Criminal Justice Predictions

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"Modern technology can make many specific contributions to criminal administration. The most significant will come from the use of computers to collect and analyze the masses of data the system needs to understand the crime control process"

- 1967 President's Commission on Law Enforcement and Administration of Justice

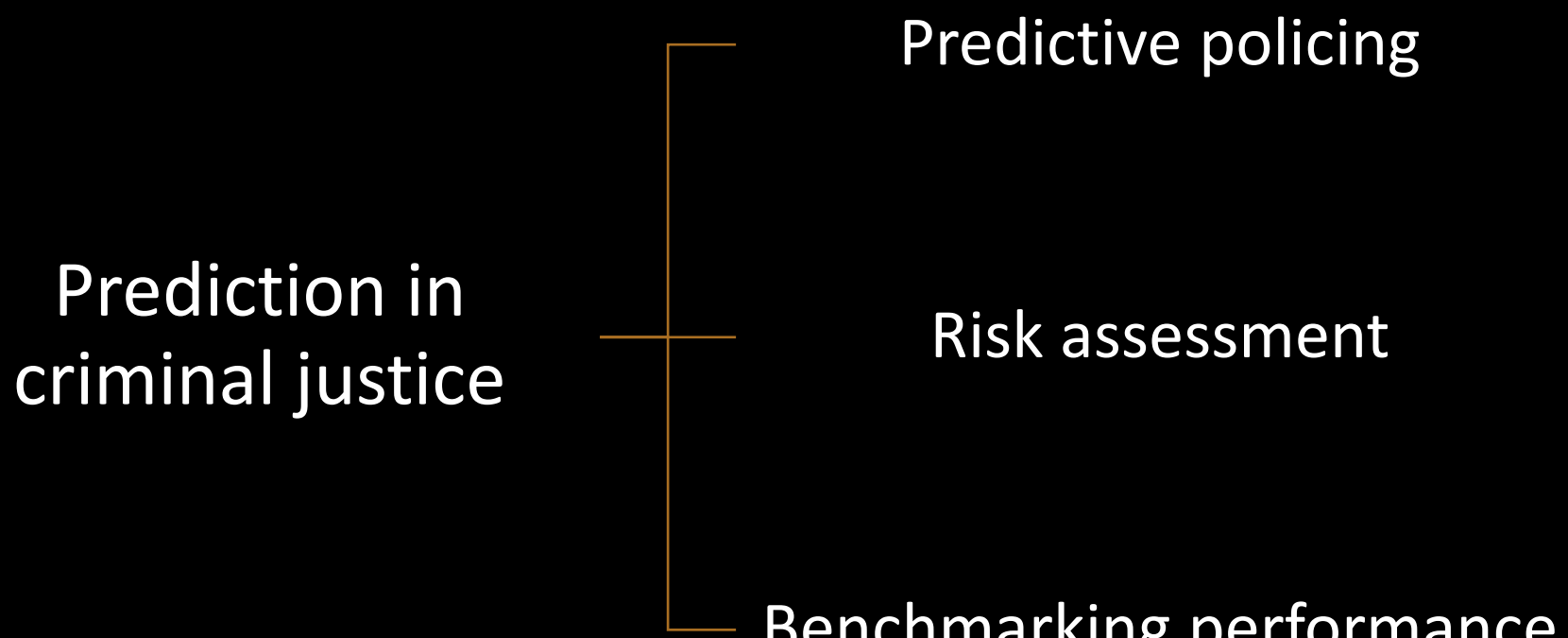
Commission foretold many computing innovations for justice

- “portable recording devices” to facilitate data collection
- computers that could automate the dispatch of patrol cars closest to calls for service
- networked alarms that could notify nearby officers without a dispatcher
- alteration of police deployments in real-time as data reveal emerging problems
- new wireless networks to reduce communication congestion
- …even electronic cocktail olives

