Data-Driven Safety Dashboard
Assessing Maryland Statewide Density Exposure of Pedestrians, Bicycles, and E-Scooters

BRTB Bicycle & Pedestrian Advisory Group
March 17, 2021

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PROJECT TEAM

MDOT SHA

- Carole Delion, Division Chief & CAV Program Manager, Project Lead and Manager
- Jay Zheng, Transportation Manager, Safety Data Technical Lead on Dashboard Deployment

University of Maryland, College Park & Baltimore

- Chenfeng Xiong, Assistant Director, MTI, and Assistant Research Professor, MTI and UMB, UMD PI
- Michael Pack, Director, CATT Lab. Project visualization and deployment support
- Kartik Kaushik, Assistant Director and Assistant Professor, Shock Trauma Anesthesiology Research Center, Safety and health data and integration support

U.S. Department of Transportation

- Office of the Secretary & supporting departments
MDOT SHA & UMD pilot a ped/bike safety dashboard

Submission of application to USDOT Safety Data Initiative

USDOT awards grant to MDOT SHA/UMD team

Cooperative Agreement Signed
Task 1. Project Management and Collaboration

Task 2. Analytical Design, Data Assembly and Integration
- Analytical tools
- Data sources and integration
- Analysis of pedestrian, bicycle, and e-scooter exposure

Task 3. Data Analysis and Visualization
- Visualization Platform
- Exposure and safety risks ranking at intersection and segment levels and other analytics

Task 4. Safety Tool Testing, Refinement, and Implementation
- Multi-agency involvement

Task 5. Technology Transfer
- Peer-exchange events
- Webinar for technology transfer

DELIVERABLE

Layer 1: Pedestrian/Bicycle/E-Scooter Volumes at Intersections
Layer 2: Pedestrian/Bicycle/E-Scooter Volumes at Road Segments
Layer 3: Pedestrian/Bicycle/E-Scooter Crashes
Layer X: Customized Exposure and Risks Analytics (e.g. Crash/Volume Ratio)

Safety Data Tool Development, Testing, Refinement, and Implementation

Step 1
Step 2
## MOBILE DEVICE LOCATION DATA SOURCES

<table>
<thead>
<tr>
<th>Cell Phone</th>
<th>GPS</th>
<th>Location-based Services (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Call Detail Record (CDR)</td>
<td>• In-vehicle (driving trips only)</td>
<td>• From smartphone apps that use</td>
</tr>
<tr>
<td>• Triangulation positioning</td>
<td>• In-Phone Embedded GPS and accelerometer</td>
<td>location-based services</td>
</tr>
</tbody>
</table>

For situational awareness: the Maryland Transportation Institute at the University of Maryland leads the Federal Highway Administration’s mobile device location data pilot project.
SAMPLE MOBILE DEVICE LOCATION DATASETS

- National data coverage
- 40 percent national coverage for 2017 in LBS alone, continuously increasing
- Continuous observations
- High location accuracy
- High sighting frequency

Cell Phone

SDK GPS

LBS (September 2017)

In-Vehicle GPS
DATA BIAS & PRIVACY MANAGEMENT

Limitations

• LBS data does have equity bias to those who have devices, which could exclude certain communities (e.g., aging or low income).
• E-scooter travel patterns and crash data are difficult to capture.

Management of Data Privacy

• Only aggregated information will be shared via the dashboard.
• Raw data, such as the crash records and the individual trajectories in the mobile device location dataset will remain internal.
• No individual-level data will be exchanged to avoid any perception or mishandling of Personally Identifiable Information (PII).
The Level of Traffic Stress (LTS) statistics are derived with the OpenStreetMap (OSM), following the definition as shown below:

- **LTS 1**: Strong separation from all except low speed, low volume traffic.

- **LTS 2**: Cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Physical separation from higher speed and multilane traffic.

- **LTS 3**: Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic.

- **LTS 4**: Involves interaction with higher speed traffic or close proximity to high-speed traffic.

Source: [http://www.northeastern.edu/peter.furth/research/level-of-traffic-stress](http://www.northeastern.edu/peter.furth/research/level-of-traffic-stress)
• Ped/bike crash records (2019) for Maryland were added as a layer
• MSCAN records received and are being merged to the system
VOLUME VALIDATION/CALIBRATION

Validation dataset: vehicle and pedestrian/bicycle counts
- Data received and has been geocoded to match our network (nodes, links)

Validation/Calibration (on-going)
- Massive data production for the entire year of 2019
- Generation of validation dataset
- Multimodal weighting
- Spatial-temporal calibration
- Validation of volume estimates as the final QAQC of the dashboard
MEASURING RISKS

- Build a model at the link and intersection levels for ped/bike-involved crashes
- Pedestrian bicycle volumes, vehicle volumes at link and intersection levels
- Level of Traffic Stress (LTS) for ped/bicyclist
- Intersection/link geometry
- Land use and built environment variables, etc.

Risk = Predicted Frequency of Ped/Bike-Involved Crashes in a Year
PROJECT TIMELINE

• Refining hiccups/data processing - Winter 2020-2021

• Internal US DOT & stakeholder reviews - Spring 2021

• Final product - Summer 2021 (required)