DDOT Crosswalk and Bike Lane Safety Projects

Jiyang Liu | DDOT Traffic Operations and Safety Division | 2019 Summer

Uncontrolled Multilane Crosswalk Safety

In daily traffic, crosswalks are common places with potential pedestrian safety hazards. Without the signal control of vehicle flow and pedestrian flow, the uncontrolled crosswalks face a greater security issue for pedestrians crossing the road.

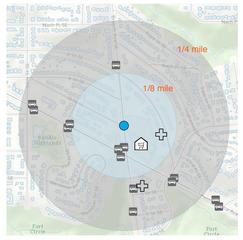
In DC, 437 uncontrolled multilane crosswalks are present and distributed in different locations. Some is facing a high pedestrian volume and complex traffic condition, while some is located in a relatively safe place. For more efficient traffic controlling and transportation planning, DDOT Traffic Operations and Safety Division hopes to obtain the hazard rank of the 437 crosswalks. It is more efficient and economical to allocate more resources to the uncontrolled multilane crosswalks of high priority based on the hazard rank.

What is considered?

Pedestrian Demand

Uncontrolled multilane crosswalks with high pedestrain demand will face more risk of pedestrian-related accidents than those are seldom used. Therefore, how frequent a crosswalk is used for pedestrians is a significant aspect of safety evaluation.

Unfortunately, pedestrian volume data is unavaible in current database. Therefore, the methodology is to figure out the surrounding demand generators of each crosswalk. Based on the proximity and type of the demand generator, crosswalks will obtain different “Demand Score”. The score is then transformed to the demand rank of the crosswalks.



- Uncontrolled Crosswalk
- Demand Generator - Hospital/Clinic
- Demand Generator - Grocery/Mall
- Demand Generator - Bus Station

Traffic and Road Condition

The complexity of traffic condition is another aspect of the safety to a crosswalk. Large traffic volume or complex road geometry can bring risk to people going across the road. Data of DDOT enable us to produce a quantified evaluation of traffic condition, consisting of volume, traffic speed, pavement slope and length.

Crash Records

Though pedestrian demand and traffic condition are capable to reflect the significance of crosswalks theoretically, the recorded traffic accidents (crashes) are more practical, which show the real safety condition of crosswalks in the past years.

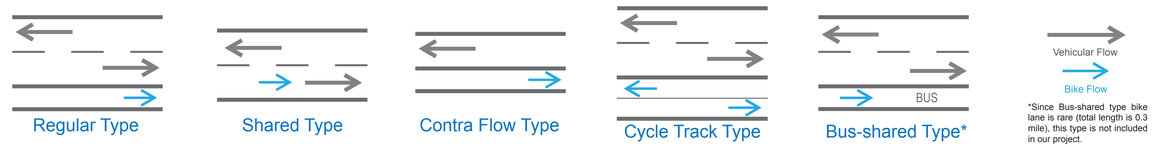
Score Criterion and Final Ranks

By transforming all the safety factors to the point of score, we can obtain a final rank for all uncontrolled nultilane crosswalks in DC. The score criterion is based on the previous projects of DDOT - Master Plan 2009, HAWK, and ATE.

The Final rank is in the largest map above. We may find that highly risky unsignalized crosswalks gathered in residential area near Howard University. This area has a dense population, and the roads have significant volume and high crash experience.

Bike Lane Safety Analysis

Bike lane is a common traffic facility which provides riders a specific traffic lane to ride safely. Usually, the bike lane is similar to a vehicle lane with narrow width. However, due to various limitation of street (geometry, geography, traffic condition, etc.), some bike lanes are designed as special types. In Washington DC, there are 5 kinds of bike lanes generally.



Though Bike lanes are generally helpful to prevent traffic crashes, safety performance difference between the types is remained unknown to us. Based on the current traffic accident database, Safety Division plans to analyze and compare the safety performance of the different types of bike lane.

