



Safe Routes
to School
**National
Partnership**



Improving Modeling and Data Collection for Active Transportation

May 2014



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About the Safe Routes to School National Partnership

The Safe Routes to School National Partnership is a fast-growing network of more than 650 organizations and professional groups working to set goals, share best practices, leverage infrastructure and program funding and advance policy change to help agencies that implement Safe Routes to School programs across the nation. The National Partnership's mission is to advocate for safe walking and bicycling to and from schools, and in daily life, to improve the health and well-being of America's children and to foster the creation of livable, sustainable communities.

The California Mission

The National Partnership's mission in California is to advance safe walking and bicycling to and from schools, to build a diverse and inclusive movement of champions, to foster the creation of active and sustainable communities, and to improve the health and quality of life for all of California's youth and families.

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Improving Modeling and Data Collection for Active Transportation

The State of California and the State's metropolitan planning organizations (MPOs) have committed to expanding active transportation networks through the State Active Transportation Program (ATP) and the Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) process. Improved quantification of the benefits of active transportation investments are becoming increasingly important as policy makers seek to expand investments in active transportation networks and understand the costs and benefits of these decisions. To ensure that future projects, funding allocations and policy decisions achieve goals related to mode shift, reduced vehicle miles traveled (VMT), cost effectiveness, greenhouse gas reductions and improved public health, it is vital that our current models accurately capture the benefits of active transportation investments.

To better understand the current state of active transportation data collection and modeling, the Safe Routes to School National Partnership (National Partnership) conducted a series of structured interviews with modeling professionals from across California in the fall of 2013. Interviewees were selected from MPO modeling staff, private consultants engaged in developing new active transportation models and academic experts conducting research in the field. From these interviews the National Partnership has compiled the results to provide policy makers a series of recommendations they can implement to improve data collection and modeling for active transportation.

Finally, there is a growing awareness of the effects of our transportation system on public health outcomes, including diabetes, asthma, obesity and chronic heart disease. Public health professionals recognize that active transportation investments provide "upstream" prevention measures that improve the health of communities by providing opportunities for physical activity. A number of innovative models have begun to emerge that seek to quantify this relationship between active transportation and public health outcomes. In addition to the recommendations made for traditional transportation models, brief recommendations have been developed on how these health focused modeling tools can be improved for active transportation.



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Data Collection for Active Transportation

The importance of data for good decision-making cannot be understated. Planning agencies have long recognized that better data can improve efficiency and reduce waste from our transportation systems. As more and more of our transportation agencies begin to increase investments in active transportation, so too must the data sources for walking and bicycling be improved to meet the growing demand for this data. MPOs, County Transportation Commissions (CTCs), Regional Transportation Planning Agencies (RTPAs), cities, counties, developers and public health departments can all benefit from improved data on active transportation to ensure that policy and funding decisions meet the needs of these modes. More importantly, our policy makers need to know that the transportation investments they are making are achieving desired goals.

Data collection efforts for active transportation happen at many levels of government. The American Community Survey and the National Household Travel Survey are national data sets collected by the federal government and widely used by modelers to develop regional predictions and outcomes. In contrast corridor/intersection level or project specific level data is often collected by consultants, local governments and even community-based organizations. This data can provide valuable information about how one treatment type may compare to another.

Improvements in each of these efforts will lead to a robust understanding of how land use and transportation investments improve the conditions for active transportation. Below is a brief summary of some of the major sources of data and how they could be improved or expanded.



BEST PRACTICE: City of Santa Monica

Santa Monica collects data on all modes at 200 intersections city-wide on a biannual basis. This effort developed out of a need to understand the impacts of numerous investment proposals that were all using project-specific counts that often conflicted with one another. The City now has a longitudinal data set that can be used to track the effects of different transportation investments over time. There is a significant cost to this effort which is paid for through development fees.

American Community Survey (ACS)

The ACS is an ongoing statistical survey that samples a small percentage of the population every year. The ACS contains several transportation-related questions regarding mode choice, age, gender, race, income, automobile ownership and occupation. The ACS is widely used for its “Journey to Work” question that is available for modeling at the census tract and block group level.

