## Measuring Racial Discrimination in Bail Decisions

David Arnold UC San Diego Will Dobbie Harvard Kennedy

Peter Hull Univ. of Chicago

#### July 22, 2020

The main data we analyze are provided by the New York State Division of Criminal Justice Services (DCJS), and the Office of Court Administration (OCA). The opinions, findings, and conclusions expressed in this publication are those of the authors and not those of DCJS or OCA. Neither New York State, DCJS or OCA assumes liability for its contents or use thereof.

# Motivation

- Large racial disparities exist throughout the criminal justice system
  - Police search, criminal charges, detention, conviction, incarceration...
  - Often taken as evidence of racial bias (due to preferences or inaccurate stereotyping) among police officers, prosecutors, judges, juries...
- Disparities may also be driven by (i) illegal statistical discrimination and (ii) unobserved but legally relevant differences (omitted variables)
  - Standard "outcome tests" can only test for racial bias and observational "benchmarking" regressions likely suffer from OVB
  - Randomized audit studies can separate discrimination from OVB, but are infeasible in high-stakes and face-to-face settings
- We develop a new quasi-experimental approach to measure racial discrimination, due to either bias or statistical discrimination
  - ${\scriptstyle \bullet}$  We apply it to NYC bail decisions, leveraging q-e judge assignment

# The Bail System

• Following arrest, pretrial release conditions are set at a bail hearing

- Case and defendant information is presented to the bail judge
- Judges decide to "release on recognizance" or set bail conditions
- Objective is to minimize pretrial misconduct (FTA or new crime)
- Bail decisions carry high stakes for defendants
  - Economically large increases in conviction and non-employment rates,  $\approx$  \$30k in lost earnings and govt. transfers (Dobbie et al. 2018)
- Large and persistent white-Black release rate gaps in most systems
  - In our data: 7pp gap overall, 5pp controlling for defendant/case obs.
  - Comparable to the gap between those without/with prior misconduct

# Defining Discrimination

- For defendant *i*, let  $Y_i^* \in \{0,1\}$  be unobserved misconduct potential,  $D_{ij} \in \{0,1\}$  indicate potential release by judge *j*, and  $R_i$  be race
- We say that judge *j* discriminates if she releases white and Black defendants with identical misconduct potential at different rates:

 $\Delta_{j} = E[E[D_{ij} | Y_{i}^{*}, R_{i} = w] - E[D_{ij} | Y_{i}^{*}, R_{i} = b]]$ 

- Inner difference: judge j's release rate gap for individuals w/same  $Y_i^*$
- Outer expectation averages over the overall distribution of  $Y_i^*$
- $\Delta_j$  gives a measure of discrimination for individual judges
- Central challenge:  $Y_i^*$  is unobserved for detained defendants

# What This Measure of Discrimination Captures

- Follows mainstream legal views on discrimination, as well as economic notions that compare workers with the same level of productivity
- Many factors can generate differences in release rates for defendants with identical misconduct potential:
  - Racial bias due to preferences/taste-based discrimination (Becker, 1957) or inaccurate stereotyping (Bordalo et al., 2016)
  - Statistical discrimination due to average risk differences (Arrow, 1973) or differences in the precision of risk signals (Aigner and Cain, 1977)
- We also capture discrimination in seemingly race-neutral practices
  - E.g., judges may place excessive weight on the types of crimes Black defendants are charged with vs. their relevance to future misconduct

# Interpretation of Discrimination Measure

- By design, our discrimination measure captures discrimination due to **both** racial bias and statistical discrimination
  - Racial bias is generally agreed to be unconstitutional under the Equal Protection Clause (McCleskey v. Kemp, 1987)
  - Statistical discrimination also likely to be unconstitutional under EPC or illegal under civil rights laws even when accurate (Buck v. Davis, 2017)
- The measure is **not** necessarily sufficient to establish illegal behavior on the part of judges, which may require proving intent (Arlington Heights v. Metropolitan Housing Development Corp., 1977)
  - That is, we capture the "disparate impact" of bail decisions unrelated to future misconduct, not necessarily "disparate treatment" due to race-contingent decision-making
- The measure does **not** capture discrimination occurring before bail decisions (e.g., differential policing): we hold that "fixed"

