

MEMORANDUM

TO: Mayor Jim Kenney of Philadelphia, Pennsylvania

FROM: Stephanie Onuaja, Data Scientist at the Department of Prisons

DATE: November 25, 2022

RE: Utilizing a recidivism algorithm to establish a job-training program for ex-offenders in Philadelphia

This memorandum is a comprehensive analysis of the recidivism algorithm and a recommendation for its adaptation to inform public investment in a job training program for previously incarcerated individuals in Philadelphia.

The state of Pennsylvania has the highest incarceration rates in the country, with Philadelphia County having the highest number of imprisoned residents.¹ Given the systemic injustices and disinvestment that prevail in Black and Brown communities, as well as the issues of over-policing in those neighborhoods, it is not surprising that incarceration rates are disproportionately higher in poorer communities of color in Philadelphia². As a result, these communities are burdened by the adverse impacts of high local incarceration rates which include broken social ties, economic insecurity, and often the duty to support those who return from prison to reintegrate into society.

Northpointe developed an algorithm named COMPASS which predicts the likelihood that an ex-offender would recidivate. The algorithm had equivalent accuracy ratios across different racial groups, but racial differences were apparent where the recidivism is predicted incorrectly. Using recidivism algorithms to inform judicial decisions cannot be taken lightly as the predicted outcomes tend to have adverse discriminatory impacts (or disparate impacts) on Black communities, even if they were not intended³.

While I would not recommend the use of algorithms to inform sentencing decisions by predicting future criminal behaviors of ex-offenders, there is an opportunity for them to be used to intervene where ex-offenders are at risk of recidivism and to redirect resources toward a job training program that would avert them from going back to prison.

¹ Prison Policy Initiative. "Pennsylvania Profile." <https://www.prisonpolicy.org/profiles/PA.html>.

² Emily Widra and Benjamin Geffen. "Where people in prison come from: The geography of mass incarceration in Pennsylvania." September 2022. <https://www.prisonpolicy.org/origin/pa/2020/report.html>.

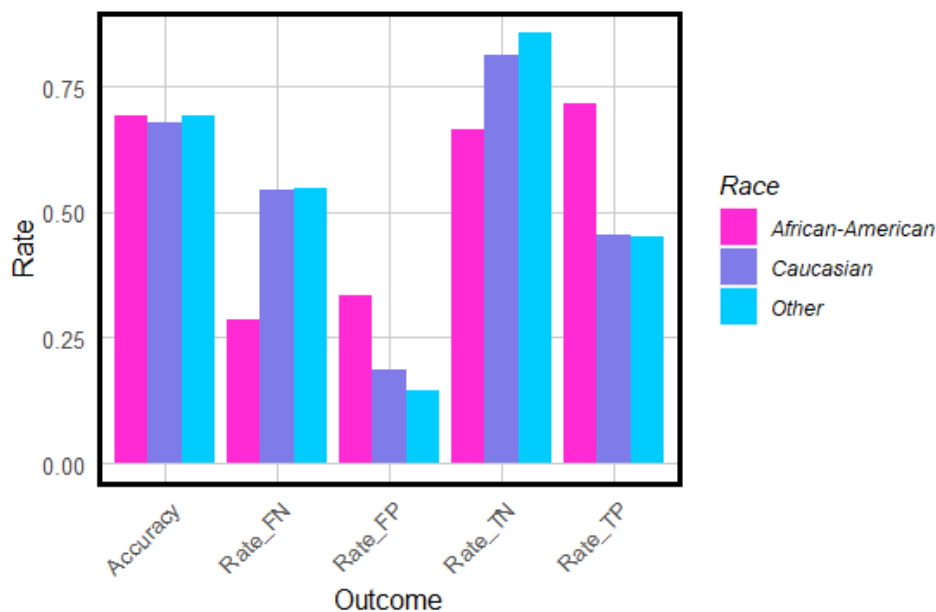
³ Ken Steif. "People Based ML Models: Algorithmic Fairness." February 2021. <https://urbanspatial.github.io/PublicPolicyAnalytics/people-based-ml-models-algorithmic-fairness.html>.

