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# Racial Disparities in Traffic Stops

## Technical Appendix

### CONTENTS

Appendix A. Additional Figures and Tables

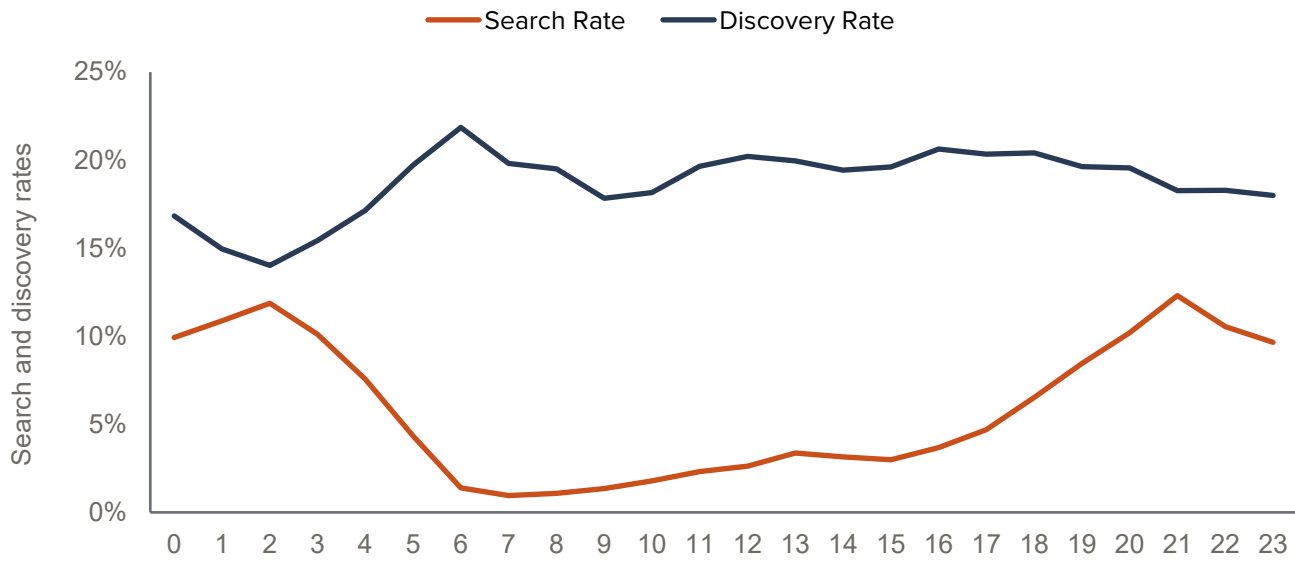
Magnus Lofstrom, Joseph Hayes, Brandon Martin, and Deepak Premkumar

