USDOT NATIONAL CENTER FOR UNDERSTANDING FUTURE
TRAVEL BEHAVIOR AND DEMAND

# *Semi-Annual Progress Report for University Transportation Centers*

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## 1. ACCOMPLISHMENTS

The mission of TBD National Center is to revolutionize the understanding and management of travel behavior and demand through pioneering research and education, fostering a fair, efficient, and accessible transportation system that effectively serves and adapts to the evolving needs of the public. Led by The University of Texas at Austin (UT) and in partnership with Arizona State University (ASU), California State Polytechnic University – Pomona (CPP), Diné College (DC), Georgia Institute of Technology (GT), The City College of New York (CCNY), University of Michigan (UM), and University of Washington (UW), the TBD Consortium is committed to serving all communities and the entirety of the U.S. economy through the safe, efficient, and accessible movement of people and goods.

***What are the major goals of the program?***

The TBD Center's overarching goal is to undertake breakthrough research that will fundamentally re-examine and transform the scientific base for measuring, monitoring, modeling, and managing traveler behaviors and demand, with an explicit focus on improving transportation system performance and reliability. The Center advances behaviorally grounded approaches that can be directly translated into tools and methods for transportation planning, operations, and policy decision-making. Through this work, TBD fosters the design, development, and operation of a people-centric, multimodal, intelligent transportation system that efficiently moves people and goods and supports the needs of individuals, institutions, and businesses for generations to come. The TBD initiative directly supports the U.S. DOT research priority area of improving mobility of people and goods and contributes to advancing a safe, efficient, and modern transportation system. Among its multitude of activities, the Center aims to undertake two flagship endeavors of national significance to bring about transformative impacts in planning and decision-making. The first is a *Travel Behavior Data (TBD) Hub* that the public, transportation planners, and policy-makers alike can leverage to understand the state of the transportation system, with built-in *quality of life, energy footprint, and mobility efficacy calculators* to aid in planning for efficiency, safety, and community wellbeing. The second is a panel-based multi-year *Transportation Heartbeat of America (THA) Travel Behavior and Demand Survey* to understand how travel behavior and demand are evolving, thereby providing critical insights into the future of transportation and the priorities of the nation.

***What was accomplished under these goals?***

***Center-Wide Accomplishments***

The TBD Center has continued to advance its mission through a range of impactful activities across research, education, workforce development, and technology transfer over the past six months. TBD researchers disseminated findings at leading national and international venues, including the 17th World Conference on Transport Research (WCTR), the ASCE International Conference on Transportation and Development (ICTD), and the 14th Symposium of the European Association for Research in Transportation (hEART). The Center hosted the 2026 National Mobility Summit, conducted extensive analyses of the second wave of the THA Survey, and expanded its suite of open-source data tools. These and other center-wide highlights are summarized below:

- On September 14, 2026, the TBD Center hosted the 2026 National Mobility Summit in Washington, D.C., in collaboration with nine other National, Regional, and Tier-1 UTCs. The Summit convened leaders from the U.S. DOT, state and local government agencies, congressional offices, and industry partners to advance a shared national agenda for strengthening the mobility of people and goods.
- The TBD team continued its extensive analyses of THA Survey data, resulting in more than a dozen research manuscripts to date examining critical topics related to emerging trends in travel behavior and demand. Findings continued to be presented at national and international venues. For broader dissemination, the Center launched a new initiative to produce a series of interactive THA data briefs. The first brief, produced by the ASU team, *America Meets the Self-Driving Car*, examines public awareness of, experience with, comfort around, and attitudes toward autonomous vehicles (AVs). In parallel, work began on the Wave 3 survey instrument and associated sampling and fielding strategies.

- As part of the continued expansion of the TBD Hub, the TBD team incorporated the newly released 2025 American Time Use Survey (ATUS) data into its ATUS-based dashboards, including T3D, TMD, and WBEAT. This update enables users to explore the latest national patterns in time use, travel behavior, work arrangements, and wellbeing while supporting comparisons across survey years.
- Within this reporting period, TBD researchers published 26 journal articles and delivered 50 conference presentations, keynote and distinguished lectures, and invited seminars at leading venues. These activities addressed topics ranging from extreme-event adaptation and travel behavior to autonomous mobility, urban freight, infrastructure resilience, and artificial intelligence (AI) in transportation.
- The *Travel Behavior and Demand* special issue was published in *Transport Policy*. Inspired by the TBD Center's 2023 symposium, "Back to Foundations: Travel Demand Analysis in a Fast Evolving Transportation Landscape," the special issue comprises eight peer-reviewed papers examining how changing travel behavior, emerging mobility technologies, new data sources, and evolving societal needs are reshaping transportation planning and policy.
- The TBD Center website continued to serve as the main hub for archiving and distributing information about the Center's activities, including research updates, workforce development initiatives, and data products. During the current reporting period, the site attracted over 4,000 visitors.

Some other overall accomplishments of the TBD Center in this reporting period are listed below:

Selected TBD Awards, Honors, and Professional Recognition:

- TBD Center Director Dr. Chandra Bhat was named an ASCE Distinguished Member as part of its 2026 class of 12 honorees. This distinction, awarded to fewer than 1% of ASCE members, recognized his contributions to travel behavior modeling, international leadership, and mentorship.
- TBD Associate Director Dr. Cynthia Chen was elected to the Washington State Academy of Sciences, and Dr. Jeff Ban was appointed Editor-in-Chief of *Transportation Engineering*.
- Dr. Jon Froehlich received the 2026 ACM SIGCHI Societal Impact Award for research addressing accessibility challenges through human-computer interaction and artificial intelligence. Dr. Yongping Zhang received the 2026 Educator of the Year Award from the WTS Los Angeles Chapter.
- Drs. Chandra Bhat and Patricia Mokhtarian were among 20 internationally recognized transportation scholars featured in the book *Conversations with Leading Transport Researchers: The Unwritten Rules of Academia*. Through interviews with leading researchers, the book shares career experiences and guidance for graduate students and early-career academics.
- Several TBD-affiliated graduate students received recognition. Dale Robbennolt (UT Austin), together with Dr. Bhat, received the Andrew Daly Award for the Most Innovative Application of Choice Modelling at the 9th International Choice Modelling Conference. Shradha Godse (CCNY) earned an honorable mention for best poster at the 2026 ASCE International Conference on Transportation and Development. Shiqi Ding (UW) received the Outstanding PhD Student Award from the Department of Urban Design and Planning at University of Washington, while Yu-Chen Chu (UW) received a $5,000 COMTO Women Who Move the Nation Scholarship.

Workforce Development/Technology Transfer Events:

- The TBD Center co-sponsored the Summer Transportation Extravaganza hosted by ASU. This week-long program provided rising high school juniors and seniors with hands-on exposure to transportation engineering, infrastructure, and emerging technologies through autonomous-vehicle projects, field visits, laboratory tours, a Transportation Traffic Bowl, and final project presentations.
- TBD Associate Director Dr. Patricia Mokhtarian delivered a keynote address at the World Transport Convention in Tianjin, China, on June 3, 2026, and presented an Eminent Scholars and Leaders Seminar at the University of Alabama on September 9, 2026.
- Dr. Srinivas Peeta delivered an invited seminar titled "Multidimensional Solution Mechanisms for Sustainable Travel in Smart Communities" as part of the University of California, Berkeley PATH Seminar Series on April 21, 2026. Dr. Peeta also contributed to public understanding of AV safety and deployment through interviews with 11Alive, Atlanta News First, and the *Atlanta Business Chronicle*.

- Dr. Don MacKenzie was interviewed by KUOW's *Booming* podcast about aftermarket plug-in vehicle conversions and their potential role in expanding access to electric vehicles.
- The TBD team at ASU organized a three-part webinar series on artificial intelligence, autonomous transportation, and mixed-autonomy systems, which collectively attracted approximately 150 live participants. The presentations by Zhe Fu (UC Berkeley), Chuheng Wei (UC Riverside), and Can Cui (Bosch Center for Artificial Intelligence) addressed physics-informed traffic smoothing, intelligent and personalized autonomous driving, and foundation models for human-autonomy teaming.

***Project-Specific Accomplishments***

During this reporting period, TBD researchers made significant progress across various projects. The TBD Center has initiated a total of **72 projects** since 2023, of which **34 projects** were completed, while others advanced into subsequent phases. Final reports for the completed projects have either been distributed or are in the final stages of proofing for distribution in the coming months, per U.S. DOT guidelines. Table 1 lists all *active* projects across the Center's research portfolio, together with projects *completed within the last two reporting periods*. To ensure accessibility and transparency, the TBD website continues to be regularly updated with information and deliverables related to all ongoing and completed research projects.

**Table 1. TBD Research Projects (Currently Active or Completed in Last 12 Months)**

| | Project Topic/Title | Institution (PI) | Active Period | Status |
|---|---|---|---|---|
| 1* | Travel Behavior Data (TBD) Hub | ALL (Bhat) | 2023 - Present | ⚙ |
| 2* | Transportation Heartbeat of America Travel Behavior and Demand Survey | ALL (Bhat) | 2023 - Present | ⚙ |
| 3 | Evolution of Mode Choice: Examining the Relationship Between Telecommuting and Transit Use | ASU (Batur) | 2023 - 2025 | ✓ |
| 4 | City-Wide Strategic EV Charging Network Design: Demand-Supply Integration via Market Dynamics | ASU (Zhou) | 2023 - Present | ⚙ |
| 5 | Exploring the Changing Dynamics of Household Vehicle Ownership and Use in the U.S. | ASU (Pendyala) | 2023 - Present | ⚙ |
| 6 | Trends in Time, Travel, Transit, Telework, and Treasure (T5) | ASU (Polzin) | 2023 - 2025 | ✓ |
| 7 | Analysis and Implications of the Vehicle Inventory and Use Survey (VIUS) | ASU (Polzin) | 2024 - 2025 | ✓ |
| 8 | Future Travel Foresight Catalyst: Phases 1-2 | ASU (Maynard) | 2024 - 2025 | ✓ |
| 9 | Smart Transportation Digital Infrastructure: Advancing System Efficiency, Resilience, and Safety through Multi-Source Open-Standard Data Integration | ASU (Zhou) | 2024 - Present | ⚙ |
| 10 | From Cross-Sectional to Longitudinal: The Impact of Sampling Strategies on Measuring Mobility Choices | ASU (Pendyala) | 2024 - 2026 | ✓ |
| 11 | Time Use, Travel, and Telework Dashboard (T3D) | ASU (Batur) | 2024 - 2026 | ✓ |
| 12 | The Mobility Dashboard (TMD) | ASU (Batur) | 2025 - Present | ⚙ |
| 13 | Future Travel Foresight Catalyst – Phase 3 | ASU (Maynard) | 2025 - Present | ⚙ |
| 14* | Understanding Transportation Investment Priorities in Suburban Communities | ASU (Pendyala) | 2025 - Present | ⚙ |
| 15 | Understanding Household Vehicle Fleet Evolution | ASU (Hennessy) | 2025 - Present | ⚙ |
| 16 | Measuring the Last-Mile: A Comprehensive Evaluation of Synthesis Approaches to Address Data Gaps for Local Freight Decision-Making (Phase 1) | CCNY (Conway) | 2023 - 2025 | ✓ |
| 17 | Exploring Top-Down Visual Attention for Transportation Behavior Analysis | CCNY (Zhu) | 2024 - 2025 | ✓ |
| 18 | Investigation of Emerging Sensing and AI/ML Technologies to Enhance the Safety of Vulnerable Roadway Users at Signalized Intersection | CCNY (Li) | 2024 - 2026 | ✓ |
| 19 | Blockchain Application on Smart Transportation Systems | CCNY (Allahviranloo) | 2024 - 2025 | ✓ |
| 20 | From Reactive to Predictive: Modeling Urban Event Impacts on Transportation Systems | CCNY (Allahviranloo) | 2025 - Present | ⚙ |
| 21* | The Home as a Trip Attractor: An Exploratory Study of Residential Service Demand | CCNY (Conway) | 2025 - Present | ⚙ |
| 22 | Measuring the Last-Mile: Leveraging Synthetic Data to Evaluate the Effects of Urban Freight Interventions | CCNY (Conway) | 2025 - Present | ⚙ |
| 23 | Exploring Top-Down Visual Attention for Transportation Behavior Analysis: Walkability and Pedestrian Behaviors | CCNY (Zhu) | 2025 - Present | ⚙ |

