J. J., Fagnant, D. J., Qu, H., Barrett, J., & Kockelman, K.

**Abstract:** Employment growth is a common public policy goal, but it can lead to a number of unwanted environmental, social, and economic costs – particularly in high growth communities – due to its impact on peak-hour traffic. This paper examines the short-run impacts of rapid employment growth on travel time to work. We exploit exogenous variation in employment levels resulting from movements of military troops during the 2005 Base Realignment and Closure (BRAC) in order to identify the effect of employment growth on travel time using difference-in-difference-in-differences and instrumental variable methods. Our results show that for each additional 10 workers added per square kilometer, travel time increases by 0.171 to 0.244 min per one-way commute trip per commuter in the short run, which equates to \$0.07 to \$0.20 in travel time cost per commuter per day. Our estimates imply that the annualized short-run congestion costs of the 2005 BRAC were \$79 to \$761 million per year (in constant 2005 dollars) for military commuters and \$3.15 to \$6.3 billion per year (in constant 2005 dollars) for civilian commuters in BRAC-affected areas.

**Subject Areas:** Employment growth; Travel time; Military

**Availability:** LaMondia, J. J., Fagnant, D. J., Qu, H., Barrett, J., & Kockelman, K. (2016). Shifts in Long-Distance Travel Mode Due to Automated Vehicles: Statewide Mode-Shift Simulation Experiment and Travel Survey Analysis. *Transportation Research Record: Journal of the Transportation Research Board*, (2566), 1-11.

<http://trrjournalonline.trb.org/doi/abs/10.3141/2566-01>

**Title: Does employment growth increase travel time to work?: An empirical analysis using military troop movements**

**Author:** Morrison, Geoffrey M., and C-Y. Cynthia Lin Lawell

**Abstract:** Employment growth is a common public policy goal, but it can lead to a number of unwanted environmental, social, and economic costs – particularly in high growth communities – due to its impact on peak-hour traffic. This paper examines the short-run impacts of rapid employment growth on travel time to work. We exploit exogenous variation in employment levels resulting from movements of military troops during the 2005 Base Realignment and Closure (BRAC) in order to identify the effect of employment growth on travel time using difference-in-difference-in-differences and instrumental variable methods. Our results show that for each additional 10 workers added per square kilometer, travel time increases by 0.171 to 0.244 min per one-way commute trip per commuter in the short run, which equates to \$0.07 to \$0.20 in travel time cost per commuter per day. Our estimates imply that the annualized short-run congestion costs of the 2005 BRAC were \$79 to \$761 million per year (in constant 2005 dollars) for military commuters and \$3.15 to \$6.3 billion per year (in constant 2005 dollars) for civilian commuters in BRAC-affected areas.

**Subject Areas:** Employment growth; Travel time; Military

**Availability:** Morrison, Geoffrey M., and C-Y. Cynthia Lin Lawell. "Does employment growth increase travel time to work?: An empirical analysis using military troop movements." *Regional Science and Urban Economics* 60 (2016): 180-197.

<http://www.sciencedirect.com/science/article/pii/S0166046216301016>

**Title: Online and App-Based Carpooling in France**

**Author:** Stocker, Adam, And Marie Mundler

**Abstract:** This paper examines the characteristics and practices of ridesharing users in France. In May 2013 the authors surveyed members of BlaBlaCar, the largest online and app-based carpooling service in France, to analyze the socio-demographic characteristics and usage patterns of the respondents. The survey results identify correlations between socio-demographic characteristics and usage elements. Notably, users with a lower income level are more inclined to be passengers, while higher income users employ carpooling mainly as drivers. Students are shown to be more frequent users as well. These findings indicate some equity balancing effects, which may be unique to this shared mobility mode.

**Subject Areas:** France; carpooling

**Availability:** Stocker, Adam, And Marie Mundler. "Online and App-Based Carpooling in France." (2016). [http://innovativemobility.org/wp-content/uploads/2016/07/BlaBlaCar\\_Whitepaper\\_FINAL.pdf](http://innovativemobility.org/wp-content/uploads/2016/07/BlaBlaCar_Whitepaper_FINAL.pdf)

**Title: The Influence Of Urban Form At Different Geographical Scales On Travel Behavior; Evidence From U.S. Cities**

**Author:** Arefeh Alsadat Nasri

**Abstract:** Suburban lifestyle is popular among American families, although it has been criticized for encouraging automobile use through longer commutes, causing heavy traffic congestion, and destroying open spaces (Handy, 2005). It is a serious concern that people living in low-density suburban areas suffer from high automobile dependency and lower rates of daily physical activity, both of which result in social, environmental and health-related costs.

In response to such concerns, researchers have investigated the inter-relationships between urban land-use pattern and travel behavior within the last few decades and suggested that land-use planning can play a significant role in changing travel behavior in the long-term.

However, debates regarding the magnitude and efficiency of the effects of land-use on travel patterns have been contentious over the years. Changes in built-environment patterns is potentially considered a long-term panacea for automobile dependency and traffic congestion, despite some researchers arguing that the effects of land-use on travel behavior are minor, if any. It is still not clear why the estimated impact is different in urban areas and how effective a proposed land-use change/policy is in changing certain travel behavior. This knowledge gap has made it difficult for decision-makers to evaluate land-use plans and policies.

In addition, little is known about the influence of the large-scale built environment. In the present dissertation, advanced spatial-statistical tools have been employed to better understand and analyze these impacts at different scales, along with analyzing transit-oriented development policy at both small and large scales.

The objective of this research is to: (1) develop scalable and consistent measures of the overall physical form of metropolitan areas; (2) re-examine the effects of built-environment factors at different hierarchical scales on travel behavior, and, in particular, on vehicle miles traveled (VMT) and car ownership; and (3) investigate the effects of transit-oriented development on travel behavior.

The findings show that changes in built-environment at both local and regional levels could be very influential in changing travel behavior. Specifically, the promotion of compact, mixed-use built environment with well-connected street networks reduces VMT and car ownership, resulting in less traffic congestion, air pollution, and energy consumption.

**Subject Areas:** suburban lifestyle; built environment; street network, emissions; congestion

**Availability:** Nasri, Arefeh. The Influence Of Urban Form At Different Geographical Scales On Travel Behavior; Evidence From Us Cities. University of Maryland Diss. 2016.

<http://drum.lib.umd.edu/handle/1903/18731>

**Title: Contacts and meetings: Location, duration and distance traveled**

**Author:** Tilahun, Nebiyu, and David Levinson

**Abstract:** The study of travel for social activities presents layered challenges because of the temporal and spatial flexibility with which such activities can be undertaken and the changing set of decision makers involved in each activity episode. This paper seeks to answer a set of questions based on empirical data about how relationship, social network variables, purpose, personal and household constraints, location attributes, and interdependence between meeting duration, distance, and other meetings provide some structure to the observed social activity location and duration decisions. In particular, we investigate what attributes determine whether a meeting takes place in or out of home, and what explains the distance travelled and the duration of meetings. Empirically we show that in-home meetings tend to occur most often with close contacts and less often with distant contacts. When looking at duration and distance travelled, we find that relationship related variables have some of the largest impacts on the distance travelled and the duration of meetings as compared to other variables. We find that meeting durations with close contacts are on average almost 45 min longer, and that respondents are willing to hold these meetings about 1.5 miles (2.4 km) further away from their residences than they would with non-close contacts. Overall the paper illustrates that relationship type, as well as other meeting specific and demographic variables are important in explaining the location, duration and distance travelled for social meetings.

**Subject Areas:** social activities, duration and distance

**Availability:** Tilahun, Nebiyu, and David Levinson. "Contacts and meetings: Location, duration and distance traveled." *Travel Behaviour and Society* 6 (2017): 64-74.

<http://www.sciencedirect.com/science/article/pii/S2214367X16300102>

**Title: The Impact of Flexible Work Hours on Trip Departure Time Choices in Metropolitan Miami**

**Author:** Yang, Y., L. Steiner, R., and Srinivasan, S.

**Abstract:** The fractal dimension of road networks emerges as a measure of the complexity of road transport infrastructures. In this study, we measured fractal dimensions of both the geometric form (i.e., the layout of the roads) and structure hierarchy (i.e., the connections among roads) of the major road networks in the largest 95 U.S. metro areas. We explained the causes of the variances in these fractal dimensions, especially the one for structure hierarchy. Further, we hypothesized the impacts of these fractal dimensions on the urban built environment and validated our hypotheses using path analysis. We found that a larger geometric fractal dimension ( $D_g$ ) shows a more uniform distribution of roads over the metro area, which provides the accessibility to suburban areas and incentives to low-density development. A larger structural fractal dimension ( $D_s$ ) indicates the highly-connected roads (e.g., highways) tend to join to other highly-connected roads so that most roads can be reached by a small number of neighboring roads (i.e., the small-world phenomenon). As  $D_s$  increases and the small-world effect become more significant, daily vehicle miles traveled per capita (DVMT/Cap) decline. However,  $D_s$  should be kept low in order to reduce the DVMT/Cap as population size increases. We consider that the low  $D_s$  can contribute to more mixed, polycentric and more uniform on an urban area-wide basis. Overall, higher  $D_g$  and  $D_s$  of the major road network in a metro area leads to higher per capita carbon emissions of transport, and lower quality of life as population increases. In the end, we conclude that fractal dimensions can provide valuable insight into the nature of the transportation land use nexus.

