Factors impacting the fatality of non-motorist involved crashes in New Jersey

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1/24/2023

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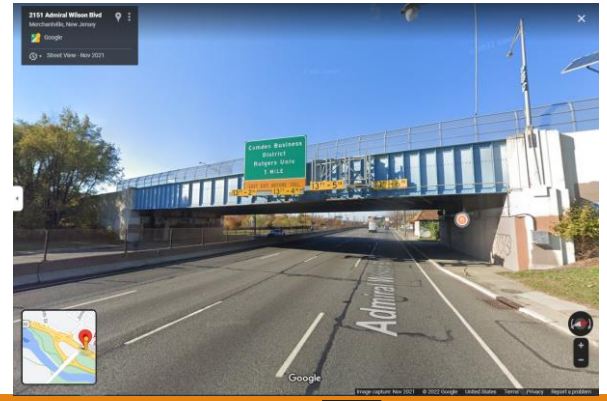
DEPARTMENT OF TRANSPORTATION
THE STATE OF NEW JERSEY

NEW JERSEY Safe Routes

Introduction and research questions

Fatal non-motorist involved crashes account for **1/3rd of all fatal crashes** in New Jersey. Non-motorist involved crashes (either fatal/injury or property damage only) occur disproportionately more in low-income and minority communities.

1. What is the relationship between non-motorist involved crashes, geocoded crashes, and low-income and minority communities?
2. Where are the community hot spots? A hot spot analysis of crashes in New Jersey.
3. What are the risk factors? A regression analysis.



Data: Geocoded Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

Data

Over 31,000 pedestrian and bicyclist involved crashes between 2016 and 2020.

Crash data came from:

- Safety Voyager – NJDOT
- Numetric – NJDHTS

Crash type	Number of Crashes	Number of Fatal Crashes	Percentage Fatal
Total	1,320,252	2,954	0.2%
Pedestrian	22,463	905	4.0%
Cyclist	9,413	72	0.8%
Pedestrian and/or cyclist	31,598	976	3.1%

Other data used:

- Sidewalk and crosswalk data – DVRPC
- Overburdened communities data – NJDEP
- Population density – Smart Location Database (EPA)
- High income communities – US Census Bureau

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Geocoded non-motorist involved crashes

Crashes needed to be geocoded in order to be spatially joined to the data sources.

90% of crashes are geocoded. Therefore, around 3,000 crashes were excluded due to lack of longitude/latitude coordinates. 20 of those were fatal crashes.

The rate of geocoded crashes varies from municipality to municipality. The 25 municipalities with the most crashes are displayed here.

Are crashes more likely to be geocoded in high-income areas and areas with more white people?

Municipality	Geocod	All Cras	Percenta
HOBOKEN CITY	349	341	97.71
PERTH AMBOY CITY	312	303	97.12
UNION CITY	475	460	96.84
MONTCLAIR TWP	249	241	96.79
BAYONNE CITY	410	394	96.10
JERSEY CITY	2067	1970	95.31
EDISON TWP	230	219	95.22
IRVINGTON TWP	630	597	94.76
CLIFTON CITY	338	320	94.67
LAKEWOOD TWP	512	484	94.53
ATLANTIC CITY	406	383	94.33
PASSAIC CITY	554	519	93.68
EAST ORANGE CITY	439	408	92.94
FORT LEE BORO	309	285	92.23
WOODBRIDGE TWP	275	253	92.00
TEANECK TWP	240	218	90.83
TRENTON CITY	495	447	90.30
NORTH BERGEN TWP	408	362	88.73
NEWARK CITY	2991	2586	86.46
WEST NEW YORK TOWN	330	282	85.45
HACKENSACK CITY	390	329	84.36
NEW BRUNSWICK CITY	389	327	84.06
CAMDEN CITY	571	473	82.84
PATERSON CITY	1382	1129	81.69
ELIZABETH CITY	914	689	75.38

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Correlation between percentage of geocoded crashes, income, and race

Crash occurrence in a municipality:

- Correlation between the percentage of non-white people and number of crashes: 0.22
- Correlation between the percentage of low-income workers and number of crashes: 0.12

