

Differential Enforcement and the Progression of Disparities within the Criminal Justice System

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Arrest is a poor proxy for crime

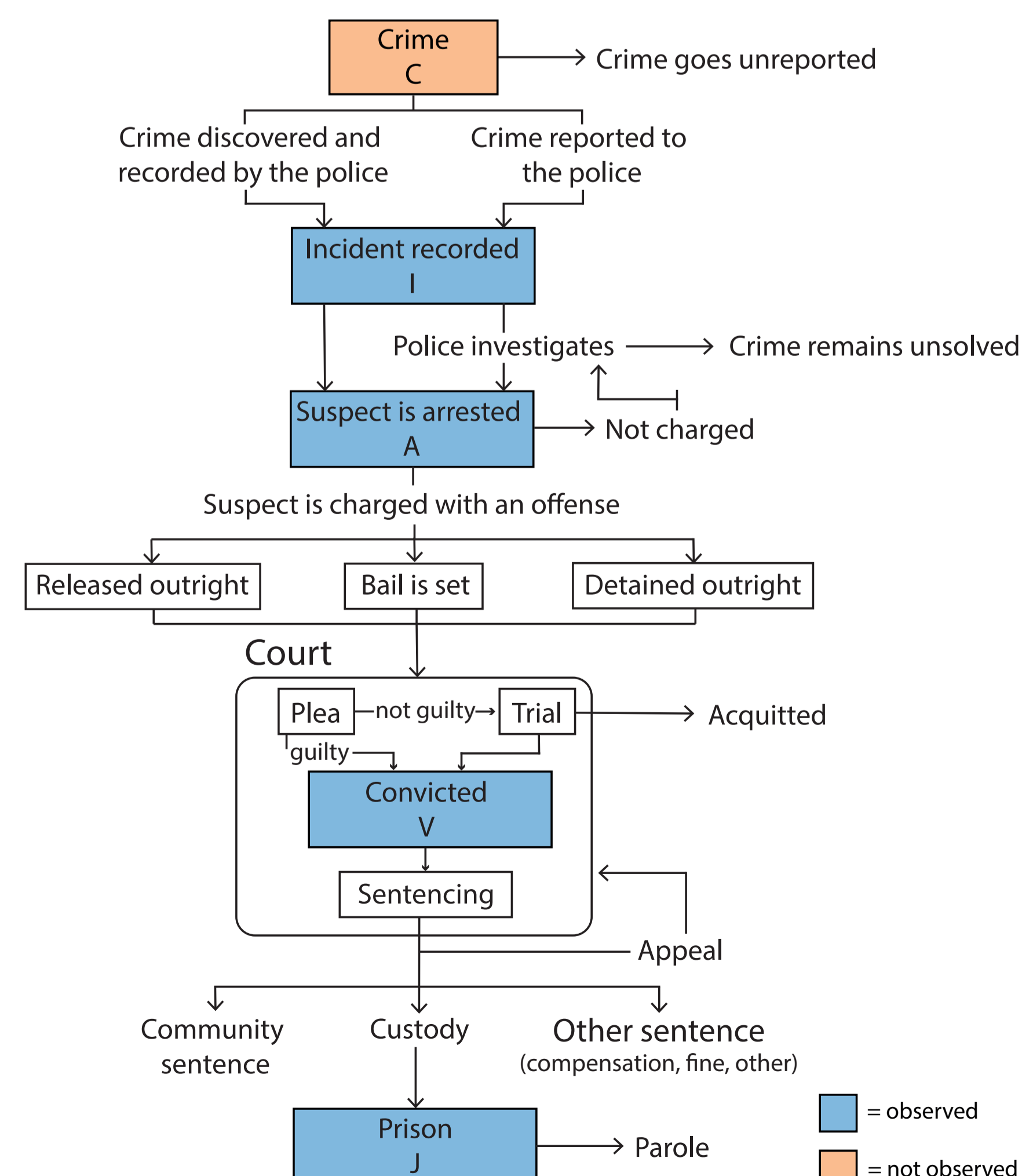
Predictive algorithms deployed in criminal justice commonly use **recorded criminal activity** as an input.

However, **observed** crime is often a poor proxy for **overall** crime [1]. Moreover, the likelihood a crime becomes known to law enforcement can vary significantly depending on offender's protected attributes such as sex, race, and age [2]. **Risk Assessment Instruments** are evaluated on predicting the **re-arrest** risk. In presence of arrest likelihood disparities, an RAI may appear fair, but in reality promote **bias**.

The criminal justice pipeline

We conceptualize law enforcement as a funnel-like pipeline. We investigate how **disparities in which crimes are observed** affect the **risk assessment tools** used later in the pipeline.

Crime can come to attention of the law enforcement in two ways: (i) a **report** by either a victim or a third party, or (ii) **discovery** via proactive policing efforts.