Supported with funding from Arnold Ventures

# Appendix A. Additional Figures and Tables

**FIGURE A1**

Overall search and discovery rates by hour of day

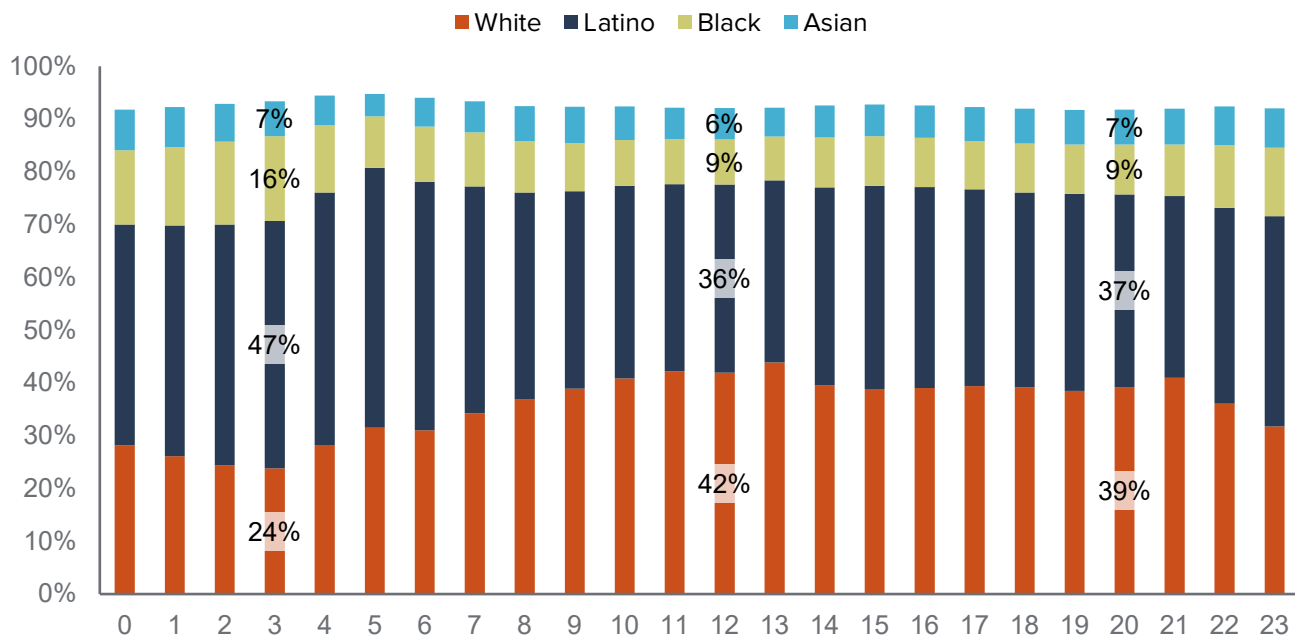


SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight.

**FIGURE A2**

Racial/ethnic distribution by stop hour, California Highway Patrol

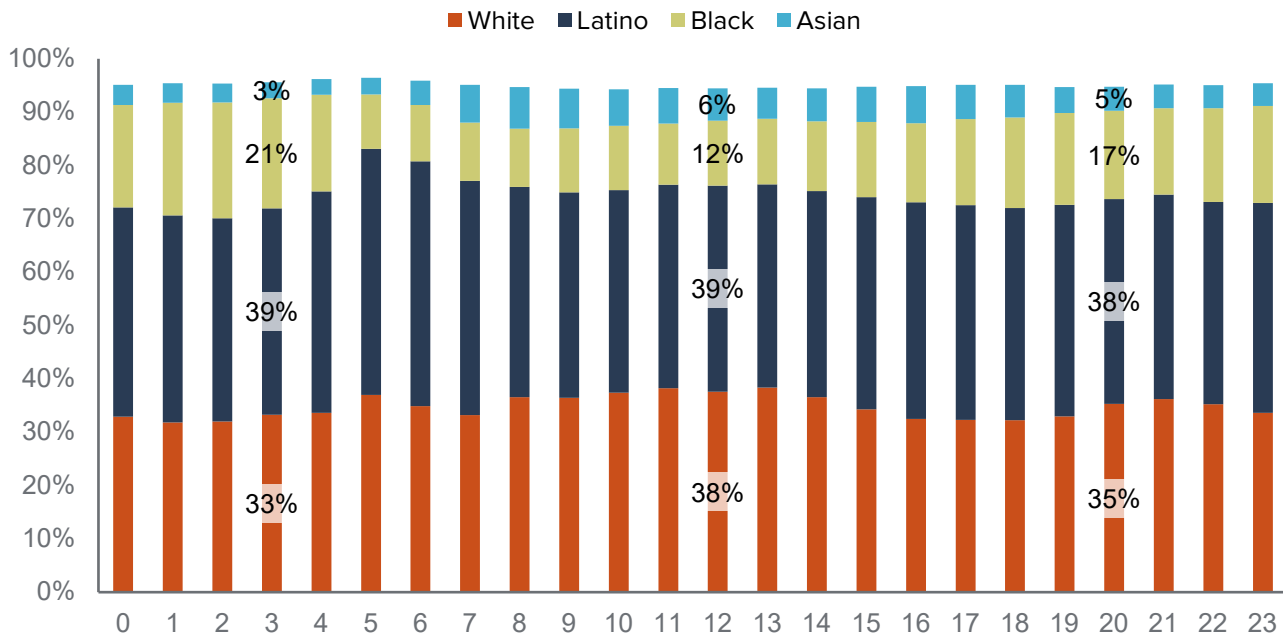


SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight. Not all racial/ethnic groups in the RIPA data are shown in the figure, thus each bar will not add up to 100 percent. The racial/ethnic groups omitted in the figure are individuals perceived by the officer to be Middle East/South Asian, Pacific Islander, Native American, or multi-racial/ethnic.