PROS: The ACS provides valuable information on the number of people who journey to work by walking and bicycling at the block group granular level.

CONS: The only type of trip monitored by the ACS is the “Journey to Work” trip. “Journey to Work” trips represent a small percentage of overall trips and an even smaller number percentage of active transportation trips since these tend to be short neighborhood-based trips. Since the ACS does not provide information on a variety of trip types, such as the journey to school, it does not provide a holistic picture for active transportation trips. In addition, it fails to capture trips made by individuals who are not currently employed. Finally, while the ACS does provide a granular level of data to the census tract level for vehicle trips, the data for active transportation is often not statistically significant at this level.

RECOMMENDATION: MPOs and states should request additional questions be added to the ACS as the need for active transportation data at smaller geographies becomes increasingly important. Adding additional questions to the ACS is very difficult and would require national support. Alternatively, new methods of estimating the non-work trips based on projections using the ACS and other data sources such as the National Household Travel Survey should be developed.

Household Travel Surveys

The National Household Travel Survey (NHTS) and the California Household Travel Survey (CHTS) are two very important sources of active transportation data. These surveys use travel diaries and other techniques to explore the characteristics of different types of trips. For example, the NHTS has questions regarding trip origin/destination, mode used, length, time, trip purpose, etc.

PROS: Household travel surveys collect active transportation trip information for a variety of trip types and provide valuable trip-type characteristics.

CONS: Household travel surveys are not collected for small geographic regions since they often require expensive survey techniques. Most of these surveys are often only done once every 10 years due to the associated costs. Response rates to these types of surveys have been steadily declining since they are collected from individuals who have land lines. While the aggregated data is useful for large counties and states to paint a broad picture, the data cannot be resolved to the census tract or project level. Many household travel surveys do not capture the entire range of active transportation trip types. For example, the CHTS does not collect data on the journey to school.

RECOMMENDATIONS: Increase the sample size and oversample counties with smaller populations to ensure the outputs from travel surveys are statistically significant at a more granular level. Oversample for active transportation users to ensure trip characteristics are available at a significant level for different demographics. Develop new methods of estimating characteristics for smaller geographies by using the ACS and other data sources to validate models. All Household Travel Surveys should ask a wide range of questions related to active transportation trips especially those related to the journey to school.

Citywide Traffic Counts

Citywide traffic counts that include bicycling and walking provide detailed information at the corridor and intersection project level and show trends over time. There are two methods available for conducting these counts. The first method is volunteer counts, which are conducted by non-profit groups. The counts done by the Los Angeles County Bicycle Coalition in the City of Los Angeles are an example of volunteer counts which are done every year at 50 intersections. The second method of conducting citywide counts is done through the hiring of a consultant to conduct traffic counts. Cities that are currently conducting such counts provide a valuable longitudinal data set that can be used to validate regional models. The City of Santa Monica currently does this for all modes to inform the City's traffic models related to new development.

PROS: These types of counts can provide fine-grained detail of the travel and mode characteristics at a particular intersection or corridor to inform project level decisions and resource allocations at the city level. They can also provide valuable information for modeling the benefits of different infrastructure improvements. Citywide counts relieve the burden of conducting counts from developers providing a consistent data set.

CONS: Both volunteer and consultant counts are resource-intensive.

RECOMMENDATIONS: Cities that are currently engaged in such work should be encouraged to continue these efforts and best practices should be developed that can be adopted by other cities. Cities that have not yet begun this type of data collection should be encouraged to integrate bicycle and pedestrian counts into their existing data collection efforts. Additionally, cities should be encouraged to develop automated counting programs that collect data on a continuous basis.

Before and After Counts

Before and after counts are usually conducted as part of infrastructure projects and non-infrastructure programs to determine the success of the project. These data sources provide valuable information regarding the impact of specific types of projects and programs.