# This Paper

- **Key challenge:** Misconduct potential is unobserved for detained defendants, so cannot be conditioned on directly
- Key insight: Under quasi-random judge assignment, we only need average misconduct rates by race, not *individual* misconduct potential
  - OVB in observational release rate comparisons arises from the correlation between race and unobserved misconduct potential
  - Under quasi-random assignment, this correlation is common to all judges and is a function of average Black/white misconduct risk
- We estimate the required Black/white misconduct risk inputs by extrapolating local IV variation from quasi-random judge assignments
  - Imagine a "supremely" lenient judge that release all defendants
  - With QR assignment, average misconduct rates identified by this judge
  - We build on recent approaches to estimate ATEs to extrapolate to such a hypothetical judge to estimate average misconduct rates

# Related Literature

- Long literature on testing/estimating discrimination
  - Theoretical: Becker 1957; Phelps 1972; Arrow 1973; Aigner and Cain 1977
  - Benchmarking (and extensions): Grogger and Ridgeway 2006; Ridgeway 2007; Gelman, Fagan, and Kiss 2007; Abrams et al. 2012; Anwar et al. 2012; Goncalves and Mello 2020...
  - Outcome tests (and extensions): Heckman 1998; Knowles et al. 2001; Anwar and Fang 2006; Charles and Guryan 2008; Antonovics and Knight 2009; Simoiu et al., 2017; Marx 2018...
  - Audit studies: Bertrand and Mullainathan 2004; Kline and Walters 2019...
  - Bail: Ayres & Waldfogel 1994; Bushway & Gelbach 2011; Arnold et al. 2018
- Econometrics literature estimating average treatment effects from IVs
  - Identification at infinity/sample selection: Chamberlain 1986; Heckman 1990; Andrews and Schafgans 1998...
  - Discrete instrument extrapolation/bounds: Brinch et al. 2017; Mogstad et al. 2018; Kowalski 2019; Hull 2020...
  - Relaxing monotonicity with many instruments: Mogstad et al. 2019; Frandsen et al. 2019; Chan et al. 2019...

# Outline

- 1. Motivation  $\checkmark$
- 2. Setting and Data
- 3. Econometric Framework
- 4. Racial Discrimination in Bail Decisions
- 5. Racial Bias and Statistical Discrimination
- 6. Conclusions

# Setting and Data

- We observe the universe of arraignments in New York City, 2008–2013
- Key variables:
  - Race: categorize defendants as white (including both non-Hispanic and Hispanic), Black (including both non-Hispanic and Hispanic), and other
  - Pretrial release: indicator for any release type ( $\approx74\%$ )
  - Pretrial misconduct: indicator for FTA or rearrest prior to disposition (conditional on release  $\approx 30\%)$
- Rich case/defendant observables: crime type, age, criminal history...
- Exploit quasi-random assignment of cases to judges in NYC (Kleinberg et al., 2017; Leslie and Pope, 2017): balance tests
- Sample includes 500k+ cases, 300k+defendants, and 250+ judges
  - Restrict to judges with 100+ cases to minimize finite-sample concerns

#### Observed White-Black Release Rate Disparities



Notes: Distribution of empirical Bayes judge posteriors. Mean, s.d., and frac. positive summarize the estimated prior distribution

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## **Observational Benchmarking Regressions**

• Goal is to estimate discrimination:

$$\Delta_j = E[E[D_{ij} \mid Y_i^*, R_i = w] - E[D_{ij} \mid Y_i^*, R_i = b]]$$

We observe race  $(R_i)$ , judge assignment  $(Z_{ij})$ , release  $(D_i = \sum_j D_{ij}Z_{ij})$ and pretrial misconduct if released  $(Y_i = D_i Y_i^*)$ 

• W/random assignment, standard benchmarking regressions estimate:

$$\alpha_j = E[D_i | Z_{ij} = 1, R_i = w] - E[D_i | Z_{ij} = 1, R_i = b]$$
  
=  $E[D_{ij} | R_i = w] - E[D_{ij} | R_i = b]$ 

Generally  $\alpha_j \neq \Delta_j$  if average misconduct potential  $\mu_r = E[Y_i^* | R_i = r]$ differs by race  $r \in \{w.b\}$ 