**FIGURE A3**

Racial/ethnic distribution by stop hour, Sheriff Departments

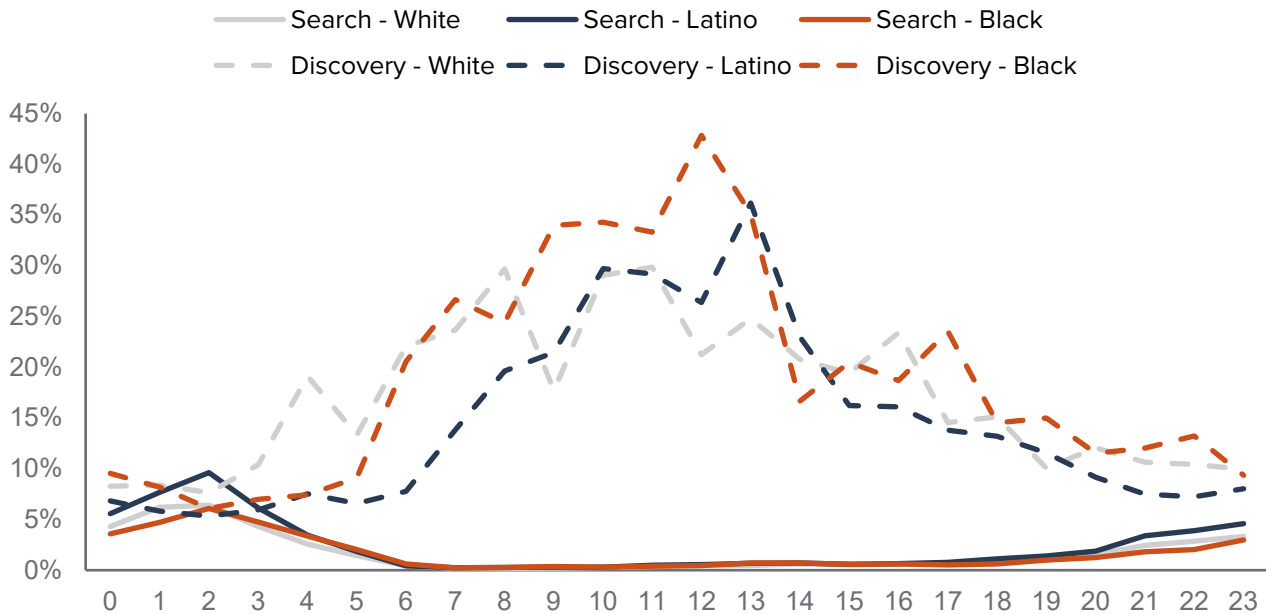


SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight. Not all racial/ethnic groups in the RIPA data are shown in the figure, thus each bar will not add up to 100 percent. The racial/ethnic groups omitted in the figure are individuals perceived by the officer to be Middle East/South Asian, Pacific Islander, Native American, or multi-racial/ethnic.

