Traffic Safety Camera Analysis

City of New Orleans

July 28, 2017

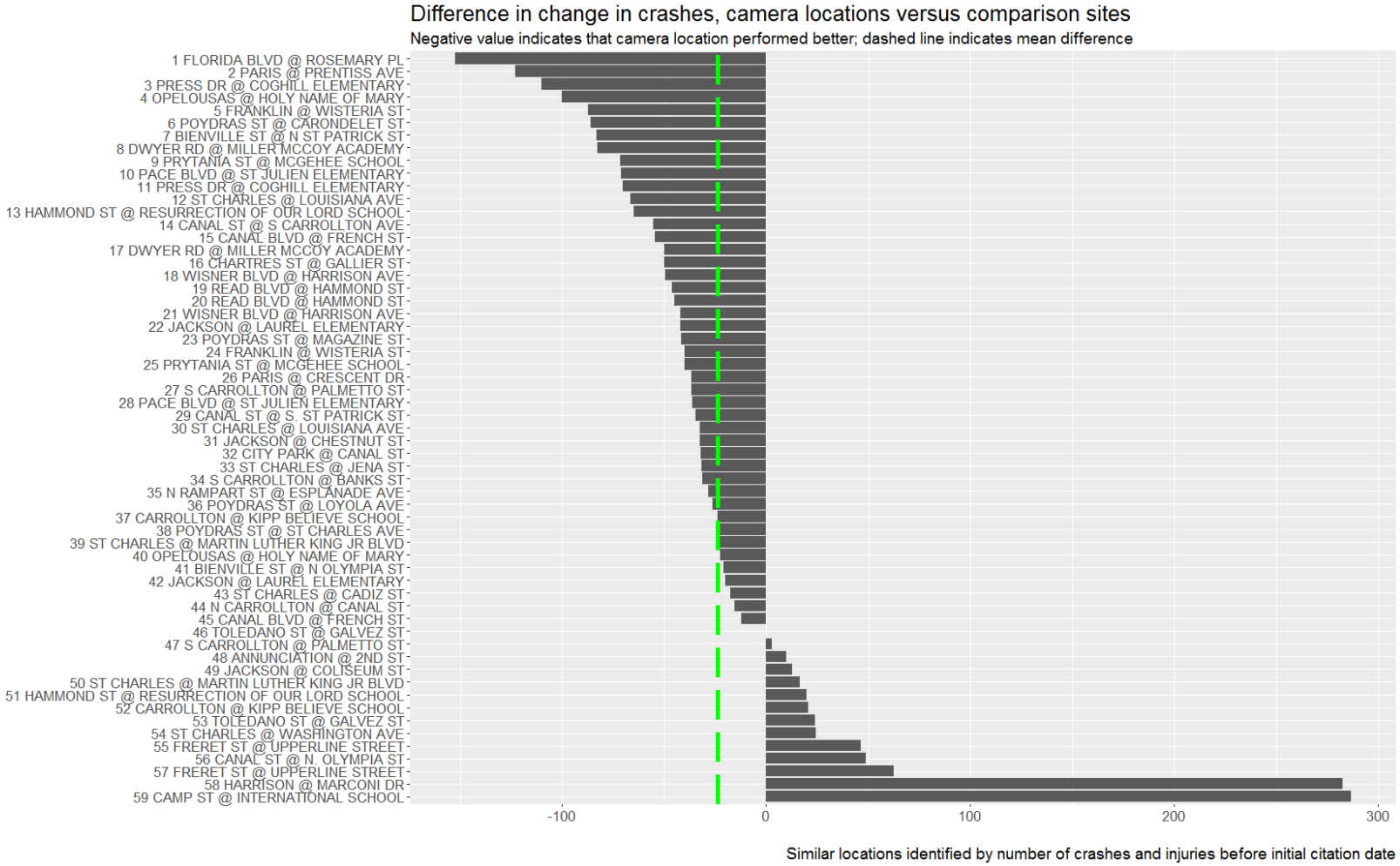
Contents

Executive summary

- This analysis finds strong evidence that traffic cameras installed in New Orleans from 2008 to 2012 did have a beneficial effect in terms of reducing crashes at the camera locations
- While there was considerable variation among camera sites (see slide 3), road segments with cameras had approximately 21 percent fewer crashes on average than would have otherwise been expected, even after controlling for confounding factors
- Other findings include:
  - 76 percent of camera locations experienced a smaller increase in crashes than a set of matched comparison sites, with an average difference of 23 percentage points
  - 54 percent of camera locations had a decrease in the crash rate, compared to 9 percent for comparison sites
  - As a group, camera sites experienced a 1 percent increase in crashes, while the control group experienced a 24 percent increased in crashes
- Because significant variance existed among locations, estimates of average effect size should be interpreted as directionally correct, rather than numerically precise