An illustration of the criminal justice pipeline and the relationships between the random variables C, I, A, V, J denoting crime, recorded incident, arrest, conviction, and a prison sentence respectively.

Differential enforcement probabilities

Our goal is to **estimate how well predictive risk scores based on arrest history reflect underlying criminal activity**.

We create a **semi-synthetic dataset** containing both observed and unobserved crimes, using two data sources: (i) individual arrest records; (ii) baseline criminality and arrests data.

We use (ii) to **estimate the conditional probability of arrest for different offense types** (e.g., drugs, robbery), given that a crime was committed, the individual's age, gender, and race.

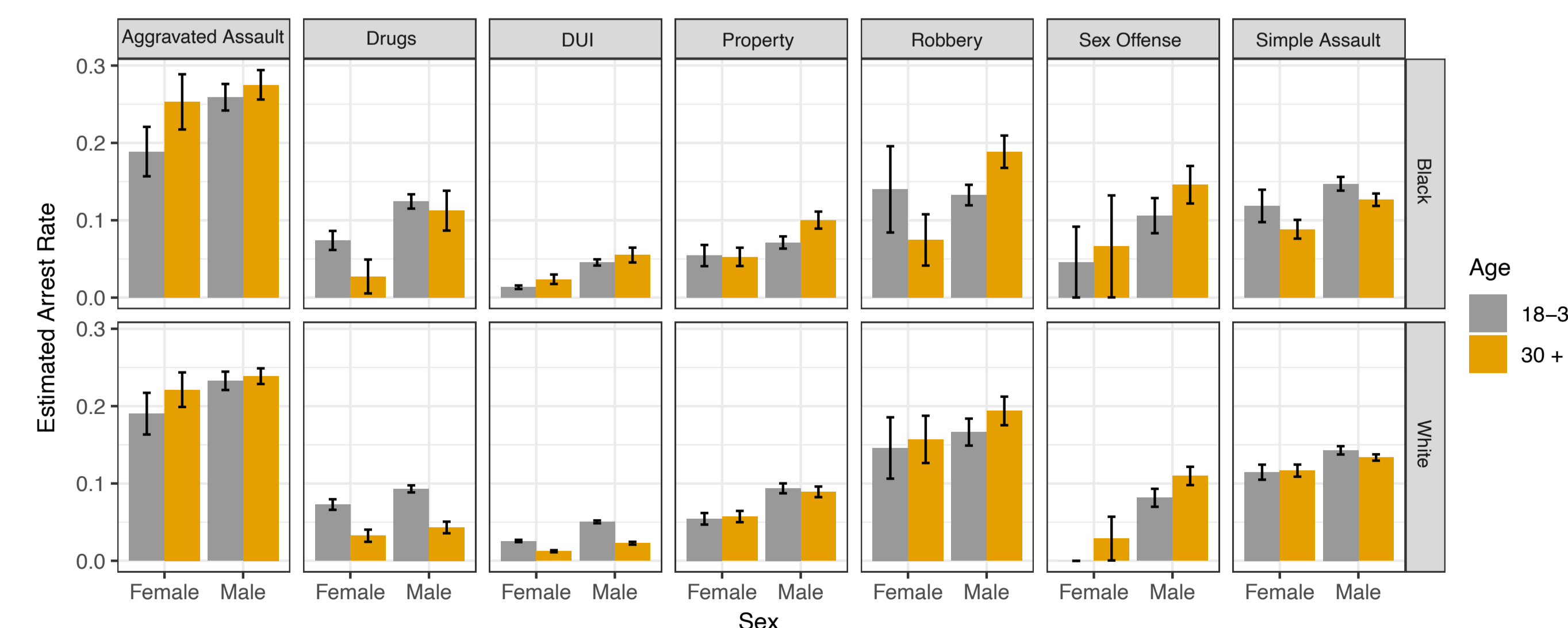
For offenders in (i), we impute unobserved offenses using the Horvitz-Thompson estimator. Each unobserved offense is assigned to an offender with probability proportional to

$$1 + \omega_{s,k} \cdot n_A^{k,y}$$

where $n_A^{k,y}$ is the number of arrests offender k has for offenses from type y , and ω is a parameter we vary.

For each offender, we calculate four risk scores based on four **real-world risk assessment instruments**, including the Public Safety Assessment's (PSA) New Criminal Arrest (NCA) score [3], which estimates the risk of an arrest for any offense.