Computing is only just starting to have a measurable effect

- Crime clearance rates have remained at approximately 45% for violent crimes and just under 20% for property crimes
- Garicano and Heaton (2010) find
  - general IT investments result in improvements in record keeping
  - produce no reduction in crime or improvement in clearance rates
  - when IT is coupled with data-driven management processes crime and clearance rates improve
- Lincoln (NE) PD found officers randomized to have information pushed to them had more arrests
  - However, a similar study in Redlands (CA) found that most officers never opened the app
- Mesa (AZ) police officers randomized to use license plate readers had 2.7 times as many hits on stolen cars

Three areas where prediction is impacting criminal justice

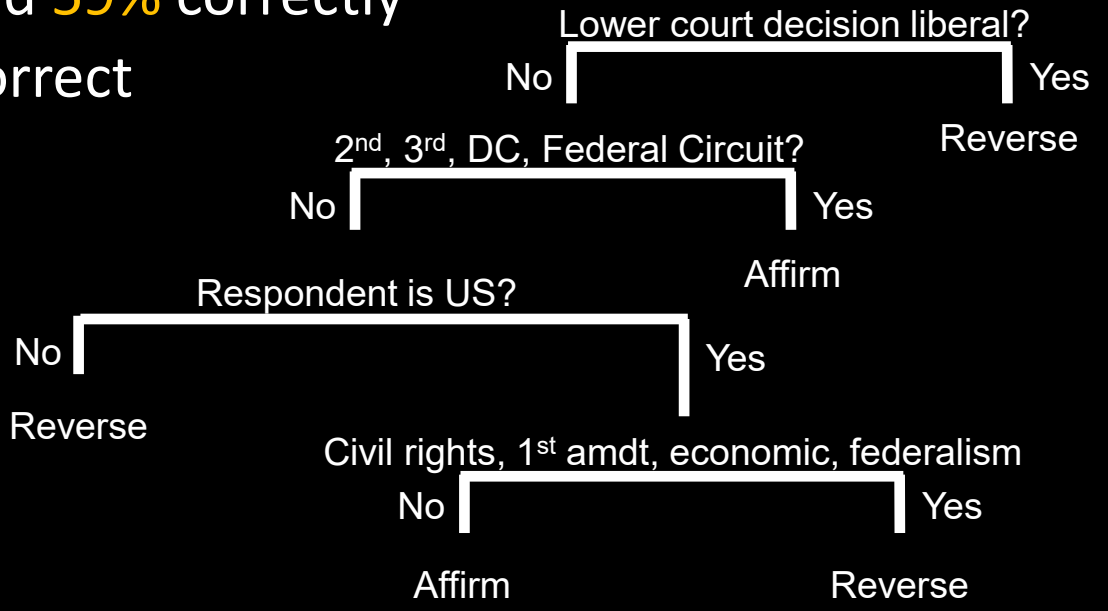


Computers outperform humans on some tasks, but still not used

- MYCIN in 1979 could synthesize patient features and therapeutic options and outperform practitioners in selecting appropriate antibiotic treatments
- Engle and Flehinger (1987) noted “physicians have a high regard for their own decision-making ability and are afraid of any competition from computers”

With good data, simple models can outperform experts

- Ruger et al. (2002) pitted 83 supreme court experts against a classification tree
  - aimed to predict the outcome of the 68 cases decided in 2002
  - experts forecasted 59% correctly
  - computer 75% correct