| Project Topic/Title | | Institution (PI) | Active Period | Status |
|---|---|---|---|---|
| 24 | Leveraging Vision-Language Models for Efficient Understanding of Vulnerable Roadway Users via a Multimodal Traffic Sensing Approach | CCNY (Li) | 2025 - Present | ⚙ |
| 25 | Vehicle Edge Computing for Travel Behavior and Demand in Future Intelligent Transportation Systems (ITS) | CPP (Wang) | 2024 - 2025 | ✓ |
| 26* | Spatiotemporal Heterogeneous Change of Travel Behavior during Wildfires in California | CPP (Gu) | 2025 - Present | ⚙ |
| 27 | Examining Heterogeneity in Public Attitudes Toward Shared Autonomous Vehicles by User Experience | CPP (Zhang) | 2025 - Present | ⚙ |
| 28 | Empirical Investigation of Post-Disaster Travel Behavior to Points of Distribution of Relief Supplies | GT (Perez-Guzman) | 2024 - Present | ⚙ |
| 29 | How Much Do Attitudinal Variables Improve Travel Demand Models? Evaluation Using an Overlap Sample from an Attitude-rich Survey and the 2017 National Household Travel Survey | GT (Mokhtarian) | 2024 - 2025 | ✓ |
| 30 | Improving Mobility Options through Transit Signal Priority (TSP) | GT (Hunter) | 2024 - Present | ⚙ |
| 31 | How Complete are Your City's Streets? Evaluating the Completeness of Urban Streets Using Big Data and Computer Vision | GT (Guhathakurta) | 2024 - Present | ⚙ |
| 32 | Neutralizing Onerous Heat Effects on Active Transportation (NO-HEAT) in Atlanta | GT (Basu) | 2025 - Present | ⚙ |
| 33* | Enhancing the Use of Attitudinal Marker Variables in Travel Behavior Models: Evaluation of Latent Class Modeling Approaches Using a Nationwide Travel Survey | GT (Mokhtarian) | 2025 - Present | ⚙ |
| 34 | From Perception to Policy: Measuring Road Driver Behavior and Public Support for Autonomous Truck Regulation | GT (Perez-Guzman) | 2025 - Present | ⚙ |
| 35 | Fostering Multimodal Travel Options through Behavioral Interventions and Emerging Mobility Solutions | GT (Peeta) | 2025 - Present | ⚙ |
| 36 | Investigating Travel Survey Representativeness: Who's Missing and What Can We Do? | UM (Shaw) | 2024 - 2025 | ✓ |
| 37 | Michigan Mobility Metrics (M3): An Outcome-Focused, Multi-Year Survey Deployment and Data Collection Effort | UM (Shaw) | 2024 - Present | ⚙ |
| 38* | An Application-Agnostic Investigation of Location-Based Services Data Quality: Using Synthetic Data and Empirical Benchmarking | UM (Shaw) | 2025 - Present | ⚙ |
| 39 | Enhanced Network Models for Multimodal Resiliency | UT (Boyles) | 2023 - 2025 | ✓ |
| 40 | Identifying Targets for Electric Vehicle Industry Improvement | UT (Machemehl) | 2023 - 2025 | ✓ |
| 41 | A Model of EV Adoption and Rank-Based Contributing Factors | UT (Bhat) | 2024 - 2025 | ✓ |
| 42 | An Evaluation of the Long-Term Effects of the COVID-19 Pandemic on Public Transportation Use | UT (Bhat) | 2024 - 2025 | ✓ |
| 43 | The Reverse Side of Online Shopping: Examining Sociodemographic and Built-Environment Determinants of Delivery Returns | UT (Bhat) | 2024 - 2025 | ✓ |
| 44 | A Multidimensional Analysis for Understanding Walking Habits in Older Adults Post-Pandemic | UT (Bhat) | 2024 - 2025 | ✓ |
| 45 | Potential Use of Large Language Models (LLMs) for Travel Behavior Survey Research | UT (Bhat) | 2025 - Present | ⚙ |
| 46 | Modeling Spatial Dependency of Active Travel Behavior | UT (Bhat) | 2025 - Present | ⚙ |
| 47 | A Virtual Reality Framework for Analyzing Pedestrian Crossing Behavior and Decision-Making Factors | UT (Bhat) | 2025 - Present | ⚙ |
| 48 | Data Collection, Weighting, and Modeling Techniques to Estimate Unbiased Population Parameters | UT (Bhat) | 2025 - Present | ⚙ |
| 49 | Multimodal Freight Network Capacity and Resilience Under Demand Shifts | UT (Boyles) | 2025 - Present | ⚙ |
| 50 | Development of Demand Estimation Methodology for On-street Shared Paths | UT (Machemehl) | 2025 - Present | ⚙ |
| 51* | Do Millennials and Zoomers Participate in Teleactivities More and Travel Less Than Older Generations? | UT (Zhang) | 2025 - Present | ⚙ |
| 52 | Quasi-Sparsity in Transportation Origin-Destination Demand | UW (Ban) | 2024 - 2026 | ✓ |
| 53 | Imputing Socio-Demographics for Mobile Trajectors | UW (Chen) | 2024 - 2025 | ✓ |
| 54 | Disabled Parking CV: Scalable Methods to Analyze Disability Parking Using Computer Vision and High-Resolution Aerial and Streetscape Images | UW (Froehlich) | 2024 - 2026 | ✓ |
| 55 | Real-Time Transportation Origin-Destination Demand Estimation Using Multimodality Data | UW (Ban) | 2025 - Present | ⚙ |

| Project Topic/Title | | Institution (PI) | Active Period | Status |
|---|---|---|---|---|
| 56 | Estimating Point of Interests (POI) Visit Demand using Location-Based Services (LBS) Data and Large-Language Models (LLMs) | UW (Chen) | 2025 - Present | ⚙ |
| 57* | Opportunities and Limits of Individual Behavioral Changes: Phase I | UW (Chen) | 2025 - Present | ⚙ |
| 58 | Are We Ready? Evaluating Evacuation Preparedness, Behavior, and Vulnerability During Wildfires in Washington | UW (Lingzi) | 2025 - Present | ⚙ |
| 59 | Determinants of Vehicle Holding Time and Scrappage | UW (MacKenzie) | 2025 - Present | ⚙ |

ASU = Arizona State University; CCNY = The City College of New York; CPP = California State Polytechnic University – Pomona; GT = Georgia Institute of Technology; UM = University of Michigan; UT = The University of Texas at Austin; UW = University of Washington. ✓ = Completed in last 12 months; ⚙ = In progress; * = Narrative provided below.

A few illustrative details about the progress made for ***a sample*** of active projects are provided below.

**Project #1:** Travel Behavior Data (TBD) Hub
**PI:** Chandra Bhat (UT) **Co-PIs:** Irfan Batur (ASU) and Ram Pendyala (ASU)

**Progress:** Serving as one of the two TBD flagship endeavors, this project aims to develop a comprehensive Travel Behavior Data (TBD) Hub that brings a variety of data sets into a single unified platform, thus serving as a one-stop shop for instant data-driven insights on travel behavior and demand. The team is leveraging advanced techniques in data aggregation, fusion, imputation, weighting, prediction, and visualization to build a national hub that can be used by the public, planners, and policymakers to better understand the state of the transportation system. The Hub is being built through a multi-year, multi-university effort spanning multiple disciplines and thrust areas. In previous reporting periods, the team developed three dashboards integrated into the Hub: (i) the Time Use, Travel, and Telework Dashboard (T3D), (ii) The Mobility Dashboard (TMD), and (iii) the Wellbeing Estimator for Activities and Travel (WBEAT). During this reporting period, all three were updated to incorporate the 2025 ATUS data. The team also completed the scenario analysis page of the Community Adaptation and Resilience to Extremes (CARE) Dashboard, which enables users to assess how specific geographic areas and user groups may be affected under different extreme event conditions, and the dashboard is now undergoing testing and validation ahead of a public release planned within the next few months. In addition, the team initiated development of two new dashboards: (i) the T4 Emerging Transportation Technologies Dashboard and (ii) the U.S. Population and VMT Trends Dashboard. In the next reporting period, the team will release the CARE Dashboard, continue developing the two new dashboards, and add a weighted analysis capability to both T3D and TMD in response to growing interest from the user community.