# Simple Example: Benchmarking OVB

- Two hypothetical races, of different misconduct risk: L(ow) & H(igh)
  - 100 L defendants, 25 of whom have  $Y^* = 1$
  - 100 H defendants, 75 of whom have  $Y^* = 1$
- A single judge who does not discriminate on race:
  - If  $Y_i^* = 0$ , releases with probability 0.8
  - If  $Y_i^* = 1$ , releases with probability 0.2
- Despite no discrimination, defendants of race L seem favored:

		Number of	Number	Release	Release
		Defendants	Released	Rate	Disparity
		(1)	(2)	(3)	(4)
I Defendants	$Y_{i}^{*} = 0$	75	60	0.65	
E Defendants	$Y_i^* = 1$	25	5	0.05	0.30
H Dofondants	$Y_{i}^{*} = 0$	25	20	0.35	0.50
n Delendants	$Y_i^* = 1$	75	15	0.55	

# Solution: Rescaling Observational Disparities

• Under quasi-random judge assignment, discrimination is identified by a "rescaled" benchmarking regression:

$$\Delta_j = E[\Omega_i D_i \mid Z_{ij} = 1, R_i = w] - E[\Omega_i D_i \mid Z_{ij} = 1, R_i = b],$$

where

$$\Omega_i=Y_irac{ar\mu}{\mu_{R_i}}+(1-Y_i)rac{1-ar\mu}{1-\mu_{R_i}}$$

and  $\mu_r$  are race-specific misconduct rates (with average  $ar{\mu}$ )

 Ω<sub>i</sub> rebalances the sample to make released defendants of different races comparable, on average, in terms of their misconduct potential Y<sub>i</sub><sup>\*</sup>

		Number	Rescaling	Rescaled	Rescaled	Rescaled
		Released	Factor	N. Released	Release Rate	Disparity
		(4)	(5)	(6)	(7)	(8)
	$Y_{i}^{*} = 0$	60	2/3	40	0.5	
L	$Y_{i}^{*} = 1$	5	2	10	0.5	0.0
ы	$Y_{i}^{*} = 0$	20	2	40	0 5	0.0
$H Y_{i}^{*} = 1$	15	2/3	10	0.5		

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# First Step: Estimate Average Misconduct

- To estimate discrimination in NYC bail decisions, we estimate race-specific misconduct rates μ<sub>r</sub> = E[Y<sub>i</sub><sup>\*</sup>|, R<sub>i</sub> = r]
  - We do this by extrapolating local variation in judge release rates and released misconduct rates, among white and Black defendants
- Imagine a judge who releases nearly all defendants:  $E[D_{ij^*}|R_i = r] \approx 1$ 
  - $\bullet\,$  W/random assignment, her released misconduct rates are close to  $\mu_r$
- Absent such a judge, we can extrapolate released misconduct rates  $E[Y_i^* \mid D_{ij} = 1, R_i = r]$  to this maximal release rate "cutoff"
  - Akin to extrapolating mean potential outcomes to an RD cutoff
  - Like in RD, extrapolation can be model-based or non-parametric
- Nerdy point: like ATE "identification at infinity" with many discrete IVs; does not require first-stage monotonicity, just good extrapolation

#### Simple Example: Extrapolating Race-Specific Misconduct Rates



#### Simple Example: Extrapolating Race-Specific Misconduct Rates



#### Intuition: Extrapolating to Estimate Race-Specific Misconduct Rates



#### Race-Specific Extrapolations in NYC Bail Decisions



Notes: estimates adjust for court-by-time fixed effects and baseline controls. Local linear regressions use a Gaussian kernel with a race-specific rule-of-thumb bandwidth.

