Impacts of Growing Non-Motorized Infrastructure on Freight Operations and Accessibility

METROFREIGHT
Volvo Center of Excellence

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Project Motivation:

- In recent years, New York City's urban streets have undergone rapid redesign, with widespread implementation of pedestrian-friendly intersection designs, tremendous growth of on-street bicycle infrastructure, installation of dedicated bus lanes, and introduction of a bicycle share network with more than 500 stations.
- These changes have resulted in new accessibility challenges for commercial vehicles (CVs), including lost parking and travel lane capacity and increased interactions with non-motorized travelers; however, these impacts have not been well quantified.

Project Goals:

- To provide basic quantitative evidence of truck route impacts and of commercial vehicle—bicycle interactions on New York City's recently redesigned urban street network through visualization and basic statistical analysis of NYC open datasets (see Figure 1).
- To identify data needs and potential approaches for future research to better quantify resulting impacts for goods movement.

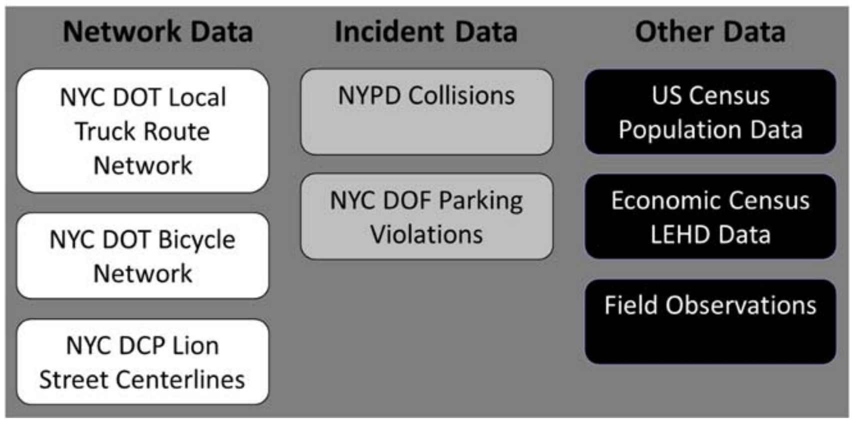

Figure 1. Data Inputs

Figure 2. Network Overlap in Lower Manhattan

Analysis Method:

Network Overlap

- Evaluate the extent of overlap between the city's designated bicycle and local truck routes to better understand the truck route mileage affected by bicycle lane implementations.

Collision Locations

- Examine locations of NYPD Collisions involving bicycles to identify their spatial distribution and the extent to which they occur on truck routes.
- Conduct difference of medians tests to identify freight demand-related predictors of CV-bicycle collision locations.

Parking Conflicts

- Map locations of parking violations for CVs "stopping, standing or parking within a marked bicycle lane" to identify critical conflict areas.
- Conduct field observations in three locations in Manhattan and the Bronx to examine the factors impacting driver decisions to park in the bicycle lane.

Results:

- Approximately 89 miles of bicycle lane network overlaps the city's 794 mile local truck network.
- About two-thirds of bike lanes installed on the truck network were installed after 2000.
- The majority of bicycle network implementations on the truck route network are lane types that require moderate to high allocation of dedicated space for bicycle use; more than 10 percent of all mileage installed on truck routes (and more than 12 percent installed since 2000) includes protected lanes.

Table 1. Network Extent by Bicycle Lane Type

	On-Street Bike Lanes		Truck Route Overlap		Truck Route Overlap Installed Since 2000	
Total Length (mi)	363.4		70.5		55.1	
Lane type	Length	Percent	Length	Percent	Length	Percent
Signed Route	27.7	7.6	3.9	5.5	3.0	5.5
Sharrows	57.4	15.8	14.0	19.9	11.2	20.3
Bike-Friendly Parking	23.4	6.4	7.2	10.3	7.2	13.1
Standard	218.4	60.1	31.3	44.4	23.3	42.3
Curbside	25.0	6.9	6.6	9.4	3.7	6.7
Protected Path	11.7	3.2	7.5	10.6	6.7	12.1

Table 2. Collision Locations by Lane Type

	On-Street Bike Lanes		Truck Route Overlap	
	All	CV	All	CV
Total Collisions	4358	122	2282	78
Share of Total Collisions By Lane Type				
Signed Route	3.9	4.9	3.0	2.6
Sharrows	18.4	16.4	18.2	12.8
Bike-Friendly Parking	2.5	0.0	1.6	0.0
Standard	53.2	46.7	44.4	39.7
Curbside	6.0	9.0	4.3	11.5
Protected Path	15.9	23	28.5	33.3

- The percentage of CV-involved collisions is higher in the on-street bicycle lanes (2.9 percent) than as a share of citywide observed bicycle collisions (1.9 percent).
- While bus and CV collisions constitute a very small share of collisions, these are frequently located along specific corridors
- More than half of all bicycle collisions occur on truck route segments that make up only 19 percent of the on-street bicycle network.
- Collision frequencies are very high on protected paths compared to their total mileage.
- Large CV collisions occurred in locations with higher employment shares in Wholesale, Transportation and Warehousing, and Retail; small CV collisions were in locations with high employment shares in Transportation and Warehousing and Manufacturing and with high population densities.
- For both food and parcel deliveries, the majority of CVs parked for less than 10 minutes; service vehicles and moving trucks parked for longer durations.
- Enforcement rates vary by location.

Table 3. Parking Availability and Use

	Vehicles Observed	Legal Parking at Location		Legal Parking on Block	
	Total	% Available	% Used	% Available	% Used
Food and Beverage	43	51	68	16	43
Parcel	58	12	43	19	9
Moving Truck	6	17	100	0	---
Service Vehicle	35	14	80	34	75

Areas of Future Research Need:

- Urban street level data collection of commercial vehicle and bicycle volumes.
- Detailed accident causality on specific types of bicycle infrastructure (particularly protected lanes).
- Network level impacts of reduced lane capacities, and related costs to industry and the surrounding area.
- Parking strategies appropriate for implementation on multimodal streets that better take into consideration differences in behavior of specific types of operators.

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