**Project #2: Transportation Heartbeat of America (THA) Travel Behavior and Demand Survey**
**PI:** Chandra Bhat (UT) **Co-PIs:** Irfan Batur (ASU), Ram Pendyala (ASU), Patricia Mokhtarian (GT), Atiyya Shaw (UM), Steve Polzin (ASU), Alison Conway (CCNY), and Cynthia Chen (UW)

**Progress:** Serving as one of the two TBD flagship endeavors, TBD has begun to deploy a comprehensive longitudinal travel behavior and demand survey across the nation. The goal of the Transportation Heartbeat of America ("THA") survey is to obtain a statistically representative depiction of attitudes and behaviors across a wide range of transportation domains. To assess rapidly changing travel conditions and behaviors, the survey employs a combination of panel and cross-sectional methods deployed over a five-year period. In the previous years, the first two waves of the THA survey were distributed to more than 8,000 participants. During the current reporting period, the team extensively analyzed Wave 2 data, developed more than a dozen research manuscripts, presented findings at multiple venues, and released the interactive data brief *America Meets the Self-Driving Car*. The team also began developing the Wave 3 instrument and associated sampling and fielding strategies. In the next reporting period, the team will finalize and deploy Wave 3, continue preparing research publications, and produce additional interactive data briefs addressing autonomous vehicles, transportation satisfaction and well-being, transportation funding and investment priorities, safety experiences across travel modes, and micromobility.

**Project #14:** Understanding Transportation Investment Priorities in Suburban Communities
**PI:** Ram Pendyala (ASU), **Co-PI:** Irfan Batur (ASU)

**Progress:** Over the past several decades, suburbs have become home to a majority of Americans; however, there is limited empirical evidence about the transportation investments that suburban residents value most. This project aims to examine the heterogeneity of transportation investment priorities among suburban residents to inform community-level infrastructure planning and policy development. Utilizing a unique survey collected in 2024 in a rapidly growing suburban community in the southwestern U.S., the project conducts a comprehensive analysis to examine patterns of variability in suburban residents' prioritization of transportation investments. Before the current reporting period, the team completed the analysis and presented its findings at the 2026 TRB Annual Meeting. During this reporting period, the team incorporated feedback received at TRB, refined the manuscript, submitted it to *Transportation Research Record*, and began preparing the final project report. In the next reporting period, the team will finalize and submit the report, respond to journal review comments as appropriate, and continue disseminating the findings.

**Project #21:** The Home as a Trip Attractor: An Exploratory Study of Residential Service Demand
**PI:** Alison Conway (CCNY)

**Progress:** This project examines household-based service demand to support improved data collection and travel demand modeling. The team's analysis using the THA Survey previously demonstrated the need to better categorize heterogeneous household service activities. During the current reporting period, the team completed a comprehensive review of supply- and demand-side data sources. The review screened 807 six-digit Standard Occupational Classification codes, identified 104 occupations that potentially provide residential services, and categorized them by service type and expected frequency. The team also evaluated nine national datasets and six regional, local, and travel surveys, identifying important data gaps and developing recommendations for future household and vehicle surveys and data integration. A journal manuscript documenting the review is in development. In the next reporting period, the team will assess alternative data sources, including LBS and telematics data; complete the final project report and an agency-oriented brief; submit the journal manuscript; and present the findings at ASCE ICTD 2027 in Philadelphia.

**Project #26:** Spatiotemporal Heterogeneous Change of Travel Behavior during Wildfires in California
**PI:** Yangsong Gu (CPP) **Co-PIs:** Yongping Zhang (CPP)

**Progress:** This project examines how wildfires reshape travel behavior and destination choice across space and time. The 2025 Eaton Fire in the Los Angeles area serves as the primary case. The team combines Advan Weekly Patterns and SafeGraph Points of Interest (POI) data with fire perimeters and emergency zone boundaries. A difference-in-differences model estimates wildfire impacts on visitation for different destination types. Student researcher built a set of interactive dashboards that show changes in POI visitation inside fire perimeters, in surrounding buffer zones, and across evacuation, warning, and alert zones. An abstract from this work was accepted for an oral presentation at the American Geophysical Union (AGU) Annual Meeting in San Francisco in December 2026. The team is now preparing the dashboards for public release and drafting the journal manuscript.

**Project #33:** Enhancing the Use of Attitudinal Marker Variables in Travel Behavior Models: Evaluation of Latent Class Modeling Approaches Using a Nationwide Travel Survey | **PI:** Patricia Mokhtarian (GT)

**Progress:** This project is one in a series of studies designed to demonstrate the practicality of including attitudes as explanatory variables in practice-oriented travel demand forecasting models. The team uses the THA Wave 1 data to examine the potential improvement that could bring to travel behavior models with attitudinal variables incorporated. The goal is to prepare, implement, and evaluate a framework that provides systematic guidance to practitioners and researchers with respect to specifying travel demand forecasting models that incorporate attitudes. The framework acknowledges the role played by deterministic segmentation, together with latent class segmentation, in pointing the way to model improvements. The team has developed the framework, and its application to vehicle ownership models produced notable

improvements in the predictive ability of those models. The team completed and submitted a paper on this project during the reporting period, which was accepted for presentation at the 2027 TRB Annual Meeting. The team are currently fleshing out the TRB paper into a manuscript for journal submission and the final report for this project, and expects to submit both during the next reporting period.

**Project #38:** An Application-Agnostic Investigation of Location-Based Services Data Quality: Using Synthetic Data and Empirical Benchmarking | **PI:** Atiyya Shaw (UM)

**Progress:** This project was motivated by existing literature that assessed Location-Based Services (LBS) data quality and produced inconsistent findings, often due to varying and opaque data preprocessing practices. The goal is to contribute to the growing need for LBS data validation by examining how preprocessing affects the socioeconomic and demographic (SED) and behavioral representativeness of the data. Through systematic redefinition of filtering thresholds introduced in previous studies coupled with representativeness analysis, the team aims to provide a clearer understanding of how preprocessing decisions influence data quality and bias. First stage results on this work were presented at the TRB Annual Meeting in January 2026. The team continues to refine the algorithm development process, and plans to submit the manuscript on this by December 2026, with a related policy brief attached.

**Project #51:** Do Millennials and Zoomers Participate in Teleactivities More and Travel Less Than Older Generations? | **PI:** Ming Zhang (UT)

**Progress:** This project seeks to bridge two lines of inquiry, both concerning the future trajectory of travel behavior: (1) shifts in travel patterns amid the rise of home-based teleactivities, (20 lifestyle preferences and travel characteristics across generation cohorts, with a particular focus on Millennials and Zoomers who are the two largest living adult cohorts in the United States. The motivation is that few studies have examined how teleactivity participation and travel behavior intersect across generational cohorts. To disentangle the complex interplay of age, period, and cohort effects, the study will apply an Age-Period-Cohort (APC) modeling framework to examine teleactivity participation and travel characteristics before, during, and after the COVID-19 pandemic, comparing trends across generation cohorts. During this reporting period, the team has completed initial analysis of activity-travel patterns under four work modalities: *Work from home only, Work from workplace or other non-home locations, Mixed work-from-home and from non-home locations,* and *Did not work in the survey day*. Activity-travel patterns have been analyzed using both ATUS and NHTS datasets. In the next reporting period, the team will examine activity participation and travel behavior patterns across generations, with a focus on Millennials and Zoomers.

**Project #57:** Opportunities and Limits of Individual Behavioral Changes: Phase I
**PI:** Cynthia Chen (UW)

**Progress:** This study aims to discover individuals' underlying preferences for both points-of-interest (POIs) and active travel modes can be learned and used to generate a personalized recommendation. The research has potential for more exploration into personalized recommendation as a way to change an individual's travel routine to incorporate active travel modes, encourage interaction with their built environment, or increase their overall physical activity. During this reporting period, the team developed an Android mobile application, selected a Generalized Linear Model Upper Confidence Bound (GLM-UCB) algorithm for personalized recommendations and conducted simulation testing with virtual users. Simulation results demonstrated strong algorithmic convergence, indicating that the model is able to learn user preferences effectively within a reasonable number of interactions. In the next reporting period, the team will pilot the application with real participants to validate the algorithm's performance in real-world conditions as well as to conduct full study with a larger sample and compare GLM-UCB against other algorithms.

***What opportunities for training and professional development has the program provided?***

The center-wide workforce development/technology transfer events are discussed earlier in this SAPR. In terms of education, the courses offered by faculty members closely affiliated with the Center are presented

in Table 2. While there are many additional transportation-related courses taught at each TBD institution, the scope of activities reported in this SAPR is limited to the activities of faculty members who comprise the *core* group of the TBD, who are deeply engaged in advancing the activities and mission of the Center.

**Table 2. Courses Offered by Core Faculty Members of TBD (Fall 2025 & Winter 2026)**

| Semester | Level | Course No | Course Title | No* | Instructor | Unit |
|---|---|---|---|---|---|---|
| **Arizona State University** | | | | | | |
| Spring 26 | Grad | CEE 598 | Public Transportation | 8 | Zhou | SSEBE |
| Spring 26 | Undergrad | CEE 372 | Transportation Engineering | 55 | Zhou | SSEBE |
| **Cal Poly Pomona** | | | | | | |
| Spring 26 | Undergrad | EGR 4820/4830 | Senior Project | 54 | Zhang/Cheng | CoE |
| Spring 26 | Undergrad | CE 3601 | Transportation Engineering | 72 | Zhang | CoE |
| Spring 26 | Undergrad | CE 3601 | Transportation Engineering | 32 | Gu | CoE |
| Spring 26 | Undergrad | CE 4690 | Traffic Engineering | 24 | Gu | CoE |
| Spring 26 | Grad | CE 5620 | Traffic Flow Analysis | 23 | Gu | CoE |
| **City College of New York** | | | | | | |
| Spring 26 | Grad | CE H0200 | Transportation Economics | 4 | Allahviranloo | GSOE |
| Spring 26 | Undergrad /Grad | CE 54700/H4700 SUS 8400B | Urban Freight and City Logistics | 18 | Conway | GSOE |
| Spring 26 | Grad | CSC I1910 | Neural Networks with Tensorflow | 25 | Grossberg | GSOE |
| Spring 26 | Grad | DSE I2100 | Applied Machine Learning and Data Mining | 26 | Grossberg | GSOE |
| Spring 26 | Grad | CE I2600 | Transportation Planning | 7 | Kamga | GSOE |
| Spring 26 | Undergrad | CE 32700 | Transportation Systems Engineering | 61 | Li | GSOE |
| Spring 26 | Undergrad | CSC 3200 | Software Engineering | 76 | Wei | GSOE |
| Spring 26 | Grad | CSC 83000-01 & CNS 80300-01 | Seminar in Special Topics: Bio-Inspired and AI-Enabled Multimodal Computing | 15 | Zhu | GC |
| Spring 26 | Undergrad | CSC 21200 | Data Structures | 28 | Zhu | GSOE |
| **Georgia Institute of Technology** | | | | | | |
| Spring 26 | Undergrad | CEE 3770 | Statistics and Applications | 57 | Mokhtarian | CEE |
| Spring 26 | Grad | CEE 6623 | Survey Design and Analysis | 13 | Mokhtarian | CEE |
| Spring 26 | Grad | CEE 8813 | Transportation Systems Analysis | 14 | Peeta | CEE |
| Spring 26 | Undergrad/ Grad | VIP2601, 3601-2, 4601-3, 6601-3 | VIP Course: Autonomous and Connected Transportation (ACT) Driving Simulator | 61 | Peeta | VIP |
| **University of Texas at Austin** | | | | | | |
| Spring 26 | Undergrad | CE 301 | Civil Engineering Systems | 76 | Boyles | CE |
| Spring 26 | Undergrad | CE 321 | Transportation Systems | 50 | Boyles | CE |
| Spring 26 | Undergrad | CE 321 | Transportation Systems | 53 | Machemehl | CE |
| Spring 26 | Undergrad | CE 367T | Traffic Engineering | 32 | Machemehl | CE |
| Spring 26 | Grad | CE 397 | Traffic Engineering | 12 | Machemehl | CE |
| Spring 26 | Grad | CRP 391D | Colloquium on Planning Issues | 4 | Karner | CRP |
| Summer 26 | Grad | CRP 384 | Megaregional Planning (Second term) | 13 | Zhang | CRP |
| **University of Washington** | | | | | | |
| Spring 26 | Undergrad | CEE 327 | Transportation Engineering | 93 | Ban | CEE |
| Spring 26 | Grad | CEE 415A | Machine Learning for Civil Engineers | 18 | Chen | CEE |
| Spring 26 | Grad | CET 583 | Transportation Energy & Sustainability | 5 | MacKenzie | CEE |
| Spring 26 | Undergrad | CEE 422 | Transportation Energy & Sustainability | 26 | MacKenzie | CEE |