The proposed job training program would be designed for ex-offenders to further their education and develop skills that would contribute to a successful reentry into society, with a goal for its participants to be gainfully employed upon completing the program. The services would include one-on-one career mentorship, literacy tutoring, introductory computer training, vocational training referrals, job-attire acquisition and transportation, tuition assistance, resume/interview preparation, and job placements at no cost. The implementation of this program would remove the financial and social barriers that would normally discourage ex-offenders from pursuing like endeavors. The program is projected to cost \$20,000 per individual.

Bearing in mind the inequalities that exist across races, we developed an algorithm that produces a greater recidivism accuracy by optimizing for the differences that exist between races, rather than employing the same metrics across all racial groups. In Figure 1, the threshold for the rate of recidivism is set to 50% across all racial groups. The chart reveals stark racial discrepancies that would cause disparate impacts on African Americans. Looking at the rate of those predicted not to recidivate (Rate_FN), African Americans have significantly lower rates compared to other races. The false positives (Rate_FP) show that African Americans are wrongly predicted to recidivate at significantly higher rates.

Fig. 1: Confusion matrix rates by race

50% threshold

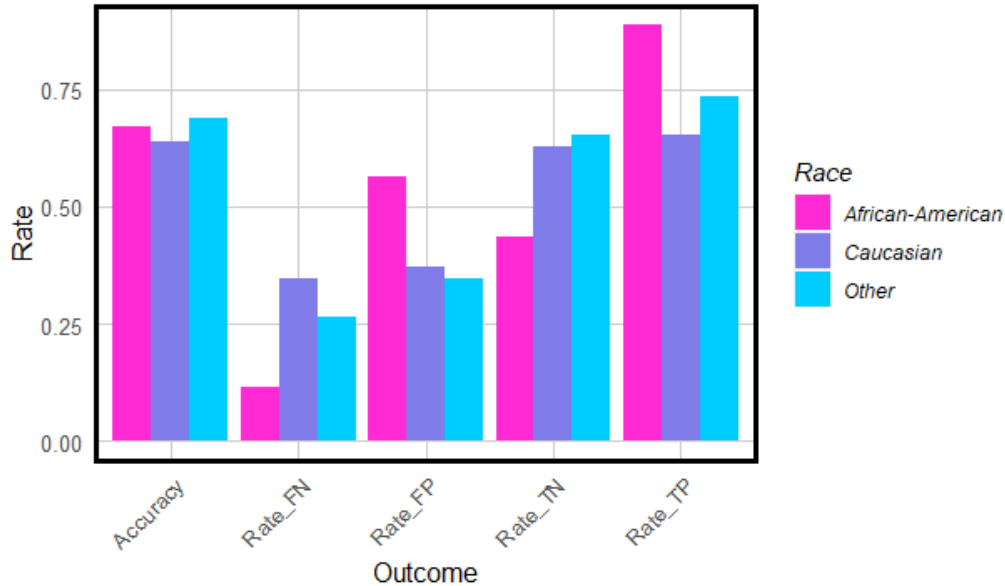


To mitigate these discrepancies, we adapted the thresholds of recidivism by race. In Figure 2 we designated thresholds of 46%, 32%, and 29% for African Americans, Caucasians, and Others respectively.

As seen on the graph, the model produces more equitable distribution by lowering the racial discrepancies found in the previous model.

Fig. 2: Confusion matrix rates by race

Thresholds: 46% African American, 32% Caucasian, 29% Other



The two figures illustrate the trade-off between accuracy and generalizability. In the first model, across-race accuracy is prioritized, but the social costs demonstrated by the racial discrepancies cannot be ignored. The second model utilizes an optimal threshold for each race which led to a more equitable result and generalizability across races. By employing our optimal thresholds racial biases are minimized and therefore can be used to precisely project enrollment in the job training program and budget accordingly for its implementation.

The average to cost detain people held by the Department of Prisons was \$50,965 per incarcerated person, totaling \$220.2 million in 2021.⁴ This program would not only cost less than what it takes to detain a person, but it direct invests in the success of previously incarcerated people rather than in their failures. With your commitment, Philadelphia County could tackle the disparaging impacts mass incarceration has had on poor communities of color, stitching together fragmented communities, and strengthening the county's workforce and economic output. I urge you to adopt this algorithm and guarantee a more equitable future for all Philadelphians.

⁴ Vera Institute of Justice. "What Jails Cost: Cities, Philadelphia, PA." <https://www.vera.org/publications/what-jails-cost-cities/philadelphia-pa>.