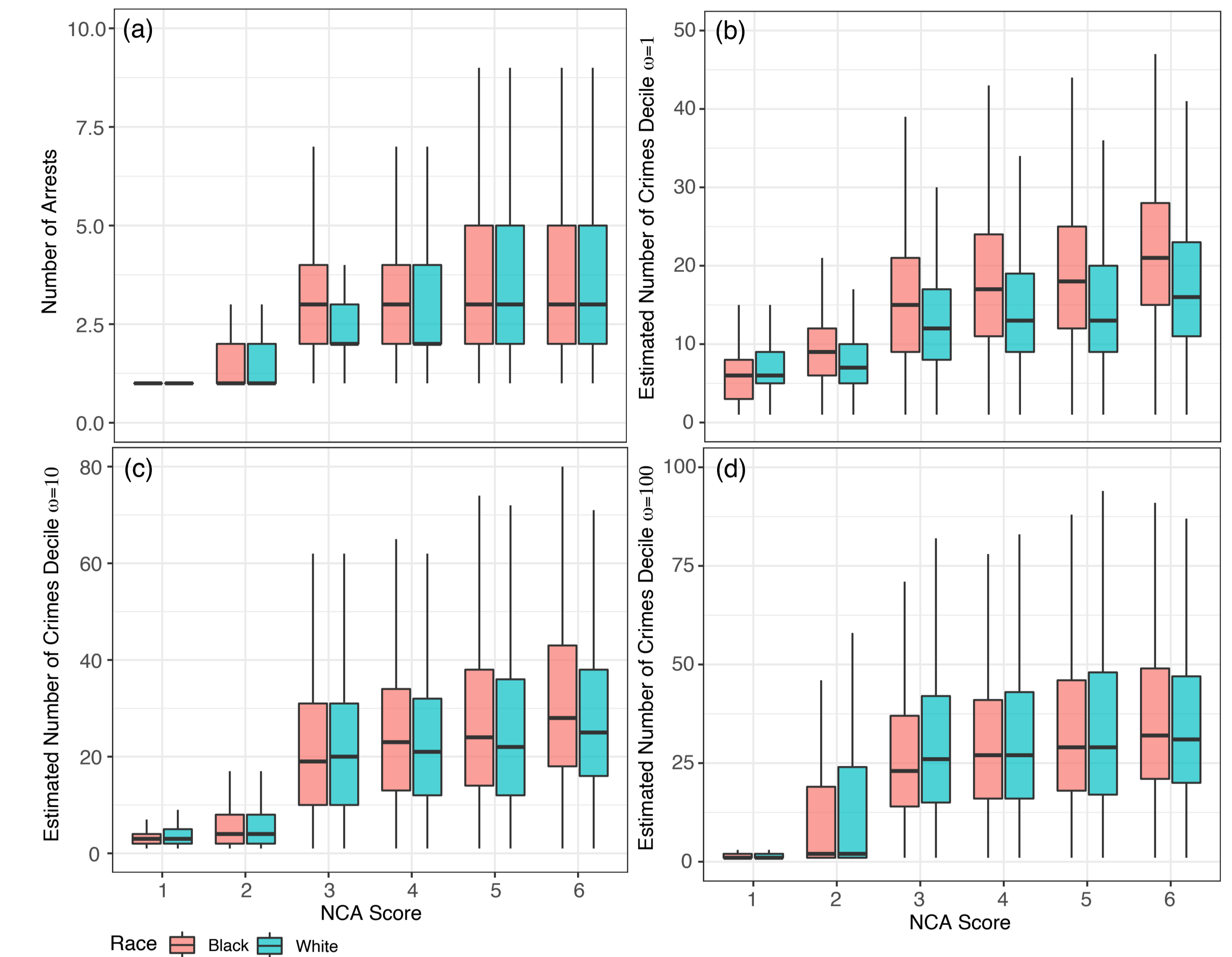
Arrest rates



Estimates of arrest rates by sex, age, and race of the offender. Arrest rates for drugs and DUI are estimated from the National Survey on Drug Use and Health. Arrest rates for all other offenses are estimated from the National Crime Victimization Survey.

For DUI and drug offenses, black males over 30 are arrested $\sim 2.5x$ more often than their white counterparts.

Number of crimes vs. risk score



Boxplot of the (a) the number of arrests and the estimated number of crimes, with $\omega = 1$ (b), $\omega = 10$ (c), and $\omega = 100$ (d), plotted against the NCA score. Plotted separately for black individuals in the cohort, in red (left), and white individuals in the cohort, in blue (right).

For the same risk score, the arrest rate is on average higher for black than for white individuals. For low risk score, the crime rate is on average lower for black than for white individuals, given an equal score. For high risk score, the picture is mixed, and depends strongly on ω , i.e., the extent to which arrests are a reliable proxy for the actual crime level.

Takeaways

Differential arrest rates **increase both noise and bias** within RAI risk scores. This **may be compounded** by the deployment of multiple algorithmic tools within criminal justice.

References:

1. R Fogliato, A Xiang, Z Lipton, D Nagin, A Chouldechova. On the Validity of Arrest as a Proxy for Offense: Race and the Likelihood of Arrest for Violent Crimes.
2. S J Bosick, C M Rennison, A R Gover, M Dodge. Reporting violence to the police: Predictors through the life course.
3. Public Safety Assessment. <https://advancingpretrial.org/psa>