Notes: CEE = Civil and Environmental Engineering; CET = Civil, Environmental, and Transportation Engineering; CM = Construction Management; CRP = Community and Regional Planning; SSEBE = School of Sustainable Engineering and the Built Environment; GSOE = Grove School of Engineering; GC = CUNY Graduate Center. *Enrollment number.

Over **100** students across all levels, along with postdoctoral scholars at TBD institutions, participated in TBD-related activities during the reporting period. Table 3 provides a list of graduate students and early-career researchers *primarily* involved in these activities. During this period, several TBD-supported students and scholars also achieved significant academic and professional milestones. Dr. Rachael Panik, a partially TBD-funded postdoctoral scholar at Georgia Tech, joined the University of Alabama as an assistant professor. Valentina Castañeda-Torres, a partially TBD-funded M.S. student at Georgia Tech, graduated and joined Alta Planning + Design as a research consultant. Ekin Ugurel, a former

TBD-sponsored Ph.D. student at UW, became an assistant professor in the Department of Industrial and Systems Engineering at the University of Houston. Kyle Bathgate, a TBD-sponsored Ph.D. student at UT Austin, graduated in Summer 2026 and began a tenure-track faculty position at Duquesne University.

**Table 3. Students and Research Staff Engaged in TBD-Related Research and Education Activities**

| Name of Scholar | Level | Major/ Unit | Supervisor/ Advisor |
|---|---|---|---|
| **Arizona State University** | | | |
| Roberto Dimas Valle | PhD Student | SSEBE | Ram Pendyala |
| Fan Yu | PhD Student | SSEBE | Ram Pendyala |
| Victor O. Alhassan | PhD Student | SSEBE | Ram Pendyala |
| Jinghai Huo | PhD Student | SSEBE | Ram Pendyala |
| Miguel Rodriguez Ocana | PhD Student | SSEBE | Ram Pendyala |
| Fawzan Alfawzan | PhD Student | SSEBE | Ram Pendyala |
| **Cal Poly Pomona** | | | |
| Yichi Cheng | MS Student | Civil Engineering | Yongping Zhang |
| Defeng Chen | MS Student | Civil Engineering | Yongping Zhang |
| Daniel Nomura | MS Student | Civil Engineering | Yangsong Gu |
| **City College of New York** | | | |
| Fateme Rezapour Fardin | PhD Student | Civil Engineering | Alison Conway |
| Shradha Ghodse | PhD Student | Data Science | Alison Conway/Michael Grossberg |
| Nikhita Kannam | PhD Student | Data Science | Mahdieh Allahviranloo |
| Bilal Abdulrahman | PhD Student | Computer Science | Zhigang Zhu /Alison Conway |
| Gong Qi Chen | PhD Student | Computer Science | Zhigang Zhu /Alison Conway |
| Bo Shang | Post-Doc | Civil Engineering | Yiqiao Li |
| Faed Ahmed Arnob | PhD Student | Civil Engineering | Yiqiao Li |
| Matthew Grafals | MS Student | Data Science | Yiqiao Li |
| Weicong Feng | PhD Student | Computer Science | Jie Wei |
| Yingying Zhou | PhD Student | Computer Science | Yiqiao Li |
| **Georgia Institute of Technology** | | | |
| Chaeyeon Han | PhD Student | City & Reg. Plan. | Subhrajit Guhathakurta |
| Sujin Lee | MS Student | Urban Analytics | Subhrajit Guhathakurta |
| Animesh Agrawal | MS Student | Comp. Science | Subhrajit Guhathakurta |
| Bryce Jones | MS Student | City and Regional Plan. | Subhrajit Guhathakurta |
| Sungho Synn | MS Student | City and Regional Plan. | Subhrajit Guhathakurta |
| Seung Jae Liu | PhD Student | City and Regional Plan. | Subhrajit Guhathakurta |
| Jaegeon Lee | PhD Student | City and Regional Plan. | Subhrajit Guhathakurta |
| Shreya Chivilkar | MS Student | Comp. Science | Subhrajit Guhathakurta |
| Hojung Yu | MS Student | City and Regional Plan. | Rounaq Basu |
| Hajra Shahab | PhD Student | City and Regional Plan. | Rounaq Basu |
| Ilsu Kim | PhD Student | Civil and Env. Eng. | Patricia Mokhtarian |
| Seung-eun (Katy) Choi | PhD Student | Civil and Env. Eng. | Patricia Mokhtarian |
| Eliana Duarte | PhD Student | Civil and Env. Eng. | Patricia Mokhtarian |
| Rachael Panik | Postdoc | Civil and Env. Eng. | Patricia Mokhtarian |
| Viswa Sri Rupa Anne | PhD Student | Civil and Env. Eng. | Srinivas Peeta |
| Yuming Chang | PhD Student | Civil and Env. Eng. | Srinivas Peeta |
| Yufei Xu | PhD Student | Civil and Env. Eng. | Srinivas Peeta |
| Keke (Coco) Li | PhD Student | ISyE | Sofia Perez-Guzman |
| Adriana Isabel Arias Andrade | PhD Student | Civil and Env. Eng. | Sofia Perez-Guzman |
| Meen-Sung Kim | PhD Student | ISyE | Sofia Perez-Guzman |
| Mengtao Lyu | Postdoc | Psyc | Sofia Perez-Guzman |
| **University of Michigan** | | | |
| Ivan Shih | PhD Student | Civil and Env. Eng. | Atiyya Shaw |
| Sungho Lim | PhD Student | Civil and Env. Eng. | Atiyya Shaw |
| Brynn Woolley | PhD Student | Civil and Env. Eng. | Atiyya Shaw |
| Emily Youngs | PhD Student | Civil and Env. Eng. | Atiyya Shaw |
| **University of Texas at Austin** | | | |
| Hyunjun Hwang | PhD Student | Civil Engineering | Chandra Bhat |
| Adeeba Naz | PhD Student | Civil Engineering | Chandra Bhat |

| | | | |
|---|---|---|---|
| Ifratul Hoque | PhD Student | Civil Engineering | Chandra Bhat |
| Dale Robbennolt | PhD Student | Civil Engineering | Chandra Bhat |
| Anna Beliveau | MS Student | Civil Engineering | Chandra Bhat |
| Stella Boswell | MS Student | Civil Engineering | Chandra Bhat |
| Carol Anne Starks | MS Student | Civil Engineering | Chandra Bhat |
| Debojjal Bagchi | PhD Student | Civil Engineering | Stephen Boyles |
| Kyle Bathgate | PhD Student | Civil Engineering | Stephen Boyles |
| Jake Robbennolt | PhD Student | Civil Engineering | Stephen Boyles |
| Md Hamidur Rahman | PhD Student | CRP | Alex Karner |
| Yue Qi | PhD Student | Civil Engineering | Randy Machemehl |
| Seunggwan Park | PhD Student | CRP | Ming Zhang |
| **University of Washington** | | | |
| Lyra Chen | Research Scientist | Civil and Env. Eng. | Cynthia Chen |
| Donghun Son | Postdoc | Civil and Env. Eng. | Cynthia Chen |
| Yida Xu | PhD Student | ISE | Cynthia Chen |
| Lexi Liu | PhD Student | Statistics | Cynthia Chen |
| Yuteng Zhang | MS Student | ISE | Cynthia Chen |
| Andrew Zunt | MS Student | Civil and Env. Eng. | Cynthia Chen |
| Niraj L. Mali | MS Student | Civil and Env. Eng. | Cynthia Chen |
| Chu Li | PhD Student | CSE | Jon E. Froehlich |
| Jared Hwang | PhD Student | CSE | Jon E. Froehlich |
| Mohammad Oshanreh | PhD Student | Civil and Env. Eng. | Don MacKenzie |
| Rubina Singh | PhD Student | Civil and Env. Eng. | Don MacKenzie |
| Zepu Wang | PhD Student | Civil and Env. Eng. | Jeff Ban |
| Yu-Chen Chu | PhD Student | URBDP | Lingzi Wu |

***What do you plan to do during the next reporting period to accomplish the goals?***

In the next reporting period, active projects will continue to advance according to their proposed schedules, and the Center's two flagship endeavors will reach important milestones. The Wave 3 THA Survey instrument will be finalized and deployed, while analyses of Waves 1 and 2 will continue. The team will also expand its series of interactive data briefs on topics such as AVs, transportation satisfaction and wellbeing, funding priorities, and safety experiences across travel modes. TBD Hub will continue to grow through the release and enhancement of open-source dashboards, analytical tools, and other data products.

