VISION ZERO AND TRAFFIC INJURY PREVENTION IN NEW YORK CITY

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INTRODUCTION: VISION ZERO

The Vision Zero approach accepts that some number of traffic crashes are unavoidable because some level of human error will always exist. Vision Zero rejects the traditional approach which placed responsibility for crashes almost entirely on road users, and re-allocates it largely to traffic system designers (Tingvall and Haworth 1999)

The law change cut the default speed limit for streets with no speed limit signs from 30 MPH to 25 MPH beginning November 7, 2014. (Roughly a 18% reduction in speed)

Intended to reduce traffic fatalities, presumably would also have an effect on injuries.

V0 is bundled with several other changes, such as road expansions, etc., but many of these gradual improvements phased in over several years around. However, some changes happened at the same time, such as the addition of 3000 street signs to the control group, which makes our estimates smaller (closer to 0)

FINDINGS:

Using a difference-in-difference (DID) approach, we estimate that after the speed limit change there was:

- A significant decline in casualties on the slowed NYC streets.
- A significant decline in collisions on the slowed NYC streets.
- A significant decline in speed attributions on the slowed NYC streets.

Note: these findings are on the intensive margin

DATA:

Accident Data:

New York City's Vision Zero initiative provides monthly traffic fatality & injury statistics at each NYC street intersection, collected and maintained jointly by the NYC Department of Transportation and the NYC Police Department.

Street Data:

Street segment data were obtained from NYC's DOT publicly available LION data set which is the most complete record of street segment data in NYC. Contains posted speed limit. We keep only those street segments that are in the 25mph and 30mph range.

Data were collected between Jan 2012 and July 2019, inclusive. This left us with 8,200 street segments with speeds between 25-30MPH, and of those 7,120 were unsigned (and therefore treated by the V0 program). In total, just over 520,000 street-month-year segment observations, when including segments that were always 0.

(a) Signed streets in black; unsigned streets in grey

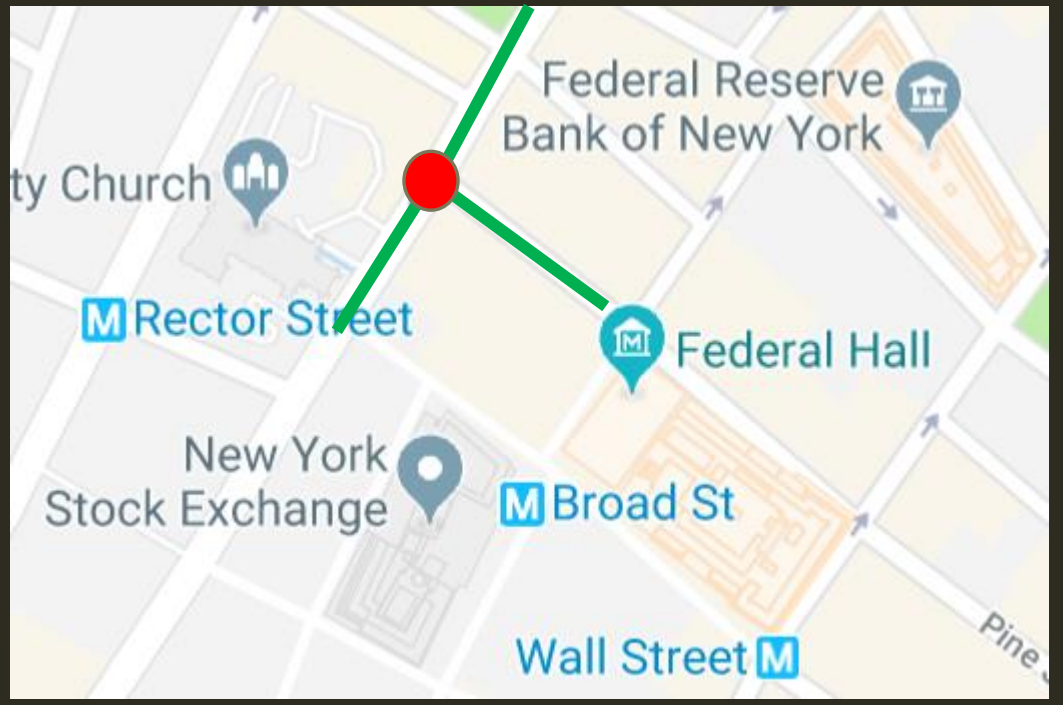
(b) Heat map of NYC crashes

Location of Streets & Collisions

NOTE ON ACCIDENT DATA:

Injuries & fatalities are per intersection, speed limit data are per street-segment.

So an accident at the red intersection could be reasonably applied to each of the 3 green street segments. Our approach is to apply it randomly to one of the green street segments.



DATA SUMMARY

Vast majority of streets are treated.

Treated streets generally have fewer collisions and are generally safer than control streets.

Natural because signs are placed on more dangerous streets preemptively.

More likely to list speed as a problem on treated streets.