### Mean Risk and Discrimination Estimates

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	Linear	Quadratic	Local Linear
	Extrapolation	Extrapolation	Extrapolation
Panel A: Mean Risk by Race	(1)	(2)	(3)
White Defendants	0.352	0.333	0.352
	(0.007)	(0.019)	(0.014)
Black Defendants	0.395	0.415	0.424
	(0.006)	(0.021)	(0.016)
Panel B: System-Wide Discrin	nination		
Mean Across Cases	0.044	0.037	0.036
	(0.002)	(0.006)	(0.005)

At least 2/3 of the observed 5pp white-Black disparity is due to racial discrimination

#### Variation in Discrimination Across Judges



Notes: Distribution of empirical Bayes judge posteriors. Unwarranted disparities use local linear mean risk estimates. Mean, s.d., and frac. positive summarize the estimated prior distribution.

		5 11	с I D:			Split-	Sample
	(1)	Full-	Disp	Darities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
New Judge	-0.012				-0.011		-0.004
	(0.004)				(0.003)		(0.004)
Lenient Judge		-0.008			-0.010		-0.005
		(0.003)			(0.003)		(0.002)
Above-Median Black Share			-0.007		-0.006		0.002
			(0.003)		(0.004)		(0.003)
Manhattan Courtroom				0.023	0.021		0.014
				(0.004)	(0.004)		(0.003)
Bronx Courtroom				-0.003	-0.006		0.007
				(0.003)	(0.004)		(0.004)
Queens Courtroom				0.014	0.008		0.009
<b>,</b>				(0.004)	(0.005)		(0.004)
Richmond Courtroom				0.010	0.005		0.016
				(0,004)	(0,006)		(0.004)
Lagged Disparity				(0.000)	(0.000)	0 518	0.416
						(0.062)	(0.071)
Mean Disparity	0.034	0.034	0.034	0.034	0.034	0.047	0.047

#### Unwarranted Disparities and Judge Characteristics

Notes: OLS coefficients from regressing unwarranted disparity posteriors on judge characteristics. Posteriors are weighted inversely to their estimated variance.

## Robustness

- Consistent across different extrapolations of mean risk
  - Different extrapolation methods
  - Nonparametric bounds (no extrapolation)
  - Borough-specific extrapolation
- Consistent for different definitions of misconduct
  - Case FTA, rearrest, violent rearrest
- Consistent for different judge decision variables
  - Release on recognizance vs. any bail conditions
- Consistent for different categorizations of race
  - Non-Hispanic white vs. Black and/or Hispanic

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# Recap and Next Steps

- We find large and pervasive racial discrimination, without imposing assumptions on judge decision-making
- But our estimates are silent on the drivers of discrimination (i.e. racial bias vs. statistical discrimination)
  - Also want to know if we can reliably identify discriminatory judges
- To open the black box of our estimates, and simulate policies, we put some structure on the reduced-form variation

# A Hierarchical Marginal Treatment Effects Model

- We model judge behavior by drawing on Aigner and Cain (1977)
  - Judges observe noisy signals of misconduct potential and form posterior risk beliefs (allowing for incorrect judge- and race-specific priors)
  - Release if posterior risk is beneath a judge- and race-specific threshold
  - Assume judge thresholds and signal quality are joint-normal
- The model allows us to separate racial bias from statistical discrimination
  - Bias: Different thresholds by race (driven by animus or stereotypes) generates discrimination "at the margin" of release
  - SD: Racial differences in mean risk or signal quality generates discrimination "on average," even absent bias
- The model can be seen as specifying a *distribution* of judge MTE curves
  - Monotonicity is violated when judge signal quality ("skill") varies
- Identification of the model's hyperparameters can be easily visualized...

# Identification: Mean Misconduct Risk



Notes: quasi-experimental data simulated from the hierarchical model, with no estimation error.

# Identification: Mean Signal Quality



Notes: quasi-experimental data simulated from the hierarchical model, with no estimation error.

# Identification: Variance of Signal Quality



Notes: quasi-experimental data simulated from the hierarchical model, with no estimation error.