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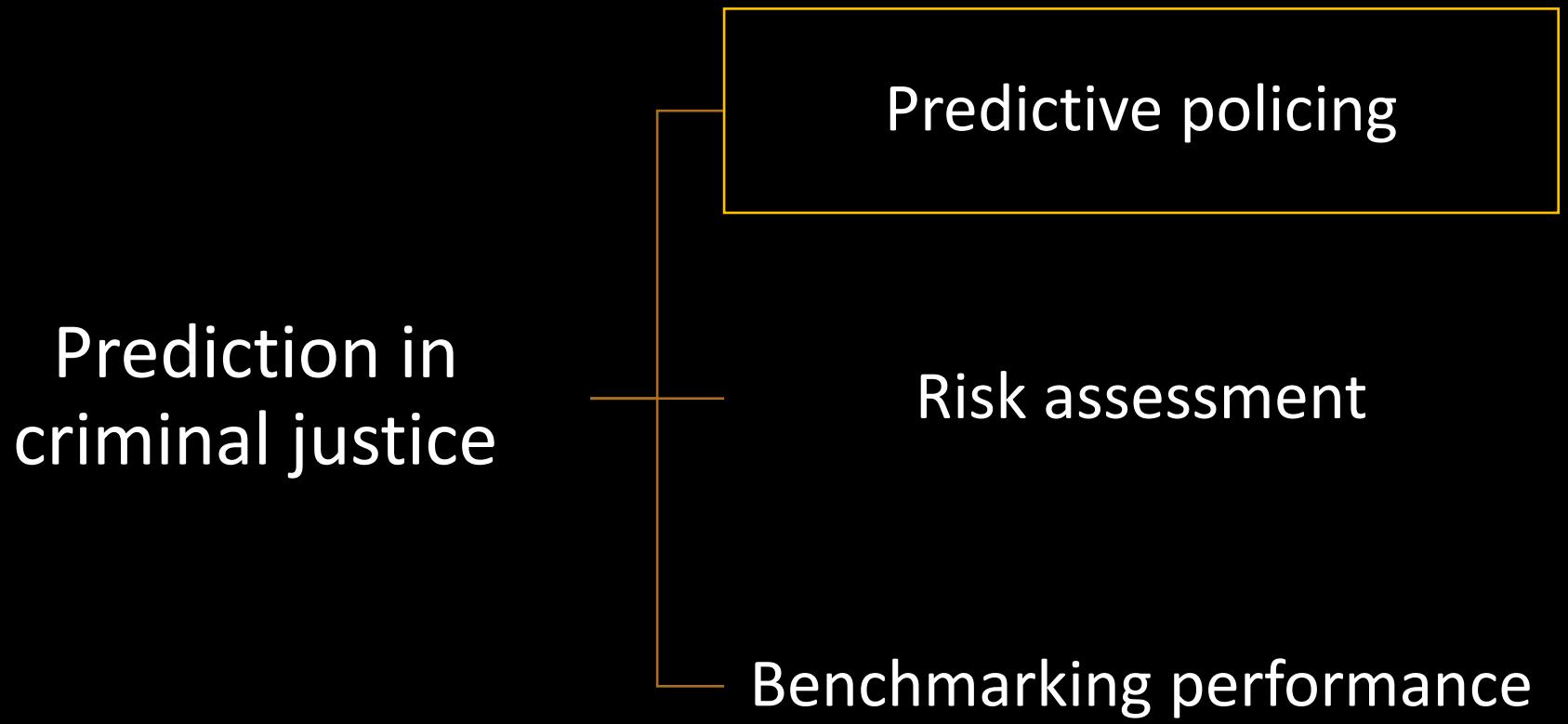


Predictive policing is the use of data in predictive models to prevent crime

- Detect signals and patterns in crime reports to anticipate
  - if crime will spike
  - when a shooting might occur
  - where the next car will be broken into
  - who the next crime victim will be
- Couple the prediction with a prevention strategy
  - typically… send an officer to the predicted time and place

Predictive policing is in use now

- 2014 survey of 200 police departments
  - predictive policing in use at 38% of respondents
  - 70% stated they will be using predictive policing by 2017
- Police would be negligent if they were not using all the information at their disposal
  - to anticipate the concerns of the community
  - to not allocate resources to times and places where they would be wasted
  - to prevent victimization

Translating prediction to prevention is underdeveloped

- Chicago PD developed a strategic subject list
  - uses data on arrestee social network and homicide victimization within that network
  - predict the likelihood that an individual would be a homicide victim based on those data
  - 7% of those on the SSL became victims/arrestees in shootings compared to 0.2% of other arrestees
- RAND evaluation of the SSL
  - SSL subjects received so little attention the team questioned calling it a prevention strategy