Many streets have no accidents so they get dropped by FE

Table 2 Summary statistics: means by street–month–year

	(1) Treatment streets—no posted speed limit $n=7120$	(2) Control streets—posted speed limit $n=1080$	(3) All streets $n=8200$
Casualties	0.45	1.70	0.65
Injuries	0.45	1.70	0.64
Fatalities	0.00	0.01	0.00
Crashes	1.81	6.13	2.48
Motorist casualties	0.31	1.30	0.46
Pedestrian casualties	0.10	0.29	0.13
Cyclist casualties	0.04	0.11	0.05
Speed attributions	0.01	0.05	0.02
Observations (street–month–year)	439,318	81,297	520,615

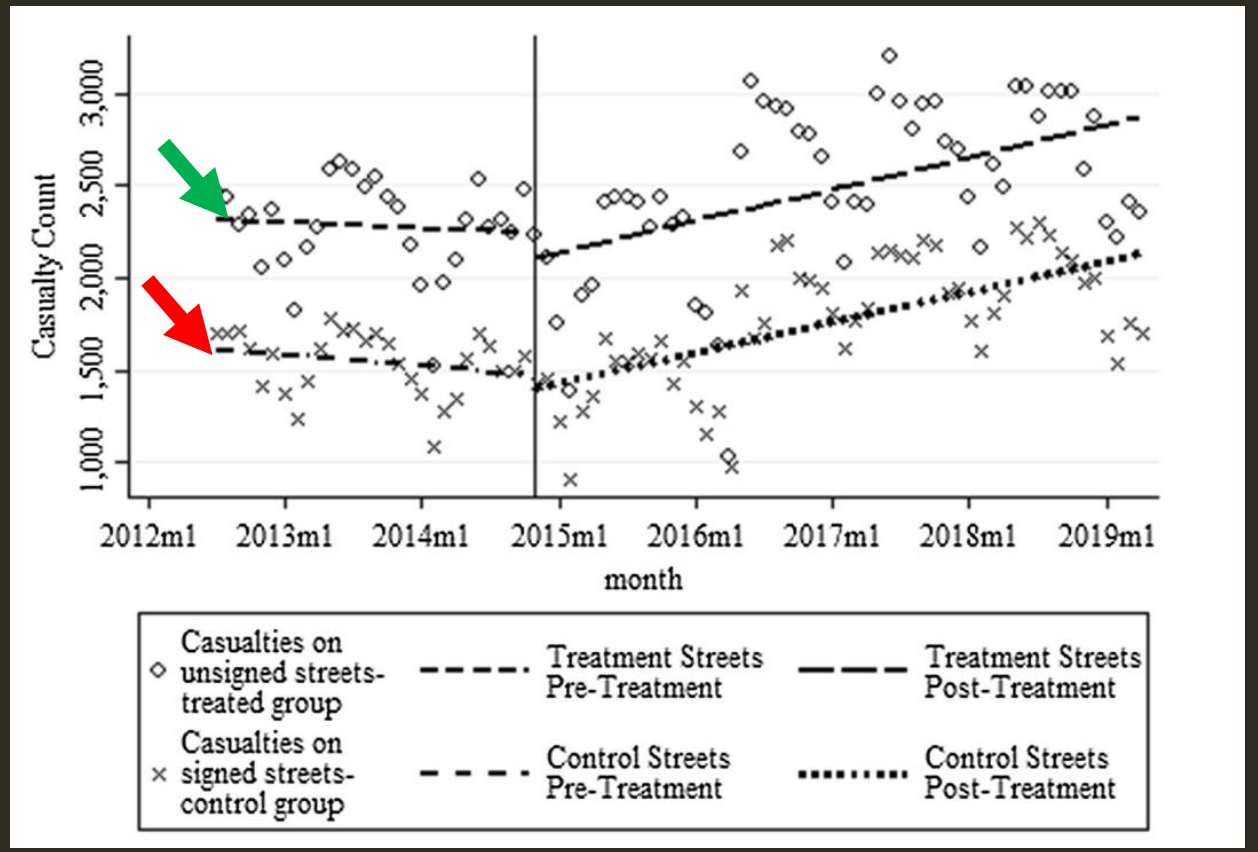
Data is per street segment

Casualties

Treated streets have a small decline in injuries and fatalities.

The control streets (25mph and 30mph) see a very small drop in accidents.

The final DiD analysis will compare the drop in treated vs drop in untreated (on a per-street basis)



Data is per street segment, unadjusted

Difference-in-Differences Equation

$$Casualties_{it} = \alpha_i + \delta_t + \beta_1 TreatmentPd_t + \beta_2 TreatmentPd * TreatedSt_i + \epsilon_{it}$$

Simultaneous treatments so no need for CSDID

t is monthly, *i* is individual street

α & δ are vectors of fixed effects, aka a two-way fixed-effects model (TWFE)

ESTIMATED EFFECTS

.174 fewer casualties on treated streets in treated months (.174/0.45 = 36%)

No measurable change in fatalities, reduction is entirely injuries.

Fewer crashes, 0.65/street-month.

Math balances out if 27% of those “reduced crashes” were injurious.