PROS: Before and after counts provide detailed information about specific types of infrastructure improvements and programs.

CONS: Before and after counts do not provide longitudinal data that would show the long-term effects of the project. Likewise, to determine the broader applicability of the data, additional research must be performed to compare similar projects.

RECOMMENDATIONS: Before and after counts should be required of all projects for all modes. In addition, automated continuous counters should be included in the project scope whenever possible. Resources are also needed for follow up studies once counts are completed to compare multiple projects and develop observations that can be used to influence larger modeling efforts.

Automated Traffic Counters

Automated counters for active transportation are becoming increasingly sophisticated and affordable. Installing sensors (e.g. in-pavement loops) and a utility box during project implementation lowers costs relative to retrofitting a site. A jurisdiction can then use a limited number of “rotating” data loggers at sites so equipped. Automated counters can be installed for single projects or across a network, and have long been used to collect automobile data.

PROS: Automated counters provide longitudinal data for specific facilities that can inform cost benefit analysis and mode shift estimates for future projects.

CONS: The costs of developing and maintaining automated counters increases project costs.

RECOMMENDATIONS: The State, MPOs and CTCs should consider requiring certain types of new active transportation projects to include automated counters to track the benefits of these investments over time.

School Trip Data

Data on the journey to school is difficult to attain. The most prominent source of this data in California is the National Household Travel Survey (NHTS). However, NHTS data is only statistically significant at the county level. The second source of data for the journey to school trips are before and after surveys that have been required through the federal Safe Routes to School grant programs which is stored and compiled by the National Center for Safe Routes to School. While this data shows changes in behavior for individual schools, it does not provide longitudinal data on behavior change once the grant ends. In addition to these two sources, the California Health Interview Survey (CHIS) surveys 50,000 people every two years regarding a number of health topics and includes journey to school questions for students.

PROS: The NHTS provides valuable trip characteristics for the journey to school. The federal Safe Routes to School surveys provide before and after data that has been used to show that these programs are successful at changing behavior.

CONS: The NHTS, the federal surveys and CHIS do not provide longitudinal data at a granularity that can be used to measure the success of different types of interventions at the school level. The federal surveys are resource intensive to implement and can be burdensome for school staff to administer.

RECOMMENDATIONS: Research needs to be done to determine how school travel information can be collected on a longitudinal basis through existing data collection sources such as the California Physical Fitness Test, in order to minimize the burden on school staff and to provide transportation agencies with data on how school travel behaviors change with the implementation of Safe Routes to School projects and programs.

Recommendations for Data Collection

EXISTING DATA SOURCES

- Expand the questions in the California Household Travel Survey, the National Household Travel Survey and the American Community Survey for active transportation to expand knowledge of different trip types and demographic trends for active transportation.
- Increase the sample size and oversample smaller jurisdictions to ensure the outputs from travel surveys are statistically significant for smaller geographic areas.
- Oversample for active transportation users to ensure trip characteristics are available at a significant level for different demographics.

NEW DATA SOURCES

- Develop infrastructure network inventories for both bicycle and pedestrian modes to inform gap analysis and infrastructure investments.
- Require before and after counts for all modes for all projects to develop projections for different facility types and to track mode shift. This may require agencies to revise current implementation schedules for grants to allow for post implementation billing of evaluation costs.
- Secure funding and develop automated counting programs in each county to provide seasonal and longitudinal data that can be used to validate transportation models.
- Encourage local jurisdictions to incorporate bicycle and pedestrian counts into all traffic counting opportunities.
- Explore opportunities to partner with the private sector to use “big data” and other new technologies to analyze travel behavior.
- Develop a process for collecting longitudinal journey to school data from each school to track mode shift from Safe Routes to School projects and to better understand how schools impact development patterns and trip generation rates.



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Modeling for Active Transportation

Active transportation trips have only recently begun to be incorporated into transportation models. Previously, transportation modeling focused exclusively on motorized vehicle trips such as cars, trucks and buses, and these were modeled for longer regional trips on major arterials and freeways. For example, traditional “Four Step Travel Models” use Transportation Analysis Zones (TAZs) that cover many blocks or even multiple census tracts as the base level of analysis.

