A Test of Racial Disproportionality in Traffic Stops Conducted by the Greensboro Police Department

REPORT

Prepared for

Greensboro Police Department
300 W. Washington St.
Greensboro, NC 27402

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Prepared by

Travis Taniguchi, PhD
Josh Hendrix, PhD
Brian Aagaard, MA
Kevin Strom, PhD
Alison Levin-Rector, MPH
Stephanie Zimmer, PhD

RTI International
P.O. Box 12194
Research Triangle Park, NC
27709-2194
http://www.rti.org/

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Recent research has generated questions regarding the Greensboro Police Department's (GPD) use of race as a proxy for criminal behavior. For example, a recent *New York Times* article highlighted the racial disproportionality in traffic stops in Greensboro (LaFraniere & Lehren, 2015). Critically, these kinds of analyses typically use census population estimates to establish a benchmark for the driving population. Census estimates, however, demonstrate only where people reside and serve as a poor proxy for the actual driving population. Therefore, census population cannot accurately measure the population at risk (i.e., the driving population that is likely to be involved in a traffic stop). RTI International conducted a series of analyses to address this methodological limitation. This research was funded internally by RTI to serve the community and to contribute to a growing body of scientific research on this topic.

Data

The analysis described below was conducted on data from 251,524 traffic stops conducted by the GPD from January 1, 2010, through November 30, 2015. The stop data analyzed here were obtained from the North Carolina state-maintained traffic stop information data system.

Analytical Approach

To study the racial distribution of traffic stops in Greensboro, we used the "veil of darkness" (VOD) approach, which is based on the logic that police officers are less likely to be able to ascertain the race of a motorist after dark than they are during daylight. As such, stops occurring in darkness serve as a comparison group for stops occurring during daylight, so the existence of racial profiling can be assessed by comparing the numbers of drivers of each race stopped during daylight with the numbers of drivers of each race stopped after dark. The analysis is limited to stops that occur during the intertwilight period (roughly between 5:30 p.m. and 9:15 p.m.) in order to reduce the variation in travel patterns that are dependent upon time of day. Figure 1 graphically depicts the intertwilight period.

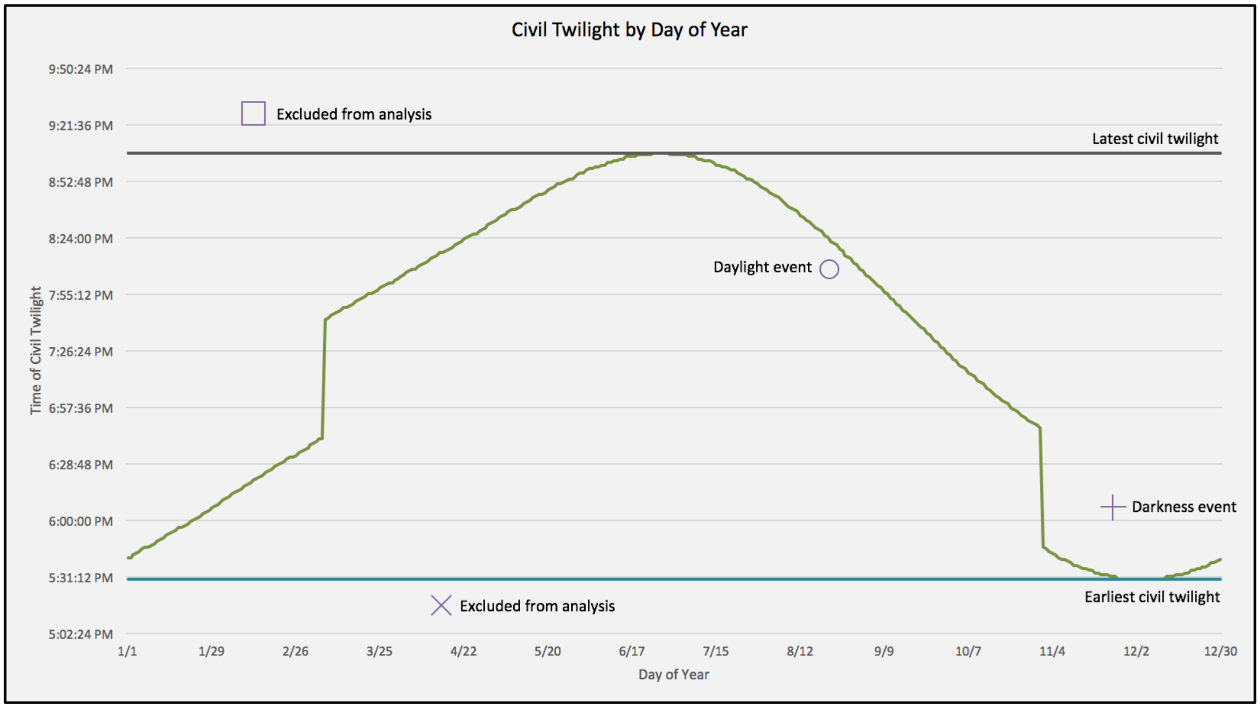
The VOD method was developed and first employed by Jeffery Grogger and Greg Ridgeway in an analysis of traffic stops in Oakland, California, in 2006 (Grogger & Ridgeway, 2006) and Cincinnati, Ohio, in 2009 (Ridgeway et al., 2009). The method has also been used to explore racial bias in Minneapolis, Minnesota (Ritter & Bael, 2009), Syracuse, New York (Worden, McLean, & Wheeler, 2010), San Diego, California (Burks, 2015), and the state of Connecticut (Pazniokas, 2015). Using this method, evidence of racial bias was identified in Minneapolis and for several jurisdictions in Connecticut.