While detailed project-specific plans are provided earlier for a sample of projects, several key activities are anticipated across the TBD portfolio. At the **UT Austin**, teams will advance research on shared-path use and generational travel behavior and convene strategic planning and workforce-development activities. **ASU** team will support the THA Survey, produce interactive data briefs, and maintain and enhance TBD Hub. Researchers at **CCNY** will release an open-source street-feature labeling tool, prepare guidance for survey designers on home-based service activities, and expand research on home-delivery demand. **Cal Poly Pomona** team will prepare wildfire travel behavior dashboards for public release and disseminate findings on wildfire impacts and shared AVs. At **Georgia Tech**, researchers will analyze the stability of attitudes across THA Survey waves and advance studies of extreme heat and behavioral interventions. The **University of Michigan** team will refine methods for assessing location-based services data quality. At the **University of Washington**, teams will advance real-time origin-destination and point-of-interest demand forecasting, pilot personalized travel-behavior interventions, model wildfire evacuation, and examine household vehicle-holding decisions. Across all institutions, project teams will complete final reports, prepare and submit journal manuscripts and practitioner-oriented briefs, release open-source tools and datasets, and advance pilot studies and field experiments.

Findings will continue to be disseminated through presentations, seminars, webinars, workshops, and outreach. TBD-supported papers accepted for presentation at the 2027 TRB Annual Meeting will highlight the Center's research accomplishments and impact. In addition, TBD researchers will participate in other international, national, and regional conferences, workshops, and professional events to further disseminate findings, strengthen collaborations within the transportation community, and help advance the nation's transportation priorities.

## 2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

***What organizations have been involved as partners?***

- Arizona Department of Transportation (ADOT), Phoenix, AZ: Collaborative research
- California Department of Transportation (Caltrans), District 8: Co-advising senior projects
- Cascadia Conservation District: Collaborative research
- CCNY College-wide Research Vision (CRV) initiative: Collaborative research on urban scene analysis
- City of Peachtree Corners, GA: Transit ridership and automated-vehicle shuttle data; community engagement
- Commute Seattle: Collaborative research
- CUNY Research Foundation: In-kind support and machine-learning server infrastructure
- Department of Transportation Engineering, University of Seoul, South Korea: Collaborative research
- Foothill Transit: In-kind support, panel participation, and hands-on activities for the Summer Transportation Institute
- Institute for Social Research Survey Methodology Program, Ann Arbor, MI: Collaboration and personnel exchanges
- King County Metro: Collaborative research
- Kittitas County Fire District: Collaborative research
- Maricopa Association of Governments (MAG): Collaborative research
- Metropolitan Council, Minneapolis–St. Paul, MN: Collaborative research
- Michigan Department of Transportation, Lansing, MI: Collaborative research and data sharing
- National Laboratory of the Rockies (NLR), CO: In-kind support and access to its mobile application
- New York City Department of Transportation (NYC DOT), NY: In-kind support, datasets, and workshop participation
- Northeast Washington Regional Transportation Planning Organization: Collaborative research
- Okanogan County Economic Alliance: Collaborative research
- Puget Sound Energy: Collaborative research
- Puget Sound Regional Council (PSRC): Collaborative research
- Seattle Department of Transportation: Collaborative research
- Sky Packets, New York, NY: Sensor installation
- Sound Transit: Collaborative research
- Southeast Michigan Council of Governments: Collaborative research and data sharing
- Spokane County Emergency Management: Collaborative research
- Sustainable NCW: Collaborative research
- Technical University of Denmark: Collaborative research
- Texas Department of Transportation (TxDOT), Austin, TX: Collaborative research
- Town of Queen Creek, AZ: Collaborative research
- U.S. Army Corps of Engineers Coastal and Hydraulics Laboratory, Vicksburg, MS: Datasets, collaboration, and in-kind support
- Urban and Regional Planning Department at the University of Michigan: Collaboration and personnel exchanges
- Washington State Department of Transportation (WSDOT): Collaborative research
- WTS Los Angeles Chapter: Co-hosting Girls' Empowerment Day
- Yakima Regional Clean Air Agency, Yakima, WA: Collaborative research

***Have other collaborators or contacts been involved?***

- Dr. Abdul R. Pinjari, Indian Institute of Science, India
- Dr. Abolfazl Mohammadian, Univ of Illinois-Chicago, IL
- Dr. Baiba Pudane, TU Delft
- Dr. Baloka Belezamo, ADOT, Phoenix, AZ
- Dr. Basar Ozbilen, U. of California, Davis
- Dr. Bert van Wee, Delft University of Technology
- Dr. Brian German, Georgia Tech, Atlanta, GA
- Dr. Brian Lee, PSRC, Seattle, WA
- Dr. Deborah Salon, ASU, Tempe, AZ
- Dr. Diana Ramirez-Rios, University of New York at Buffalo
- Dr. Filipe Rodrigues, DTU, Copenhagen, DK
- Dr. Giovanni Circella, Ghent Univ, Belgium
- Dr. Hillel Bar-Gera, Ben-Gurion University, Israel
- Dr. Jason Soria, Cintra
- Dr. Jinhua Zhao, Massachusetts Institute of Technology
- Dr. Joe Grengs, University of Michigan, Ann Arbor, MI
- Dr. Srijith Balakrishnan, Delft University of Technology
- Dr. Steve Mooney, University of Washington
- Dr. Sung Hoo Kim, Hanyang Univ, S. Korea
- Dr. Sunghee Lee, University of Michigan, Ann Arbor, MI
- Dr. Sybil Derrible Univ of Illinois-Chicago, IL
- Dr. Taehooie Kim, Maricopa, MAG, Phoenix, AZ
- Dr. Tassio Magassy, WSP USA
- Dr. Trilce Encarnación, U. of Missouri-St. Louis, MO
- Dr. Uijeong Hwang, Atlanta Regional Commission
- Dr. Vivien Lim, National Univ of Singapore
- Dr. Xinyi Wang, MIT, Cambridge, MA
- Dr. Ying Chen, Northwestern U, Evanston, IL
- Dr. Yongsung Lee, U. of California, Davis
- Dr. Zihao Zhang, City College of New York, NY
- Brice Nichols, PSRC, WA

- Dr. Kari Watkins, University of California, Davis
- Dr. Kenneth Mitchell, Army Corps of Engineers, Vicksburg, MS
- Dr. Laurie Garrow, Georgia Tech, Atlanta, GA
- Dr. Liron Ravner, University of Haifa, Israel
- Dr. Magdalena Asborno, Army Corps of Engineers, Vicksburg
- Dr. Marin Cress, Army Corps of Engineers, Vicksburg, MS
- Dr. Maryam Hosseini, UC Berkeley
- Dr. Mikhail Chester, ASU, Tempe, AZ
- Dr. Seungnam Kim, Chung-Ang University, S. Korea
- Henry Quintin, Sky Packets, New York, NY
- Jason Collado, Caltrans District 8, San Bernardino, CA
- Joanne Lin, PSRC, Seattle, WA
- Justine Niu, Caltrans District 8, San Bernardino, CA
- Kerwin Trenard, MS, Haiti Community Representative
- Kurt Winner, Commute Seattle, WA
- Taofeek Ganiyu, University of New York at Buffalo
- Tianming Liu, U. of Michigan, Ann Arbor, MI

# 3. OUTPUTS

## *Publications, conference papers, and presentations:*

### ***Journal Publications: Papers Published Within Reporting Period***

1. Allahviranloo, M. (2026). Agent-based analysis of cryptocurrency adoption in transit systems. *Smart Cities, 9*(8), Article 121.
2. Asmussen, K. E., Haddad, A. J., & Bhat, C. R. (2026). Telework-to-play or play-to-telework? Investigating the directional relationship between telework and nonwork travel. *Transportation Research Part A: Policy and Practice, 206*, Article 104857.
3. Bar-Gera, H., Boyles, S., & Ravner, L. (2026). Departure time choice with parametric heterogeneity: Equilibrium and instability. *Transportation Science, 60*(5), 696–712.
4. Bathgate, K., Bagchi, D., Boyles, S. D., Mitchell, K. N., Asborno, M. I., & Kress, M. M. (2026a). Anchorage queue dynamics due to fog channel closures at the Port of Houston. *Journal of Waterway, Port, Coastal, and Ocean Engineering, 152*(4).
5. Bathgate, K., Bagchi, D., Boyles, S. D., Mitchell, K. N., Asborno, M. I., & Kress, M. M. (2026b). Characterizing longitudinal vessel arrival and queue behavior from AIS at the Port of Houston. *Journal of Waterway, Port, Coastal, and Ocean Engineering, 152*(4), Article 05026004.
6. Beliveau, A. E., Haddad, A. J., Podnar, E. A., Sharma, D., & Bhat, C. R. (2026). Disparities in pedestrian crossing and driver yielding behaviors: Evidence from a large-scale observational study at urban intersections. *Accident Analysis & Prevention*.
7. Bilal, A., Zhu, Z., & Conway, A. (2026). A survey on action recognition: Multimodal approaches, ethical considerations, and feedback mechanisms. *Electronics, 15*(14), Article 3139.
8. Feng, F., Anastasopoulos, P., Guo, Y., Wang, W., Peeta, S., & Li, X. (2026). Willingness to use ridesplitting services for home-to-work morning commute in the post-COVID-19 era. *Transportation, 53*, 1877–1910.
9. Hwang, H., Batur, I., Robbennolt, D., Haddad, A. J., Ocana, M. G. R., Pendyala, R. M., & Bhat, C. R. (2026). A tale of two perspectives: The mileage-based user fee conundrum. *Transportation Research Part A: Policy and Practice, 212*, 105141.
10. Jones, B., Lieu, S. J., & Guhathakurta, S. (2026). Active navigation with reinforcement learning for bus stop amenity auditing in street view imagery. *Transportation Research Interdisciplinary Perspectives, 39*, 102240.
11. Kannam, N., Allahviranloo, M., & Vatin, L. A. R. (2026). Multi-day activity pattern inference using constrained Gaussian mixture model (GMM) classification. *Urban Science, 10*(6), 331.
12. Lieu, S. J., & Guhathakurta, S. (2026). A novel approach for estimating sidewalk width from street view images and computer vision. *Environment and Planning B: Urban Analytics and City Science, 53*(5), 1129–1144.
13. Liu, Y., Zhou, A., Wang, Y., & Peeta, S. (2026a). Navigating in mixed traffic: A human-centric approach to manage lane changes of human-driven vehicles. *IEEE Transactions on Intelligent Transportation Systems, 27*(6), 6574–6588.
14. Liu, Y., Zhou, A., Wang, Y., & Peeta, S. (2026b). Proactive longitudinal control to assist lane changes of human-driven vehicles in mixed traffic: Human-emulation approach. *Automotive Innovation, 9*(1), 48–64.
15. Robbennolt, D., Hwang, H., Jaiswal, A., Verma, S., Chakrabarti, S., & Bhat, C. R. (2026). Who is willing to pay for travel time savings and how much? An iterative bidding contingent valuation study in Mumbai. *Transportation Research Part A*.
16. Sakai, T., Kin, B., Buldeo Rai, H., Conway, A., Cheah, L., Dalla Chiara, G., & Ploos van Amstel, W. (2026). Diversity in the evolution of last-mile deliveries: Interactions between e-commerce growth, urban development, planning, and the delivery service market. *Case Studies on Transport Policy*, Article 101845.
17. Shang, B., & Li, Y. (2026a). Drive-by urban freight sensing: Large-scale fine-grained truck classification using Google Street View imagery and deep learning. *IEEE Open Journal of Intelligent Transportation Systems, 7*, 2327–2347.
18. Sharda, S., Laguarda, I., Garikapati, V. M., Viz, N., Pendyala, R. M., & Alonso, P. (2026). Substitution or shared utilization? Intrahousehold vehicle use in mixed-powertrain households. *Transportation Research Record*, Article 03611981261447275.
19. Shaw, F. A., Wang, X., Mokhtarian, P. L., & Watkins, K. E. (2026). A framework for enriching survey datasets using passive data and machine learning, with an application to transferring attitudinal variables across transport surveys. *Transportation Research Part A: Policy and Practice, 212*, Article 105126.
20. Uğurel, E., Chen, C., Lee, B., & Rodrigues, F. (2026). On predicting sociodemographics from mobility signals. *Computers, Environment and Urban Systems, 127*, Article 102420.
21. Wang, X., & Mokhtarian, P. L. (2026). Reintroducing multinomial logit switching regression models: Examining the treatment effect of multiple teleworking frequency categories on vehicle-miles driven. *Journal of Choice Modelling* [In proof].
22. Xie, N., Zhou, X., Zheng, Z., Zhu, M., Wu, J., Chen, X. M., & Li, L. (2026). Car-following models in the era of AI and AV/CAV: Recent developments, reflections and perspectives. *Transportation Research Part C: Emerging Technologies, 191*.