Modeling active transportation trips requires more sophisticated modeling tools because the trips are often quite short and are heavily influenced by adjacent land use and the presence or lack of facilities. Newer ABMs and Scenario Planning Models can model trips on a much smaller geographic level and often can incorporate the effect of adjacent land use on trip behavior. This smaller geographic focus makes these models much more appropriate for modeling active transportation trips.

With the development of newer Scenario Planning Models, there is now an opportunity to incorporate health and other important outcomes into the modeling process. These models can also run scenarios much faster which allows scenarios to be revised more often. This flexibility allows a much wider range of policy decisions to be examined in a reasonable time frame.

As with data collection, transportation modeling can happen at many different levels from the regional MPO level focused on air quality and greenhouse gas emissions to the local level focused on the performance of specific intersections. A brief summary of different types of transportation models and recommendations on how to improve them follows below.



BEST PRACTICE: “ITHIM” Public Health Model

The Integrated Transport and Health Impacts Model (ITHIM) developed by the California Department of Public Health was used to show that “an ambitious, but achievable shift in mode share to active transport in the San Francisco Bay Area could reduce GHG emissions from personal passenger vehicles by 14.5 percent, while reducing the burden of chronic diseases, such as heart attacks, stroke, and diabetes, by 15 percent.”

Traditional Four Step Models

“Four Step Models” also known as “trip based” models are used to develop travel forecasts and model air quality/emissions from the transportation sector. The four sub-models of trip generation, trip distribution, mode choice, and trip assignment are run through an iterative process across the defined transportation network to forecast future traffic volumes and transportation network performance characteristics. Four Step Models use Transportation Analysis Zones (TAZs) to determine trip generation within each zone. Trip generation rates are based on socioeconomic data and transportation data that is often taken from the American Community Survey or the United States Census. Four Step Model outputs often include traffic volumes, VMT by link, trip length, mode shares and transit boarding data.

PROS: Four Step Models are excellent for estimating trips of longer distances along a regional network and predicting the impact of large-scale developments on these networks. Four Step Models have been tested and are legally defensible for measuring the effects of the transportation on air quality and greenhouse gas emissions.

CONS: Due to their focus on regional trips, Four Step Models are less useful for predicting short trips within smaller geographic areas. Given that most active transportation trips are relatively short, four step models have difficulty accurately predicting mode shares for these trip types. A second criticism of Four Step Models is that they do a poor job of modeling “trip chains” where a person may stop multiple times in one journey.

RECOMMENDATIONS: Many Four Step Models are still being used by MPOs because newer models are still being calibrated and have not yet been extensively used to produce data for environmental impact reports. Agencies are therefore reluctant to discontinue their use. We recommend that these models continue to be used until agencies are comfortable with the ability of newer ABMs to estimate statutory requirements. However, we recommend that their use for making policy decisions should be contextualized and limited and that other models that better represent all trips be used to inform these discussions.

Activity Based Models (ABMs)

ABMs simulate individual and household transportation decisions that compose a daily travel itinerary. ABMs create rich socio-economic characteristics for each person and for each household within a region and predict “whether, when, where, for how long, with whom and in what sequence” that person will participate in activities. ABMs strive to be as behaviorally realistic as possible and are based on empirical data collected by MPOs, Caltrans, and the federal government. The analytic capabilities of an ABM are particularly helpful in evaluating Transportation Demand Management (TDM) policies (including active transportation), social equity, carpooling, transit access, facility pricing and land development investments.

PROS: ABMs can produce more accurate and nuanced data regarding active transportation trips than four step models. They can also model the impacts of a wider range of policy decisions that may affect mode choice such as socioeconomic data.

CONS: Given the complexity of ABMs they often take many years to calibrate. The outputs of ABMs are also sensitive to the quality of the data that is provided. Given the lack of strong active transportation data, models have to be closely scrutinized to ensure that realistic outcomes are produced.