**FIGURE A4**

Search and discovery rates by race and stop hour, California Highway Patrol

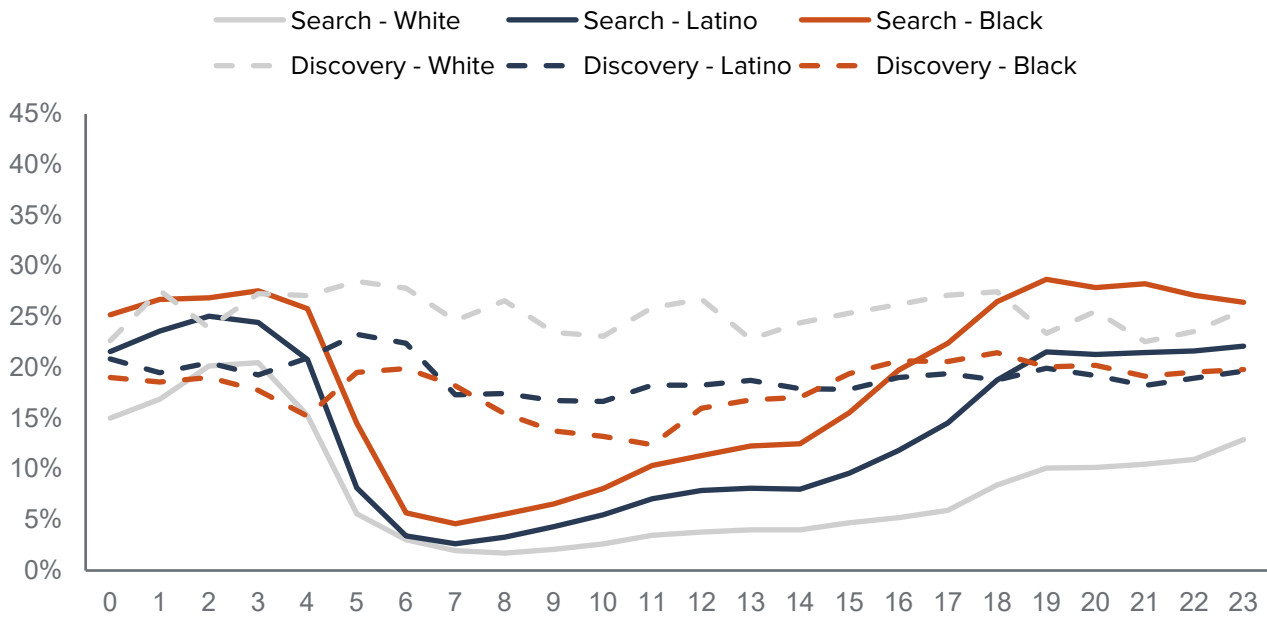


SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight.

**FIGURE A5**

Search and discovery rates by race and stop hour, local LEAs

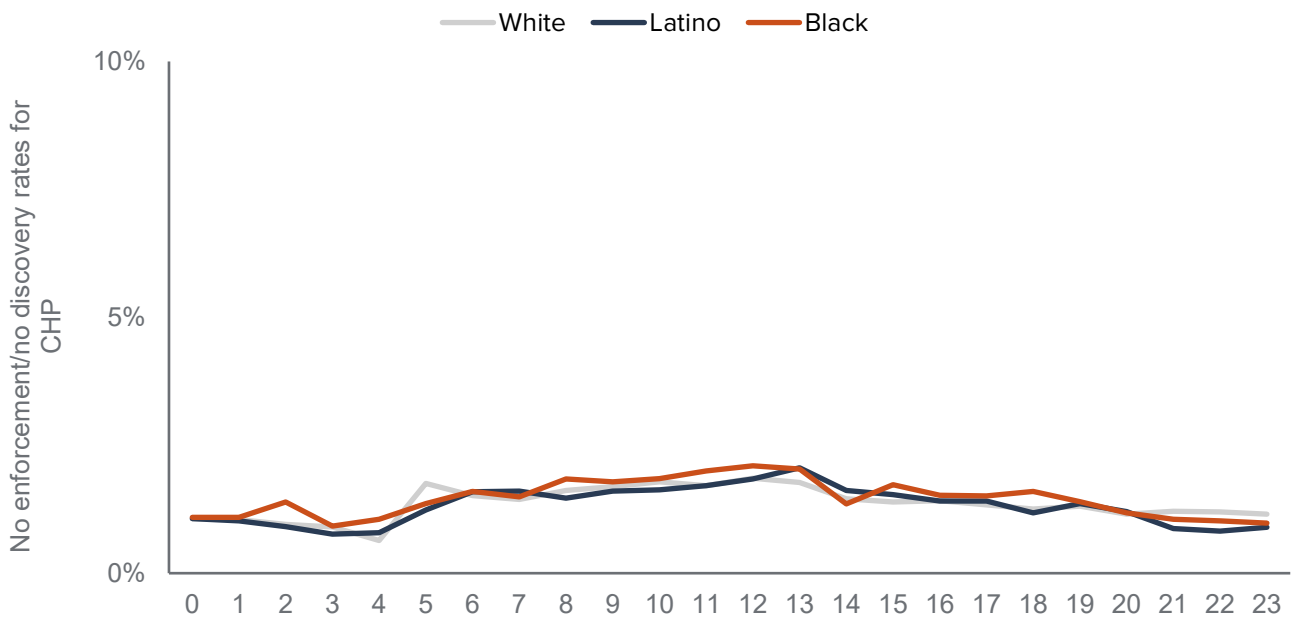


SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight.

**FIGURE A6**

Rate of no-enforcement/no-discovery stops by stop hour, California Highway Patrol



SOURCE: Author calculations using California Department of Justice, Racial and Identity Profiling Act (RIPA) Wave 2 data, 2019.