Percent of crashes that are geocoded in a municipality

- Correlation between the percentage of non-white people and the rate of geocoded crashes: -0.17
- Correlation between the percentage of low-income workers and the rate of geocoded crashes: -0.13

- As the percentage of minorities and low-income households increases, **more reported crashes** (per person and per sq. mi)
- As the percentage of minorities and low-income households increases, **reported crashes are less likely to be geocoded**

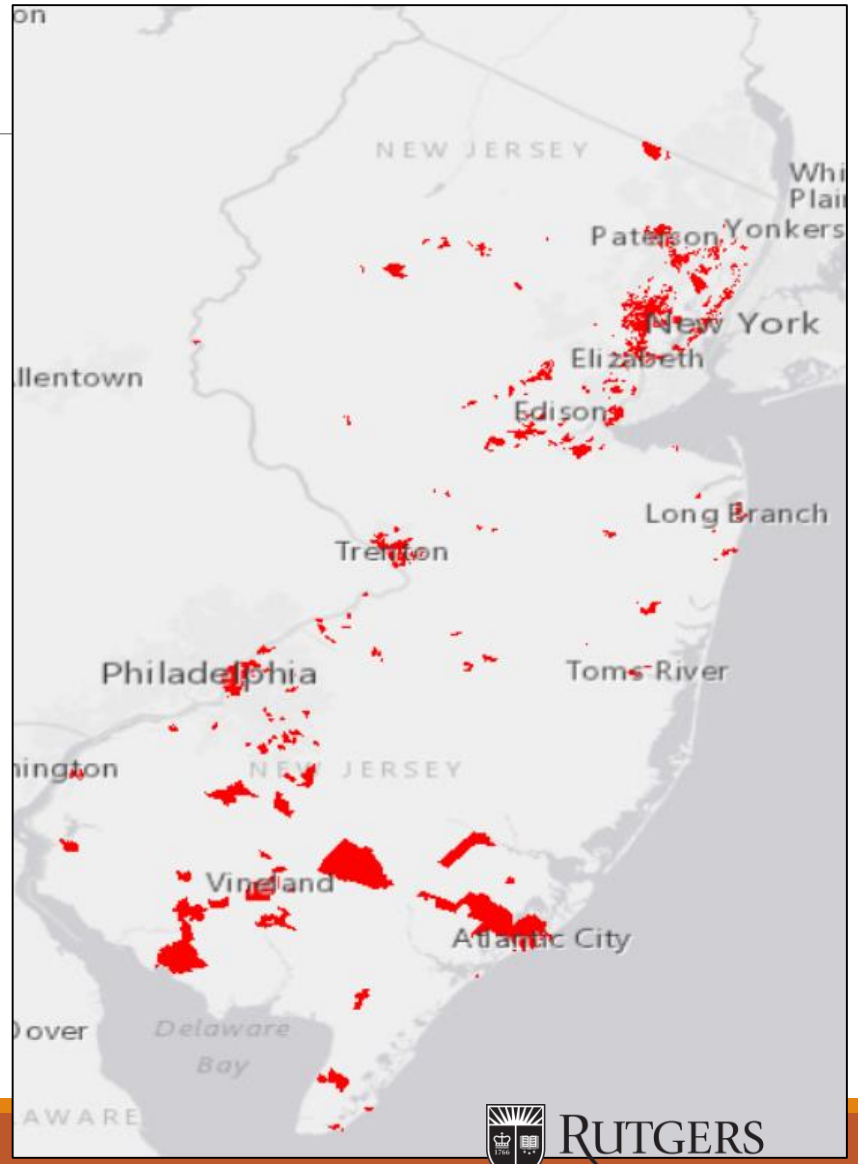
Data: Geocoded Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

Overburdened communities and geocoded crashes

Overburdened communities are defined here as: CBGs where **at least 35 percent** of the households qualify as **low-income households** and **at least 40 percent** of the residents identify as **minority**. (NJDEP)

These communities make up **21%** of the NJ population

<u>However, 40% of all NJ geocoded crashes occur in overburdened communities</u>



Data: Geocoded Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

Overburdened communities and geocoded crashes

Overburdened communities are minority, low income, and/or limited English communities. They make up 20.6% of the NJ population.