# Model Estimates

• We find evidence of both racial bias and statistical discrimination

- Bias: higher threshold (6.6 pp) for white defendants
- SD: higher mean risk for Black defendants exacerbates discrimination
- SD: lower signal quality for Black defendants alleviates discrimination
- Counterfactual simulations gauge the reliability of judge-specific discrimination estimates and the role of OVB
  - Targeting discrimination posteriors virtually eliminates discrimination
  - Targeting observed disparities significantly reduces discrimination, despite OVB from mean risk differences
  - Non-negligible tradeoff between eliminating racial discrimination (on average) and racial bias (at the margin)

# Conclusion

- We develop new quasi-experimental tools to measure discrimination
  - Extrapolate local variation to estimate average misconduct risk and purge OVB from observational comparisons
  - Use a hierarchical MTE model to explore drivers of discrimination
- Estimates show significant racial discrimination in bail decisions
  - Two-thirds of observed release rate disparities is due to discrimination
  - Significant variation in the extent of discrimination across judges
  - Driven by both racial bias and statistical discrimination. Thus standard outcome tests miss an important source of discrimination
- The methods may prove useful in other high-stakes settings
  - Key requirement: quasi-random assignment of decision-makers with narrow & measurable objectives for an endogenous treatment
  - Possible decision-makers include judges, police officers, benefit examiners, teachers, doctors, EMTs, resume screeners...

Thank you!

Appendix

### Judge Leniency and Sample Attrition

	All	White	Black
	Defendants	Defendants	Defendants
	(1)	(2)	(3)
Dropped from Sample	0.00015	0.00010	0.00020
	(0.00014)	(0.00014)	(0.00017)
Mean Sample Attrition	0.416	0.409	0.424

Notes: OLS estimates from regressions of judge leniency on an indicator for leaving the sample due to case adjournment or case disposal, baseline controls, and court-by-time FE. Standard errors two-way clustered at the individual and the judge level

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	All Defendants			White Defendants			Black Defendants	
	Full	Estimation	-	Full	Estimation		Full	Estimation
	Sample	Sample		Sample	Sample		Sample	Sample
Panel A: Pretrial Release	(1)	(2)	_	(3)	(4)	-	(5)	(6)
Released Before Trial	0.856	0.730		0.879	0.767		0.832	0.695
Share ROR	0.603	0.852		0.620	0.852		0.586	0.851
Share Disposed	0.295	0.000		0.266	0.000		0.327	0.000
Share Adjourned	0.192	0.000		0.201	0.000		0.183	0.000
Share Money Bail	0.068	0.144		0.069	0.144		0.066	0.145
Share Other Bail Type	0.329	0.004		0.311	0.004		0.348	0.004
Share Remanded	0.000	0.000		0.000	0.000		0.000	0.000
Panel B: Defendant Charact	eristics							
Black	0.495	0.522		0.000	0.000		1.000	1.000
Male	0.820	0.821		0.826	0.839		0.813	0.804
Age at Arrest	31.871	31.969		31.667	32.055		32.080	31.890
Prior Rearrest	0.189	0.229		0.164	0.204		0.214	0.253
Prior FTA	0.083	0.103		0.068	0.087		0.099	0.117
Panel C: Charge Characteris	tics							
Number of Charges	1.100	1.150		1.122	1.184		1.078	1.118
Felony Charge	0.183	0.362		0.177	0.355		0.188	0.368
Misdemeanor Charge	0.817	0.638		0.823	0.645		0.812	0.632
Any Drug Charge	0.340	0.256		0.327	0.257		0.352	0.256
Any DUI Charge	0.033	0.046		0.048	0.067		0.017	0.027
Any Violent Charge	0.071	0.143		0.062	0.124		0.081	0.160
Any Property Charge	0.217	0.136		0.209	0.127		0.226	0.144

## Tests of Quasi-Random Judge Assignment

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	A 11	14/1 1	
	All	vvnite	Black
	Defendants	Defendants	Defendants
	(1)	(2)	(3)
White	0.00013		
	(0.00009)		
Male	0.00003	0.00003	0.00004
	(0.00014)	(0.00019)	(0.00018)
Age at Arrest	-0.00011	-0.00015	-0.0008
	(0.00004)	(0.00006)	(0.00005)
Prior Rearrest	-0.00021	0.00007	-0.00044
	(0.00011)	(0.00018)	(0.00015)
Prior FTA	0.00016	-0.00014	0.00039
	(0.00016)	(0.00024)	(0.00023)
Number of Charges	-0.00001	-0.00001	-0.00001
	(0.00001)	(0.00001)	(0.00003)
Felony Charge	0.00025	0.00011	0.00039
	(0.00020)	(0.00023)	(0.00025)