**Subject Areas:** flexitime; commute

**Availability:** Yang, Y., L. Steiner, R., and Srinivasan, S. (2016) The Impact of Flexible Work Hours on Trip Departure Time Choices in Metropolitan Miami. CICTP 2016: pp. 2215-2229.  
<http://ascelibrary.org/doi/abs/10.1061/9780784479896.199>



**Title: Synergistic neighborhood relationships with travel behavior: An analysis of travel in 30,000 US neighborhoods**

**Author:** Voulgaris CT, Taylor BD, Blumenberg E, Brown A, Ralph K.

**Abstract:** A now substantial body of literature finds that land use and urban form have a statistically significant, albeit relatively modest, effect on travel behavior. Some scholars have suggested that various built-environment characteristics influence travel more in concert than when considered in isolation. Yet few previous studies have combined built-environment measures to create holistic descriptions of the overall character of neighborhoods, and fewer still have related these neighborhoods to residents' travel decisions. To address this gap in the literature, we develop a typology of seven distinct neighborhood types by applying factor analysis and then cluster analysis to a set of 20 variables describing built-environment characteristics for most census tracts in the United States. We then include these neighborhood types in a set of multivariate regression models to estimate the effect of neighborhood type on the travel behavior of neighborhood residents, controlling for an array of personal and household characteristics. We find relatively little variation in the number of daily trips among neighborhood types, but there is substantial neighborhood variation in both person miles of travel and mode choice. Travel by residents of one particular neighborhood type is notably distinguished from all others by a very low number of miles traveled, little solo driving, and high transit use. However, this neighborhood type is found almost exclusively in just a few very large metropolitan areas, and its replicability is uncertain.

**Subject Areas:** Built environment; neighborhood types; SOV; transit

**Availability:** Voulgaris CT, Taylor BD, Blumenberg E, Brown A, Ralph K. Synergistic neighborhood relationships with travel behavior: An analysis of travel in 30,000 US neighborhoods. *Journal of Transport and Land Use*. 2016 Aug 10. <https://www.jtlu.org/index.php/jtlu/article/view/840>

**Title: Fractal dimensions of metropolitan area road networks and the impacts on the urban built environment**

**Author:** Lu Z, Zhang H, Southworth F, Crittenden J.

**Abstract:** The fractal dimension of road networks emerges as a measure of the complexity of road transport infrastructures. In this study, we measured fractal dimensions of both the geometric form (i.e., the layout of the roads) and structure hierarchy (i.e., the connections among roads) of the major road networks in the largest 95 U.S. metro areas. We explained the causes of the variances in these fractal dimensions, especially the one for structure hierarchy. Further, we hypothesized the impacts of these fractal dimensions on the urban built environment and validated our hypotheses using path analysis. We found that a larger geometric fractal dimension ( $D_g$ ) shows a more uniform distribution of roads over the metro area, which provides the accessibility to suburban areas and incentives to low-density development. A larger structural fractal dimension ( $D_s$ ) indicates the highly-connected roads (e.g., highways) tend to join to other highly-connected roads so that most roads can be reached by a small number of neighboring roads (i.e., the small-world phenomenon). As  $D_s$  increases and the small-world effect become more significant, daily vehicle miles traveled per capita (DVMT/Cap) decline. However,  $D_s$  should be kept low in order to reduce the DVMT/Cap as population size increases. We consider that the low  $D_s$  can contribute to more mixed, polycentric and more uniform on an urban area-wide basis. Overall, higher  $D_g$  and  $D_s$  of the major road network in a metro area leads to higher per capita carbon emissions of transport, and lower quality of life as population increases. In the end, we conclude that fractal dimensions can provide valuable insight into the nature of the transportation land use nexus.

**Subject Areas:** Road network; Fractal analysis; Path analysis; Sustainable urban development; Carbon footprint

**Availability:** Lu Z, Zhang H, Southworth F, Crittenden J. Fractal dimensions of metropolitan area road networks and the impacts on the urban built environment. *Ecological Indicators*. 2016 Nov 30;70:285-96. <http://www.sciencedirect.com/science/article/pii/S1470160X16303168>

**Title: Constructing human activity spaces: A new approach incorporating complex urban activity-travel**

**Author:** Li, Ran, and Daoqin Tong

**Abstract:** Activity space represents an important concept for understanding human activity-travel. The existing activity space delineation approaches are limited in fully characterizing real-world travel behaviors. To address the issue, this research proposes a new time geography based approach to more accurately portray activity spaces of urban travelers. The proposed approach takes into account the full complexity of real-world travel and underlying urban structures. Results of an empirical study are presented based on the 2008 Add-on National Household Travel Survey conducted in Tucson, Arizona. Activity spaces of 1164 sample travelers are delineated and analyzed. Results show the effectiveness of the new approach in more realistically depicting urban activity-travel.

**Subject Areas:** Activity space; Activity-travel; Transportation; GIS

**Availability:** Li, Ran, and Daoqin Tong. "Constructing human activity spaces: A new approach incorporating complex urban activity-travel." *Journal of Transport Geography* 56 (2016): 23-35. <http://www.sciencedirect.com/science/article/pii/S0966692316300254>

**Title: Gender and Commuting Behavior: Evidence from the American Time Use Survey**

**Author:** Kimbrough G.

**Abstract:** A wealth of research has shown that the commutes of American women are shorter, both in time and distance, than those of American men. This study takes advantage of a large, nationally representative dataset, the American Time Use Survey (ATUS), to examine this relationship. A basic labor supply model is presented, with testable predictions about relationships between commuting time and worker characteristics that could explain the gender gap. Additionally, the detailed commuting characteristics derived from the ATUS make possible an examination of gender differences in the character of commutes, including the number, length, and type of stops along the way. Results show that women tend to make more stops between home and work. Even controlling for marital status and the presence of children, women are more likely to be accompanied by children for their commute. Moreover, the stops made by women along this journey tend to be longer than those for men. These differences in commute character necessitate the use of a methodology that accounts for stop duration in the calculation of commuting time. Blinder-Oaxaca decompositions are performed to decompose the gender commuting gap by estimating a model in which these characteristics are fully interacted with gender. Results support two previously proposed explanations for the gender commuting gap, based on gender differences in wages and types of jobs held. The evidence does not support the explanation that women's greater household responsibility contributes to the gender commuting gap.

**Subject Areas:** women's commute; gender gap; ATUS

**Availability:** Kimbrough G. Gender and Commuting Behavior: Evidence from the American Time Use Survey. 2016 May 31. University of North Carolina Greensboro Department of Economics Working Paper Series

<http://bae.uncg.edu/econ/files/2016/05/GenderAndCommutingBehavior.pdf>

**Title: Car Ownership and the Impact of Built Environment, Demographics and Transport Systems**

**Author:** Zolnik, Edmund J.

**Abstract:** Auto ownership is one of the most important linkages between travel demand and land use. Residents in denser, urban or more transit accessible neighborhoods tend to own fewer cars. Car ownership influences almost all aspects of travel behavior, including travel frequency, travel distances, mode choice and time-of-day choice. At the same time, car ownership affects residential location choices, as households owning cars are less likely to choose urban neighborhoods than households without cars. This paper describes a new microscopic auto-ownership model that has been estimated with survey data. The model is fully integrated with a land use and a transportation model to capture: (1) how owning a car affects travel behavior and location choice; and (2) how the built environment and the transportation needs affect auto-ownership decisions. The model has been validated against census data and is fully operational.

**Subject Areas:** Auto ownership, vehicle ownership, discrete choice, logistic regression, land-use/transport interactions

**Availability:** Moeckel, Rolf, and Di Yang. "Car Ownership and the Impact of Built Environment, Demographics and Transport Systems." *Journal of Civil Engineering and Architecture* 10 (2016) 587-595 doi: 10.17265/1934-7359/2016.05.008  
<http://www.davidpublisher.org/Public/uploads/Contribute/57513908eaf00.pdf>

**Title: Inducing Demand by Expanding Road Capacity: Controlling for the Rebound Effect**

**Author:** Zolnik, Edmund J.

**Abstract:** Expanding road capacity and raising fuel economy are two policy mechanisms to mitigate greenhouse gas (GHG) emissions, but each is susceptible to feedback effects that might offset their overall effectiveness at promoting sustainable transportation. Expanding road capacity engenders more traffic through the induced demand effect and raising fuel economy encourages more use through the rebound effect. Research on each feedback effect is evident in the sustainable transportation literature. However, research on their interaction is lacking. To fill this void, this article analyzes how additional road capacity and higher fuel economy interact to affect individual vehicle kilometers of travel (VKT) in metropolitan areas across the United States. The article pools individual data from the respective 2001 and 2009 National Household Travel Surveys (NHTS) and adopts a novel methodological approach known as multilevel modeling to estimate a three-level VKT model that nests individuals within vehicles within metropolitan areas. Data on fuel economy at the vehicle level provide an accurate estimate of the rebound effect and data on additional capacity at the metropolitan area level provide an accurate estimate of the induced demand effect. Results indicate that the feedback effects do indeed interact to affect individual travel behavior. Further research with three time points of individual data from the NHTS is necessary to establish a trend, but the empirical results suggest that the interaction between these feedback effects decreases their efficacy to mitigate GHG emissions. However, some of these effects could be offset by higher road and fuel prices.

**Subject Areas:** Data transferability, trip rate, decision tree, travel demand, vehicle miles traveled

**Availability:** Zolnik, Edmund J. "Inducing Demand by Expanding Road Capacity: Controlling for the Rebound Effect." *Annals of the American Association of Geographers* (2016): 1-16.

<http://www.tandfonline.com/doi/abs/10.1080/24694452.2016.1167584>

**Title: Online shopping habits and the potential for reductions in carbon dioxide emissions from passenger transport**

**Author:** Rosqvist, Lena Smidfelt, and Lena Winslott Hiselius.

**Abstract:** Opportunities for online shopping are transforming travel behaviour related to shopping, and they have the potential to reduce overall travel demands. This paper analyses the potential for reductions in carbon dioxide (CO<sub>2</sub>) emissions from passenger transport due to an increased use of online shopping in Sweden and adds to the broader picture of what potential growing online shopping might have on transport sustainability. This paper shows that there is a sustainability potential related to more sustainable travel habits by those who shop online more frequently. Calculations indicate that the predicted increase in online shopping behaviour together with the predicted increase of the Swedish population in 2030 would give a 22% decrease in CO<sub>2</sub> emissions related to shopping trips compared to 2012. Furthermore, if all travel is taken into account this would result in a 2% reduction in 2030 compared to total CO<sub>2</sub> emissions 2012. The paper furthermore discusses how these results might influence transport sustainability ambitions and policies. The discussion suggests that online shopping might facilitate reductions in CO<sub>2</sub> emissions but above all, it could act as a facilitator for implementing other policies promoting a less car dependent planning regime including shopping localisation.