However, 40.3% of all NJ crashes occur in overburdened communities

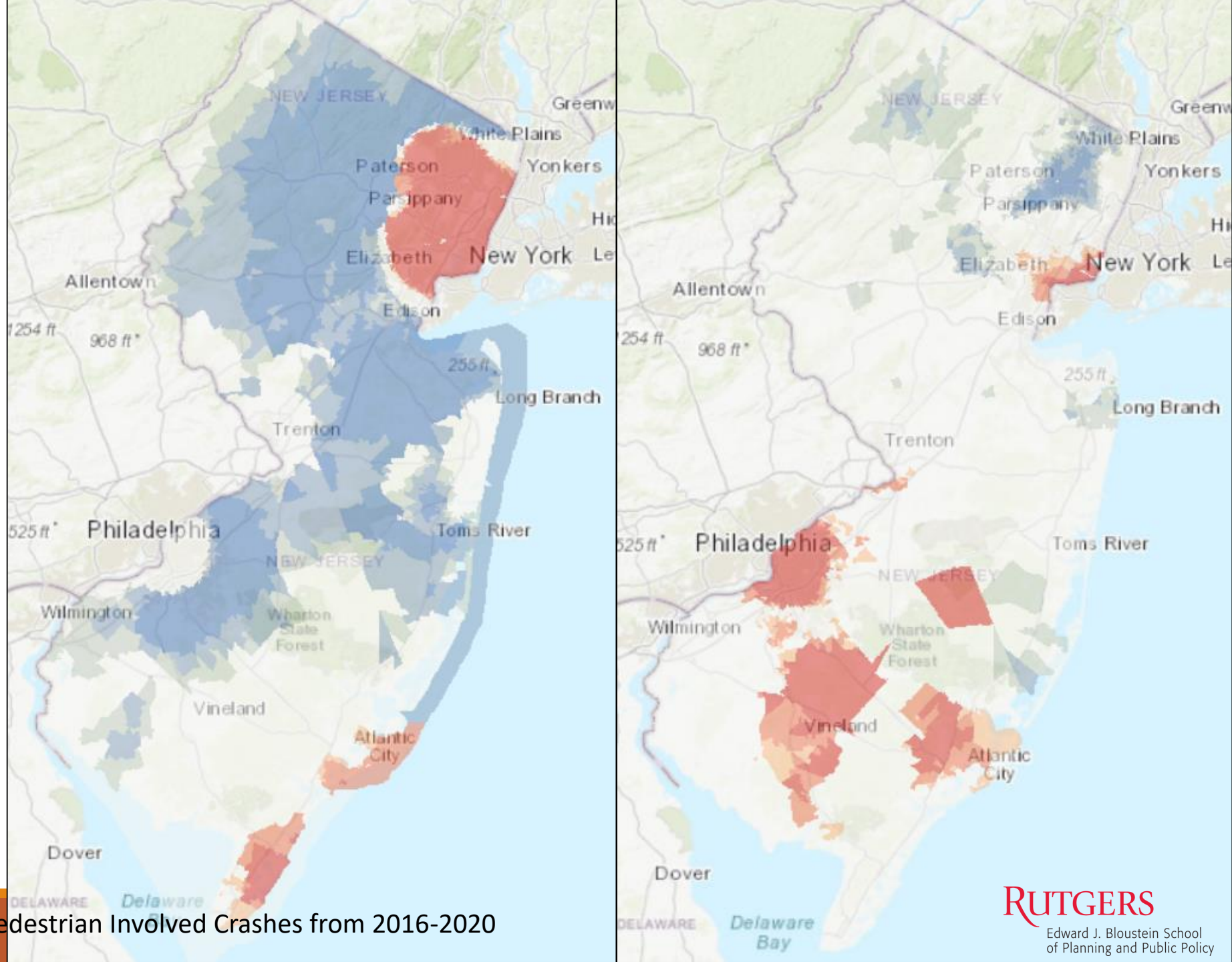
Geocoded Crashes	NJ	Low income/Minorities	Percentage
Dark Conditions (No lights)	1,111	320	28.8%
Dark Conditions (Lights)	8,620	3,819	44.3%
Daylight	17,404	6,753	38.8%
State Highway Crashes	4,000	921	23.0%
Fatal Crashes	956	258	27.0%
Youth Involved Crashes	5,126	2,047	39.9%
All Crashes	28,643	11,544	40.3%