One benefit of the VOD approach is the simple interpretation of results. If the daylight indicator is statistically nonsignificant, it suggests that daylight was not associated with the race of the driver who was stopped. Alternatively, if the daylight indicator is statistically significant and positive, it suggests that Black motorists are more likely to be stopped during times when visibility is higher. Evidence of racial bias is present of minority drivers are overrepresented during daylight hours compared with during times of darkness.

We processed GPD's traffic stop data for 2010–2015 and incorporated information on civil twilight, collected from a public database maintained by the U.S. Naval Observatory. Using the VOD method, we explored three areas of interest:

1. The relationship between light visibility and race of the driver stopped
2. The relationship between light visibility and race of the driver stopped among male drivers only
3. The relationship between light visibility and race of the driver stopped among female drivers only

Figure 1: Civil Twilight by Day of Year



- ☐ Events above the black line occurred *after* the latest civil twilight—always in the dark. These events are excluded.
- X Events below the blue line occurred *before* the earliest civil twilight—always during daylight. These events are excluded.
- O Events between the blue and black lines occurred after the earliest civil twilight and before the latest civil twilight. Events under the green curve occurred before civil twilight of that day and are considered daylight events.
- \+ Events outside of the green curve occurred after civil twilight for that day and are considered darkness events.

Our models incorporate one enhancement from the previous studies: We use a random intercepts model to control for differences between officers. By doing so, we recognize that officers may have inherent differences in the percentage of Black motorists they are likely to encounter. These differences may be caused by factors such as geographic deployment, unit assignment, or individual characteristics (e.g., unique decision-making processes).

Results

Table 1 presents descriptive statistics for the race and sex of drivers for the overall sample of stops (*N* = 251,524) and for the stops that occurred during the intertwilight period (*n* = 37,125). An assessment of group percentages indicates only minor differences between the overall sample and the sample restricted to intertwilight stops. Traffic stops more commonly involved men than women, and the vast majority of stops (approximately 97%) involved either a Black or a White driver. In both the overall sample and the sample limited to stops during the intertwilight period, Black drivers were the majority.

Table 1: Race and Sex of People Stopped

	Overall (*N* = 251,524)		Intertwilight Period Stops (n = 37,125)	
	Frequency	%	Frequency	%
Sex				
Male	148,569	59.07	21,796	58.71
Female	102,955	40.93	15,329	41.29
Total	251,524	100.00	37,125	100.00
Race				
Asian	4,587	1.82	687	1.85
Black	136,126	54.12	21,629	58.26
Native American	1,321	0.53	190	0.51
Unknown	1,319	0.52	181	0.49
White	108,171	43.01	14,438	38.89
Total	251,524	100.00	37,125	100.00

Note. Data on traffic stops from Greensboro, North Carolina, from January 1, 2010, through November 30, 2015, were obtained from the state-maintained traffic stop information data system.