**Subject Areas:** Online shopping; Travel behaviour; Modal split; Transport policy

**Availability:** Rosqvist, Lena Smidfelt, and Lena Winslott Hiselius. "Online shopping habits and the potential for reductions in carbon dioxide emissions from passenger transport." *Journal of Cleaner Production* (2016).

<http://www.sciencedirect.com/science/article/pii/S0959652616305091>

**Title: Individual trip rate transferability analysis based on a decision tree approach**

**Author:** Fasihozaman Langerudi, Mehran, Taha Hossein Rashidi, and Abolfazl Mohammadian

**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 decision tree method to develop individual-level trip generation models for eight different trip purposes as defined in the US National Household Travel Survey in addition to daily vehicle miles traveled. For each trip purpose, the models are obtained by finding the best fitted statistical distribution to each of the final decision tree clusters while considering the correlation between the trip rates for other trip purposes. The rule-based models are sensitive to changes in demographics. The performance of the models is then tested and validated in a transferability application to the Phoenix Metropolitan Region. These models can be employed in a disaggregate microsimulation framework to generate trips with different purposes at the individual or household level.

**Subject Areas:** Data transferability, trip rate, decision tree, travel demand, vehicle miles traveled

**Availability:** Fasihozaman Langerudi, Mehran, Taha Hossein Rashidi, and Abolfazl Mohammadian. "Individual trip rate transferability analysis based on a decision tree approach." *Transportation Planning and Technology* 39.4 (2016): 370-388.  
<http://www.tandfonline.com/doi/abs/10.1080/03081060.2016.1160580>



**Title: Commuting in A Post-Baby Boomer World****Author:** Alan Pisarski, Steve Polzin, and Elaine Murakami

**Abstract:** In 2011, the first baby boomers--defined as those born between 1946 and 1964--reached age 65. Their move into retirement is causing a dramatic demographic shift, raising the question of how commuting will change in a post-baby boomer world. The labor force now includes generation X (born between 1965 and 1980) and the millennials (born 1981–2000). Together, these groups now surpass baby boomers in numbers in the workforce and therefore dominate the commuting population. The future of commuting may be very different from what it has been. Not only are the ages of workers changing, but so are the occupations that can be done remotely. In addition to the impacts of demographic changes and working from home, another trend is growing that might affect the traffic picture: the rapid transformations caused by technology's influence. The presence of self-driving vehicles, for example, might well be felt on U.S. highways as early as 2030. In addition to demographic, economic, and technological changes, another trend is likely to affect the transportation outlook. Domestic migration of working-age people continues to favor the South and West, leading to highly varying growth rates across the Nation. Finally, the United States is recovering from a serious recession, raising uncertainties as to which changes are cyclical in character, and therefore likely to return to historical patterns as the economy recovers, and which are truly structural in nature, indicating more permanent change. For example, a substantial number of post-recession jobs appear to be part time and thus might not contribute to peak-period travel in the same way as full-time employment would. These trends point to a complex and difficult time for forecasting. The answers needed by the transportation community to guide policy and planning might not be known until future data are available from the American Community Survey, which is released annually, and until completion of the 2015/2016 National Household Travel Survey.

**Subject Areas:** commuters; baby boomers; ACS; NHTS

**Availability:** Alan Pisarski, Steve Polzin, and Elaine Murakami *Commuting in A Post-Baby Boomer World* Publication Number: FHWA-HRT-16-002 Issue No: Vol. 79 No. 4; January/February 2016 <http://www.fhwa.dot.gov/publications/publicroads/16janfeb/04.cfm>

**Title: Classification of Tours in the U.S. National Household Travel Survey through Clustering Techniques**

**Author:** Miriam Pirra and Marco Diana

**Abstract:** Tours are increasingly being considered as an appropriate unit of observation of mobility behaviors and are one of the key ideas underpinning contemporary activity-based modeling approaches. Identifying typologies of tours would benefit both modelers and decision makers, striving to set up more tailored actions aimed at promoting environmentally benign travel choices. Different a priori classifications based on activity kinds have been proposed, none of which seems clearly preferable on empirical grounds. This paper takes a complementary approach and defines a data-driven segmentation through a cluster analysis of tours that were derived from the trip records from a United States national survey. The socioeconomic characterization of each cluster is finally carried out to link travelers' profiles with specific kinds of tours. Four main tour clusters have thus been identified: nonwork tours for compulsory activities done by young individuals, tours done by elder or retired persons, short and secondary tours within the travel day, and tours dominated by the working activity. Their relevance on a modeling and policy viewpoint is discussed.

**Subject Areas:** Tour-based analysis, Cluster analysis, k-means, Multimodality, Market segmentation, Classification

**Availability:** Pirra, M. and Diana, M. (2016). "Classification of Tours in the U.S. National Household Travel Survey through Clustering Techniques." *J. Transp. Eng.*, 10.1061/(ASCE)TE.1943-5436.0000845, 04016021.  
[http://ascelibrary.org/doi/abs/10.1061/\(ASCE\)TE.1943-5436.0000845](http://ascelibrary.org/doi/abs/10.1061/(ASCE)TE.1943-5436.0000845)

**Title:** Modeling air passengers' rescheduling strategies for airport service lines based on an empirical study with the aid of a virtual 3-D computer graphic environment

**Author:** Xuan Liu & John M. Usher

**Abstract:** This study investigates the rescheduling behavior of pedestrians using airport services based on air passengers' socio-demographic information and environmental attributes of the airport. It is a part of an overall project involving the development of an intermodal simulator for analyzing pedestrian traffic within intermodal facilities, which requires an understanding of pedestrian behavior. This paper presents a Multinomial Logit (MNL) model for simulating the rescheduling decision making behavioral responses of air passengers. A stated preference survey incorporating the use of a virtual 3D computer-graphic model is employed for data collection. The resulting data is then used for model estimation and validation. The empirical results show that the MNL model is able to predict air passengers' rescheduling strategies.

**Subject Areas:** Air passenger behavior – Rescheduling behavior – Stated preference survey – Pedestrian simulation – The Multinomial Logit model – Travel demand forecasting

**Availability:** Liu, Xuan, and John M. Usher. "Modeling air passengers' rescheduling strategies for airport service lines based on an empirical study with the aid of a virtual 3-D computer graphic environment." *Public Transport* 8.1 (2016): 57-84.

<http://link.springer.com/article/10.1007/s12469-016-0120-4>

**Title: Assessing the Effect of Compressed Work Week Strategy on Transportation Network Performance Measures**

**Author:** Duddu, Venkata R., and Srinivas S. Pulugurtha

**Abstract:** The focus of this paper is on evaluating and assessing the effect of a compressed work week strategy (say, not working a day each week) on transportation network performance measures such as link-level traffic speed, travel time, and volume-to-capacity ratio using data gathered for the Charlotte metropolitan area, North Carolina. The results obtained indicate that reducing 15% to 20% of work commute during the morning peak hours using compressed work week strategy would increase traffic speeds by up to 5 mph on at least 64% of center-lane miles (sum of the length of the center line of all lanes of traffic for each selected link). It would also decrease the travel time by up to two minutes on at least 61% of center-lane miles.

**Subject Areas:** compressed work week; transportation network performance measures

**Availability:** Duddu, Venkata R., and Srinivas S. Pulugurtha. "Assessing the Effect of Compressed Work Week Strategy on Transportation Network Performance Measures." A Message from the JTRF Co-General Editors 3 54.2 (2015): 57.

<http://www.trforum.org/journal/downloads/2015v54n2.pdf#page=59>

## **Title: A Theoretical and Methodological Framework to Analyze Long-Distance Pleasure Travel**

**Author:** Sivaraman, Vijayaraghavan

**Abstract:** The United States (US) witnessed remarkable growth in annual long distance travel over the past few decades. Over half of the long distance travel in the US is made for pleasure, including visiting friends and relatives (VFR) and leisure activities. This trend could continue with increased use of information and communication technologies for socialization, and enhanced mobility being achieved using fuel-efficient (electric/hybrid) and technology enhanced vehicles. Despite these developments, and recent interest to implement alternate mass transit options to serve this market, not much exists on the measurement, analysis and modeling of long distance pleasure travel in the U.S.

Statewide and national models are used to estimate long distance travel, but these are predominantly trip-based models, making it difficult to understand long distance trips as collection of household-level travel behavior. This form of travel behavior has been studied a lot in tourism, but in a piecemeal manner, such as to (from) a specific destination. Further, most of these studies are confined to analyzing leisure market, with VFR market gaining recognition only recently. In essence, annual household long distance pleasure travel behavior needs to be studied in a comprehensive manner rather than as isolated trips. This is because, most of these household travel decisions are undertaken considering their annual time and monetary budget, and their perceived cost to travel to one (or more) destination for given pleasure purpose on one (or more) occasion using a given mode of travel. Thus, the main objective of this dissertation is to develop a comprehensive behavioral model framework to analyze the above-discussed annual household long distance pleasure travel choices.

To start the above effort, it is first required to collect detailed annual household travel data, last collected over two decades ago (e.g.: ATS, 1995). No such recent effort has been pursued due to the significant labor and economic resource required to undertake it. There exist recent surveys (NHTS, 2001), but collected over a shorter (four week) period, and require significant processing even to arrive at aggregate annual travel estimates. Second, besides surveys, there is a need for additional data to estimate households' annual pleasure travel budget, and their cost to travel and stay at each of their potential destination choices, which are not readily available.