RECOMMENDATIONS: In order for ABMs to accurately represent the benefits of active transportation and the impact of specific transportation investments, additional investments need to be made to collect active transportation trip behavior from a variety of projects. We recommend that MPOs invest in additional data collection efforts and continue to fund improvements to ABMs to ensure that they can accurately predict travel behavior for active transportation trips.

Scenario Planning Models

Scenario Planning Models (SPMs), sometimes known as sketch-planning models, are designed to provide relatively quick analyses (days instead of weeks or months) of a wide range of public policy topics. SPMs can model the fiscal, environmental, transportation, public health and community impacts of plans and policies, and are focused on improving the linkages between local and regional planning. In California, the major MPOs are adopting a new open source SPM called “UrbanFootprint” which is an online platform that will allow local and regional agencies the ability to store and exchange data, and to collaborate on regional and local plan development

PROS: SPMs provide accelerated modeling of many public policy topics that relate to active transportation investments such as land use, public health and safety.

CONS: SPMs generally use outputs from ABMs and socio economic data from sources like the ACS to conduct their analysis of policy initiatives. This means that if the underlying data does not accurately represent the number of active transportation trips, the SPM will not produce accurate results. In addition, since many SPMs are relatively new, modules related to active transportation and public health still need to be reviewed and improved to ensure they provide accurate predictions.

RECOMMENDATIONS: Additional investments need to be made to ensure that accurate results can be gleaned from these models. In addition, since these models rely on the data from ABMs to produce results, additional data on active transportation trips needs to be provided, especially at the project level of analysis.

Public Health Models

In recent years there has been added interest in how transportation systems affect public health, both from an air quality and a physical activity standpoint. To calculate the effects of different public investment strategies, transportation models are beginning to include public health outcomes into their array of outputs. In California, several models have been developed that are designed to show the benefits of added active transportation investments on public safety, greenhouse gas emissions and chronic disease outcomes, related to physical inactivity. The two most prominent of these are the California Department of Public Health’s Integrated Transport and Health Impacts Model (ITHIM) and the Urban Footprint Public Health Module.

PROS: Public Health Models are important to achieving additional investments in active transportation infrastructure and programs because they help to quantify the benefits of these investments for reducing healthcare costs and greenhouse gas emissions.

CONS: These models are relatively new and to date only provide regional level cost and benefit estimates.

RECOMMENDATIONS: These models need to be further developed and expanded to more regions so that statewide benefits can be calculated. This will help state level policy makers make important decisions related to Active Transportation funding.

Project Level Models

Cities and counties rely on project level models to generate trip estimates for new transportation projects. Applications for state and federal funding often rely on these estimates to develop cost and benefit analysis for project eligibility. Project level models for active transportation have been developed by numerous consulting firms and public agencies. Unfortunately, many of these are sketch type models that give only rough estimates for a project's expected trip generation.

PROS: Project level models are necessary to justify investments in specific projects. They can be used to analyze different facility types to determine the most cost effective strategies for specific project locations.

CONS: There are no widely recognized models currently in use that local agencies can use to develop project level estimates for trip generation rates. This makes applying for state and federal funding onerous and time consuming.

RECOMMENDATIONS: MPOs and state agencies should develop and adopt standardized tools for calculating the active transportation trip rates that different infrastructure investments will generate in different land use scenarios. In addition, add-ons for safety and greenhouse gas reductions should be included.

BEST PRACTICE: Metropolitan Transportation Commission - Activity Based Model

MTC moved to the activity-based travel model (Travel Model One) in December 2010. Over the next two years, MTC will be making significant improvements to the model that should facilitate order of magnitude improvements in how non-motorized travel is represented. MTC is currently working on an ambitious effort to overhaul the representation of supply – space, roadways, transit service, bicycle ways, and sidewalks – in its travel model, increasing the fidelity of these representations by one or more orders of magnitude. MTC refers to this change as developing its Travel Model Two for planning work – MTC's existing activity-based travel model is referred to as Travel Model One. Travel Model Two will consist of the improved representation of supply with the SANDAG representation of demand and the SANDAG application software. In subsequent years, Travel Model Three will consist of improved representation of supply with an improved representation of demand. MTC has also been working toward incorporating the public health ITHIM into their modeling.