Data Processing

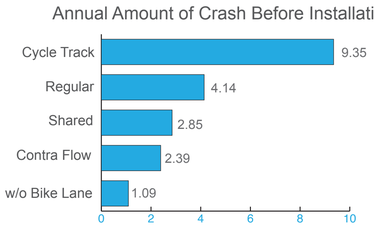
- Calculate the crash amount from year 2013 to 2018 for each street segment via ArcGIS
- Select the bike lanes that are installed between year 2013 and 2018
- Classify the street segments to 5+1 types (5 types of bike lane + 1 type with no bike lane)
- The streets with no bike lane are plentiful to be selected as the control group for comparison

Why 2013 to 2018?

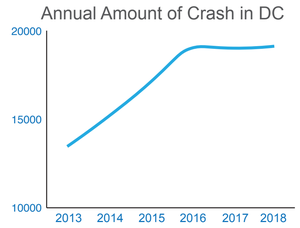
Though DDOT has a long-term crash database from year 2008. The crash records in early years are much less reliable than those of recent years. A six-year-long period is a good balance of sample size and data accuracy.

Problems of the Crash Data

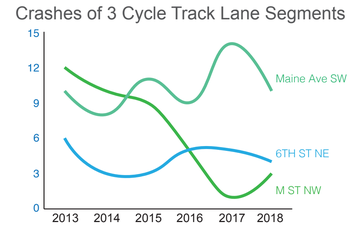
When crash data on each street is collected and processed, we are ready to make comparison. Since the data is not perfect, directly comparing the annual amount of crashes for each type is simple but inadequate. Why?



Street segments with bike lane have high crash experience before the installation of bike lane.



Data before 2015 is less reliable and shows an increasing tendency.



For a specific bike lane type, segments with different crash risk perform diversely.

Methodology: Vertical Comparison & Horizontal Comparison

VERTICAL: 2016 / 2015 / 2014 + HORIZONTAL: Shared, Contra Flow, Cycle Track = 2016 Contra Flow vs w/o Bike Lane 2014 / 2016 Contra Flow vs w/o Bike Lane 2014

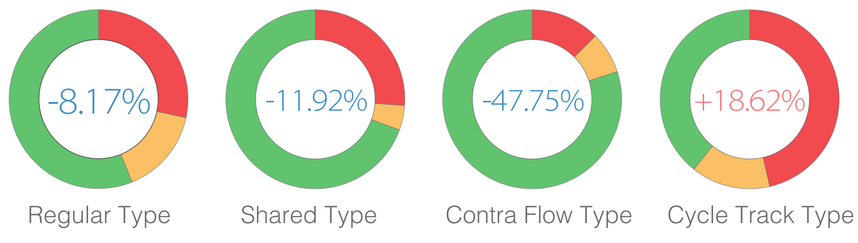
Compare the annual crash performance of the years before the installation with the years after installation.

Compare the safety performance between the backgroud group and different types of bike lanes.

Vertical + Horizontal Comparison is the methodology used in our project. For each ONE segment of a specific type of bike lane, search for the segments of the control group (with no bike lane) which have similar amount of crashes before the installation year. Then compare the annual crash amount in the following years after installation. Aggregate the comparison outcomes of all segments with the type.

Results and Conclusions

The results are shown in the ring charts. The colored ring segments represent for segments with different performance. And the numbers at the center are the average changes of crash number after installing a bike lane among all segments. The results of regular type and shared type are not surprising. These two types witnessed an around 10% decrease after the installation. However, the excellent performance of the contra flow and the unsatisfactory outcome of the cycle track are somewhat unexpected.



Contra flow lane is the special type used for one-way streets, and the cycle track is the type for restricted road geometry. Is the outcome caused by the character of lane or deficient sample size? Current database is not enough for a convincing explanation. In the coming years, larger sample size for this two type may help us to understand more about the safety benefit of them.

- Perform better after installation
- No significant change
- Perform worse after installation