Thus, as the first goal, this dissertation analyzes long distance travel reported across historical surveys (NPTS; ATS; NHTS), to understand the differences in their definition, enumeration of purpose and collection methods. The intent here is twofold, first to conceive a method to estimate annual travel from surveys with shorter collection period. Further, the second intent is to gather travel patterns from these historical datasets such that it informs the second goal of this dissertation, i.e. development of a behavioral framework to analyze annual household pleasure travel. To this effect, this research also analyzes pleasure expenditures using Consumer Expenditure Survey (CEX, BLS) data. Interestingly, the analysis reveals CEX pleasure travel expenditure pattern to be similar to the travel pattern reported for the same market segments in travel survey (ATS).

Importantly, the above analysis informs the development of behavioral models, pursued as two distinct tasks to achieve the second goal. As the first task, a novel econometric model and forecasting procedure is developed to analyze a household's annual long distance leisure

travel decisions. Specifically, a households' time spent across one (or more) destination and travel mode to such destination for leisure is modeled subject to time and money budget constraints. In this methodological framework, the destination choice is modeled as a continuous variable (time at destination) using Multiple-Discrete Continuous Extreme Value model (MDCEV). While, travel mode choice to these destination(s) are modeled as a discrete choice, through a nested Multinomial Logit Model (MNL), with price variation introduced across the above choice of destination(s) and travel modes (air/ground). This required estimating annual monetary budgets, travel cost and per night lodging cost for each sample household, with each of them having 210 potential destinations and 2 travel mode choices respectively.

The second task, involved the development of a broader national model system to analyze households' annual pleasure travel decisions such as: choice (duration) at destination(s), travel purpose (VFR or leisure), mode (airplane or auto) choice and trip frequencies to these destination(s) using the same dataset. It was modeled in two stages, with the first stage estimating households' annual pleasure time budget using a stochastic frontier model. This budget was then used as constraint to analyze households' annual choice of destination and purpose using a nested MDCEV-MNL model in the second stage. A log sum variable from a nested joint multinomial logit model of trip frequency and mode choice for each purpose (VFR or leisure) is also introduced as input at this stage. This model was then validated using a prediction procedure, and further applied to test a policy scenario (increase in travel cost). The above national pleasure travel demand model could be further enhanced by including monetary constraints and price variation as in the first task. Overall, the model system proposed in this dissertation forms the foundation for a national comprehensive long distance travel model. This could be achieved through inclusion of other prominent travel purpose such as business and commuting to the national travel demand model presented in this research.

**Subject Areas:** Mathematics; Economics; Transportation planning

**Availability:** A Theoretical and Methodological Framework to Analyze Long-Distance Pleasure Travel by Sivaraman, Vijayaraghavan, Ph.D., University Of South Florida, 2015, 181 pages; 3738446 <http://gradworks.umi.com/37/38/3738446.html>

**Title: The Impacts of Shoulder Days on Non mandatory Activity Duration: A Time-Use Analysis Based on 2009 NHTS Survey**

**Author:** Asgari H, Jin X, Srinivasan S, Hu F.

**Abstract:** This study is intended to explore the temporal variations observed in non-mandatory activity involvement from a time-use analysis perspective. Five non-mandatory activities including "Household maintenance", "Personal maintenance", "Social", "Meal" and "Exercise" are examined in terms of activity duration. More importantly, this study emphasizes on the impacts of shoulder days (Mondays and Fridays) on non-mandatory activity duration as there has been a tendency to ignore the roles of these two days of the week compared to typical mid-weekdays. A structural equations model (SEM) is developed to investigate 1) How non-mandatory activities compete with each other in view of time budget allocation, 2) How activity durations vary across different segments (days) of the week, and 3) How observed differences could be correlated with socioeconomic and demographic attributes. Temporal variations are captured through the incorporation of a weekday category variable (Monday, Midweek, and Friday), and the associated interaction effects with various personal and household characteristics. The model results reveal significant interaction effects, confirming the hypothesis that people do show temporal preferences on shoulder days compared to typical mid-weekday for non-mandatory errands. The data applied in this study was obtained from the 2009 National Household Travel Survey (NHTS).

**Subject Areas:** Activity choices; Schedules and scheduling; Structural equation modeling; Travel surveys

**Availability:** Asgari, Hamidreza, et al. "The Impacts of Shoulder Days on Non mandatory Activity Duration: A Time-Use Analysis Based on 2009 NHTS Survey." Transportation Research Board 95th Annual Meeting. No. 16-2834. 2016. <https://trid.trb.org/view.aspx?id=1393063>

## 11. Trend Analysis and Market Segmentation

**Title:** Analysis of the Effectiveness of Varying Car-sharing Business Models

**Author:** William Tong, Sachin Govind, Ankit Agarwal, David Xu, George Moe

**Abstract:** Our goal was to develop a model that can be used by car-sharing service companies to evaluate their business models and maximize their customer base. To do so, a model was created for each of the three major car-sharing service types in different city environments. The first step to developing these models is to provide a more accurate representation of the driving habits of individuals. To do so, the population data is separated into bins determined by the factors of miles travelled and the amount of time that the user is in the car. Normally, the bins are separated into high, medium, and low based on the 30th and 70th percentiles (as can be seen in papers such as those by Fama and French), but another table with bins separated by 20 percent was created to gain a better distribution of the data. As expected, the greater majority of driving instances are either short distance trips that require little time or longer trips that require more time. From this a company is able to decide which service would be optimal to cater for the needs of their consumer base. We then modeled each city topologically and figured out what cities had the most potential to implement a model. We determined that Richmond Virginia was the best place to implement a new solution because of its currently unoccupied area. We then conducted a Monte Carlo simulation that reflected the normal interactions between users and transportation within a city containing car-sharing businesses. From this we were able to determine which program(s) was the most popular within a normal city. We determined that the Round Trip business model would be the most popular within a generic city. Finally, in order to account for increases in self-driving cars and green-tech cars, we modified the simulation to assume that all service cars were self-driving and made use of clean energy. As a result, the utilities of each car-sharing plan was altered, accommodating for the ability of the car to arrive at the user's doorstep, thus removing the negative utility of having to walk to the station, and increasing the utility of using a green-tech car. We determined that the One-Way business model is the best model to implement in a generic city. Therefore, we conclude that the One-Way model is the best suited model to implement in Richmond, Virginia. In addition, the One-Way model is the ideal service for any business within a city that focuses on self-driving and/or green-tech cars. We recommend that a company start with a Round Trip model and monitor the rise of self-driving/green vehicles within the area. From there they may decide to switch to the One-Way model.

**Subject Areas:** Monte Carlo Simulations; car-sharing

**Availability:** William Tong, Sachin Govind, Ankit Agarwal, David Xu, George Moe *IMSA Analysis of the Effectiveness of Varying Car-sharing Business Models* Feb. 28, 2016

[http://digitalcommons.imsa.edu/cgi/viewcontent.cgi?article=1000&context=math\\_sw](http://digitalcommons.imsa.edu/cgi/viewcontent.cgi?article=1000&context=math_sw)



# **Title: Development Of Regional Optimization And Market Penetration Models For The Electric Vehicles In The United States**

**Author:** Noori, Mehdi

**Abstract:** Since the transportation sector still relies mostly on fossil fuels, the emissions and overall environmental impacts of the transportation sector are particularly relevant to the mitigation of the adverse effects of climate change. Sustainable transportation therefore plays a vital role in the ongoing discussion on how to promote energy insecurity and address future energy requirements. One of the most promising ways to increase energy security and reduce emissions from the transportation sector is to support alternative fuel technologies, including electric vehicles (EVs). As vehicles become electrified, the transportation fleet will rely on the electric grid as well as traditional transportation fuels for energy. The life cycle cost and environmental impacts of EVs are still very uncertain, but are nonetheless extremely important for making policy decisions. Moreover, the use of EVs will help to diversify the fuel mix and thereby reduce dependence on petroleum. In this respect, the United States has set a goal of a 20% share of EVs on U.S. roadways by 2030. However, there is also a considerable amount of uncertainty in the market share of EVs that must be taken into account. This dissertation aims to address these inherent uncertainties by presenting two new models: the Electric Vehicles Regional Optimizer (EVRO), and Electric Vehicle Regional Market Penetration (EVReMP). Using these two models, decision makers can predict the optimal combination of drivetrains and the market penetration of the EVs in different regions of the United States for the year 2030.

First, the life cycle cost and life cycle environmental emissions of internal combustion engine vehicles, gasoline hybrid electric vehicles, and three different EV types (gasoline plug-in hybrid EVs, gasoline extended-range EVs, and all-electric EVs) are evaluated with their inherent uncertainties duly considered. Then, the environmental damage costs and water footprints of the studied drivetrains are estimated. Additionally, using an Exploratory Modeling and Analysis method, the uncertainties related to the life cycle costs, environmental damage costs, and water footprints of the studied vehicle types are modeled for different U.S. electricity grid regions. Next, an optimization model is used in conjunction with this Exploratory Modeling and Analysis method to find the ideal combination of different vehicle types in each U.S. region for the year 2030. Finally, an agent-based model is developed to identify the optimal market shares of the studied vehicles in each of 22 electric regions in the United States. The findings of this research will help policy makers and transportation planners to prepare our nation's transportation system for the future influx of EVs.

The findings of this research indicate that the decision maker's point of view plays a vital role in selecting the optimal fleet array. While internal combustion engine vehicles have the lowest life cycle cost, the highest environmental damage cost, and a relatively low water footprint, they will not be a good choice in the future. On the other hand, although all-electric vehicles have a relatively low life cycle cost and the lowest environmental damage cost of the evaluated vehicle options, they also have the highest water footprint, so relying solely on all-electric vehicles is not an ideal choice either. Rather, the best fleet mix in 2030 will be an electrified fleet that relies on both electricity and gasoline. From the agent-based model results, a deviation is evident between the ideal fleet mix and that resulting from consumer behavior, in

which EV shares increase dramatically by the year 2030 but only dominate 30 percent of the market. Therefore, government subsidies and the word-of-mouth effect will play a vital role in the future adoption of EVs.

