 **Attachment Seven**

 *“turning data into decisions”*

**Tennessee Department of Correction (TDOC)**

**Correctional Simulation Model Development & Deployment**

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The TDOC projection model relies on customized discrete-event simulation software application to mimic the flow of offenders into, through, and out of the Tennessee judicial and correctional system.

Simulation is the imitation of the operation of a real-world process or system over time (Banks, Carson, and Nelson, 1999). The simulation model consists of a set of assumptions concerning the operation of the system that are usually grounded in historical observations and data. These assumptions are expressed in the model as mathematical, logical or symbolic relationships between the entities moving through the system (offenders) and their interaction with decision processes in the model (Banks, Carson, and Nelson, 1999). These models, once completed and validated, provide the analyst with a risk-free, experimental platform to investigate a wide range of “what if” scenarios, assessing the impact of policy changes on system processing times and resources. Investigators can manipulate the system to predict the potential impact such changes would have on actual system performance. Simulation can be used to evaluate different systems while still in the design phase to test the efficiency and performance of competing system designs under different operation conditions.

**Capabilities**

The simulation model will provide the ability to analyze the impact of changes in operating policies, sentencing practices, post-release practices, and external system pressures on the system. The model offers an experimental, risk-free environment for policy makers to test different “what-if” scenarios to quickly assess the potential impact associated with complex policy decisions or changes in criminal sanctions. This includes, for example, the projected impact of different sentencing guideline policies on institutional bed space, correctional alternatives, jail populations (local sentencing, jail backup), prison admissions, and length-of-stay. In addition to modeling prison bed space needs, the model will support ad hoc amendments to the underlying logic to support future modifications, expansions, or system changes, as well as support for proposed legislation. To date, ARS has built similar models for California, Georgia, Alabama (Sentencing Commission), Indiana (JRI reform), as well as South Carolina and Missouri engaged that were undergoing sentencing form (Pew Charitable Trust).

**Data Sources**

The TDOC has relied a discrete-event simulation model since 2013 for annual 5-year projections. The data sources include two major TDOC files: crim\_hx and crimhxal. These raw data sources include enough data to create stock populations, admissions (and Admission types – new court, parole and probation revocations), and estimated lengths-of-stay. By drawing data from actual TDOC case management systems, the model can track very specific characteristics of each offender in the model. Such examples include primary offense, sentence length, felony class, total day served, location (jail/prison), and other individual data. To prepare these data, ARS uses SQL-Server databases and programs to prepare the data to incorporate into the model Although some policy/legislative proposal may require data that is not available, the model does provide the capability to use estimates gathered from collateral data.

**Annual Projections**

On an annual basis, ARS worked with TDOC to analyze the error rate between three populations (local sentence, backup, and TDOC system) and actual census. If there is an acceptable rate, such as local sentence, TDOC and ARS examine model assumptions to make any adjustments to the upcoming year. Such assumptions and analysis include the following:

1. Previous Admissions to TDOC state prisons or Local Sentencing (LS).
2. Any changes in authorized bed space (added/reduced capacity) stemming from a several factors: Construction of Trousdale, reduced staffing, and facility reengineering. These factors and the extent to which they affect operational capacity affects the jail backup population.
3. Parole release practices & changes in length-of-stay
4. Any significant legislation affecting prison commitments or length-of-stay
5. Adding prison alternatives and estimates on the likely impact (drug courts)
6. Polices affecting probation/parole violators
7. Leading indicators (jail felony pre-trial population)

Note: Forecasting future admissions takes place outside the model using other methods: expert consensus or statistical methods (ARIMA, Exponential Smoothing).

**2019 Projections**

At the end of FY-18, ARS/TDOC detected a gradual increase in the overall system population, reaching levels above forecasted levels. Continued monitoring of the population revealed that this was may still be a random trend but increasing population since December 2018 cannot rule out this possibility. The May 2019 Jail Report shows that the average annual pre-trial felony population has reached the highest levels observed and up 15% since 2015. Although jail felony pre-trial population is not a perfect predictor of future admissions, it does merit attention.

1. Another trend that should raise concerns is the decrease in parole grant rates over the past four years. This previous model assumed existing parole grants would remain constant.
2. The 2019 projection still relies on a 1% increase in admissions over the next five years, but this assumption depends on any factors that could increase admissions above this level (pre-trial felons).
3. Probation/Parole violations have performed as predicted following the Public Safety Act so no adjustments were made in the past projection.
4. No significant legislative changes have affected 2019 assumptions about length-of-stay.