Model 1 presents the results of the VOD analysis conducted on the entire subset of stops that occurred during the intertwilight period (see ***Table 2***). We did not find a statistically significant relationship between lighting and driver race. Subset analyses were conducted for males only (Model 2) and then again for females only (Model 3). We found no relationship between lighting and driver race among the male subset. We found a small but statistically significant negative relationship between lighting and driver race among the female subset. An odds ratio of 0.891 suggests that, among female drivers, the odds of the driver's being Black were about 11% *lower* during daylight than during darkness. An assessment of predicted probabilities shows that, during darkness, the chances that a traffic stop involved a Black female driver were 63%; during daylight, the chances were 60% (controlling for other predictors in the model).[1, 2]

[1] Likelihood ratio tests were conducted for each set of analyses (i.e., overall, males only, and females only) to assess goodness-of-fit between the full model and a model that excluded the night/day indicator. The chi-squared statistic was statistically nonsignificant (at $p < .05$) for the overall and male-only models and statistically significant for the female-only model ($\chi^2 = 8.25$, $p < 0.01$).

[2] We used random intercepts models to control for differences between officers. As such, we calculated intraclass correlation coefficients to determine how much of the variation in the dependent variable was accounted for by officer-level variation. Results indicated that, for each model, approximately 11% of the total variation in the probability of the driver's being Black was accounted for by the officer who was conducting the stop.

Table 2: Veil of Darkness Results

Model	*n*	Odds Ratio
Model 1: Overall	37,125	0.988
Model 2: Males only	21,796	1.051
Model 3: Females only	15,329	0.891**

Notes: Data on traffic stops from Greensboro, North Carolina, from January 1, 2010, through November 30, 2015, were obtained from the state-maintained traffic stop information data system. Models also controlled for day of week, year, and time of stop as linear and quadratic terms. These coefficients are omitted for brevity. Models were specified as generalized linear mixed models where officer ID was treated as a random effect. ** $p < .01$.

Discussion

We did not find evidence of racial profiling in the traffic stops conducted by the GPD. For the overall model, there was no relationship between available lighting and the race of the driver stopped. We found a negative (odds ratio less than 1) and statistically significant relationship between lighting and driver race in the female subsample. The negative relationship suggests that the odds of the female driver's being Black were about 11% *lower* during daylight than during darkness. In other words, Black females were actually underrepresented during daylight hours. Taken together, the evidence suggests that the proportion of Black drivers involved in traffic stops was not disproportionally high. Although differences may have existed between the racial composition of drivers involved in traffic stops and the racial composition of the jurisdiction's population, our analyses did not suggest that this difference was caused by racial bias of GPD officers. Other factors, such as the driving population at risk, should be considered.

References

Burks, M. (2015, June 15). Using 'darkness' to shed light on racial profiling claims. *KPBS.org*. Retrieved from http://www.kpbs.org/news/2015/jun/15/san-diego-researchers-turn-data-answers-police-rac/

Grogger, J., & Ridgeway, G. (2006). Testing for racial profiling in traffic stops from behind a veil of darkness. *Journal of the American Statistical Association, 101,* 878–887. doi:10.1198/016214506000000168

LaFraniere, S., & Lehren, A. W. (2015, October 24). The disproportionate risks of driving while Black. *The New York Tim*es. http://www.nytimes.com/2015/10/25/us/racial-disparity-traffic-stops-driving-black.html

Pazniokas, M. (2015, April 7). Connecticut's deep data dive on racial profiling. *The Connecticut Mirror*. Retrieved from http://ctmirror.org/2015/04/07/connecticuts-deep-data-dive-on-racial-profiling/

Ridgeway, G., Schell, T.L., Gifford, B., Saunders, J., Turner, S., Riley, K.J., & Dixon, T.L. (2009). *Police-community relations in Cincinnati*. Santa Monica, CA: RAND Center on Quality Policing. Retrieved from http://www.rand.org/content/dam/rand/pubs/monographs/2009/RAND_MG853.pdf

Ritter, J. A., & Bael, D. (2009, Spring/Summer). Detecting racial profiling in Minneapolis traffic stops: A new approach. *CURA Reporter,* 11–17. Retrieved from http://hup.umn.edu/docs/DetectingRacialProfiling.pdf

Worden, R. E., McLean, S. J., & Wheeler, A. (2010). *Stops by Syracuse police, 2006–2009*. Albany, NY: John F. Finn Institute for Public Safety. Retrieved from http://finninstitute.org/wp-content/uploads/2010/11/Stops-by-Syracuse-Police.pdf