NOTE: Stop hours are shown using the 24-hour clock, sometimes referred to as "military time," where 0 hour represents midnight.

**TABLE A1**

Testing the Veil of Darkness (VOD) theory, OLS Regression results, share of people of color (POC) stopped for a traffic violation.

VARIABLES	Local LEAs		CHP	
	(1)	(2)	(1)	(2)
	POC (Black and Latino Drivers)			
Light_Dark	0.044*** (0.006)	0.031*** (0.006)	-0.002 (0.005)	-0.006 (0.004)
Dark_Light	0.016** (0.007)	0.007 (0.007)	0.003 (0.006)	0.001 (0.006)
Post	0.003 (0.003)	-0.001 (0.003)	-0.004** (0.002)	-0.004** (0.002)
Post_Light_Dark	-0.022** (0.009)	-0.015* (0.009)	-0.001 (0.007)	0.006 (0.007)
Post_Dark_Light	0.015 (0.010)	0.019** (0.009)	0.015* (0.008)	0.011 (0.007)
Female		-0.066*** (0.003)		-0.061*** (0.002)
Transgender Male		0.163*** (0.036)		-0.585*** (0.017)
Transgender Female		0.138*** (0.050)		-0.500*** (0.064)
Nonconforming		-0.084 (0.067)		-0.065** (0.029)
LGBT		-0.119*** (0.016)		-0.040** (0.017)
Age 1-14		0.011 (0.027)		-0.173*** (0.060)
Age 15-17		0.078*** (0.025)		0.059 (0.059)
Age 18-24		0.027 (0.025)		0.051 (0.059)
Age 25-34		-0.030 (0.025)		-0.001 (0.059)
Age 35-44		-0.090*** (0.025)		-0.060 (0.059)
Age 45-54		-0.170*** (0.025)		-0.182*** (0.059)
Age 55-64		-0.276*** (0.026)		-0.306*** (0.059)
LEP		0.259*** (0.003)		0.417*** (0.002)
Disability (Deafness)		-0.022 (0.035)		-0.113* (0.063)
Disability (Speech)		0.115*** (0.036)		-0.059 (0.102)
Disability (Blind)		0.147* (0.081)		-0.001 (0.135)
Disability (MH Condition)		-0.064 (0.046)		-0.190*** (0.070)
Disability (Development)		-0.032 (0.094)		-0.086 (0.104)
Disability (Other)		0.001 (0.033)		-0.118** (0.049)
Disability (Multiple)		-0.140 (0.101)		-0.160 (0.103)
Call for Service		-0.005 (0.011)		-0.070*** (0.012)

Non-Moving		0.069***		0.053***
		(0.002)		(0.002)
year = 2019	-0.022***	-0.022***	0.006**	0.006**
	(0.003)	(0.003)	(0.003)	(0.003)
year = 2020	-0.006*	-0.006*	0.027***	0.026***
	(0.004)	(0.003)	(0.003)	(0.003)
Constant	0.715***	0.723***	0.563***	0.565***
	(0.003)	(0.025)	(0.002)	(0.059)
Observations	107,356	107,356	273,238	273,238
R-squared	0.001	0.075	0.001	0.069

NOTES: Estimates for linear probability models (LPM) of the likelihood the person stopped is a person of color, estimated for people of color (POC) relative to white individuals:

$$POC_{it} = \beta_0 + \beta_1 LTtoDark_t + \beta_2 DarktoLT_t + \beta_3 Post_t + \beta_4 Post * LTtoDark_t + \beta_5 Post * DarktoLT_t + \mathbf{X}_{it}\boldsymbol{\gamma} + \varepsilon_{it}$$

where *LttoDark* and *DarktoLT* are indicator variables for the relevant time period in which light conditions switch from light to dark and dark to light, respectively at the date of DST, and *Post* is an indicator variable equal to one for the two-week period on and after the DST switches. *X* represents a matrix with demographic and stop controls. We limit the sample to traffic stops two weeks pre- and post-DST switches, and to stops between 4am-8am and 4pm-8pm. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**TABLE A2**

Testing the Veil of Darkness (VOD) theory, OLS Regression results, share of Black drivers stopped for a traffic violation.

