

A SIMULATION ANALYSIS OF ANALYTICS-DRIVEN COMMUNITY-BASED RE-INTEGRATION PROGRAMS

Iman Attari

Operations and Decision Technologies
Indiana University, Kelley School of Business
1309 E 10th street
Bloomington, IN 47405, USA

ABSTRACT

We develop a data-driven simulation model in partnership with Tippecanoe County Community Corrections to evaluate assignment policies of reintegration programs. These programs are intended to help clients with their transition back to society after release, with the goal of ending the "revolving door of recidivism". Leveraging client-level and system-level data, we develop a queueing-based network model to capture the movement of clients in the system. We integrate a personalized recidivism prediction to capture heterogeneous risks, along with estimated effects of reintegration programs from literature. Using simulation, we find that the largest benefit is achieved by implementing any kind of re-integration program, regardless of assignment policy, as the savings in the societal and re-incarceration costs (from recidivism) outweigh program costs. Assignment policy based on predictive analytics achieves a 1.5-time larger reduction in recidivism compared to current practice. In expanding capacity, greater consideration should be given to investing in analytics-driven program assignments.

1 INTRODUCTION

The overuse of incarceration in the United States and the lack of social and community support for offenders leads to a "revolving door" in criminal justice system. Recidivism creates a cycle of incarceration that essentially removes an entire subpopulation from society and leads to generational criminalization (Adams 2020). The large influx of non-violent drug offenders and SUD sufferers, combined with high recidivism rates, has contributed to the national crisis of jail and prison overcrowding; 44% of states have prison populations in excess of 100% capacity and 63% of states have prison occupancies over 90% (Carson and Anderson 2015). To mitigate mass-overcrowding, many states have initiated efforts to reduce recidivism such as designing community-based programs that steer non-violent drug offenders to supervision and treatment programs instead of jail/prison. In this work we analyze these programs within a simulation model to determine the impact of adoption and means of implementation on societal recidivism risk and costs. Specifically, we study how to leverage and implement these resources in a heavily constrained environment.

2 SIMULATION AND RESULTS

Figure 1 shows the transition diagram for offenders' interactions with the network of criminal justice system resources. We model the impact of Community Corrections' (CC) services (Work Release and Monitoring) and reintegration programs applied at Monitoring and Home on recidivism and cost. To estimate the simulation parameters, we use a dataset obtained from Tippecanoe County (Indiana) Community Corrections (TCCC) which includes demographics and history of involvement with the center. We first apply logistic regression to predict the recidivism risk based on client risk factors as an input to our

simulation model. We run the simulation until 7,000 clients exit the network, which is equivalent to about 12 years. For each set of experiments, we run 50 replications to calculate the average performance metrics.

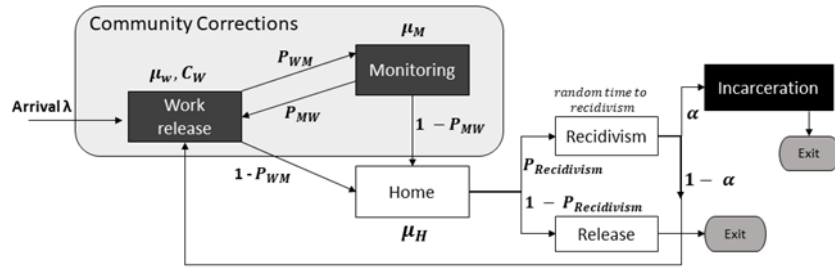


Figure 1: The transition diagram for the network of interactions with the criminal justice system and the cycle of recidivism.

Using the simulation model, we analyze the impact of program assignment, program design, and budget allocation decisions by performing counterfactual experiments, comparing options along the metrics of client access, reintegration impact, case managers' caseload, total client load, and costs. Because of limited budgets and community resources it is not possible to provide a comprehensive suite of reintegration programs to all Community Corrections Clients. We analyze four program assignment policies based on an individual's recidivism risk: random, higher risk first, threshold assignment, and none (no programs). A key takeaway from both tables is that the largest benefit is achieved by implementing any kind of reintegration program, regardless of assignment policy. However, the threshold policy does provide more significant gains over the current state, achieving a 1.5 times large reduction in recidivism.

One of the most important decisions for a Community Corrections organization is how to allocate their limited budget among different services. We explore the impact of different budget allocations between Work Release and reintegration programs. We see the greatest decrease in total cost (14.5%) and recidivism (15.5%) by increasing Work Release capacity, which is not surprising since Work Release is the most effective service. However, Work Release capacity is also the most expensive capacity investment. Increasing access to re-integration programs is cheapest and easiest strategy to implement but it is not as effective as increasing Work Release capacity so a careful cost-benefit analysis should be undertaken.

3 CONCLUSION

In this paper we develop a simulation model to evaluate different mechanisms that can be employed by incarceration-alternatives, such as Community Corrections, to reduce recidivism. We specifically study (i) how to assign clients to different re-integration and treatment programs and (ii) how to make budgeting decisions to have the greatest impact on correctional system costs and individual and societal benefit. We find that these two high-level metrics move in the same direction, i.e., what is good for correctional center costs is also good for clients and society. For program assignment, we find significant gains in all areas can be obtained by implementing a carefully designed risk prediction-based threshold assignment policy. Further, we find that budget decisions have an increasing impact in the following order: continuity of programs when clients are discharged from Community Corrections, overall increased capacity for programs, and increased capacity for Work Release.

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