

Safety Applications of Crowdsourced Data



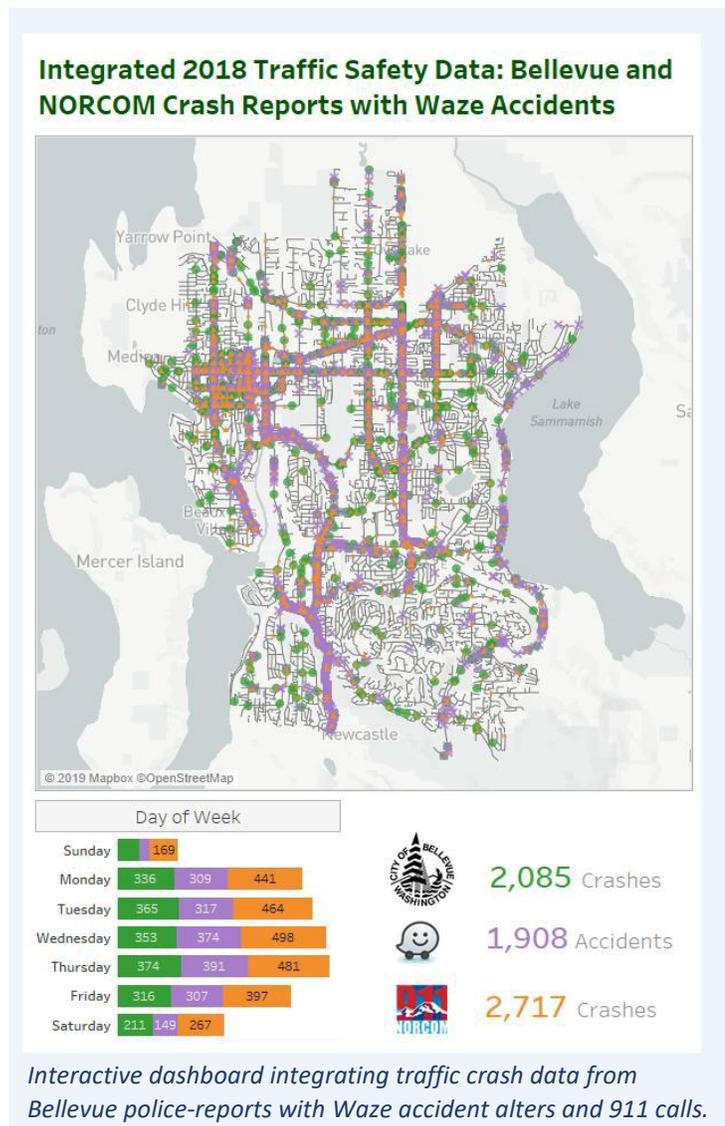
Bellevue Washington Case Study Report

The U.S. DOT [Safety Data Initiative](#) (SDI) aims to leverage and integrate datasets, and use advanced analytical tools and compelling visualizations to provide new insights to identify and address surface transportation safety risks. Crowdsourced mobile applications from the private sector—such as Waze—offer real-time and historical data about roadway conditions, including user-reported crashes. Funded by the SDI, U.S. DOT Volpe Center researchers are integrating these new data sources with other traffic and roadway information to assess potential safety applications. In the first project phase, state-wide crash models based on integrated Waze, traffic volume, census, and weather data provided reliable hourly estimates of police-reportable crashes. In the second phase, the team focused on pilot projects testing state and local safety applications of Waze data.

The City of Bellevue in Washington State is committed to implementing a Vision Zero plan, with the goal of zero traffic deaths and serious injuries by 2030. The transportation planning department partnered with the SDI to evaluate how integrating Waze with traffic safety data can inform Vision Zero strategies.

Integrated Crash Dashboards

The Volpe team created dashboards with an integrated view of three crash datasets provided by the City of Bellevue, with interactive features for exploring patterns over time and by road segment. The tool highlights locations where police-reported crashes coincide with 911 or Waze crash alerts, as well as locations with unique reports. The information can help identify unreported traffic incidents. The dashboard tool could also support studies comparing crash reports with hospital records to build a more complete view of traffic-related injuries.



Highlighting Severe Crashes

Vision Zero strategies are focused on eliminating severe injuries and deaths. The weighted dashboard is designed to highlight road segments and corridors with the most fatalities or injuries, along with locations with a large number of total crashes. The dashboard offers interactive features to explore patterns by day of week, time of day, mobility management areas, and a high injury network. The dashboards provide a macro perspective that allows the City of Bellevue to prioritize efforts to diagnose and address safety concerns at a micro (intersection) level.

Crash Estimation Models

Volpe developed segment-level crash models for 2018, based on integrated police-reported crash, Waze alert, historical traffic fatality, weather, and public survey data. Performance of the crash estimation models was best using a supervised machine learning method (XGBoost). The direction of travel associated with reported Waze events had the highest variable importance, followed by Waze accident alerts, segment length, and reported bike and pedestrian traffic conflicts. Consistent with prior results, Waze alerts significantly improved model performance. Like many other cities, Bellevue has periodic traffic count data over time for select road segments, but not for the complete road network. Thus, there is not a direct measure of exposure in the models. Waze alerts appear to serve as a proxy for exposure to improve the crash models. The team prepared a results dashboard to display observed and estimated crash counts by road segment. Locations with a higher number of estimated than observed crashes have data features associated with higher crash counts, and may indicate an overall higher crash risk.

Key Outcomes

The City of Bellevue is using the dashboards and crash models to inform the development of its Vision Zero action plan. Bellevue is also evaluating how the SDI tools support efforts such as its Local Road Safety Plans, focusing on systemic safety solutions based on risk factors and exposure rather than the number of crashes. More broadly, the SDI tools will allow the City of Bellevue to identify high priority locations to deploy systems such as video analytics for safety monitoring (in collaboration with Brisk Synergies) to identify specific causal information. The combination of approaches will support programmatic evaluations of before-and-after safety data to continually assess and diagnose priorities for safety improvements in the City.