Table 3 Road safety outcomes: difference in differences results

Variables	(1) Casualties	(2) Injuries	(3) Fatalities	(4) Crashes
After November 2014	0.105	0.108*	−0.002	0.538***
	(0.065)	(0.065)	(0.003)	(0.162)
D-I-D	−0.174***	−0.174***	0.000	−0.648***
	(0.045)	(0.045)	(0.001)	(0.132)
Constant	0.785***	0.780***	0.005**	2.543***
	(0.028)	(0.028)	(0.002)	(0.045)
Street FE	Yes	Yes	Yes	Yes
Monthly FE	Yes	Yes	Yes	Yes
Observations	520,615	520,615	520,615	520,615
R-squared	0.008	0.008	0.000	0.023
F test	12.60	12.54	1.335	23.40
Prob > *F*	0	0	0.0243	0
Number of streets	8200	8200	8200	8200

Robust standard errors in parentheses

*** $p<0.01$; ** $p<0.05$; * $p<0.1$

Requirements for Inclusion:	Never 0	Never 0	Has been >0	Has been >0

ESTIMATED EFFECTS

Reduction is primarily in motorist casualties.

No real reduction in cyclist casualties.

Curious (but very tiny) increase in pedestrian casualties, speculatively, they are more emboldened to cross at lower speeds?

Reminder no deaths

Officers are less frequently indicating that speed was a factor in collisions.

Table 4 Heterogeneity in difference-in-differences results

Variables	(1) Motorist casualties	(2) Pedestrian casualties	(3) Cyclist casualties	(4) Speed attributions
After November 2014	0.187***	−0.058***	−0.023**	0.104***
	(0.062)	(0.015)	(0.010)	(0.011)
D-I-D	−0.191***	0.023***	−0.007*	−0.054***
	(0.044)	(0.007)	(0.003)	(0.008)
Constant	0.566***	0.131***	0.088***	−0.010***
	(0.025)	(0.010)	(0.007)	(0.002)
Street FE	Yes	Yes	Yes	Yes
Monthly FE	Yes	Yes	Yes	Yes
Observations	520,615	520,615	520,615	520,615
R-squared	0.007	0.004	0.008	0.018
F test	11.01	9.623	11.04	18.29
Prob > *F*	0	0	0	0
Number of streets	8200	8200	8200	8200

Robust standard errors in parentheses

*** $p<0.01$; ** $p<0.05$; * $p<0.1$

Robustness Checks

No indication of pretreatment trends

- Almost never significant (2/30)
- No obvious directional pattern over the 6 months.

Table 5 Robustness checks for pre-treatment effects

Variables	(1) Casualties	(2) Injuries	(3) Fatalities	(4) Crashes	(5) Speed attributions
After November 2014	−0.038	−0.042	0.004	−0.479***	0.110***
	(0.104)	(0.103)	(0.005)	(0.178)	(0.011)
D-I-D	−0.175***	−0.172***	−0.002	−0.365**	−0.049***
	−0.038	−0.042	0.004	(0.142)	(0.008)
D-I-D 1-month lead	−0.031	−0.036	0.005	−0.167	−0.001
	(0.078)	(0.078)	(0.004)	(0.105)	(0.004)
D-I-D 2-month lead	−0.015	−0.013	−0.002	−0.092	0.002
	(0.084)	(0.083)	(0.005)	(0.111)	(0.004)
D-I-D 3-month lead	0.145	0.144	0.001	0.003	−0.001
	(0.090)	(0.090)	(0.004)	(0.101)	(0.004)
D-I-D 4-month lead	0.015	0.016	−0.001	0.261**	0.003
	(0.094)	(0.093)	(0.004)	(0.110)	(0.005)
D-I-D 5-month lead	−0.093	−0.096	0.003	−0.051	−0.007
	(0.099)	(0.098)	(0.005)	(0.104)	(0.005)
D-I-D 6-month lead	−0.026	−0.023	−0.003	−0.274**	−0.002
	(0.075)	(0.076)	(0.0036)	(0.108)	(0.003)
Constant	0.788***	0.784***	0.004**	2.553***	−0.008***
	(0.029)	(0.029)	(0.002)	(0.044)	(0.002)
Street FE	Yes	Yes	Yes	Yes	Yes
Monthly FE	Yes	Yes	Yes	Yes	Yes
Observations	520,445	520,445	520,445	520,445	520,445
R-squared	0.008	0.008	0.000	0.023	0.017
F test	11.36	11.29	1.195	11.36	16.12
Prob > *F*	0	0	0.098	0	0
Number of streets	8189	8189	8189	8189	8189

Robust standard errors in parentheses

*** $p<0.01$; ** $p<0.05$; * $p<0.1$

CONCLUSION

- Speed reduction on treated streets is associated with
  - Significant reduction in casualties (36%)
  - Significant reduction in collisions (36%)
    - Compared to (18%) maximum legal speed reduction, elasticity of -2
  - Significant reduction in speed-associated collision reports

- V0 seems to be an effective policy at reducing collisions and improving safety, speed limits in particular seem to be a low cost measure to accomplish this goal, especially on *unsigned streets*!