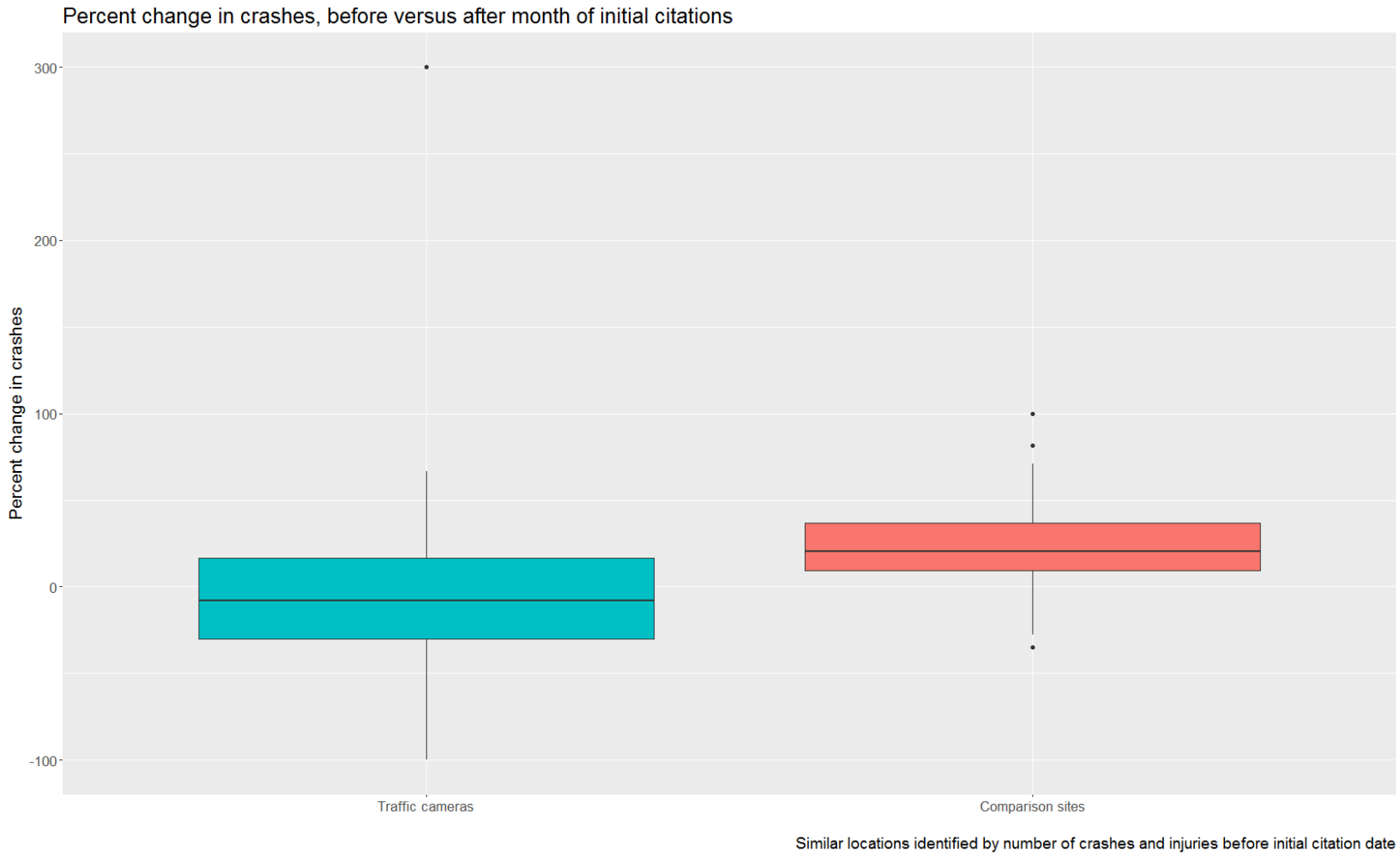
Individual site comparisons

76% of camera locations had a smaller increase in crashes per year than matched comparison sites (45 of 59)



Group comparison

Traffic camera locations on average experienced less than a 1% increase in crashes, compared to a 24% increase for comparison sites



Methodology

Preliminary geoprocessing

Crashes

- La. DOTD crash data obtained from 2005 to 2015
- Missing locations filled in using street names and ESRI World Geocoder
- Because of imprecision in crash data, crashes were matched to all road segments within 150 feet (diagonal of a major intersection)