VARIABLES	Local LEAs		CHP	
	(1)	(2)	(1)	(2)
	Black Drivers			
Light_Dark	0.066*** (0.010)	0.049*** (0.010)	-0.003 (0.005)	-0.003 (0.005)
Dark_Light	0.022** (0.011)	0.006 (0.010)	-0.004 (0.006)	-0.002 (0.006)
Post	0.004 (0.004)	-0.001 (0.004)	0.000 (0.002)	0.001 (0.002)
Post_Light_Dark	-0.025* (0.014)	-0.020 (0.014)	-0.003 (0.008)	0.001 (0.008)
Post_Dark_Light	0.014 (0.015)	0.019 (0.015)	0.002 (0.009)	-0.001 (0.009)
Female		-0.059*** (0.004)		0.011*** (0.002)
Transgender Male		0.141** (0.064)		-0.206*** (0.019)
Transgender Female		0.202*** (0.074)		-0.183*** (0.035)
Nonconforming		-0.125 (0.087)		-0.078** (0.031)
LGBT		-0.110*** (0.020)		0.001 (0.018)
Age 1-14		-0.024 (0.042)		-0.179** (0.072)
Age 15-17		0.061 (0.038)		-0.041 (0.071)
Age 18-24		0.014 (0.038)		0.002 (0.071)
Age 25-34		-0.086** (0.038)		-0.045 (0.071)
Age 35-44		-0.131*** (0.038)		-0.080 (0.071)
Age 45-54		-0.162*** (0.038)		-0.121* (0.071)
Age 55-64		-0.236*** (0.039)		-0.163** (0.071)
LEP		0.096*** (0.018)		0.013 (0.021)
Disability (Deafness)		-0.028 (0.052)		0.007 (0.062)
Disability (Speech)		-0.112 (0.128)		-0.018 (0.098)
Disability (Blind)		0.317** (0.127)		-0.164*** (0.021)
Disability (MH Condition)		0.076 (0.057)		-0.001 (0.066)
Disability (Development)		-0.131 (0.143)		0.088 (0.114)
Disability (Other)		0.065 (0.044)		-0.009 (0.046)
Disability (Multiple)		-0.128 (0.119)		-0.169*** (0.024)
Call for Service		0.020 (0.018)		-0.058*** (0.011)

Non-Moving		0.161***		0.043***
		(0.004)		(0.002)
year = 2019	-0.027***	-0.032***	0.010***	0.010***
	(0.005)	(0.005)	(0.003)	(0.003)
year = 2020	0.003	-0.001	0.028***	0.031***
	(0.005)	(0.005)	(0.003)	(0.003)
Constant	0.439***	0.463***	0.197***	0.235***
	(0.005)	(0.038)	(0.003)	(0.071)
Observations	71,728	71,728	147,784	147,784
R-squared	0.002	0.063	0.001	0.018

NOTES: Estimates for linear probability models (LPM) of the likelihood the person stopped is a person of color, estimated for Black individuals, relative to white individuals:

$$POC_{it} = \beta_0 + \beta_1 LTtoDark_t + \beta_2 DarktoLT_t + \beta_3 Post_t + \beta_4 Post * LTtoDark_t + \beta_5 Post * DarktoLT_t + \mathbf{X}_{it}\boldsymbol{\gamma} + \varepsilon_{it}$$

where *LttoDark* and *DarktoLT* are indicator variables for the relevant time period in which light conditions switch from light to dark and dark to light, respectively at the date of DST, and *Post* is an indicator variable equal to one for the two-week period on and after the DST switches. *X* represents a matrix with demographic and stop controls. We limit the sample to traffic stops two weeks pre- and post-DST switches, and to stops between 4am-8am and 4pm-8pm. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**TABLE A3**

Testing the Veil of Darkness (VOD) theory, OLS Regression results, share of Latino drivers stopped for a traffic violation.