23. Yu, F., Batur, I., Haddad, A. J., Hennessy, E. M., Ocana, M. G. R., Chen, C., Zhou, X., Bhat, C. R., & Pendyala, R. M. (2026). A U-shaped paradigm: Understanding the impact of telecommuting on public transit ridership before and after the pandemic. *Transportation Research Part A: Policy and Practice, 211*, Article 105128.
24. Zhang, Y., Chen, L., & Chen, C. (2026). Adapting travel behavior to extreme heat: Public transportation evidence from Seattle's heatwave. *Transportation Research Part D: Transport and Environment, 156*, Article 105363.
25. Zheng, H., Corman, F., Dick, C. T., & Zhou, X. S. (2026). Generalized system response diagram model: Corridor-level rail performance characteristics. *Transportation Research Part C: Emerging Technologies, 193*, Article 105931.
26. Zhou, X. S., & Honma, Y. (2026). Structure before intelligence: A demand–supply mismatch framework for scalable AI transportation applications. *Transportation Research Today*, Article 100024.

***Presentations Within Reporting Period***

1. Aalimi, S., and S. Peeta. 2026. "Market-based trip planning for autonomous shuttles." Presented at the 26th International Symposium on Transportation and Traffic Theory, Munich, Germany, July.
2. Anne, V. S. R., G. Kibria, Y. Liu, O. I. Asensio, and S. Peeta. 2026. "Engagement effects of gamified health and environmental metrics on travel mode choice." Presented at the 2026 International Choice Modelling Conference, Australia, July 20–22.
3. Arnob, F., and Y. Li. 2026. "An accurate infrastructure-based LiDAR framework for precise vehicle length estimation." Presented at the ASCE International Conference on Transportation and Development, Detroit, MI, June 28–July 1.
4. Bar-Gera, H., S. Boyles, and L. Ravner. 2026. "Equilibrium characterization and computational solutions for departure time choice with two-dimensional heterogeneity." Invited lecture at EPFL, Switzerland, September.
5. Bathgate, K., and S. D. Boyles. 2026. "Modeling the resilience of maritime freight transportation systems using anchorage queues." Invited lecture at Technical University of Delft, Netherlands.
6. Batur, I. 2026. "Measuring and understanding micromobility: Adoption, use, and travel behavior in the United States." Seminar at the UT Student Transportation Council Seminar Series, The University of Texas at Austin, Austin, TX, June 11.
7. Batur, I., and R. M. Pendyala. 2026. "Integrated dashboards for exploring time use and mobility patterns in the American Time Use Survey." Presented at the 48th International Association for Time Use Research Conference, Lisbon, Portugal, Sep 16–18.
8. Beeramoole, P. B., Z. Ahern, R. Kelly, A. Paz, and S. Peeta. 2026. "A hypothesis testing approach to capture heterogenous effects on discrete choice behavior." Presented at the International Choice Modelling Conference, Gold Coast, Australia, July.
9. Beliveau, A., and D. Robbennolt. 2026. "The advantages of rank-ordered preferences over first choice preferences in consumer surveys, with an application to investigate urban air mobility (UAM) adoption." Invited Seminar at the Centre for Transportation and Logistics, Indian Institute of Management Ahmedabad, Ahmedabad, India, July.
10. Beliveau, A., D. Robbennolt, and C. R. Bhat. 2026. "Heterogeneous preferences for air metro and air taxi services: A sociotechnical analysis of urban air mobility adoption intentions." Presented at the International Choice Modelling Conference (ICMC 2026), Gold Coast, Australia, July.
11. Bharate, G. R., A. R. Pinjari, and C. R. Bhat. 2026. "Identification of random parameters on categorical attributes in mixed logit models of travel choices and crash outcomes." Presented at the International Choice Modelling Conference (ICMC 2026), Gold Coast, Australia, July.
12. Bhat, C. R. 2026a. "A flexible multinomial YJ-based model with non-normal random coefficients and non-normal kernel error terms." Invited Seminar at the Technical University of Denmark, Copenhagen, Denmark, June.
13. Bhat, C. R. 2026b. "A new flexible skewed bimodal distribution with multivariate extensions: Theory and application to traffic crash injury severity analysis." Presented at the 17th World Conference on Transport Research, Toulouse, France, July.
14. Bhat, C. R., and A. E. Beliveau. 2026. "How can we improve pedestrian safety: Insights from a large scale surveillance camera-based observational study." Presented at the Center for Transportation Research Annual Symposium, Austin, TX, April.
15. Bhat, C. R., and D. Robbennolt. 2026. "A flexible multinomial YJ-based model with non-normal random coefficients and non-normal kernel error terms." Presented at the International Choice Modelling Conference, Gold Coast, Australia, July.
16. Dimas Valle, J. R., I. Batur, S. E. Polzin, M. G. Rodriguez Ocana, V. Alhassan, and R. M. Pendyala. 2026. "Strategies and mechanisms to mitigate interpersonal violence in public transit." Presented at the 17th World Conference on Transport Research (WCTR), Toulouse, France, July 6–10.
17. Ding, S., and L. Wu. 2026. "Modeling the mixed effects of perceived temperature on hourly electric vehicle charging energy demand." Presented at the 2026 ASCE International Conference on Computing in Civil Engineering (i3ce 2026).
18. Dong, B., L. Wu, and X. Li. 2026. "Flood impact assessment on highway networks considering socioeconomic vulnerability: Evidence from Harris County." Presented at the 43rd International Symposium on Automation and Robotics in Construction.
19. Godse, S., A. Conway, and M. Grossberg. 2026. "Generative AI and machine learning to address data gaps for local freight decision-making." Presented at the ASCE International Conference on Transportation and Development, Detroit, MI, June.
20. He, Y., B. Shang, Y. Li, and J. Xiao. 2026. "Investigation of active learning approaches for efficient vehicle detection and classification." Presented at the ASCE International Conference on Transportation and Development, Detroit, MI, June.
21. Hennessy, E., I. Batur, M. G. Rodriguez Ocana, F. Yu, S. E. Polzin, C. Chen, X. Zhou, M. V. Chester, and R. M. Pendyala. 2026. "Understanding human activity and travel adaptation strategies in response to extreme events." Presented at the 17th World Conference on Transport Research (WCTR), Toulouse, France, July 6–10.
22. Huo, J., I. Batur, D. Robbennolt, F. Yu, M. G. Rodriguez Ocana, H. Hwang, E. Hennessy, C. Chen, S. E. Polzin, X. Zhou, M. V. Chester, C. R. Bhat, and R. M. Pendyala. 2026. "The role of prior experience in shaping anticipated travel and activity behavior changes in future extreme heat events." Presented at the 14th Symposium of the European Association for Research in Transportation (hEART 2026), Paris, France, September 29–October 1.

