Unlocking Opportunities: A Blueprint for Implementing a Recidivism-Reducing Algorithm in Job-Training Selection for Ex-Offenders.

Highlights:

* The city decided to allocate job-training resources for ex-offenders as a solution to prison overcrowding, but currently has no system in place to decide who receives these resources.
* We recommend the implementation of our new algorithm as an equitable and economical way to decide which ex-offenders the city should allocate job-training resources to.
* Upon analysis of the economic and social costs at both the individual and societal level, we found that the benefits outweigh the potential costs of implementing this algorithm.

Background:

Ever since the War on Crimes, War on Drugs and other tough-on-crime strategies were implemented, incarceration rates in the US have skyrocketed (1). As a result, prisons all over the country face the consequences of overcrowding. The shortage of already little resources that prisons can provide incarcerated individuals are exasperated by this, stripping people in custody of any chance to gain the skills necessary to reenter mainstream society and avoid recidivating.

Our city responded by creating a job-training program for ex-offenders, offering them tools to prevent re-offending. The program includes resume-writing, interview techniques, specific job-related technical skill teachings, and networking events with local organizations and companies. Many ex-offenders were already unemployed before being arrested due to factors including low levels of education and family background, making this program an essential part of preventing the cycle of unemployment and crime.

Research has found that vocational training programs do not work on all ex-offenders (2). How do we ensure that we enroll the people who are most receptive and have the highest likelihood of successfully completing the job-training program? We propose our algorithm as a solution.

The Algorithm:

Data for the algorithm comes from COMPAS, including information from 6,162 ex-offenders with features such as demographics like age, sex, and race in addition to details about their crime and time in prison. This algorithm takes these and other features of an individual as input and gives us a simple output: a “yes” or “no” to the question, “Is this person very likely to recidivate?”

This model was first constructed by figuring out the combination of features that provided the highest level of prediction accuracy. The algorithm is based on a model which helps us figure out the likelihood of something happening by using an S-shaped curve. The S-shaped curve begins flat at a zero value, rises steeply in the middle, and settles at a value of one (with zero being “no” and one being “yes” for the question above). The model predicts everyone to be on some part of this line, so the final decision we needed to make about the model is where to mark the threshold, or decision boundary on this S-curve for which all the points above it would be categorized as “yes”, and the rest are categorized as “no”.

Cost-Benefit Analysis:

Though we care about the algorithm’s accuracy, we argue that it’s more important for it to accurately predict the people who don’t recidivate because those are the people we will be providing job-training resources to. If the model predicted that someone will not recidivate but they actually do, that would not only mean that the city resources we spent for this person would go to waste (about $5,000 per person), but also that we would be paying more to keep this person in prison now (). On the other hand, if the model had predicted that someone was likely to recidivate, but it turns out that this person wouldn’t have, we would again be spending money on keeping this person incarcerated, but the greater social cost is that this individual will now lose years of their life in prison and have a much more difficult time reentering society, altering their whole course of life.

The city estimates this program to cost $5,000 per ex-offender based on costs for similar programs (2), compared to the average social cost of crimes (violent and non-violent, spanning from vandalism to murder) of $109,682 (per unit crime;).

Recommendations:

We recommend the use of this algorithm to decide which ex-offenders are offered job-training resources from the city. Using an algorithm provides a data driven approach to sort ex-offenders into those that are likely to recidivate or not – a decision that humans cannot make without worrying about the biases we might have against certain qualities of people and crimes.

A good algorithm must be accurate and generalizable. We tweaked and tested the model repeatedly until we found a combination of features that predicted whether an ex-offender recidivated or not with the highest accuracy. Given the disparate impact of the model, this model can be improved on its generalizability, or ability of a model to [something]. we [recommend a person to review model results].

Conclusion:

Employing this algorithm will [greater impact]. [inspire immediate action]

Sources (not part of official document):

1. Hodge, J. and Dholakia, N. (2021). Fifty Years Ago Today, President Nixon Declared the War on Drugs. Vera Institute of Justice, vera.org, June 17. <https://www.vera.org/news/fifty-years-ago-today-president-nixon-declared-the-war-on-drugs>
2. Bollinger, C.R. and Yelowitz, A. (2021). Targeting Intensive Job Assistance to Ex-Offenders by the Nature of Offense: Results from a Randomized Control Trial. Institute of Labor Economics (IZA), Discussion Paper Series, IZA DP No. 14078, January. <https://docs.iza.org/dp14078.pdf>
3. McCollister, K.E., French, M.T., Fang, H (2010). The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation. Drug Alcohol Depend. April 1; 108(1-2): 98–109. doi:10.1016/j.drugalcdep.2009.12.002. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835847/pdf/nihms170575.pdf>
4. Prison Policy Initiative. Economics of Incarceration: The economic drivers and consequences of mass incarceration. <https://www.prisonpolicy.org/research/economics_of_incarceration/>

Paper checklist:

* sketching out the basics of the job training program
* quantifying the program costs
  + research the financial costs to individuals and society related to imprisonment
* Calculate costs and benefits using this research as well as your own sensible assumptions
  + choose a threshold from testProbs.thresholds
  + use it to develop a qualitative and quantitative cost/benefit analysis
* why the City is considering an algorithm to allocate the program
* how the algorithm works, in brief
* why Mayor should be concerned with algorithmic fairness
* Present your cost/benefit analysis for your equitable threshold of choice **including** an across-race grouped bar plot of each confusion metric the 0.5, 0.5 threshold and your optimal threshold
* Interpret the trade-off between accuracy and generalizability as it relates to the use of this algorithm
  + To advocate for the algorithm

Cost-benefit analysis:

* TP – HR and recidivated
  + We identified them as HR, so did not go into the job program,
  + Cost: median cost of imprisonment
  + Benefit: median social cost of crime
* TN – LR, did not recidivate.
  + Cost: cost of program
  + Benefit: income tax from job, cost of imprisonment (that we didn’t spend) + cost of crime
* FP – HR and did not recidivate.
  + Cost: cost of imprisonment
  + Benefit:
* FN – LR and recidivated
  + Cost: median cost of imprisonment, median cost of crime, cost of program
  + Benefit: nothing.

Want to avoid FN more than anything