VARIABLES	Local LEAs		CHP	
	(1)	(2)	(1)	(2)
	Latino Drivers			
Light_Dark	0.046*** (0.008)	0.030*** (0.007)	-0.001 (0.005)	-0.006 (0.005)
Dark_Light	0.018** (0.008)	0.008 (0.008)	0.005 (0.006)	0.001 (0.006)
Post	0.003 (0.003)	-0.000 (0.003)	-0.006** (0.002)	-0.005** (0.002)
Post_Light_Dark	-0.028** (0.011)	-0.017 (0.011)	-0.000 (0.008)	0.006 (0.007)
Post_Dark_Light	0.020* (0.012)	0.022** (0.011)	0.018** (0.008)	0.015* (0.008)
Female		-0.081*** (0.003)		-0.082*** (0.002)
Transgender Male		0.190*** (0.043)		-0.535*** (0.018)
Transgender Female		0.123* (0.070)		-0.439*** (0.068)
Nonconforming		-0.083 (0.075)		-0.058* (0.030)
LGBT		-0.129*** (0.019)		-0.053*** (0.018)
Age 1-14		0.032 (0.034)		-0.129** (0.066)
Age 15-17		0.111*** (0.031)		0.093 (0.065)
Age 18-24		0.039 (0.031)		0.070 (0.065)
Age 25-34		-0.014 (0.031)		0.018 (0.065)
Age 35-44		-0.087*** (0.031)		-0.042 (0.065)
Age 45-54		-0.194*** (0.032)		-0.175*** (0.065)
Age 55-64		-0.296*** (0.032)		-0.294*** (0.065)
LEP		0.345*** (0.004)		0.474*** (0.002)
Disability (Deafness)		-0.017 (0.039)		-0.156** (0.062)
Disability (Speech)		0.164*** (0.039)		-0.063 (0.103)
Disability (Blind)		0.045 (0.118)		0.040 (0.134)
Disability (MH Condition)		-0.217*** (0.059)		-0.252*** (0.066)
Disability (Development)		0.013 (0.107)		-0.162 (0.107)
Disability (Other)		-0.055 (0.041)		-0.148*** (0.047)
Disability (Multiple)		-0.179* (0.106)		-0.100 (0.103)
Call for Service		-0.021 (0.013)		-0.062*** (0.012)
Non-Moving		0.043***		0.050***

		(0.003)		(0.002)
year = 2019	-0.025***	-0.022***	0.003	0.004
	(0.004)	(0.004)	(0.003)	(0.003)
year = 2020	-0.012***	-0.010**	0.024***	0.022***
	(0.004)	(0.004)	(0.003)	(0.003)
Constant	0.633***	0.638***	0.510***	0.496***
	(0.004)	(0.031)	(0.003)	(0.065)
Observations	107,356	107,356	241,927	241,927
R-squared	0.001	0.075	0.001	0.086

NOTES: Estimates for linear probability models (LPM) of the likelihood the person stopped is a person of color, estimated for Latino individuals, relative to white individuals:

$$POC_{it} = \beta_0 + \beta_1 LTtoDark_t + \beta_2 DarktoLT_t + \beta_3 Post_t + \beta_4 Post * LTtoDark_t + \beta_5 Post * DarktoLT_t + X_{it}\gamma + \varepsilon_{it}$$

where *LttoDark* and *DarktoLT* are indicator variables for the relevant time period in which light conditions switch from light to dark and dark to light, respectively at the date of DST, and *Post* is an indicator variable equal to one for the two-week period on and after the DST switches. *X* represents a matrix with demographic and stop controls. We limit the sample to traffic stops two weeks pre- and post-DST switches, and to stops between 4am-8am and 4pm-8pm. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**TABLE A4.**

Testing the Veil of Darkness (VOD) theory, OLS Regression results, share of People of color stopped for a traffic violation by local law enforcement agencies.

VARIABLES	Local Law Enforcement					
	Non-Moving Traffic Violation			Moving Traffic Violation		
	POC	Black	Latino	POC	Black	Latino
Light_Dark	0.032***	0.058***	0.033**	0.046***	0.058***	0.049***
	(0.010)	(0.016)	(0.013)	(0.008)	(0.012)	(0.009)
Dark_Light	0.009	0.013	0.011	0.013	0.008	0.016
	(0.010)	(0.017)	(0.014)	(0.009)	(0.013)	(0.010)
Post	0.003	0.003	0.004	0.001	0.000	0.001
	(0.004)	(0.007)	(0.006)	(0.003)	(0.005)	(0.004)
Post_Light_Dark	-0.026*	-0.040*	-0.031	-0.021*	-0.018	-0.027*
	(0.014)	(0.023)	(0.019)	(0.012)	(0.018)	(0.014)
Post_Dark_Light	0.007	0.017	0.005	0.026**	0.022	0.031**
	(0.015)	(0.024)	(0.020)	(0.012)	(0.019)	(0.014)
year = 2019	-0.028***	-0.036***	-0.036***	-0.024***	-0.034***	-0.023***
	(0.006)	(0.009)	(0.007)	(0.004)	(0.006)	(0.005)
year = 2020	-0.011*	-0.001	-0.022***	-0.005	0.001	-0.008
	(0.006)	(0.010)	(0.008)	(0.004)	(0.006)	(0.005)
Constant	0.778***	0.565***	0.688***	0.687***	0.385***	0.611***
	(0.005)	(0.009)	(0.007)	(0.004)	(0.006)	(0.005)
Observations	46,380	24,473	32,854	92,198	47,255	74,502
R-squared	0.001	0.002	0.001	0.001	0.002	0.001