**Subject Areas:** Electric Vehicles, Life Cycle Cost, Environmental Damage Cost, Water Footprint, Market Penetration, Inherent Uncertainty, Stochastic Optimization, Agent Based Modeling, Exploratory Modeling and Analysis.

**Availability:** Noori, Mehdi. Development of Regional Optimization and Market Penetration Models for the Electric Vehicles in the United States. Diss. University of Central Florida Orlando, Florida, 2015. [http://etd.fcla.edu/CF/CFE0005852/Dissertation-Mehdi\\_Noori\\_2.pdf](http://etd.fcla.edu/CF/CFE0005852/Dissertation-Mehdi_Noori_2.pdf)

**Title: Towards Safe and Secure Autonomous and Cooperative Vehicle Ecosystems**

**Author:** Lima, A., Rocha, F., Völöp, M., & Esteves-Verissimo, P.

**Abstract:** Semi-autonomous driver assists are already widely deployed and fully autonomous cars are progressively leaving the realm of laboratories. This evolution coexists with a progressive connectivity and cooperation, creating important safety and security challenges, the latter ranging from casual hackers to highly-skilled attackers, requiring a holistic analysis, under the perspective of fully-fledged ecosystems of autonomous and cooperative vehicles. This position paper attempts at contributing to a better understanding of the global threat plane and the specific threat vectors designers should be attentive to. We survey paradigms and mechanisms that may be used to overcome or at least mitigate the potential risks that may arise through the several threat vectors analyzed.

**Subject Areas:** semi-autonomous driver; threat vector; global threat

**Availability:** Lima, A., Rocha, F., Völöp, M., & Esteves-Verissimo, P. (2016, October). Towards Safe and Secure Autonomous and Cooperative Vehicle Ecosystems. In Proceedings of the 2nd ACM Workshop on Cyber-Physical Systems Security and Privacy (pp. 59-70). ACM.  
<http://dl.acm.org/citation.cfm?id=2994489>

**Title: The Relationship between Online Shopping and Traditional Shopping (Shopping Trip),  
Case Study: The City of Tehran**

**Author:** Edrisi, Ali, and Houmaan Ganjipour

**Abstract:** Development of science and technology and expansion of communication networks have overhauled many traditional aspects of human life. Shopping is a traditional urban practice that plays a central role not only in economics but also in urban development and transportation. Some may argue that home delivery services provided by online shopping (e-shopping) systems reduce the number of shopping trips to retailers, but online shopping may lead to generation of additional trips made by those buyers who first search, select, or even buy a product online and then travel to an actual vendor to examine, test, or compare it. Therefore, accurate determination of complex relationship between these two methods of purchase can yield valuable data for transportation planners. Some researchers have reported a negative correlation between online buying and the number of shopping trips, and yet others have reported the exact opposite. The objective of this study is to assess this relationship for Tehran residents, to provide a path for adoption of new policies geared to reduce congestion and traffic. To pursue this objective, 435 questionnaires were distributed and filled by Tehran residents and the obtained raw data was analyzed by SPSS23 software; the results were then processed by AMOS 23 software to develop a structural equation model. The final results showed that online searching has a positive impact on both online shopping and traditional shopping, but they also showed that e-shopping has in fact a positive impact on traditional shopping. The results obtained in this study point toward the presence of a complementary relationship between e-shopping and in-store shopping, which means that people who use internet to purchase products are also committed to traditional methods of shopping.

**Subject Areas:** Online shopping, Shopping trip, Structural equation modelling

**Availability:** Edrisi, Ali, and Houmaan Ganjipour. "The Relationship between Online Shopping and Traditional Shopping (Shopping Trip), Case Study: The City of Tehran." (2016). [http://www.sid.ir/en/VEWSSID/s\\_pdf/288E20160202.pdf](http://www.sid.ir/en/VEWSSID/s_pdf/288E20160202.pdf)

**Title: Associations Between Online Purchasing and Store Purchasing for Four Types of Products in Nanjing, China**

**Author:** Zhen, F., Cao, X., Mokhtarian, P. L., & Xi, G.

**Abstract:** As e-shopping proliferates, transportation planners examine the extent to which it will replace shopping trips. Although previous studies have explored relationships between online purchasing and store purchasing, few have examined the relationships for different types of products in China. A joint ordered probit model was applied to investigate the relationships among 963 respondents in Nanjing, China. Online purchasing had positive associations with store purchasing for all four types of products (clothing, books, daily goods, and electronics), even after shopping attitudes and demographics were controlled for. The magnitude of the complementarity effect differs by product type, with less frequently purchased products showing a larger effect. The impact of online purchasing on road systems is limited in China because transit and walking are dominant modes for shopping trips. However, the impact is expected to grow.

**Subject Areas:** online shopping; probit model;

**Availability:** Zhen, Feng, et al. "Associations Between Online Purchasing and Store Purchasing for Four Types of Products in Nanjing, China." *Transportation Research Record: Journal of the Transportation Research Board* 2566 (2016): 93-101.  
<http://trrjournalonline.trb.org/doi/abs/10.3141/2566-10>

**Title:** Shaping the Future of Autonomous Vehicles: How Policymakers Can Promote Safety, Mobility, and Efficiency in an Uncertain World

**Author:** Nidhi Kalra, Rand Corporation

**Abstract:** Testimony before the Committee on Appropriations

**Subject Areas:** autonomous vehicle; emerging opportunities; risks of AVs

**Availability:** Kalra, Nidhi. *Shaping the Future of Autonomous Vehicles: How Policymakers Can Promote Safety, Mobility, and Efficiency in an Uncertain World* Testimony before the Committee on Appropriations. November 16, 2016

**Title:** The Importance of Transportation Forecasting

**Author:** Jack Wells

**Abstract:** blog

**Subject Areas:** transportation forecasting

**Availability:** Jack Wells October 22, 2016 [www.nafafrieght.com/blog.html](http://www.nafafrieght.com/blog.html) The Importance of Transportation Forecasting <http://www.nafafreight.com/blog.html>

**Title: Exploring the Effects of Factors on the Willingness of Female Employees to Telecommute in Kuala Lumpur, Malaysia**

**Author:** Hamsa, A. A. K., Jaff, M. M., Ibrahim, M., Mohamed, M. Z., & Zahari, R. K.

**Abstract:** Telecommuting is increasingly gaining attention in Malaysia as a means of both easing the worsening peak-hour traffic congestion, and retaining women in the workforce. Moreover, substantial evidence in the literature suggests that telecommuting is more suited to women who when compared to men, experience more work/non-work role conflict and more career interruptions. However, the incidence of actual telecommuting among female employees in Kuala Lumpur remains very limited. A survey of 454 women employed in the industries of financial intermediation, real estate, education and ICT in Kuala Lumpur, revealed that only 2% of the respondents were practicing telecommuters, and that more than a third (35%) of those who stated their ability to telecommute, were in fact unwilling to utilize that working arrangement if given the opportunity. The main aim of this study is to explore the factors contributing to the willingness to telecommute or the lack thereof. The significance of this study stems from the fact that a better understanding of what influences the willingness to telecommute is a prerequisite for the successful promotion of the practice, and thus reaping its well researched benefits. Job suitability, delay experienced in the morning commute, and the increased usage of Smartphone technology were found to have a positive correlation with the willingness to telework, whereas car ownership, household size, and the negative perceptions towards teleworking were found to have a negative correlation.

**Subject Areas:** Telecommuting; willingness; female employees; Kuala Lumpur

**Availability:** Hamsa, A. A. K., Jaff, M. M., Ibrahim, M., Mohamed, M. Z., & Zahari, R. K. (2016). Exploring the Effects of Factors on the Willingness of Female Employees to Telecommute in Kuala Lumpur, Malaysia. *Transportation Research Procedia*, 17, 408-417.  
<http://www.sciencedirect.com/science/article/pii/S2352146516306974>



**Title:** Linking online niche sales to offline brand conditions

**Author:** Son, Jungmin, Jikyung Jeanne Kim, Jeonghye Choi, and Mingyung Kim

**Abstract:** With the dramatic growth in the online marketplace, online retailers are keen to understand and leverage the interplay between offline environment and online sales. This study examines the influence of offline brand conditions on online sales of niche brands. Specifically, we investigate the proximity to the leading brand's headquarters, city of origin, and the extent of its offline distribution, offline brand availability. We also examine the moderating effect of offline affinity for niche attributes, offline niche affinity. Using sales data of niche brands, we find that brand share is higher in regions closer to the city of origin and where brand availability is limited. The category sales benefit from proximity to the city of origin and increased offline brand availability. This positive impact of favorable offline brand conditions on category sales is more prominent in regions with lower niche affinity. Finally we offer managerial insights for marketing practice.

**Subject Areas:** Multichannel retailing; Channel substitution; Channel synergy; City of origin; Niche brand; Offline brand condition

**Availability:** Son, Jungmin, et al. "Linking online niche sales to offline brand conditions." *Journal of Business Research* (2016).

<http://www.sciencedirect.com/science/article/pii/S0148296316304817>

**Title: Small Business Adapts to the Digital World with SAP Anywhere**

**Author:** Christine Donato

**Abstract:** According to Reuters, the average American commuter wastes about 42 hours a year mired in traffic, especially in the California Bay Area. It's one of the six most-congested urban areas in the US, and traffic congestion there is growing faster than the region's population and employment levels. A potential solution to the commuter gridlock? Electric scooters.

**Subject Areas:** Trends by Generation, Long Distance Travel, Attitudinal Theories, Hybrid Models, Environmental Motivations/strategies, Information Technologies, productivity of time, application of market segmentation techniques

**Availability:** Donato, Christine for Uber Tech July 18, 2016 Small Business Adapts to the Digital World with SAP Anywhere; The California Bay Area is one of the six most-congested urban areas in the US. Tune into this #SAPTalks show to hear how EcoReco is digitizing its business to sell more e-scooters and help ease the Bay Area commute.