Cameras

- Geographic coordinates for cameras obtained from contractor
- Duplicates were removed, leaving 60 unique locations installed between 2008 and 2012
- Camera matched to nearest road segment within 50 feet
- Where multiple segments could be matched to one camera, segment with most crashes before installation was used (for example, to match Canal Street itself, rather than a U-turn cut on Canal Street)
- Henry Clay at Coliseum was excluded because no crashes were reported prior to installation

Methodology

Data processing and determination of comparison sites

Data processing

- Cameras were assigned to one of ten date cutoffs, based on month of initial citation
- For each road segment, the number of crashes was calculated for three years before and after each date cutoff; crashes during the month of initial citation were excluded to account for time needed to notify drivers of violations committed
- A "treatment" or "intervention" group consisting of the 59 camera locations was constructed using the change in crashes relative to each camera's initial citation date

Comparison sites

- To generate a comparison group for each test location, 10 sites with similar crash totals, injury totals, and severity scores before installation were identified using widely available computer software. Severity scores for locations were calculated using methodology from the Regional Planning Commission's "Pedestrian Safety Action Plan"
- Candidate sites were excluded if located within 2000 feet of the camera location, within 2000 feet of another comparison site, or more than 5 miles away from the camera (approximately)

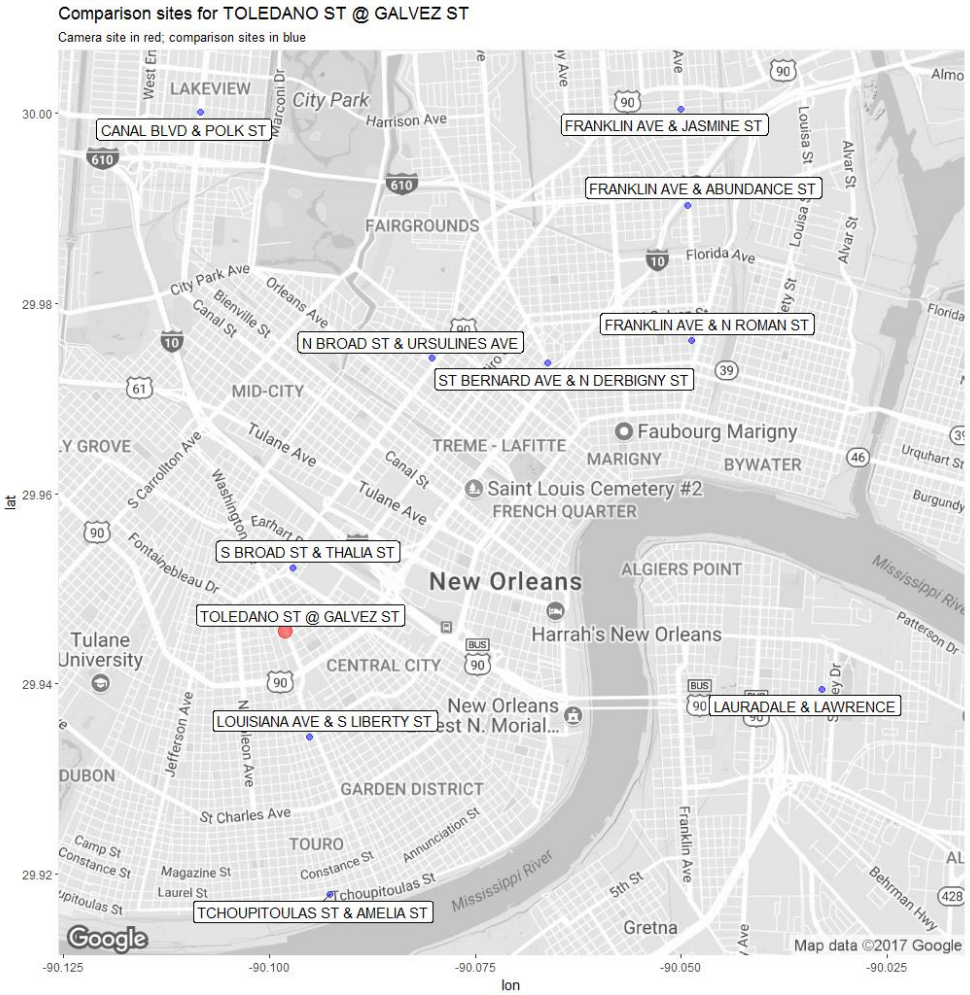
Comparison sites illustration

The following locations were matched to the Toledano @ Galvez site, based on crashes and injuries before the initial citation date