NOTES: Estimates for linear probability models (LPM) of the likelihood the person stopped is a person of color, estimated for people of color (POC) and separately for Black and Latino individuals, relative to white individuals:

$$POC_{it} = \beta_0 + \beta_1 LTtoDark_t + \beta_2 DarktoLT_t + \beta_3 Post_t + \beta_4 Post * LTtoDark_t + \beta_5 Post * DarktoLT_t + X_{it}\gamma + \varepsilon_{it}$$

where *LttoDark* and *DarktoLT* are indicator variables for the relevant time period in which light conditions switch from light to dark and dark to light, respectively at the date of DST, and *Post* is an indicator variable equal to one for the two-week period on and after the DST switches. *X* represents a matrix with demographic and stop controls. We limit the sample to traffic stops two weeks pre- and post-DST switches, and to stops between 4am-8am and 4pm-8pm. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**TABLE A5**

Testing the Veil of Darkness (VOD) theory, OLS Regression results, share of People of color stopped for a traffic violation by CHP.

VARIABLES	CHP					
	Non-Moving Traffic Violation			Moving Traffic Violation		
	POC	Black	Latino	POC	Black	Latino
Light_Dark	0.002 (0.008)	0.008 (0.010)	-0.000 (0.009)	-0.003 (0.006)	-0.008 (0.006)	-0.001 (0.006)
Dark_Light	-0.000 (0.010)	0.005 (0.013)	-0.002 (0.011)	0.008 (0.007)	-0.005 (0.007)	0.012 (0.007)
Post	-0.001 (0.004)	0.003 (0.004)	-0.002 (0.004)	-0.005* (0.003)	-0.000 (0.003)	-0.006** (0.003)
Post_Light_Dark	-0.019 (0.013)	-0.025* (0.015)	-0.016 (0.014)	0.008 (0.009)	0.008 (0.009)	0.007 (0.009)
Post_Dark_Light	0.016 (0.014)	-0.006 (0.017)	0.023 (0.015)	0.012 (0.009)	0.003 (0.010)	0.014 (0.010)
year = 2019	-0.001 (0.004)	0.009* (0.005)	-0.005 (0.005)	0.009*** (0.003)	0.011*** (0.003)	0.007** (0.003)
year = 2020	0.019*** (0.005)	0.016*** (0.006)	0.020*** (0.005)	0.037*** (0.003)	0.038*** (0.003)	0.032*** (0.004)
Constant	0.605*** (0.004)	0.231*** (0.005)	0.552*** (0.004)	0.539*** (0.003)	0.180*** (0.003)	0.487*** (0.003)
Observations	89,789	46,164	78,639	183,449	101,620	163,288
R-squared	0.000	0.000	0.001	0.001	0.002	0.001

NOTES: Estimates for linear probability models (LPM) of the likelihood the person stopped is a person of color, estimated for people of color (POC) and separately for Black and Latino individuals, relative to white individuals:

$$POC_{it} = \beta_0 + \beta_1 LTtoDark_t + \beta_2 DarktoLT_t + \beta_3 Post_t + \beta_4 Post * LTtoDark_t + \beta_5 Post * DarktoLT_t + X_{it}\gamma + \varepsilon_{it}$$

where *LttoDark* and *DarktoLT* are indicator variables for the relevant time period in which light conditions switch from light to dark and dark to light, respectively at the date of DST, and *Post* is an indicator variable equal to one for the two-week period on and after the DST switches. *X* represents a matrix with demographic and stop controls. We limit the sample to traffic stops two weeks pre- and post-DST switches, and to stops between 4am-8am and 4pm-8pm. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



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