Recommendations for Modeling

ACTIVITY BASED MODELS (ABMs)

- Additional funding resources need to be dedicated by MPOs to expand the capabilities of ABMs and validate their outputs to track active transportation trips accurately.
- ABMs need local geographic data at a small scale for calibration to ensure accuracy. Agencies should invest in the collection of this data to ensure their ABMs are producing accurate results.
- ABMs need more demographic data from active transportation trips to be sensitive to different network users. Agencies should invest in the collection of this data to ensure their ABMs are producing accurate results.

LAND USE AND SCENARIO PLANNING MODELS

- Strategies should be developed for modeling the “journey to school” and school-based travel trips to inform land use and transportation models.
- Scenario planning models should be used in early planning stages and scenarios should be developed with stakeholder input.
- Existing land use models need to be improved to project the impact land use has on active transportation rates and greenhouse gas reductions.
- Models should examine the benefits of improving the jobs housing fit, the impact of providing low income housing, the impacts of transit oriented development and mixed use development, the impacts on public health outcomes and the access to different land uses such as parks and schools.

PROJECT BASED MODELS

- MPOs and transportation agencies should invest in developing project-level trip generation rates for active transportation projects that can be standardized and used for all projects in the grant application process for state and federal funds.
- Models should be developed to show the greenhouse gas reductions from active transportation projects in different land use place types.

PUBLIC HEALTH MODELS

- Public Health Models need to be expanded and incorporated into the transportation and land use planning process for all MPOs to project health outcomes and quantify associated fiscal impacts of transportation investments.
- Public Health Models used for transportation need to be reviewed by public health departments and stakeholders to ensure outputs are useful for both fields.



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Partnership Opportunities to Improve Modeling and Data Collection

STATE AGENCIES

- State agencies should provide detailed analysis of national and state household travel surveys and make data readily available for MPOs and cities.
- State agencies should partner with federal agencies to improve and recommend new questions for data collected through the National Household Travel Survey and the American Community Survey.
- State agencies should develop standardized models and performance metrics to calculate the benefits of different active transportation infrastructure improvement to inform grant applications and cost benefit discussions.

LOCAL JURISDICTIONS

- Local jurisdictions should partner with and fund community based organizations to conduct bicycle and pedestrian counts.
- Local jurisdictions should partner with MPOs to conduct studies when data is collected to build a knowledge base for different active transportation infrastructure improvements.
- Cities and regional agencies should develop regional systems of automated counters for active transportation trips.
- Local jurisdictions should partner with private agencies to develop new technologies or utilize private data sources such as cell phones to collect additional data.

UNIVERSITIES

- MPOs and transportation agencies should partner with universities to develop project based models based on analysis of existing data sources.
- Universities should be harnessed to improve forecasting for reductions in vehicle-miles traveled and greenhouse gas emissions from active transportation projects. They should also be engaged to analyze other co-benefits such as health and economic activity related to active transportation improvements.

DEPARTMENT OF EDUCATION

- CA Department of Education should partner with school districts to include the collection of student travel data into existing data sets such as school health surveys or physical fitness testing.
- State and regional level transportation agencies should partner with the Department of Education and school districts to better understand the impact of school siting and development on land use and transportation demand.

PRIVATE SECTOR

- Cities and regional agencies should partner with private sector firms to expand opportunities for systems integration and data collection.
- Private sector firms should develop new technologies for counting and modeling active transportation trips.



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Improving Modeling and Data Collection for Active Transportation gives an overview of current methods that can be used to track and improve conditions for walking and bicycling. A breakdown of each method is given as well as specific recommendations modeling, data collection, and on creating partnerships around these two subjects.

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