Data: Numetric and Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020 and NJDEP Overburdened Communities Data

Hotspots for bike/ped crashes per capita

All crashes (left)

Fatal Crashes (right)



Data: Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

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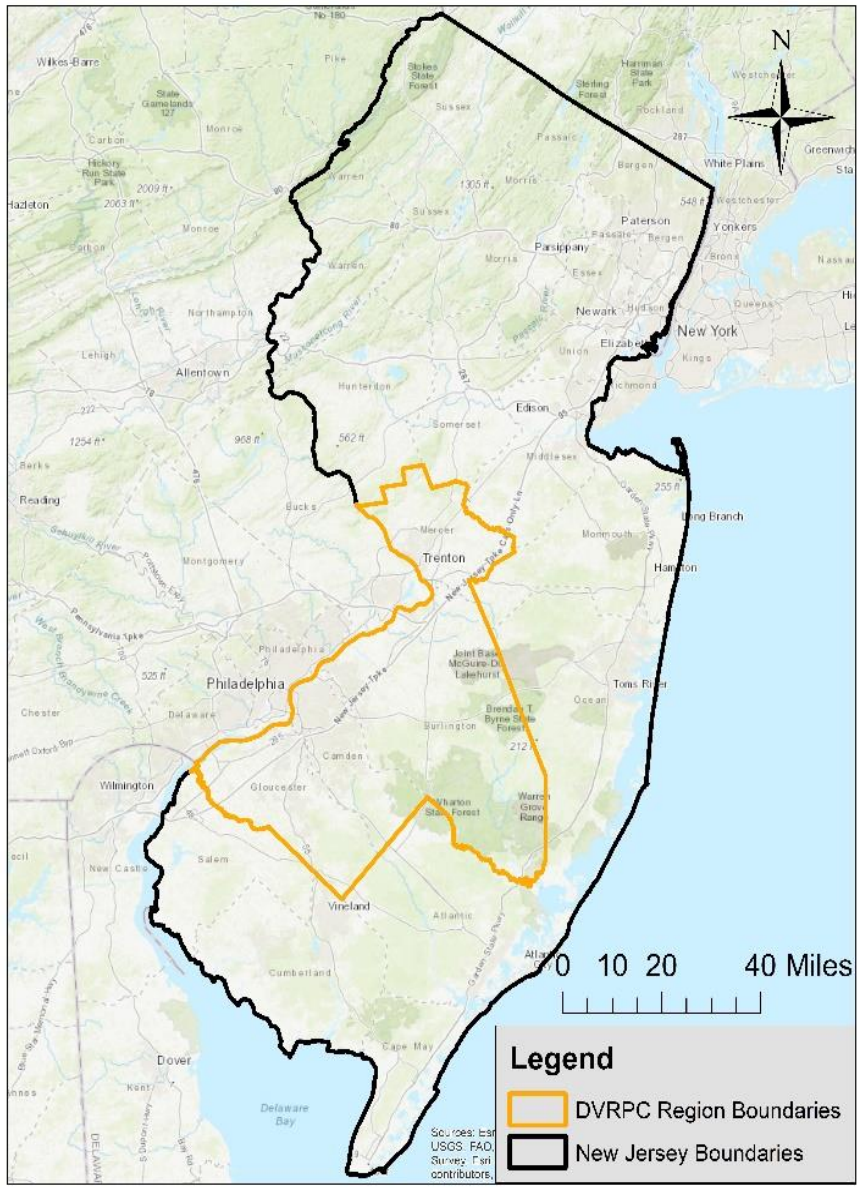
Regression analysis

Research questions:

1. Which factors impact whether a crash is fatal for a pedestrian or a bicyclist?
2. Do those factors differ between pedestrian and bicyclist crashes?
3. Is the proximity to a crosswalk and sidewalk a significant factor in the fatality of pedestrian crashes? (analysis on DVRPC region only)



Data: Geocoded Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

Factors considered

- Road Type
- Light Conditions
- Environmental Conditions
- Vehicle Type
- Speed of Roadway
- Availability of a sidewalk and/or a crosswalk
- Socio-demographic variables at the community (CBG) level

976 out of 31,598 non-motorist involved crashes were fatal for the non-motorist in all of New Jersey (3%)

239 out of 3,893 non-motorist involved crashes were fatal for the non-motorist in the DVRPC region (6%)

Data: Geocoded Safety Voyager Bicycle and/or Pedestrian Involved Crashes from 2016-2020

RESPONSE VARIABLE: IS THE CRASH FATAL FOR THE NON-MOTORIST? (Yes/No)	DVRPC Region – Peds (N=2,199; 175 fatal)	All NJ - Peds (N = 17,336; 690 fatal)	All NJ – Cyclists (N=8,118; 66 fatal)
Age of Non-motorist			
Non-motorist age: > 65	**3.2**	**3.4**	**2.6**
Non-motorist age: < 20	n.s.	**0.6**	n.s.
Road System (Reference: Municipal)			
County	n.s.	**1.5**	**0.6**
State/US Highway	**3.6**	**3.4**	n.s.
Light Conditions (Reference: Daylight)			
Dark (Street lights on)	**3.3**	**3.5**	**2.2**
Dark (Street lights off)	**6**	**6.5**	**7.5**
Dawn	**5.4**	**2.6**	n.s.
Dusk	**3.9**	**2.5**	n/a
Environmental Conditions: Not Clear	n.s.	n.s.	n.s.
Road Conditions: Not Dry	n.s.	n.s.	n.s.
Vehicle Type:			
Bus	n.s.	**2.8**	**10.8**
Truck	n.s.	**6.2**	**13.7**
Speed limit: Faster than 40mph	**3**	**3.2**	**5.2**
Weekend	n.s.	**1.3**	n.s.
Sidewalk > 20 meters	**1.6**	n/a	n/a
Crosswalk > 10 meters	**1.6**	n/a	n/a
CBG level variables			
Population Density	n.s.	–	n.s.
Employment Density	n.s.	n.s.	n.s.
Low income	n.s.	n.s.	**1.6**
High income	n.s.	n.s.	n.s.

Results: Under what conditions are fatal crashes more likely to occur?

Non-motorists aged 65+ were 2.6-3.4 times more likely to suffer a fatal injury.

Road system: State/US highways are more likely to be fatal for pedestrians (3.4-3.6 times more likely).

Light conditions: Compared to daylight, crashes that occurred in dark conditions (no street lights) were 6-7.5 times more likely to be fatal.

Speed: a posted speed of > 40mph was 2.9-3.0 times more likely to be deadly

A truck or bus collision are particularly deadlier for cyclists: 10.8-13.7 times more than cars.

No sidewalk nearby (20 meters): 1.6 times more likely to be fatal for pedestrians

No crosswalk nearby (10 meters): 1.6 times more likely to be fatal for pedestrians

Cyclist crashes in low-income areas are 1.6 times more likely to be fatal.

Some conclusions for planning

Light conditions: At night, a crash is twice as likely to be deadly if there are no lights available or if they are broken or off.

Crosswalks and sidewalks: A crash involving a pedestrian who had no access to a crosswalk or sidewalk was 1.6 times as likely to be deadly.

Speed: A lower speed limit of less than 40mph can save lives.

Bike lanes: Bike lanes save lives. Low-income areas often do not have as many bike lanes, which may explain the increased likelihood of fatality.

Data necessity: The model could be improved if we had more information on number of road lanes (missing in 83% of the records), sidewalk and crosswalk availability for all of NJ, vehicle involved (including year), availability of a bicycle lane, etc.

Thank you!

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We would like to thank NJDOT for funding this research through the Safe Routes Resource Center contract.

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