Oregon Modeling Statewide Collaborative

Activity-Based Models

Oregon's Next Generation of Transportation Forecasting Models

A New Transportation Forecasting Framework for Oregon

Since it's inception in 1996, the Oregon Modeling Statewide Collaborative (OMSC) has been at the forefront of transportation forecasting, helping to ensure Oregon has the right data, tools, skills, and expertise needed to answer questions for decision makers about Oregon's multi-modal transportation systems and their relation to our economy, environment, and livability.

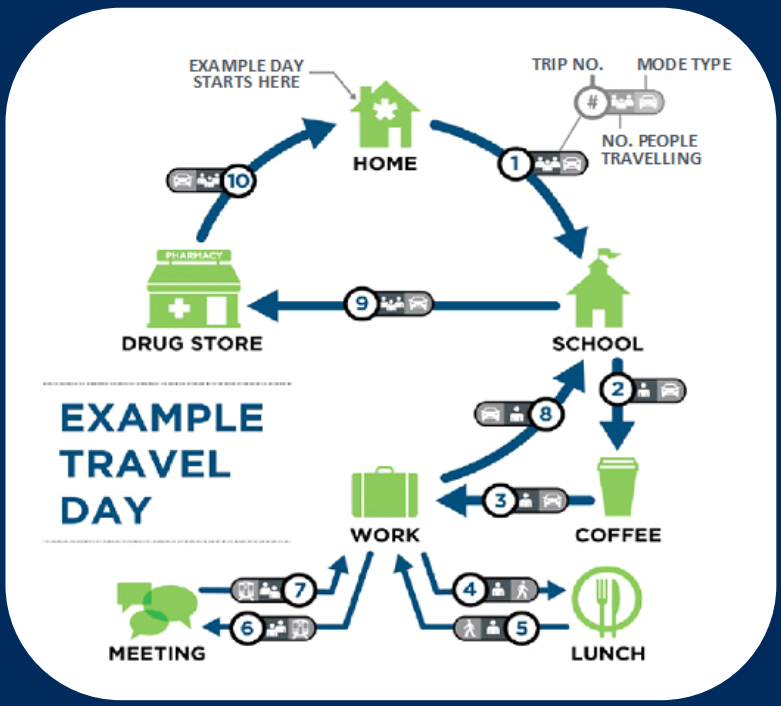
In recent years, decision makers have begun to grapple with new questions about equity, transportation-related greenhouse gas emissions, climate resilience, new vehicle and fuel technologies, new ride hailing and ride sharing applications, active transportation planning, and many other emerging trends and policy topics. Oregon's traditional transportation forecasting models have served us well for traditional automobile-oriented analysis through the years but were not optimally designed to address many of these modern-day multi-modal analysis needs.

In 2010, the OMSC began discussing the need for expanded transportation forecasting capabilities to help answer new and emerging questions about our transportation systems. In 2018, an early-version Activity-Based Model (ABM) was implemented in southern Oregon, allowing us to test and evaluate ABM capabilities and providing many helpful insights. Along with an inter-agency effort to complete a statewide household travel study, the OMSC designed a new activity-based modeling framework in 2023 and 2024, to be implemented across Oregon starting in 2026.

Increased Detail in Activity-Based Models

In the past, transportation agencies in Oregon employed "trip-based" models, which simulate the travel behaviors of groups of households (neighborhoods). By contrast, ABMs simulate the travel choices and behaviors of individual people, considering their full set of daily activities and how each person's travel is affected by others in their household, such as dropping off a child on the way to work.

ABMs can model chains of trips with multiple destinations. The day-long, inter-related travel choices of household members are reflected in the model, giving ABMs the ability to simulate travel at a greater level of detail and across longer timeframes than previous forecasting models.