Predictive policing shown to be more effective than human planners

- Epidemic-type aftershock sequence (ETAS)

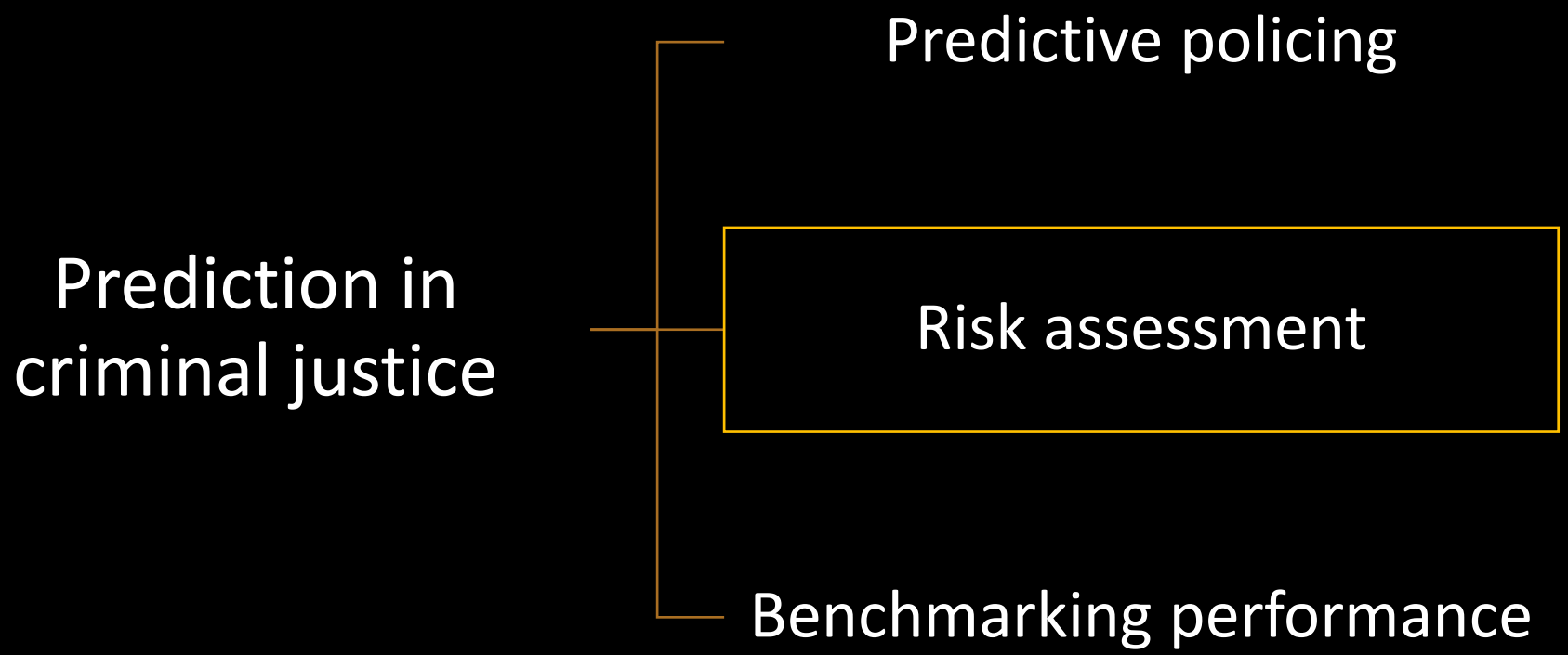
$$\lambda_n(t) = \mu_n + \theta \sum_{t_n^i < t} \omega \exp\left(-\omega\left(t - t_n^i\right)\right)$$