<http://www.zdnet.com/article/small-business-adapts-to-the-digital-world-with-sap-anywhere/>

**Title: Improving the behavioral realism of global integrated assessment models: An application to consumers' vehicle choices**

**Author:** McCollum, David L., Charlie Wilson, Hazel Pettifor, Kalai Ramea, Volker Krey, Keywan Riahi, Christoph Bertram, Zhenhong Lin, Oreane Y. Edelenbosch, and Sei Fujisawa

**Abstract:** A large body of transport sector-focused research recognizes the complexity of human behavior in relation to mobility. Yet, global integrated assessment models (IAMs), which are widely used to evaluate the costs, potentials, and consequences of different greenhouse gas emission trajectories over the medium-to-long term, typically represent behavior and the end use of energy as a simple rational choice between available alternatives, even though abundant empirical evidence shows that real-world decision making is more complex and less routinely rational. This paper demonstrates the value of incorporating certain features of consumer behavior in IAMs, focusing on light-duty vehicle (LDV) purchase decisions. An innovative model formulation is developed to represent heterogeneous consumer groups with varying preferences for vehicle novelty, range, refueling/recharging availability, and variety. The formulation is then implemented in the transport module of MESSAGE-Transport, a global IAM, although it also has the generic flexibility to be applied in energy-economy models with varying set-ups. Comparison of conventional and 'behaviorally-realistic' model runs with respect to vehicle purchase decisions shows that consumer preferences may slow down the transition to alternative fuel (low-carbon) vehicles. Consequently, stronger price-based incentives and/or non-price based measures may be needed to transform the global fleet of passenger vehicles, at least in the initial market phases of novel alternatives. Otherwise, the mitigation burden borne by other transport sub-sectors and other energy sectors could be higher than previously estimated. More generally, capturing behavioral features of energy consumers in global IAMs increases their usefulness to policy makers by allowing a more realistic assessment of a more diverse suite of policies.

**Subject Areas:** Consumer choice, human behavior, Transport, Light-duty vehicles, Climate change mitigation

**Availability:** McCollum, David L., et al. "Improving the behavioral realism of global integrated assessment models: An application to consumers' vehicle choices." *Transportation Research Part D: Transport and Environment* (2016).

<http://www.sciencedirect.com/science/article/pii/S1361920915300900>

**Title: Three Essays on the Applications of Housing Transactions**

**Author:** Baron, A.

**Abstract:** What information is captured in home prices? Clearly prices should reflect characteristics such as square footage, build quality, and the number of bedrooms. Economists also believe that house prices reflect local characteristics, such as school and air quality, presence of open space, and crime rates. Traditionally, researchers employ hedonic models, where the marginal willingness to pay of these characteristics is obtained by running a linear regression of housing and neighborhood characteristics on the log of house price. These models have been used to study the value of a myriad of topics, from pollution and crime rates, to views of windmills and presence of nearby methamphetamine labs. As with many methods of analysis, hedonic models are subject to numerous assumptions and caveats, many of which are often ignored. This dissertation explores several complexities of and proposes new means of employing house prices in economic analysis. The first chapter asks a question that has received little study: why do buyers pay different prices for the same house? In most studies utilizing house transactions, the researcher does not know who the buyers and sellers are, and thus implicitly assumes that specific types of individuals have no effect on home prices. The chapter measures the effect of experience: the relative number of transactions the buyer and seller have taken part in over a given period of time. First, I develop a two-sided real estate search model that incorporates information costs, search costs, and Nash bargaining power. I test the implications of this model using repeat-sales housing data on 113,272 transactions from 1998-2006 in two large metropolitan regions of Ohio. The main results show that more experienced buyers purchase properties at a discount, experienced sellers sell at a premium, and that the magnitude of these differences varies depending on the relative and absolute levels of buyer and seller experience and geographic location. On average, being more experienced than the other party leads to a 4% better price, although it appears that experience is more important to buyers than sellers. The results are found to be robust to different specifications, including varying the time interval and geographic area of study.

**Subject Areas:** home prices; real estate

**Availability:** Baron, A. (2016). Three Essays on the Applications of Housing Transactions (Doctoral dissertation, The Ohio State University).

[https://etd.ohiolink.edu/!etd.send\\_file?accession=osu1468450347&disposition=attachment](https://etd.ohiolink.edu/!etd.send_file?accession=osu1468450347&disposition=attachment)

**Title: Are consumers willing to pay to let cars drive for them? Analyzing response to autonomous vehicles**

**Author:** Daziano, Ricardo A., Mauricio Sarrias, and Benjamin Leard

**Abstract:** Autonomous vehicles use sensing and communication technologies to navigate safely and efficiently with little or no input from the driver. These driverless technologies will create an unprecedented revolution in how people move, and policymakers will need appropriate tools to plan for and analyze the large impacts of novel navigation systems. In this paper we derive semiparametric estimates of the willingness to pay for automation. We use data from a nation-wide online panel of 1,260 individuals who answered a vehicle-purchase discrete choice experiment focused on energy efficiency and autonomous features. Several models were estimated with the choice microdata, including a conditional logit with deterministic consumer heterogeneity, a parametric random parameter logit, and a semiparametric random parameter logit. We draw three key results from our analysis. First, we find that the average household is willing to pay a significant amount for automation: about \$3,500 for partial automation and \$4,900 for full automation. Second, we estimate substantial heterogeneity in preferences for automation, where a significant share of the sample is willing to pay above \$10,000 for full automation technology while many are not willing to pay any positive amount for the technology. Third, our semiparametric random parameter logit estimates suggest that the demand for automation is split approximately evenly between high, modest and no demand, highlighting the importance of modeling flexible preferences for emerging vehicle technology.

**Subject Areas:** willingness to pay, autonomous vehicle technology, discrete choice models; semiparametric heterogeneity

**Availability:** Daziano, Ricardo A., Mauricio Sarrias, and Benjamin Leard. "Are Consumers Willing to Pay to Let Cars Drive for Them? Analyzing Response to Autonomous Vehicles." (2016). <http://www.rff.org/files/document/file/RFF-DP-16-35.pdf>

**Title: Determining charging load of PHEVs considering HVAC system and analyzing its probabilistic impacts on residential distribution network**

**Author:** Pouladi, Jaber, MB Bannae Sharifian, and Soodabeh Soleymani

**Abstract:** Over the recent years, using a plug-in hybrid electric vehicle (PHEV) has been offered as a promising solution to the problems to do with energy and environmental issues. To design a promising residential distribution system with extensive presence of PHEVs in the future, it is necessary to predict the demand load of PHEVs in the network. This paper proposes a new model for calculating the initial state of charge in PHEVs. The impact of power consumption of HVAC on the PHEV charging load is considered in the proposed model. Then, the probabilistic load flow is used based on the point estimate method to simulate the stochastic aspects of the PHEV charging and also to investigate the PHEV effects on the residential distribution network. Also, the probability of having PHEV effects is discussed. The proposed model is applied to the IEEE-37 node test feeder to evaluate its performance and accuracy.

**Subject Areas:** Plug-in hybrid electric vehicles (PHEVs); Initial state of charge; Charging load; Probabilistic load flow; HVAC system

**Availability:** Pouladi, Jaber, MB Bannae Sharifian, and Soodabeh Soleymani. "Determining charging load of PHEVs considering HVAC system and analyzing its probabilistic impacts on residential distribution network." *Electric Power Systems Research* 141 (2016): 300-312.  
<http://www.sciencedirect.com/science/article/pii/S0378779616303005>

**Title:** Mobile content distribution with vehicular cloud in urban VANETs

**Author:** Gong H, Yu L, Liu N, Zhang X

**Abstract:** Plenty of multimedia contents such as traffic images, surveillance video, music and movie will flood into vehicular ad hoc networks. However, content distribution over VANETs is not a easy task, due to the high mobility of vehicles and intermittent connectivity. Infrastructure-based scheme can relieve the problem, but with a large amount of investment. In this paper, we propose a mobile content distribution scheme based on roadside parking cloud (RPC), which is formed by the parked car on the roadside, and mobile cloud (MC), which is formed by moving cars on the road. According to a trip history model, a mobile car can estimate its following trajectory. When it wants to download the content, gateway node of the RPC will work out a downloading schedule, which tells it how much chunks it can download from which RPCs. Moreover, the helper of the mobile car in mobile cloud would deliver specified chunks to it when there is lack of RPC in the following trip. Simulation results show that cloud-based scheme performs better than inter-vehicle communication approach and cluster-based scheme.

**Subject Areas:** roadside parking cloud; mobile cloud; trip history model; trajectory prediction; content distribution

**Availability:** Gong H, Yu L, Liu N, Zhang X. Mobile content distribution with vehicular cloud in urban VANETs. China Communications. 2016 Aug;13(8):84-96.  
<http://ieeexplore.ieee.org/abstract/document/7563691/>

**Title:** Potential for widespread electrification of personal vehicle travel in the United States

**Author:** Needell ZA, McNerney J, Chang MT, Trancik JE.

**Abstract:** Electric vehicles can contribute to climate change mitigation if coupled with decarbonized electricity, but only if vehicle range matches travellers' needs. Evaluating electric vehicle range against a population's needs is challenging because detailed driving behaviour must be taken into account. Here we develop a model to combine information from coarse-grained but expansive travel surveys with high-resolution GPS data to estimate the energy requirements of personal vehicle trips across the US. We find that the energy requirements of 87% of vehicle-days could be met by an existing, affordable electric vehicle. This percentage is markedly similar across diverse cities, even when per capita gasoline consumption differs significantly. We also find that for the highest-energy days, other vehicle technologies are likely to be needed even as batteries improve and charging infrastructure expands. Car sharing or other means to serve this small number of high-energy days could play an important role in the electrification and decarbonization of transportation.

**Subject Areas:** Energy and behavior, Energy and society, Energy modelling, Energy science and technology

**Availability:** Needell, Zachary A., et al. "Potential for widespread electrification of personal vehicle travel in the United States." *Nature Energy* 1 (2016): 16112.

