Supplemental Information: Impact of precipitation and temperature on the racial composition and citation activity of traffic stops in the United States

The following document presents supplemental information. All data and code to recreate the analysis in the paper is available at https://www.github.com/trafficstops/Paper. Here is the Quick Guide to replicate the results and Supplemental Information.

1. Download the 9 files in the aforementioned GitHub repository in a folder onto your local drive.
2. Run `PolicingMain.R` to get the paper results. This will also write the `PolicingRegData.RData` into the folder. Make sure all the necessary R packages are available.
3. Run `PolicingSupplementalInfo.Rmd`.

Here is the slightly longer version. The repository contains the following main files necessary to replicate the analysis and results in the main manuscript:

- `PolicingMain.R`
- `PolicingData.RData`

For the file `PolicingMain.R` to run, the following functions are required as well:

- `FunGLMBlack.R`
- `FunGLMCitation.R`
- `FunOrmsbeeDeterministic.R`
- `FunOrmsbeeStochastic.R`
- `FunProRain.R`

Executing the file `PolicingMain.R` replicates the calculations to obtain Tables 1 and 2 as well as Figure 2. Note that on Line 102 and 106 of `PolicingMain.R`, the software writes and immediately reads the following file:

- `PolicingRegData.RData`

The file `PolicingRegData.RData` is necessary to compile the Supplemental Information. The code prior to line 102 determines the precipitation distribution over various time intervals (i.e., 10-, 15-, 20-minute intervals). The code after line 106, executes the actual analysis from the paper. The source file and the pdf-file associated this document are included as well.

City summary statistics on race and warning/citation/arrest

Note that for some cities, the data is missing regarding the issuance of citations whereas for others, the summary statistics indicate that for 100% of stops a citation was issued. For the analysis with *citation* as the dependent variable, all cities (and states) with a value of 100% citations were removed.

City	State	Black	Hispanic	White	Citation
Little Rock	AR	62%	0%	38%	100%
Mesa	AZ	6%	22%	72%	100%
Bakersfield	CA	14%	36%	50%	100%
Los Angeles	CA	30%	50%	20%	
Oakland	CA	66%	22%	14%	32%
San Diego	CA	14%	42%	44%	
San Francisco	CA	26%	18%	56%	62%
San Jose	CA	10%	70%	18%	
Aurora	CO	28%	6%	66%	100%
Hartford	CT	44%	28%	28%	46%
Wichita	KS	24%	16%	60%	100%
Louisville	KY	36%	4%	60%	70%
Owensboro	KY	10%	0%	90%	100%
New Orleans	LA	72%	2%	24%	30%
Saint Paul	MN	46%	10%	44%	28%
Charlotte	NC	56%	10%	34%	40%
Durham	NC	60%	14%	26%	40%
Fayetteville	NC	56%	6%	36%	44%
Greensboro	NC	60%	6%	34%	40%
Raleigh	NC	50%	10%	38%	44%
Winston-Salem	NC	46%	12%	42%	64%
Grand Forks	ND	8%	0%	92%	96%
Camden	NJ	48%	34%	18%	
Henderson	NV	10%	12%	78%	100%
Albany	NY	46%	4%	50%	
Cincinnati	OH	60%	0%	40%	
Columbus	OH	48%	4%	50%	50%
Oklahoma City	OK	24%	0%	76%	100%
Tulsa	OK	26%	6%	68%	
Philadelphia	PA	70%	12%	18%	
Nashville	TN	42%	6%	52%	
Arlington	TX	38%	24%	38%	
Garland	TX	18%	48%	34%	100%
Plano	TX	18%	20%	62%	
San Antonio	TX	10%	50%	40%	100%
Burlington	VT	8%	0%	92%	
Madison	WI	24%	8%	68%	70%

State summary statistics on race and warning/citation/arrest

State	Black	Hispanic	White	Citation
CT	14%	12%	74%	40%
FL	18%	22%	60%	
GA	28%	4%	70%	
MI	16%	2%	82%	74%
ND	4%	4%	92%	
NH	2%	2%	96%	32%
NY	10%	6%	82%	
OH	12%	2%	86%	
TN	12%	4%	84%	100%
TX	10%	38%	52%	34%
WI	6%	4%	90%	44%

Robustness checks regarding weather disaggregation

For data main results in the manuscript, we have used the "deterministic" approached presented in Ormsbee (1989). This section uses the "stochastic" approach including for the 20-minute interval. Our results are robust to a different method in distributing the precipitation data over the interval of one hour.

City data and 20-min intervals

Table 3:

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	−0.020**	−0.025**	−0.026**
	(0.009)	(0.010)	(0.010)
year	0.052***	0.052***	0.052***
	(0.002)	(0.002)	(0.002)
sto20	0.037*		−1.809**
	(0.020)		(0.884)
I(tempk ∗sto20)			0.006**
			(0.003)
tempk		−0.001	−0.001*
		(0.001)	(0.001)
Constant	−105.124***	−105.085***	−105.139***
	(3.635)	(3.635)	(3.636)
Observations	458,976	458,976	458,976
Log Likelihood	−278,184.900	−278,185.600	−278,181.500
Akaike Inf. Crit.	556,463.800	556,465.200	556,461.000
Note:			*p<0.1; **p<0.05; ***p<0.01

City data and 15-min intervals

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Table 4:

		Dependent variable:	
		black	
	(1)	(2)	(3)
night	−0.020**	−0.025**	−0.026**
	(0.009)	(0.010)	(0.010)
year	0.052***	0.052***	0.052***
	(0.002)	(0.002)	(0.002)
sto15	0.051*		−2.363**
	(0.026)		(1.161)
I(tempk ∗sto15)			0.008**
			(0.004)
tempk		−0.001	−0.001*
		(0.001)	(0.001)
Constant	−105.130***	−105.085***	−105.146***
	(3.635)	(3.635)	(3.636)
Observations	458,976	458,976	458,976
Log Likelihood	−278,184.700	−278,185.600	−278,181.400
Akaike Inf. Crit.	556,463.500	556,465.200	556,460.800

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Note: *p<0.1; **p<0.05; ***p<0.01

City data and 10-min intervals

Table 5:

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	-0.020^{**}	-0.025^{**}	-0.026^{**}
	(0.009)	(0.010)	(0.010)
year	0.052^{***}	0.052^{***}	0.052^{***}
	(0.002)	(0.002)	(0.002)
sto10	0.073^{*}		-3.626^{**}
	(0.039)		(1.747)
I(tempk *sto10)			0.013^{**}
			(0.006)
tempk		-0.001	-0.001^{*}
		(0.001)	(0.001)
Constant	-105.122^{***}	-105.085^{***}	-105.135^{***}
	(3.635)	(3.635)	(3.636)
Observations	458,976	458,976	458,976
Log Likelihood	$-278,184.900$	$-278,185.600$	$-278,181.500$
Akaike Inf. Crit.	556,463.900	556,465.200	556,461.000

| *Note:* | *p<0.1; **p<0.05; ***p<0.01 |

State data and 20-min intervals

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Table 6:

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	−0.009	0.032***	0.032***
	(0.008)	(0.009)	(0.009)
year	0.043***	0.044***	0.044***
	(0.001)	(0.001)	(0.001)
sto20	0.018		−3.739***
	(0.028)		(1.112)
I(tempk ∗sto20)			0.013***
			(0.004)
tempk		0.006***	0.005***
		(0.0005)	(0.0005)
Constant	−89.087***	−91.463***	−91.459***
	(3.011)	(3.015)	(3.015)
Observations	981,192	981,192	981,192
Log Likelihood	−403,396.400	−403,327.700	−403,322.000
Akaike Inf. Crit.	806,834.900	806,697.400	806,689.900

Note: ∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

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State data and 15-min intervals

<div align="center">Table 7:</div>

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	−0.009	0.032***	0.032***
	(0.008)	(0.009)	(0.009)
year	0.043***	0.044***	0.044***
	(0.001)	(0.001)	(0.001)
sto15	0.037		−4.710***
	(0.036)		(1.460)
I(tempk ∗sto15)			0.016***
			(0.005)
tempk		0.006***	0.005***
		(0.0005)	(0.0005)
Constant	−89.080***	−91.463***	−91.448***
	(3.011)	(3.015)	(3.015)
Observations	981,192	981,192	981,192
Log Likelihood	−403,396.100	−403,327.700	−403,322.400
Akaike Inf. Crit.	806,834.200	806,697.400	806,690.700

Note: *p<0.1; **p<0.05; ***p<0.01

State data and 10-min intervals

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Table 8:

| | _Dependent variable:_ | | |
| | black | | |
	(1)	(2)	(3)
night	−0.009	0.032***	0.032***
	(0.008)	(0.009)	(0.009)
year	0.043***	0.044***	0.044***
	(0.001)	(0.001)	(0.001)
sto10	0.043		−7.361***
	(0.055)		(2.200)
I(tempk ∗sto10)			0.025***
			(0.008)
tempk		0.006***	0.005***
		(0.0005)	(0.0005)
Constant	−89.084***	−91.463***	−91.455***
	(3.011)	(3.015)	(3.015)
Observations	981,192	981,192	981,192
Log Likelihood	−403,396.300	−403,327.700	−403,322.000
Akaike Inf. Crit.	806,834.700	806,697.400	806,690.000

Note: *p<0.1; **p<0.05; ***p<0.01

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Robustness checks regarding rain versus precipitation

The results in the main paper are based on precipitation which includes all forms (e.g., rain, sleet, snow). In this section, we exclude all traffic stops that were conducted below 5 degrees Celsius to ensure that only rain is measured. Again, the results are robust and overlap with results presented in the main text.

City data

Table 9:

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	−0.025**	−0.037***	−0.038***
	(0.010)	(0.011)	(0.011)
year	0.053***	0.054***	0.054***
	(0.002)	(0.002)	(0.002)
det	0.042**		−1.942*
	(0.019)		(1.026)
I(tempk ∗det)			0.007*
			(0.004)
tempk		−0.002***	−0.003***
		(0.001)	(0.001)
Constant	−107.239***	−107.177***	−107.228***
	(3.879)	(3.878)	(3.879)
Observations	374,366	374,366	374,366
Log Likelihood	−229,026.000	−229,023.600	−229,019.100
Akaike Inf. Crit.	458,146.000	458,141.200	458,136.100

Note:	*p<0.1; **p<0.05; ***p<0.01

State data

Table 10:

	Dependent variable:		
	black		
	(1)	(2)	(3)
night	0.020**	0.039***	0.039***
	(0.009)	(0.010)	(0.010)
year	0.042***	0.042***	0.042***
	(0.002)	(0.002)	(0.002)
det	0.020		−2.375*
	(0.026)		(1.291)
I(tempk ∗det)			0.008*
			(0.004)
tempk		0.003***	0.003***
		(0.001)	(0.001)
Constant	−87.164***	−88.232***	−88.209***
	(3.253)	(3.258)	(3.258)
Observations	735,020	735,020	735,020
Log Likelihood	−317,407.100	−317,393.600	−317,391.700
Akaike Inf. Crit.	634,856.300	634,829.200	634,829.400

Note: *p<0.1; **p<0.05; ***p<0.01