Seattle's New-and-Improved Proactive Approach to Pedestrian Safety

Seattle, Washington

KEY ELEMENTS:

Systemic Pedestrian Safety Analysis

Data-Driven Countermeasure Implementation

While Seattle's population continues to grow, the number of overall traffic-related fatalities continues to trend downward. However, pedestrian and cyclist crashes have remained relatively steady. To meet the growing demand while improving safety, the City developed the Bicycle and Pedestrian Safety Analysis (BPSA), a robust approach to modeling pedestrian and bicyclist safety.[1] Seattle is using the analysis results to encourage consideration of pedestrian and cyclist safety and countermeasure implementation in project development.

BACKGROUND ON SEATTLE'S BPSA

The City of Seattle Department of Transportation (SDOT) first implemented the Bicycle and Pedestrian Safety Analysis (BPSA) in 2016 as a data-driven approach for understanding where, how, and why crashes involving pedestrians and bicyclists happen.[2] Phase 1 laid the foundation for conducting the statistical analysis. It included pedestrian and bicycle crash data from 2007 to 2014, as well as roadway, demographics, transit, lighting, traffic signal presence, and pedestrian and bicyclist volume data.

PHASE 2 IMPROVEMENTS

Phase 2 of the BPSA concluded in early 2020. It involved updating the statistical models and incorporating new features into the analysis. The analysis now includes three more years of crash data (2014-2017). Additionally, Phase 2 expanded the traffic signal modeling functionality from a binary measure of traffic signal presence to a more detailed analysis of signal phasing data.

The most significant BPSA update during Phase 2 involved improvements to the exposure model used to estimate the number of events that could potentially result in a crash. While Phase 1 incorporated pedestrian and cyclist trip-generation data, Phase 2 expanded on an overall exposure model while including a reliable vehicle volume estimate model across Seattle's entire street network to complete the exposure analysis.
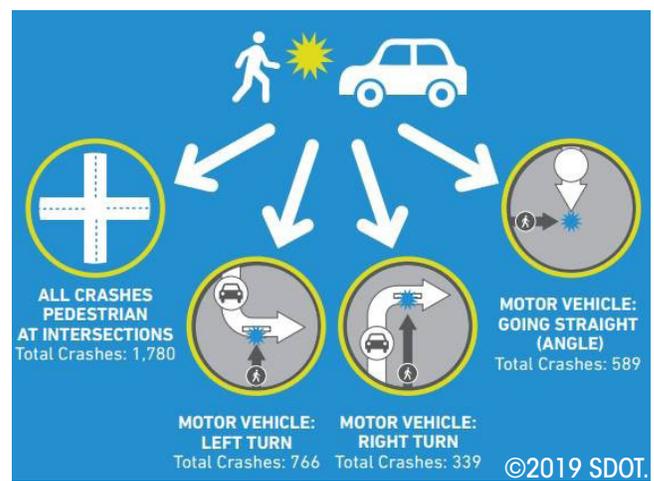

Figure 1. Graphic. Pedestrian crash types used to build statistical models for Seattle's BPSA.

For more information, please contact:

Chris Svolopoulos, City Engineer, SDOT

Chris.Svolopoulos@seattle.gov | 206.684.5312

PEDESTRIAN SAFETY ANALYSIS

SDOT developed safety performance functions (SPFs) for four different pedestrian crash types at intersections: all pedestrian crashes, vehicle turning right crashes, vehicle turning left crashes, and vehicle traveling straight crashes. SPFs are statistical models used to estimate crash frequency at a location. Phase 2 of BPSA built on the SPFs developed for Phase 1, focusing on improving certain model inputs and statistical techniques.

SAFETY IMPACTS OF BPSA

SDOT strengthened the systemic impact of the BPSA by incorporating it into the existing Complete Streets Checklist process used to identify project improvements for all road users. If a project includes a BPSA-identified location, the project is reviewed for potential pedestrian and/or bicycle improvements. This approach has led to a cultural shift within SDOT, where traffic and design engineers have become more accepting of proposed countermeasures at sites identified by BPSA's rigorous analysis.

This data-driven approach has had other positive impacts on pedestrian safety in Seattle. While the City's Vision Zero plan serves as the motivation for many safety policies and programs, BPSA provides the quantitative support and justification to deploy safety countermeasures. For example, SDOT used BPSA data to support an increased implementation of Leading Pedestrian Intervals (LPIs), from 15 intersections at the time of Phase 1 to 145 at the end of Phase 2.
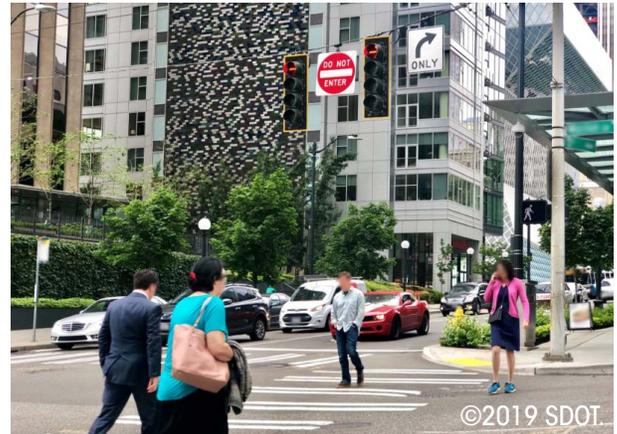
Figure 2. Photo. Pedestrians cross during the LPI at an intersection in downtown Seattle.[3]

LESSONS LEARNED AND NEXT STEPS

The City of Seattle identified key lessons learned throughout the first two BPSA phases. First, it is important to identify locations both where there is data and where there is a lack of data. Seattle used this information to perform optimization for future pedestrian and bicycle count locations, which will inform future modeling efforts. Second, an agency should geolocate pedestrian and bicycle collision data and implement quality control measures.

SDOT plans to continue to upd

> "The biggest value of BPSA is that it's proactive and systemic. It's sort of a diving board for traffic engineers, giving them ideas about where to implement improvements. It's also very helpful for informing people who make those decisions."
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> – Chris Svolopoulos, Civil Engineer, SDOT

References

[1] SDOT. City of Seattle Bicycle and Pedestrian Safety Analysis Phase 2. http://www.seattle.gov/Documents/Departments/SDOT/VisionZero/SDOT_Bike%20and%20Ped%20Safety%20Analysis_Ph2_2420(0).pdf. February 4, 2020.

[2] SDOT. City of Seattle Bicycle and Pedestrian Safety Analysis. https://www.seattle.gov/Documents/Departments/beSuperSafe/BicyclePedestrianSafetyAnalysis.pdf. September 30, 2016.

[3] SDOT. "A Big Step Forward for Pedestrian Safety." https://sdotblog.seattle.gov/2019/06/17/a-big-step-forward-for-pedestrian-safety/. June 17, 2019.