[http://www.nature.com/articles/nenergy2016112?WT.feed\\_name=subjects\\_physical-sciences](http://www.nature.com/articles/nenergy2016112?WT.feed_name=subjects_physical-sciences)



**Title: Bibliography and Technical Appendices to Intercity Passenger Rail in the Context of Dynamic Travel Markets**

**Author:** Stephane Hess

**Abstract:** n/a

**Subject Areas:** Trends by Generation, Long Distance Travel, Attitudinal Theories, Hybrid Models, Environmental Motivations/strategies, Information Technologies, productivity of time, application of market segmentation techniques

**Availability:** Hess S, Coogan M, Ajzen I, Amherst MA, Bhat C, Austin TX, Lee B, Burlington VT, Ryerson M, Schwieterman J, Chicago IL. NCRRP.

[http://onlinepubs.trb.org/onlinepubs/ncrrp/ncrrp\\_wod\\_002.pdf](http://onlinepubs.trb.org/onlinepubs/ncrrp/ncrrp_wod_002.pdf)

## **Title: M3 Challenge Third Place, \$10,000 Team Prize**

**Author:** Coach: Steven Hess Students: Niyant Narang, Gianna Miggins, Michael Wu, Anna Song, Alexander Ju

**Abstract:** Ever since the invention of the mass produced automobile in the beginning of the 20th century, the automobile has become a vital part of life around the world, especially in America. 95% of American households own at least one car, and 85% of working people in America get to work by car [1]. However, these times are changing. Due to controversy over the environmental footprints of cars and the massive amounts of oil needed to fuel these cars, an increasing percentage of the working class of America are using car-sharing. This relatively new concept is defined by the US Department of State as a process where shared cars owned by private companies parked throughout dense metropolitan areas and university campuses can be rented, based on a variety of factors, by members at any hour of the day [1].

Our job consists of three main parts: one, to determine the percentage of US drivers in varying categories based on the amount of time driven per day and the number of miles driven daily; two, to deduce which of four car-sharing methods would attract the most participation in different cities throughout the country; and three, to then account for the impact of new environmentally friendly automobile technologies and change our model to rerank the aforementioned cities in terms of citizen participation.

To build a model for the first task, we first determined the definitions of low, medium, and high mileage and time spent driving. Using mileage caps from insurance companies, we defined less than 20.548 miles per day to be low, between 20.548 and 41.096 miles to be medium, and greater than 41.096 miles to be high [2]. We then determined the time group bounds by multiplying the previous bounds by the ratio of average time spent driving annually to average miles driven annually to define low as less than 0.71 hours per day, medium being between 0.71 and 1.42 hours, and high as above 1.42 hours. A cumulative probability distribution of miles driven per day was created, and probabilities from that function were multiplied with estimated probabilities of a driver being in the low, medium, or high group given their mileage group.

Our second assignment was to build a model to determine the expected participation of several cities in car-sharing programs like Zipcar. Once we built the basic model, we were then tasked with analyzing three other variants, which were a) a system of jockeys who manually reposition cars after one-way trips, b) a station system where users drop off and pick up cars at stations, and c) a private system, where multiple individuals privately share ownership of a car. We constructed a model, based on factors such as income distribution, population, Cost of car-sharing, average commuting time, and car availability to estimate each city's participation, measured on the car shares index. Our results indicated that the basic structure of a traditional per hour or per day charge would lead to the most participation in the four cities given. Finally, we adjusted our model to consider the effects of new technological developments such as self-driving cars, and alternative energy sources. After accounting for the change in cost that these new technologies caused, we determined that the traditional hourly- or daily-based system, coupled with new alternative energy sources was the most appealing for consumers.

**Subject Areas:** new technologies; car sharing, vehicle ownership

**Availability:** Steven Hess Students: Niyant Narang, Gianna Miggins, Michael Wu, Anna Song, Alexander Ju; M3 Challenge Third Place, \$10,000 Team Prize Team#7497

<https://m3challenge.siam.org/sites/default/files/uploads/7497%20Gov%20Livingston%20HS.pdf>

**Title: A Comparison of Traffic Performance in Highly Congested Urban Areas**

**Author:** Melissa Humphrey, Scott Dona, Amarjit Singh, Thin Thin Swe

**Abstract:** Each year, traffic conditions continue to worsen around the world due to growing populations, denser concentrations in urban areas, and deteriorating road conditions. Traffic congestion contributes to negative outcomes on every scale of the economy -- global greenhouse gas emissions and atmospheric pollution, millions of dollars lost annually in commute times and vehicle repairs, and even stress-related health problems on the individuals affected. Of the ten major cities in USA that have the highest levels of congestion and impacted travel times, six are located in the western region of the country. This paper will analyze the contributing factors such as travel distance, urban and commuter populations, and public transportation utilization to correlate their effects on overall commute time, congestion percentages and costs, and the health impacts on the communities in those six cities. It is observed that these factors that contribute to congestion levels are interdependent, and therefore cannot be individually isolated for study. It is for this reason that a Data Envelopment Analysis approach was utilized to analyze the traffic system performances and their relative efficiency, in order to determine which cities perform better than others and for what reasons. However, it was discovered that all six cities perform the same, for good or bad, yielding a relative efficiency,  $E$ , of 1.0 each, implying that there is no distinguishing feature or pattern of any one city over another, as related to traffic performance.

**Subject Areas:** DEA, Linear Program, Efficiency, Western United States

**Availability:** Humphrey, Melissa, et al. "A Comparison of Traffic Performance in Highly Congested Urban Areas." *International Journal of Traffic and Transportation Engineering* 5.3 (2016): 47-63. <http://article.sapub.org/10.5923.j.ijtte.20160503.01.html>

**Title: The Effect of Market Size on Fuel-Saving Technology Adoption in Passenger Vehicles**

**Author:** Klier T, Linn J, Zhou YC

**Abstract:** Passenger vehicle fuel economy standards in the United States and many other countries will require substantial new vehicle fuel economy improvements over the next decade. Although economic theory suggests that vehicle manufacturers adopt greater fuel-saving technologies for vehicles with larger market size, there is no empirical evidence on the role of market size in passenger vehicle technology adoption. This paper documents a strong connection between market size, as measured by sales, and technology adoption. Using variation in consumer demographics and purchasing patterns to account for the endogeneity of market size, we find that a 10 percent increase in market size raises vehicle fuel efficiency by 0.3 percent, as compared to a mean improvement rate of 1.4 percent per year over 1997-2013. Moreover, fuel prices affect efficiency primarily via market size rather than other channels. Historically, fuel price and demographic driven market size changes have had large effects on fuel-saving technology adoption. Furthermore, fuel economy standards, a feebate, or fuel taxes would induce firms to adopt fuel-saving technologies on their most efficient cars, thereby polarizing the fuel efficiency distribution of the new vehicle fleet.

**Subject Areas:** passenger vehicles, technological change, market incentives, innovation incentives

**Availability:** Klier T, Linn J, Zhou YC. The effect of market size on fuel-saving technology adoption in passenger vehicles.

[http://www.econ.gatech.edu/sites/default/files/seminars/201602/71\\_Linn%20-%20Seminar.pdf](http://www.econ.gatech.edu/sites/default/files/seminars/201602/71_Linn%20-%20Seminar.pdf)

**Title: Analysis of the relationship between internet usage and allocation of time for personal travel and out of home activities: Case study of Scotland in 2005/6**

**Author:** Le Vine, Scott, Charilaos Latinopoulos, and John Polak

**Abstract:** There is much debate among transportation researchers, practitioners, and policymakers regarding how the opening up of the online world is impacting on people's physical spatio-temporal patterns. This paper presents a novel analysis of the relationship between internet usage and time use, with time spent traveling (during the course of a 24-h day) and aggregate time spent at out-of-home activities analyzed separately. The empirical analysis draws on the Scottish Household Survey, which contains a unique combination of a one-day travel diary paired with a pseudo-diary of online behavior that captures three distinct dimensions of internet activity: the amount of time that respondents spend online per week, the types of tele-activities that they perform, and where they access the internet. The empirical findings include both ceteris paribus statistical association of specific dimensions of internet usage and aggregate (multi-dimensional) relationships. The latter suggest that (in the context of this dataset), internet usage correlates positively, net of confounding effects, with both time spent traveling and time spent at out-of-home activities.

**Subject Areas:** Time use; Travel time budget; Internet usage

**Availability:** Le Vine, Scott, Charilaos Latinopoulos, and John Polak. "Analysis of the relationship between internet usage and allocation of time for personal travel and out of home activities: Case study of Scotland in 2005/6." *Travel Behaviour and Society* 4 (2016): 49-59.  
<http://www.sciencedirect.com/science/article/pii/S2214367X16000041>

**Title:** Survey Looks at Cedar Valley Travel Patterns

**Author:** Waterloo Cedar Falls Courier

**Abstract:** press release for 2016 NHTS in Waterloo

**Subject Areas:** 2016 NHTS

**Availability:** Jamison, Tim. *The Courier* "Survey Looks at Cedar Valley Travel Patterns" Mar. 29, 2016 [http://wcfcourier.com/news/local/govt-and-politics/survey-looks-at-cedar-valley-travel-patterns/article\\_3a925361-1723-5420-b347-ca29685102d6.html](http://wcfcourier.com/news/local/govt-and-politics/survey-looks-at-cedar-valley-travel-patterns/article_3a925361-1723-5420-b347-ca29685102d6.html)

**Title:** National survey to assist with travel research

**Author:** Danielle Davis

**Abstract:** press release for 2016 NHTS in Georgia

**Subject Areas:** 2016 NHTS

**Availability:** Davis, Danielle; thebayonet.com "National Survey to Assist with Travel Research"

Oct. 12, 2016 <http://www.thebayonet.com/2016/10/12/1071504/national-survey-to-assist-with.html>