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Expanded Functionality for Key Policy Areas

Policy Topic	Trip-Based Models	Activity-Based Models
Traditional highway projects	Good	Good
Transit expansion projects	Good	Superior
Bike/walk planning	Fair	Superior
Transportation related climate/greenhouse gas analysis	Good	Superior
Travel pricing (such as high occupancy toll lanes and road use fees)	Fair	Superior
Equity (including the effects of policies and investments on disadvantaged populations)	Fair	Superior

Analysis Suitability: *Superior* *Good* *Fair*

Activity-based models allow more detailed investigation of questions and issues for today's transportation decision makers and more complete information about the potential benefits and impacts of transportation investments.

ABMs can also help planning agencies customize and optimize strategic policies and programs such as travel demand management efforts, transit incentives, low-income toll discounts, e-vehicle programs, and many others.

Trip-Based Models

Travel information and outcomes can be used to estimate equity impacts at the ***neighborhood*** level.

Equity Analysis

Activity-Based Models

The travel decisions of ***individual people*** allows much richer exploration of how transportation and land use projects and policies impact different people.

ABMs can be configured to group individuals by income, age, and other demographics, to more closely examine the potential equity impacts of transportation decisions on specific population segments.

More Policy Topic Examples

Trip-Based Models

Activity-Based Models

Transit Analysis

Transit routes and schedules can be represented with trip-based models, and some impacts of route and schedule decisions (for example the average transit commute time by neighborhood) can be estimated at the neighborhood level.

ABMs give us greater insight into the effects of policies such as different fare structures by age or income, employer subsidized transit passes, and choices between parking or transit subsidies.

Additionally, the impacts of transit policies on individual travel behaviors can be assessed across a wide range of equity dimensions.

Bike/Walk Analysis

Biking and walking routes can be represented in trip-based models to help forecast neighborhood-level shifts in demand and route usage based on transportation and land use projects and policies.

With more detail at the individual person level, ABMs are superior tools to help decisionmakers with bike/walk policies. For example, an e-bike program targeted toward lower income households or certain geographies could be analyzed. Or the effects of improving the quality/user experience of a biking or walking route could be assessed.

Pricing

Trip-based models can consider some cost information, such as per mile charges, tolls, parking, and transit fares The impact of policy changes in these areas can be compiled and reported at the neighborhood level.

ABMs provide greater insight into a wider array of parking and transit price scenarios. With ABMs we can assess the effects of different fare structures by age or income, employer transit or parking subsidies, tolling discounts, and more.

Energy costs and taxes can be represented based on the vehicles that a household owns (vehicle size, gas, electric, etc.)

A significant advantage is the ability to consider different people's sensitivities to travel delays and values of time.

Planning Our Future Together

Statewide Household Travel Study Provides Essential Data

In 2023 and 2024, the OMSC conducted a statewide household travel study to collect data needed for model estimation and validation. This real-world travel behavior data improves the accuracy of and confidence in our travel model forecasts, which are the basis for many public policy and investment decisions.

OREGON TRAVEL STUDY

Household travel data is an essential building block for Oregon's ABM. Using the same survey questions and having travel data formatted consistently across the state provides a significant economy of scale for agency partners, not only during data collection but also as the ABM framework is designed and implemented.

Leveraging a National Partnership

Oregon participates in the national ActivitySim Partnership – a group of metropolitan planning organizations and state departments of transportation from across the country who have developed a core framework for activity-based models. Oregon contributes dollars to the ActivitySim pooled fund and receives shared expertise and experience, greater model stability, faster model analysis speeds, and reduced model development costs. Information about this multi-agency partnership, including access to open-source code and other materials, is available at https://research.ampo.org/.

ACTIVITYSIM PRINCIPLES	
Collaborative	One open source, common platform and code base that is shared by all users
Cost Effective	Reduced model development and maintenance costs and economies of scale through pooled funding
Practical	Easy for agencies and modelers of different skill levels to use, to produce reasonable and reliable estimates and forecasts
Extensible	Can be customized and extended for new features and region-specific needs
Performant	Make efficient use of computing resources, including memory, storage and processors

More Information

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To learn more about the Oregon Modeling Statewide Collaborative (OMSC) visit our website at www.oregonmodels.org.