23. Hwang, H., and C. R. Bhat. 2026a. “Spatial ordered probit model with heteroscedastic skewed errors and exogenous spillovers.” Presented at the ASCE International Conference on Transportation & Development (ICTD 2026), Detroit, MI, June.
24. Hwang, H., and C. R. Bhat. 2026b. “A spatial ordered-response model with localized spillovers and asymmetric errors.” Presented at the International Choice Modelling Conference (ICMC 2026), Gold Coast, Australia, July.
25. Kim, M.-S., S. Pérez-Guzmán, M. Li, and T. Encarnación. 2026. “Autonomous trucking technology, existence acceptance, and regulatory preferences of road users: A driving simulation approach.” Poster presented at the 17th World Conference on Transport Research (WCTR 2026), Toulouse, France, July 6–10.
26. Lim, S., F. A. Shaw, and P. Bansal. 2026. “An overview of multiple data usage in travel behavior and demand: Data integration to address representation and measurement limitations.” Presented at the World Conference on Transport Research, Toulouse, France, July.
27. Mokhtarian, P. 2026a. “What makes partial-day teleworking different? A typology of workday types using the American Time Use Survey.” Invited talk at the University of Pittsburgh, Pittsburgh, PA, April 24.
28. Mokhtarian, P. 2026b. “How will autonomous vehicles affect travel time use and subsequent travel-related choices?” Keynote address presented at the World Transport Convention, Tianjin, China, June 3.
29. Mokhtarian, P. 2026c. “What makes partial-day teleworking different? A typology of workday types using the American Time Use Survey.” Invited talk at the 4th International Symposium on Cities and Sustainable Transportation, Chang’An University, Xi’an, China, July 9–11.
30. Mokhtarian, P. 2026d. “What makes partial-day teleworking different? A typology of workday types using the American Time Use Survey.” Invited talk at the Eminent Scholars and Leaders Seminar, U. of Alabama, Tuscaloosa, AL, September 9.
31. Naz, A., D. Robbennolt, A. R. Pinjari, R. M. Pendyala, and C. R. Bhat. 2026. “Can large language models replace human survey respondents? Evidence from a comprehensive transportation survey.” Invited Seminar at the Centre for Transportation and Logistics, Indian Institute of Management Ahmedabad, Ahmedabad, India, July.
32. Park, S., and M. Zhang. 2026. “Time use and travel distance implications of teleworking in the post-COVID era.” Presented at the World Planning Schools Congress, Helsinki, Finland, June 29–July 5.
33. Peeta, S. 2026a. “Multidimensional solution mechanisms for sustainable travel in smart communities.” Invited Seminar virtually at the PATH Seminar, University of California, Berkeley, April 21.
34. Peeta, S. 2026b. “AI-enabled travel choice modeling and autonomous driving decision-making.” Distinguished lecture presented virtually at The University of Hong Kong, October 6.
35. Pérez-Guzmán, S. 2026a. “Modeling disaster response logistics with behavioral and mobility dynamics.” Invited Seminar at the Risk and Resilience of Complex Systems Seminar Series, CentraleSupélec, Gif-sur-Yvette, France, April 4.
36. Pérez-Guzmán, S. 2026b. “Public and consumer acceptance of autonomous trucking and sidewalk delivery robots.” Invited Seminar at the ITE Seminar Series, University of New Mexico, Albuquerque, NM, April 8.
37. Pérez-Guzmán, S. 2026c. “Modeling disaster response logistics with behavioral and mobility dynamics.” Invited Seminar at the Rotterdam School of Management, Erasmus University, Rotterdam, Netherlands, April 20.
38. Pérez-Guzmán, S. 2026d. “Public and consumer acceptance of autonomous trucking and sidewalk delivery robots.” Invited Seminar at the Freight and Logistics Lab, Delft University of Technology, Delft, Netherlands, April 21.
39. Pérez-Guzmán, S. 2026e. “Modeling disaster response logistics with behavioral and mobility dynamics.” Invited Seminar at the Smart Logistics Research Seminar, Mines Paris PSL, Paris, France, May 21.
40. Pérez-Guzmán, S. 2026f. “Innovations in urban freight.” Invited talk at the 2026 Urban Logistics Summer School, University of Antwerp, Antwerp, Belgium, July 2.
41. Rezapour-Fardin, F., and A. Conway. 2026. “Modeling the relationships between home delivery and personal travel.” Presented at the ASCE International Conference on Transportation and Development, Detroit, MI, June 28–July 1.
42. Robbennolt, D., A. Beliveau, and C. R. Bhat. 2026a. “An examination of the adoption and frequency of part-day and full-day telework and the impacts on weekly commute VMT.” Invited Seminar at the Swedish National Road and Transport Research Institute (VTI), Stockholm, Sweden, June.
43. Robbennolt, D., A. Beliveau, and C. R. Bhat. 2026b. “An examination of the adoption and frequency of part-day and full-day telework and the impacts on weekly commute VMT.” Presented at the ASCE International Conference on Transportation & Development (ICTD 2026), Detroit, MI, June.
44. Robbennolt, D., A. Beliveau, and C. R. Bhat. 2026c. “An examination of the adoption and frequency of part-day and full-day telework and the impacts on weekly commute VMT.” Presented at the International Choice Modelling Conference (ICMC 2026), Gold Coast, Australia, July.
45. Robbennolt, D., H. Hwang, A. Jaiswal, S. Verma, S. Chakrabarti, and C. R. Bhat. 2026. “Who is willing to pay for travel time savings and how much? An iterative bidding contingent valuation study in Mumbai.” Presented at the 17th World Conference on Transport Research (WCTR 2026), Toulouse, France, July.
46. Robbennolt, D., H. Hwang, M. G. Rodriguez Ocana, I. Batur, R. M. Pendyala, and C. R. Bhat. 2026. “Trapped by transport: Exploring the everyday impact of mobility challenges and transportation insecurities in the United States.” Invited Seminar at the National Transportation Center, Morgan State University, Baltimore, MD, April.
47. Tariq, M., O. Borjigin, L. Wu, and C. Dossick. 2026. “Modeling processes for digital fabrication: Insights from the MEP industry.” Presented at ICCCBE2026: International Conference on Computing in Civil and Building Engineering.
48. Villarreal, K., X. Zhao, C. Dossick, and L. Wu. 2026. “Uncovering decision-making patterns across project delivery methods: A formal concept analysis of building owner organizations.” Presented at the 2026 CSCE Annual Conference.

49. Wolfinbarger, J. R., I. Batur, M. Porto, N. A. Srivastava, E. M. Hennessy, S. Roy, M. Kimball, R. M. Sparks, S. Fletcher, and M. V. Chester. 2026. "A safe operating space for cities: Navigating tensions between emissions mitigation, climate adaptation, and well-being in urban transformation." Presented at the 33rd International Symposium on Sustainable Systems and Technology (ISSST 2026), Rochester, NY, June 16–18.
50. Zhang, M. 2026. "Work-from-home, telecommute, and trends in travel time and distance: Evidence from ATUS and NHTS." Invited talk at the Research Seminar Series, Department of Public Affairs and Planning, University of Texas at Arlington, Arlington, TX, September 4.

***Other Publications Within Reporting Period***

1. Bathgate, K., S. Pan, and S. D. Boyles. 2026. "Transportation Infrastructure." In *Handbook of Infrastructure Communication*, edited by K. K. Stephens and K. M. Faust, 111-23. John Wiley & Sons.
2. Batur, I., and R. M. Pendyala. 2026. "America Meets the Self-Driving Car." Data Brief, TBD National University Transportation Center, June 2026. https://tbd.ctr.utexas.edu/america-meets-the-self-driving-car/.
3. de Gruyter, Chris. 2026. *Conversations with Leading Transport Researchers: The Unwritten Rules of Academia*. Edward Elgar Publishing. Published August 2026. Includes an interview with Patricia Mokhtarian and Chandra Bhat.
4. Shang, B., and Y. Li. 2026. "Roadside LiDAR for Cooperative Safety Auditing at Urban Intersections: Toward Auditable V2X Infrastructure Intelligence." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*.

***Website(s) or other Internet site(s)***

One of the center's significant products is the TBD website, which serves as a central hub for all information related to the Center's objectives and activities. The website includes dedicated sections for research projects, along with detailed descriptions, updates, and reports. It also houses data products and software and tools developed by TBD researchers. Additionally, the site provides a platform for sharing policy briefs, as well as disseminating TBD events and news to a global audience. Similar to previous reporting periods, the TBD website has been consistently maintained to reflect developments in TBD's research, technology transfer, education, workforce development, and outreach activities.

***Technologies or Techniques (software codes and products)***

As noted in prior progress reports, TBD researchers continue to develop, release, and maintain open-source analytical tools and software products. The ASU team maintains the Time Use, Travel, and Telework Dashboard (T3D), The Mobility Dashboard (TMD), and Wellbeing Estimator for Activities and Travel (WBEAT). During the current reporting period, the newly released 2025 American Time Use Survey data were incorporated into all three dashboards, enabling users to examine the latest national patterns and conduct comparisons across survey years. Together, the dashboards have reached over 10,000 users since their release. The ASU team also continues to maintain the PopGen synthetic population generator and share R and Python codes for their dashboards, tools, and software through its GitHub repositories.

At the University of Washington, researchers continue to maintain and enhance the Mobility Analysis Workflow (MAW) and the NRL OpenPATH-based mobility dashboard. During this reporting period, the UW team developed scalable Python pipelines for deriving stays, trips, travel modes, visits, and other mobility metrics from location-based services data. The team also developed a street-view imagery pipeline that uses object detection to identify street furniture and an Android application supporting personalized recommendations for points of interest and active travel modes. The AccessParkCV computer-vision pipeline, trained models, and disability-parking dataset also remain publicly available.

Georgia Tech researchers released the GT TranSACT Android and iOS applications to support field experiments on sustainable travel behavior. CCNY researchers developed *feedback_molmo*, an open-source toolkit for probing, visualizing, and comparing cross-modal attention and feedback mechanisms in vision-language models. At UT Austin, BHATLIB remains available as an open-source supplement to the GAUSS programming language, and development continues on a prototype Python-based port simulation model. Additional model implementations, data-fusion procedures, and supporting code developed across the Center continue to be documented in publications and shared through public repositories.

***Databases and Research Materials***

In a number of TBD projects, integrated datasets have been developed (or are under development), using data fusion techniques to study the impact of attitudes on different transportation-related choices such as

residential location choice, mode choice, vehicle ownership, and adoption of emerging mobility services and technologies. While some of the datasets are based on native survey data collection efforts undertaken by the TBD team, others have been assembled by integrating and fusing data that is already available in the public domain. All datasets assembled by TBD are being made publicly available (without personally identifiable information) via the TBD website. In the meantime, findings from the surveys have been disseminated to the community through webinars, research papers, and interactive data briefs. Also, many TBD publications include applicable model specifications that can be used by practitioners to better model the recent changes in traveler behavior and values.

A few specific instances of database and research materials development are as follows. The TBD team at Georgia Tech has published several Audio Sensing for Pedestrian Detection (ASPED) datasets as a compilation of large-scale audio and video data prepared for pedestrian detection, which is called. ASPED consists of almost 2,600 hours of audio, more than 3.4 million continuous frames in video, and corresponding annotation of pedestrian count for each. Additional information is available through the project's publication and the ASPED-A and ASPED-B project pages. The University of Washington's Project #54 team continues to host the first open, human-labeled dataset of disability parking spaces derived from aerial orthoimagery on Hugging Face. The dataset contains 11,762 labeled objects in 5,125 image tiles from Seattle, Washington; Washington, D.C.; and Spring Hill, Tennessee. The dataset supports the publicly available AccessParkCV computer-vision pipeline. Table 4 summarizes TBD performance metrics related to software, data, models, and journal publications.

**Table 4. TBD Metrics on Products**

| Metric | Annual Target | Previous Period | This Period | Annual Total | Assessment |
|---|---|---|---|---|---|
| Number of software/data/models | 2 | 2 | 3 | 5 | Datasets are being cleaned, weighted, and documented. The codes are in beta versions. |
| Number of journal publications | 25 | 47 | 26 | 73 | Greatly exceeded the annual target. |

## 4. OUTCOMES

During this reporting period, the TBD Center made substantial progress across multiple fronts, advancing transportation knowledge, improving analytical methods, developing new research tools, and contributing to the education and development of the next generation of transportation professionals. TBD projects expanded understanding of key transportation issues with direct implications for policy and practice.