Location	Crashes before	Injured before	Severity score before	Crashes after	Injured after	Severity score after
TOLEDANO ST & S GALVEZ	8	8	74.16	10	6	7.24
LOUISIANA AVE & S LIBERTY ST	11	8	74.28	15	6	2.52
CANAL BLVD & POLK ST	8	9	76.08	10	2	5.32
N BROAD ST & URSULINES AVE	13	8	75.32	24	19	46.64
FRANKLIN AVE & ABUNDANCE ST	13	5	77.36	37	26	64.80
S BROAD ST & THALIA ST	15	5	77.44	14	14	9.32
LAURADALE & LAWRENCE	7	3	73.16	3	2	4.08
TCHOUPITOULAS ST & AMELIA ST	13	4	77.36	4	3	2.08
FRANKLIN AVE & N ROMAN ST	15	10	80.32	20	6	10.64
FRANKLIN AVE & JASMINE ST	13	9	82.28	7	4	4.24
ST BERNARD AVE & N DERBIGNY ST	14	13	79.20	23	22	13.52

Comparison sites illustration

The following locations were matched to the Toledano @ Galvez site, based on crashes and injuries before the initial citation date



Analysis

Descriptive and inferential statistics

Summary statistics

- In terms of pairwise comparisons, 76% of camera locations had a smaller increase in the crash rate than matched control sites
- Camera sites had an increase in crashes 23 percentage points lower than their matched comparison sites on average, but there was considerable variation across locations, so this finding may not be robust
- 54% of camera sites experienced a decrease in crash rate, compared to 9% for the matched control locations
- As a group, traffic camera locations experienced a 1% increase in crashes per year on average, compared to a 24% increase for comparison sites

Inference

- A "Student's t-Test" was conducted using widely available software to determine whether the average pairwise difference (camera location versus comparison sites) was statistically significant across installation sites
- The average difference was significant at the 95% confidence level (p-value for mean of pairwise differences = 0.0130), and results were similar when each camera was matched with different numbers of control sites
- The overall difference in group means was also significant at the 95% confidence level (p-value = 0.0147)

Analysis

Regression modeling

Modeling percent change in crashes

- To validate the findings of the t-test, an ordinary least squares regression model was fit to the smaller data set containing the 59 treatment locations and 590 matched control locations
- A binary dummy variable was included for the 59 treatment observations to represent the potential effect of the cameras
- Control variables for the installation date, crashes before, injuries before, and severity before were included to explicitly account for potential confounding factors
- After controlling for those factors, the coefficient for camera installation was significantly different from zero at the 95 percent confidence level (p-value = 0.0233)
- The coefficient suggests that holding other factors constant, the percent change in crashes at camera locations tended to be 23 percentage points lower on average

Modeling expected count of crashes

- Finally, a method from econometrics – the "difference in differences" approach – was used to model counts of expected crashes
- For this analysis, crash counts were modeled using quasi-Poisson regression, with variables for the presence of a camera, whether the observation took place before or after installation, and the interaction between the two terms
- As before, control variables were added for installation date, number of injuries, and severity before installation, along with a quadratic term for injuries that accounted for some additional variance
- After controlling for those factors, the interaction term between the presence of a camera and post-installation period was significantly different from zero at the 95 percent confidence level (p-value = 0.0391)
- The value of this coefficient indicates that holding other factors constant, the number of crashes at camera sites after installation was 21 percent lower than expected

Analysis

Regression coefficients

Regression coefficients for simple linear model

Term	Estimate	Std.Error	Statistic	P.Value
(Intercept)	129.6437	50.8163	2.551223	0.010965
has_camTRUE	-0.23705	0.104216	-2.27459	0.023259
crashes_before	-0.00409	0.002651	-1.54411	0.123055
injured_before	0.004046	0.004484	0.902209	0.367283
score_before	0.00171	0.001305	1.310765	0.190405
cam_dt	-0.06437	0.025267	-2.54745	0.011083

Regression coefficients* for difference of differences model (see note)

Term	Estimate	Std.Error	Statistic	P.Value
(Intercept)	168.8611	31.3621	5.384242	8.64E-08
has_camTRUE	0.005392	0.084588	0.06375	0.949179
time_periodcrashes_after	0.245726	0.034306	7.162851	1.32E-12
poly(injured_before, 2)1	21.11188	0.756799	27.89628	2.14E-134
poly(injured_before, 2)2	-8.56852	0.465459	-18.4088	2.23E-67
score_before	0.003685	5.94E-04	6.208549	7.20E-10
cam_dt	-0.08259	0.015602	-5.29347	1.41E-07
has_camTRUE:time_periodcrashes_after*	-0.24573	0.118983	-2.06521	0.039102

* To obtain the multiplier associated with the cameras from these Poisson regression coefficients, it is necessary to raise *e* to the power specified by the coefficient. In this case, *e* ^ (-0.24573) = 0.782, equivalent to a reduction of about 21 percent.