	All	White	Black
	Defendants	Defendants	Defendants
	(1)	(2)	(3)
Any Drug Charge	-0.00022	-0.00017	-0.00027
	(0.00016)	(0.00021)	(0.00018)
Any DUI Charge	0.00045	0.00051	0.00008
	(0.00027)	(0.00032)	(0.00045)
Any Violent Charge	-0.00008	-0.00023	0.00001
	(0.00023)	(0.00033)	(0.00025)
Any Property Charge	-0.00033	-0.00028	-0.00036
	(0.00018)	(0.00019)	(0.00027)
Joint p-value	[0.10521]	[0.30945]	[0.07931]

Notes: Estimates from an OLS regression of judge leniency on the variables listed and court-bytime FE. Standard errors are two-way clustered at the individual and the judge level.

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	All Defendants (1)	White Defendants (2)	Black Defendants (3)
Judge Leniency	0.953 (0.024)	0.774 (0.029)	1.112 (0.031)
Baseline Controls	Yes	Yes	Yes
Court x Time FE	Yes	Yes	Yes
Mean Release Rate R2	0.730 0.178	0.767 0.172	0.695 0.187

### First-Stage Effect of Judge Leniency on Release Rate

Notes: OLS estimates of the relationship between pretrial release and judge leniency. Standard errors are two-way clustered at the individual and the judge level.

ATE Sensitivity Analysis



#### Robustness to Pretrial Misconduct Outcome

	Any	Case	Any	Violent		
	Misconduct	FTA	Rearrest	Rearrest		
Panel A: Mean Risk	(1)	(2)	(3)	(4)		
White Defendants	0.352	0.181	0.247	0.009		
	(0.014)	(0.013)	(0.017)	(0.004)		
Black Defendants	0.424	0.231	0.307	0.012		
	(0.016)	(0.012)	(0.017)	(0.005)		
Panel B: System-Wide	Discrimination					
Mean Across Cases	0.036	0.042	0.041	0.055		
	(0.005)	(0.004)	(0.004)	(1.351)		
Panel C: Judge-Level Discrimination						
Mean Across Judges	0.034	0.041	0.040	0.054		
	(0.005)	(0.004)	(0.004)	(1.202)		

Notes: All ATEs are estimated from local linear extrapolations. Bootstrapped, two-way clustered robust standard errors in parentheses.

Robustness to Judge Decision Variable: ROR vs. Any bail conditions

	Linear	Quadratic	Local Linear				
	Extrapolation	Extrapolation	Extrapolation				
Panel A: Mean Risk	(1)	(2)	(3)				
White Defendants	0.359	0.351	0.354				
	(0.007)	(0.024)	(0.030)				
Black Defendants	0.401	0.434	0.430				
	(0.006)	(0.023)	(0.037)				
Panel B: System-Wide	Discrimination						
Mean Across Cases	0.035	0.025	0.026				
	(0.002)	(0.007)	(0.011)				
Panel C: Judge-Level Discrimination							
Mean Across Judges	0.033	0.023	0.025				
-	(0.002)	(0.007)	(0.011)				

Notes: Bootstrapped, two-way clustered robust standard errors in parentheses.

### Robustness to Definition of Defendant Race

	Linear Extranalation	Quadratic	Local Linear
	Extrapolation		
Panel A: Mean Risk	(1)	(2)	(3)
White Defendants	0.283	0.206	0.273
	(0.010)	(0.028)	(0.018)
Black or Hispanic Defendants	0.386	0.401	0.401
	(0.005)	(0.018)	(0.012)
Panel B: System-Wide Discrimina	ation		
Mean Across Cases	0.058	0.108	0.059
	(0.003)	(0.027)	(0.008)
Panel C: Judge-Level Discriminat	ion		
Mean Across Judges	0.058	0.108	0.059
, and the second s	(0.004)	(0.025)	(800.0)

Notes: Bootstrapped, two-way clustered robust standard errors in parentheses.