- Mohler et al. (2015) put ETAS and a crime analyst in a head-to-head prediction competition
  - Each would select areas of fixed size likely to contain a large share of future crime
  - ETAS outperformed the crime analyst by a factor of 1.4 to 2.2
- Mohler et al. also conducted an RCT
  - police spending 1,000 minutes in ETAS-predicted hot spots eliminated one crime on average
  - police need to spend 2,000 minutes in hot spots generated from LAPD's standard practice to have the same one-crime reduction

Predictive policing generates fears

- If police apply predictive techniques to their own outputs, the result is unproductive feedback
  - But actual applications involve anticipating when and where the *public* will call for police
- If police only focus on predictions, then other community problems will be ignored
  - But so far the problem is that they are no focusing enough on the predictions
  - And predictive policing supports one component of policing, designing a plan for deploying patrol

Three areas where prediction is impacting criminal justice



Use data and models as decision support in the justice system

- Summons versus arrest
- Pre-trial release versus pre-trial detention
- Parole granted versus parole declined
- Low-intensity probation versus close supervision

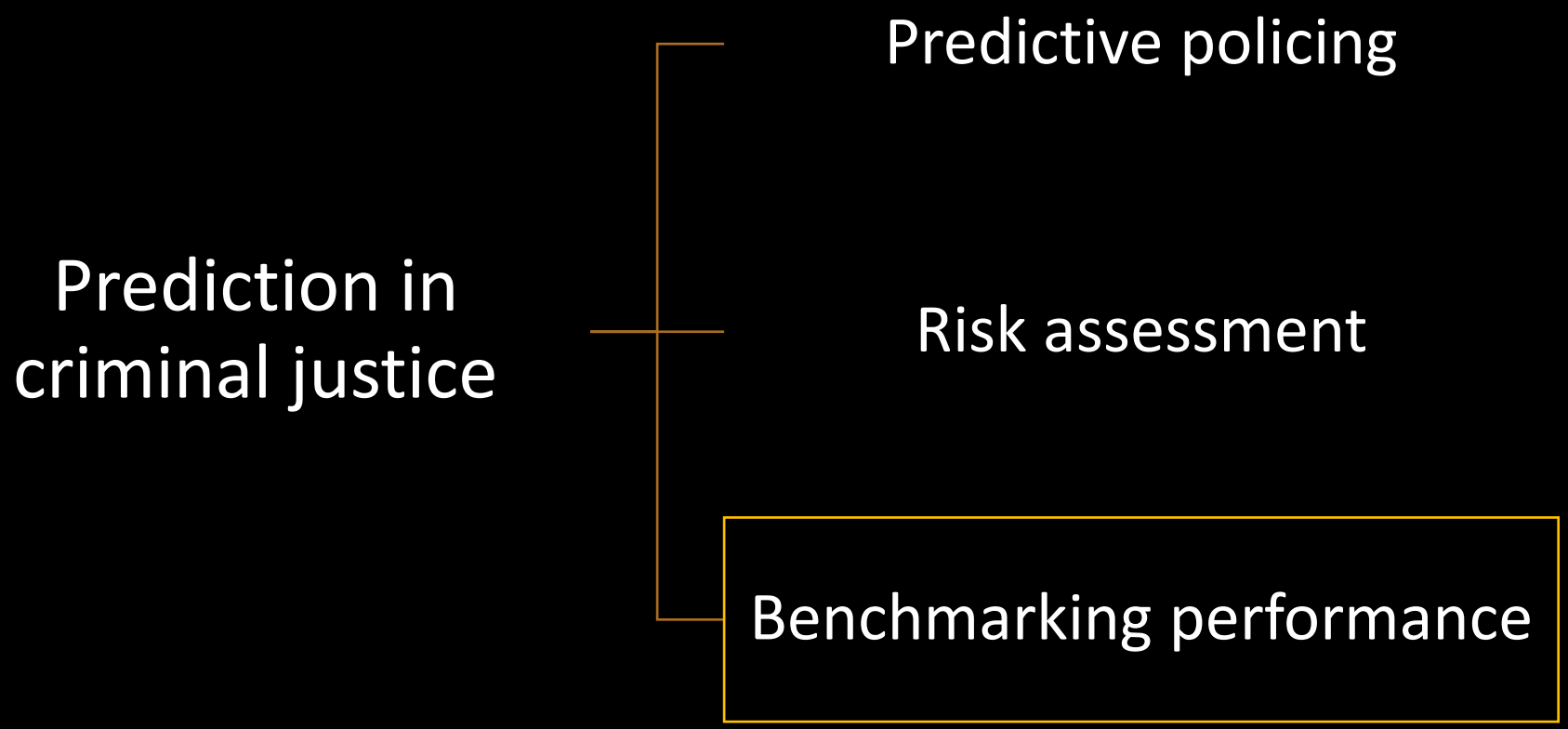
Predict domestic violence reoffending from data