**Title:** Arizona, national surveys help chart state's transportation future

**Author:** YourWestValley.com

**Abstract:** press release for 2016 NHTS in Arizona

**Subject Areas:** 2016 NHTS

**Availability:** *YourWestValley.com Sun Cities. Surprise. Glendale. Peoria.* "Arizona, national surveys help chart state's transportation future" April 5, 2016

[http://www.yourwestvalley.com/valleyandstate/article\\_3e44dcda-fa93-11e5-969d-37284f80cc73.html](http://www.yourwestvalley.com/valleyandstate/article_3e44dcda-fa93-11e5-969d-37284f80cc73.html)

**Title:** MPO survey will ask your views on transportation

**Author:** www.businessrecord.com

**Abstract:** press release for 2016 NHTS in Des Moines Area MPO

**Subject Areas:** 2016 NHTS

**Availability:** *www.businessrecord.com* "MPO survey will ask your views on transportation  
May 23, 2016

<http://www.businessrecord.com/Content/Transportation/Transportation/Article/MPO-survey-will-ask-your-views-on-transportation/175/837/73295#ixzz4B11A9O7E>

**Title:** Caltrans, FHA Urge Californians to Complete Transportation Survey

**Author:** SCVnews.com; local television for Santa Clarita

**Abstract:** press release for 2016 NHTS

**Subject Areas:** 2016 NHTS

**Availability:** SCVnews.com "Caltrans, FHA Urge Californians to Complete Transportation Survey"  
Thurs. June 21, 2016 <http://scvnews.com/2016/06/21/caltrans-fha-urge-californians-to-complete-transportation-survey/>

**Title:** USDOT revives National Household Travel Survey

**Author:** Transportation Infrastructure News Daily Reports

**Abstract:** press release for 2016 NHTS

**Subject Areas:** 2016 NHTS

**Availability:** tinewsdaily.com “USDOT revives National Household Travel Survey” Thurs. April 14, 2016 <http://tinewsdaily.com/stories/510714483-usdot-revives-national-household-travel-survey>

**Title:** Arizona Transportation Department Asks Residents To Log How They Get From Points A To B

**Author:** Kathy Ritchie

**Abstract:** press release for 2016 NHTS in Arizona

**Subject Areas:** 2016 NHTS

**Availability:** Ritchie, Kathy, *kjzz.org* "Arizona Transportation Department Asks Residents To Log How They Get From Points A To B" April 7, 2016 <http://kjzz.org/content/288868/arizona-transportation-department-asks-residents-log-how-they-get-points-b>

**Title:** Electric-car range anxiety exists, but it's overblown, says MIT study

**Author:** Stephen Edelstein

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Edelstein, Stephen, [www.greencarreports.com](http://www.greencarreports.com) August 29, 2016 Electric-car range anxiety exists, but it's overblown, says MIT study  
[http://www.greencarreports.com/news/1105820\\_electric-car-range-anxiety-exists-but-its-overblown-says-mit-study](http://www.greencarreports.com/news/1105820_electric-car-range-anxiety-exists-but-its-overblown-says-mit-study)

**Title: Most US Commutes Could be Handled by EVs: Study**

**Author:** Jason Siu

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Siu, Jason, [www.autoguide.com](http://www.autoguide.com) August 17, 2016 Most US Commutes Could be Handled by EVs: Study <http://www.autoguide.com/auto-news/2016/08/most-us-commutes-could-be-handled-by-evs-study.html>

**Title:** Study says most owners find electric vehicle range satisfactory today

**Author:** Aurel Niculescu

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Aurel Niculescu, [www.inautonews.com](http://www.inautonews.com) August 18, 2016 Study says most owners find electric vehicle range satisfactory today <http://www.boston.com/cars/news-and-reviews/2016/08/17/mit-study-says-current-electric-cars-could-meet-most-of-todays-driving-demands>



**Title:** MIT study says current electric cars could meet most of today's driving demands

**Author:** Sanjay Salomon

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Salomon, Sanjay, [www.boston.com](http://www.boston.com) August 17, 2016 MIT study says current electric cars could meet most of today's driving demands <http://www.boston.com/cars/news-and-reviews/2016/08/17/mit-study-says-current-electric-cars-could-meet-most-of-todays-driving-demands>

**Title:** Electric cars good enough for 90 percent of trips

**Author:** Robert Ferris

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Ferris, Robert, [www.cnn.com](http://www.cnn.com) August 16, 2016 Electric cars good enough for 90 percent of trips <http://www.cnn.com/2016/08/16/electric-cars-good-enough-for-90-percent-of-trips.html>

**Title:** Shorter-range electric cars meet the needs of almost all US drivers

**Author:** Jonathan M. Gitlin

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Gitlin, Jonathan, arstechnica.com August 15, 2016 Shorter Range electric cars meet the needs of almost all US drivers <http://arstechnica.com/cars/2016/08/shorter-range-electric-cars-meet-the-needs-of-almost-all-us-drivers/>

**Title:** Why Range Anxiety for Electric Cars Is Overblown

**Author:** Catherine Caruso

**Abstract:** The vast majority of American drivers could switch to battery electric vehicles (BEVs) tomorrow and carry on with their lives unaffected, according to a new study in Nature Energy.

**Subject Areas:** EV Range feasibility

**Availability:** Caruso, Catherin, MIT Technology Review, August 15, 2016 Shorter Range electric cars meet the needs of almost all US drivers

<https://www.technologyreview.com/s/602174/why-range-anxiety-for-electric-cars-is-overblown/>

**Title: Creative Cities Research In Penang, Malaysia: A Review Of Conceptual And Methodological Framework**

**Author:** Leng KS, Badarulzaman N, Samat N, Sirat M, Dawood SR.

**Abstract:** A heightened interest in the notions of 'creative cities, creative industries and creative economy' has propelled research in these emerging areas of the New Economy. As an emerging area, some conceptual and methodological issues need to be addressed prior to adopting the creative city paradigm as part of the strategic and policy framework towards a creative economy. This paper presents a review of key conceptual and methodological issues that need to be considered when conducting research on creative cities in Malaysia. The conceptual and methodological issues relating to creative cities and creative industries should be addressed and dealt with in order to facilitate an enabling framework for contemporary research in this emerging area.

**Subject Areas:** Creative cities, creative industries, creative economy

**Availability:** Leng KS, Badarulzaman N, Samat N, Sirat M, Dawood SR. Creative Cities Research In Penang, Malaysia: A Review Of Conceptual And Methodological Framework. PLANNING MALAYSIA. 2015:2. <http://www.mip.org.my/doc/PMJ2015.pdf#page=8>

**Title: Smoking prevalence in urban and rural populations: findings from California between 2001 and 2012**

**Author:** Leng KS, Badarulzaman N, Samat N, Sirat M, Dawood SR.

**Abstract:** Background: Tobacco smoking and related health problems are still major public health concerns in the United States despite the declining smoking prevalence. Objectives: This study explored differences in smoking prevalence between urban and rural areas potentially relevant to tobacco control efforts in California. Methods: Public use adult smoking data from the California Health Interview Survey (CHIS) between 2001 and 2011–2012 were analyzed. A total of 282 931 adults were surveyed across the six CHIS cycles. A ZIP code-based geographic classification (Urban, Second-City, Suburban, and Town/Rural) was used to examine the association between smoking prevalence and area of residency. Results: The overall smoking prevalence in California decreased from 17.0% in 2001 to 13.8% in 2011–2012. Within each CHIS cycle, the Town/Rural areas had the highest smoking prevalence, followed by Urban and Second-City areas, and Suburban areas had the lowest. Pooled data from all CHIS cycles showed a similar pattern, with rates in Urban, Second-City, Suburban and Town/Rural areas being 15.2%, 15.2%, 13.1% and 17.3%, respectively. Weighted multivariate logistic regression analysis indicated significantly higher odds of smoking in Urban, Second-City and Town/Rural areas compared to Suburban areas (all adjusted odds ratios > 1.10), although this trend varied by race/ethnicity, being present in non-Hispanic Whites and not present in Hispanics. Conclusions: Town/Rural and Urban populations of California are consistently at higher risk of smoking than Suburban populations. These results indicate a need for population-specific tobacco control approaches that address the lifestyle, behavior, and education of disparate populations within the same state or region.

**Subject Areas:** Smoking prevalence, rural, urban, California

**Availability:** Liu, Lianqi, et al. "Smoking prevalence in urban and rural populations: findings from California between 2001 and 2012." *The American journal of drug and alcohol abuse* 42.2 (2016): 152-161. <http://www.tandfonline.com/doi/abs/10.3109/00952990.2015.1125494>

**Title: Development of an agent-based model for regional market penetration projections of electric vehicles in the United States**

**Author:** Noori, Mehdi, and Omer Tatari

**Abstract:** One of the most promising strategies recommended for increasing energy security and for mitigating transportation sector emissions is to support alternative fuel technologies, including electric vehicles. However, there is a considerable amount of uncertainty regarding the market penetration of electric vehicles that must be accounted for in order to achieve the current market share goals. This paper aims to address these inherent uncertainties and to identify the possible market share of electric vehicles in the United States for the year 2030, using the developed Electric Vehicle Regional Market Penetration tool. First, considering their respective inherent uncertainties, the vehicle attributes are evaluated for different vehicle types, including internal combustion engine, gasoline hybrid, and three different electric vehicle types. In addition, an agent-based model is developed to identify the market shares of each of the studied vehicles. Finally, market share uncertainties are modeled using the Exploratory Modeling and Analysis approach. The government subsidies play a vital role in the market adoption of electric vehicle and, when combined with the word-of-mouth effect, may achieve electric vehicle market share of up to 30% of new sales in 2030 on average, with all-electric vehicles having the highest market share among the electric vehicle options.

**Subject Areas:** Electric vehicle; Market penetration; Inherent uncertainty; Agent-based modeling; Exploratory modeling and analysis

**Availability:** Noori, Mehdi, and Omer Tatari. "Development of an agent-based model for regional market penetration projections of electric vehicles in the United States." *Energy* 96 (2016): 215-230. <http://www.sciencedirect.com/science/article/pii/S0360544215016606>