					Split- Disp	Split-Sample Disparities	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
New Judge	-0.012	. /	. /		-0.011		-0.004
	(0.004)				(0.003)		(0.004)
Lenient Judge		-0.008			-0.010		-0.005
		(0.003)			(0.003)		(0.002)
Above-Median Black Share			-0.007		-0.006		0.002
			(0.003)		(0.004)		(0.003)
Manhattan Courtroom				0.023	0.021		0.014
				(0.004)	(0.004)		(0.003)
Bronx Courtroom				-0.003	-0.006		0.007
				(0.003)	(0.004)		(0.004)
Queens Courtroom				0.014	0.008		0.009
				(0.004)	(0.005)		(0.004)
Richmond Courtroom				0.010	0.005		0.016
				(0.004)	(0.006)		(0.004)
Lagged Disparity						0.518	0.416
						(0.062)	(0.071)
Mean Disparity	0.034	0.034	0.034	0.034	0.034	0.047	0.047
R2	0.043	0.035	0.027	0.223	0.312	0.280	0.342

#### Unwarranted Disparities and Judge Characteristics

Notes: OLS coefficients from regressing unwarranted disparity posteriors on judge characteristics. Posteriors are weighted inversely to their estimated variance; robust standard errors in parentheses.

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	Criminal History		Type of Arraignment Charge					
	Prior	No Prior	Felony	Misdemeanor	Drug	DUI	Property	Violent
Panel A: Mean Risk by Race	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
White Defendants	0.351	0.278	0.357	0.326	0.350	0.145	0.367	0.188
	(0.064)	(0.007)	(0.063)	(0.008)	(0.033)	(0.007)	(0.047)	(0.072)
Black Defendants	0.490	0.311	0.421	0.382	0.467	0.185	0.447	0.293
	(0.066)	(0.008)	(0.095)	(0.007)	(0.033)	(0.009)	(0.043)	(0.086)
Panel B: System-Wide Discrin	nination							
Mean Across Cases	0.030	0.009	0.055	0.033	0.044	0.015	0.026	0.100
	(0.019)	(0.002)	(0.112)	(0.002)	(0.008)	(0.004)	(0.012)	(0.071)
Panel C: Judge-Level Discrimination								
Mean Across Judges	0.030	0.009	0.054	0.031	0.045	0.015	0.020	0.096
	(0.019)	(0.002)	(0.108)	(0.003)	(0.008)	(0.005)	(0.012)	(0.069)
Std. Dev. Across Judges	0.029	0.015	0.034	0.030	0.038	0.003	0.035	0.003
	(0.009)	(0.003)	(0.048)	(0.003)	(0.007)	(0.010)	(0.010)	(0.037)
Fraction Positive	0.847	0.721	0.946	0.848	0.885	1.000	0.720	1.000
	(0.109)	(0.024)	(0.111)	(0.022)	(0.042)	(0.033)	(0.054)	(0.124)
Judges	263	264	261	264	258	174	222	219

Mean Risk and Unwarranted Disparity Estimates by Defendant Characteristics

Notes: Bootstrapped, two-way clustered robust standard errors in parentheses.

	From 0.90	From 0.85	From 0.80				
	Leniency	Leniency	Leniency				
Panel A: Mean Risk by Race	(1)	(2)	(3)				
White Defendants	[0.291,0.391]	[0.264,0.414]	[0.238,0.438]				
	(0.005, 0.005)	(0.003,0.003)	(0.001, 0.001)				
Black Defendants	[0.345,0.445]	[0.311,0.461]	[0.281,0.481]				
	(0.005,0.005)	(0.003,0.003)	(0.002,0.002)				
Panel B: System-Wide Discrimination							
Mean Across Cases	[0.027,0.061]	[0.020,0.070]	[0.012,0.078]				
	(0.002,0.002)	(0.002,0.002)	(0.001,0.001)				
Panel C: Judge-Level Discrimination							
Mean Across Judges	[0.025,0.060]	[0.019,0.069]	[0.010,0.077]				
	(0.002,0.002)	(0.002,0.002)	(0.002,0.002)				

#### Mean Risk and Unwarranted Disparity Bounds

Notes: Bounds are formed under the assumption that either none or all of the detained defendants in each column have pretrial misconduct potential.