- 28,646 domestic violence cases between 2007 and 2011
- Collected data on prior arrests, days in detention, age, sex, probation status, ZIP code
- Forecast who would have in the next two years
  - no new arrest
  - a new domestic violence arrest not involving injury
  - a new domestic violence arrest involving injury

Data-driven decisions would cut domestic violence arrests in half

- 20% of those currently released after arraignment are rearrested for domestic violence within 2 years
- 10% would be rearrested if judges used a forecasting model
  - translates to 1,000 fewer arrests per year

Three areas where prediction is impacting criminal justice



Create benchmarks to identify problematic system components

- Match an officer's activities with activities conducted by other officers in the same time, place, and context
- Existing systems group officers by just precinct or division and shift

We wish to determine if Officer A's stop patterns are unusual

Stop Characteristic		Officer A (%) n = 392	
Outcomes	Black	86	
	Frisk	12	

We know a lot about the time, place, and context of Officer A's stops

Stop Characteristic		Officer A (%) n = 392	
Outcomes	Black	86	
	Frisk	12	
Month	January	3	
	February	4	
	March	8	
Day of the week	Monday	13	
	Tuesday	11	
	Wednesday	14	
Time of day	(4-6 pm]	9	
	(6-8 pm]	8	
	(8-10 pm]	23	
	(10 pm-12 am]	17	
Patrol borough	Brooklyn North	100	
Precinct	B	98	
	C	1	
Outside		96	
In uniform	Yes	99	
Radio run	Yes	1	

Find stops made by other officers occurring at the same time, place, and context

Stop Characteristic		Officer A (%) n = 392	Internal Benchmark (%) ESS = 3,676
Outcomes	Black	86	
	Frisk	12	
Month	January	3	**3**
	February	4	**4**
	March	8	**9**
Day of the week	Monday	13	**13**
	Tuesday	11	**10**
	Wednesday	14	**15**
Time of day	(4-6 pm]	9	**10**
	(6-8 pm]	8	**8**
	(8-10 pm]	23	**23**
	(10 pm-12 am]	17	**17**
Patrol borough	Brooklyn North	100	**100**
Precinct	B	98	**98**
	C	1	**1**
Outside		96	**94**
In uniform	Yes	99	**97**
Radio run	Yes	1	**3**

Benchmark also matches on fine location data

Achieving high quality matches depends on predicting Officer A's stops

A higher percentage of people who Officer A stops are black

Stop Characteristic		Officer A (%) n = 392	Internal Benchmark (%) ESS = 3,676
Outcomes	Black	86	**55**
	Frisk	12	**11**
Month	January	3	**3**
	February	4	**4**
	March	8	**9**
Day of the week	Monday	13	**13**
	Tuesday	11	**10**
	Wednesday	14	**15**
Time of day	(4-6 pm]	9	**10**
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Patrol borough	Brooklyn North	100	**100**
Precinct	B	98	**98**
	C	1	**1**
Outside		96	**94**
In uniform	Yes	99	**97**
Radio run	Yes	1	**3**

Officers make stops for different reasons

Crime suspected	Officer A (%) n = 392	Internal Benchmark (%) ESS = 3,676
Criminal trespass	4	**2**
Burglary	13	**13**
Weapon possession	3	**13**
Robbery	15	**14**
Drug possession	6	**27**
Drug sale	47	**20**