Some important examples are as follows. At **ASU**, the integration of 2025 ATUS data into the TBD Hub dashboards strengthened the Center's data infrastructure by enabling users to examine the latest national patterns in time use, travel, telework, and wellbeing across survey years; together, these dashboards have reached over 10,000 users. The **UT Austin and ASU** teams also analyzed THA Survey Waves 1 and 2, generating new evidence on household vehicle composition, transportation satisfaction, work and commuting arrangements, transit barriers, investment priorities, safety experiences across modes, AVs, and AI use in transportation. At **CCNY**, research produced practical guidance linking local freight decisions with relevant performance measures and data sources, while advancing interpretable applications of vision-language models and LiDAR for transportation safety. Findings showed that LiDAR detection remained relatively stable with up to approximately 20% beam loss and that training-free vision-language classifiers could approach fully supervised model performance using limited labeled examples. At **Cal Poly Pomona**, research advanced understanding of wildfire-related travel behavior and public attitudes toward shared AVs. At **Georgia Tech**, combining deterministic segmentation with latent-class modeling increased the share of zero-vehicle single-adult households correctly predicted from 33% to 56%, demonstrating the value of incorporating attitudinal variables into travel models. Other studies generated new evidence on post-disaster relief travel and public acceptance of autonomous trucking. At the **University of Michigan**, research improved methods for evaluating the quality and representativeness of location-based services data. At **UT Austin**, an open-source port simulation framework was developed to represent interactions among terminals, commodities, and transportation modes, while analysis of fog-related closures at the Port

of Houston produced empirical estimates of queue growth and recovery. At the **University of Washington**, research advanced explainable and human-centered transportation analytics through point-of-interest demand forecasting, personalized active-travel recommendations, and analysis of vehicle holding and scrappage decisions. Collectively, these outcomes provide new data, methods, and evidence to support transportation planning, forecasting, safety, and resilience.

Overall, the TBD Center continued to play a national leadership role in shaping discussions on travel behavior, emerging technologies, and data-driven decision-making – advancing topics at the forefront of the nation's transportation research agenda and aligned with the U.S. DOT's priorities. The Center's commitment to open science and workforce development remained strong, with undergraduate, graduate, and early-career researchers across partner institutions actively engaged in data analysis, model development, dashboard design, and dissemination activities. Through the release and maintenance of open-source tools, dashboards, and curated datasets, TBD continued to democratize access to transportation data and strengthen collaboration across academia, government, and industry. Collectively, these efforts underscore the Center's ongoing role in informing policy, enhancing behavioral understanding, and preparing the next generation of transportation professionals to address the nation's mobility challenges.

## 5. IMPACTS

***What is the impact on the effectiveness of the transportation system?***

TBD's research activities have generated significant insights and tools that are enhancing the operations and effectiveness of the transportation system. TBD Hub has expanded access to critical national datasets through open, interactive dashboards such as T3D, TMD, and WBEAT. The incorporation of 2025 ATUS data provides users with the most recent available national data for tracking evolving trends in time use, travel, telework, and wellbeing across survey years. These platforms provide policymakers, planners, and researchers with user-friendly tools that support more informed, data-driven decisions. Extensive analyses of THA Survey data have provided critical insights into evolving and emerging transportation topics, including household vehicle composition, contemporary work and commuting patterns, transportation satisfaction, barriers to public transit use, investment priorities, safety experiences across modes, autonomous vehicles, AI in transportation, and micromobility. These findings provide timely evidence to guide transportation planning, investment, service delivery, and policy strategies.

In addition, several TBD projects have produced methodological advances that improve the quality of the data and models used in transportation planning and forecasting. Research on survey representativeness, location-based services data quality, attitudes, and explainable forecasting is helping improve the reliability of travel demand estimates and agencies' ability to anticipate behavioral changes. Several projects have also demonstrated system-level applications of emerging technologies and analytical methods. Research involving AI, computer vision, and roadside sensing has advanced scalable approaches to proactive safety and infrastructure assessment. Freight decision-support tools are helping agencies evaluate available data sources for local planning applications, while port simulation and analysis of weather-related disruptions are providing actionable information for freight operations and resilience planning. Other projects have generated insights into post-disaster travel and relief distribution, point-of-interest demand, personalized interventions to encourage active travel, vehicle holding and scrappage decisions, and secure and interoperable mobility payment systems. Collectively, these efforts contribute to improving transportation planning, forecasting, operations, safety management, and resilience. These outcomes are strengthening the nation's capacity to anticipate behavioral shifts, optimize operations, and plan for a more adaptive, resilient, and efficient transportation future.

***What is the impact of technology transfer on industry and government entities, on the adoption of new practices, or on research outcomes which have led to initiating a start-up company?***

TBD's research outcomes continue to influence industry practices and government applications across survey design, data sharing, policy development, and system management. **TBD Hub**, which hosts open-source dashboards such as T3D, TMD, and WBEAT, provides planners, policymakers, and researchers with accessible information on national time use, travel, telework, and wellbeing trends. The incorporation

of the latest available ATUS data and continued enhancement of these dashboards support their use in evidence-based planning and policy analysis. In addition, standardized attitudinal questions developed through the **THA Survey** have been incorporated into major data collection efforts, including the Georgia add-on to the NextGen National Household Travel Survey and the Puget Sound Regional Household Travel Survey. This adoption will help agencies better account for behavioral and attitudinal factors in regional travel analysis and forecasting.

Several TBD projects also produced tools and guidance with direct applications. Research on local freight data developed a comprehensive resource to help agencies identify available data sources, assess their usefulness for specific applications, and evaluate machine learning and generative AI approaches for addressing data gaps. Research on decentralized blockchain payment systems demonstrated the feasibility of processing transactions across multiple transportation providers with transparent pricing and automated cross-provider discounts, providing a potential framework for more integrated mobility payment systems. App-based platforms developed through TBD research are also being used in field experiments to evaluate how trip tracking, gamification, targeted messaging, and personalized recommendations can encourage more sustainable travel choices. Other open-source tools, datasets, and analytical pipelines developed by TBD researchers have been made available to agencies, practitioners, and researchers for applications involving mobility analysis, accessibility assessment, travel demand forecasting, and transportation safety. Overall, these initiatives demonstrate TBD's growing role in bridging research and practice by translating academic findings into data tools, survey practices, policy guidance, and applied methods that enhance transportation planning and management capabilities nationwide.

***What is the impact on the body of scientific knowledge?***

TBD's research is making important contributions to advancing the body of scientific knowledge in travel behavior and demand, urban analytics, and mobility systems research. Through the **TBD Hub**, which integrates multiple large-scale national datasets such as ATUS, NHTS, ACS, CES, and VIUS into a unified suite of open dashboards, the Center has established a new model for democratizing access to comprehensive travel behavior and mobility data. Each dashboard independently processes, analyzes, and visualizes specific aspects of these datasets, providing tools to explore patterns in time use, travel behaviors, household transportation expenditures, socio-demographic characteristics, and freight movements. Complementary to these efforts, the **THA Survey** continues to produce fresh empirical evidence on evolving post-pandemic trends in travel behaviors, attitudes and values, and accessibility patterns across diverse population groups. As such, these initiatives are strengthening the empirical and analytical foundations needed to understand contemporary transportation challenges and opportunities. By making these resources publicly accessible, TBD supports interdisciplinary research that advances understanding of accessibility, travel behavior dynamics, and system efficiency, laying a stronger foundation for improved demand modeling, infrastructure investment decisions, and evidence-based policy development.

Beyond these flagship initiatives, research conducted across TBD institutions has advanced theoretical and methodological frontiers in several areas. Recent work has expanded applications of artificial intelligence, computer vision, explainable forecasting, data fusion, and graph-based learning in transportation analysis. New methods have been developed to incorporate attitudes into travel demand models, forecast demand at individual points of interest, generate synthetic freight trajectories, monitor near-miss safety events, and identify accessible infrastructure from aerial imagery. Research has also advanced understanding of personalized travel interventions, multimodal cryptocurrency payments, post-disaster mobility, public discourse surrounding transportation policies, and the effects of weather-related disruptions on freight and port operations. These contributions are filling important gaps in the literature and strengthening the scientific foundations for improved demand modeling, safety analysis, infrastructure investment, system management, and evidence-based policy development. Finally, Table 6 provides two select metrics reflecting the reach and broader impact of the Center's research, including the number of agencies adopting TBD data and tools and Google Scholar citations received by publications of core TBD researchers from 2023 to date.

**Table 6. TBD Metrics on Impacts**

| Metric | 2023 | 2024 | 2025 | 2026 (+) | Total |
|---|---|---|---|---|---|
| Number of new agencies adopting TBD data/tools | 0 | 2 | 2 | 2 | 6 |
| Citations of TBD Publications (Google Scholar) | 8,100 | 8,661 | 8,435 | 7,220 | 32,616 |

***What is the impact on transportation workforce development?***

TBD has continued to play a vital role in developing the future transportation workforce by providing students and early-career researchers with meaningful, hands-on research and training opportunities. Across consortium universities, more than 100 undergraduate and graduate students, along with postdoctoral scholars, participated in TBD-related activities during the reporting period. Their work provided training in high-demand areas including survey design, travel behavior modeling, artificial intelligence, machine learning, data analytics, dashboard development, geospatial analysis, and transportation systems planning. At CCNY, students received interdisciplinary training in blockchain simulation, discrete choice modeling, vision-language models, multimodal AI, and point-cloud processing, whereas at the University of Washington, students working on accessible infrastructure research gained experience in qualitative interviewing, geospatial data engineering, deep learning, and engagement with the disability community. Students and early-career researchers across the Center also benefited from collaborations with public agencies and industry partners, ensuring that their training remained grounded in real-world challenges. Activities extended beyond university research through the Summer Transportation Extravaganza for high school students and an early-career workshop on professional service and tenure preparation at the ASCE International Conference on Transportation and Development. Several TBD-supported students and scholars received awards, presented research at major conferences, completed advanced degrees, and transitioned into faculty and professional positions. Collectively, these activities are strengthening the pipeline of transportation researchers and practitioners equipped with the interdisciplinary, technical, and analytical skills needed to address the nation's evolving mobility challenges.

## 6. CHANGES/PROBLEMS

***Changes in approach and reasons for change***

Project #20 shifted from coded GDELT event records to full-text news articles after the records were found to lack sufficient geographic accuracy and transportation information. The revised approach uses a large language model to extract relevant information, while retaining the project's original objectives. Project #59 expanded its analysis by incorporating salvage auction records and developing a vehicle-level economic-life model. These methodological refinements did not change the project's objectives.

***Actual or anticipated problems or delays and actions or plans to resolve them***

For Project #59, manufacturer's suggested retail prices were unavailable for most vehicles in the dataset. To address this limitation, the vehicle-value models control for make-model fixed effects and vehicle attributes rather than original purchase price.

***Changes that have a significant impact on expenditures***

Nothing to report.

***Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards***

Nothing to report.

***Change of primary performance site location from that originally proposed***

Nothing to report.