Officers may interpret and record activities differently

Crime suspected	Officer A (%) n = 392	Internal Benchmark (%) ESS = 3,676
Criminal trespass	4	**2**
Burglary	13	**13**
Weapon possession	3	**13**
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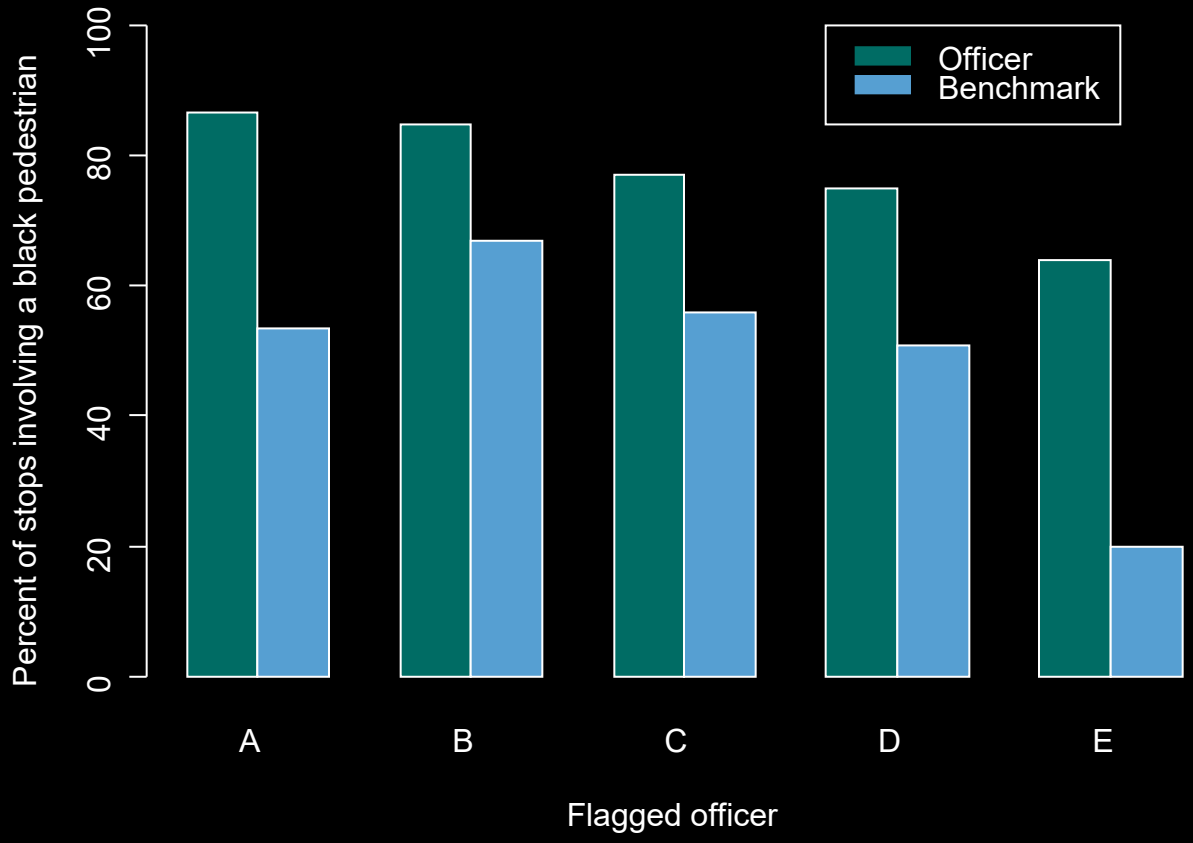
Drug sale	47	**20**

53%

47%

Analysis flagged five officers overstopping black pedestrians



Modern information technology now permits a massive assault on these problems at a level never before conceivable

- 1967 President's Commission on Law Enforcement and Administration of Justice

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