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The Alabama Sentencing Commission

Data Analysis and Simulation Enhancement Congressional Grant

If you have any questions regarding the work of the Alabama Sentencing Commission or would like additional information on any of the Commission's projects, please do not hesitate to call or contact Lynda Flynt, Director, Alabama Sentencing Commission, telephone 334.954.5096, e-mail lynda.flynt@alacourt. gov The Sentencing Commission's website: http://sentencingcommission.alacourt.gov provides additional information about the work of the Sentencing Commission, including information on the new electronic worksheet system developed for designated sentencing standards worksheet preparers and implemented statewide.

Executive Summary

Alabama Sentencing Commission's Dependence on Simulation Model Development and Knowledgeable Staff for Evidence-Based Sentencing Reform

Following three decades of prison overcrowding and creation of temporary committees formed to study and make recommendations to reform Alabama's criminal justice system, the Legislature established the Alabama Sentencing Commission as a permanent state agency of the judicial branch of government. For the first time in our state's history, reliance on anecdotal experience was abandoned for evidence substantiated by data to underscore the impact of sentencing on the prison population and other key segments of the criminal justice system.

As any sentencing commission will attest, the essential components for sentencing reform are reliable data and skilled staff knowledgeable and experienced in data collection and statistical analysis. This project assisted in acquiring both for the Alabama Sentencing Commission, at a time when these resources were critical for the advancement of the Commission's reform efforts. While both components are of equal importance, due to the more intricate phases of development of the simulation model, this aspect of the grant project is explained in greater detail than the acquisition of a staff statistician. It should be noted that emphasis on development and modification of the simulation research tool is not indicative that it deserves extra credit and does not suggest that it plays a greater role in the work of the Sentencing Commission.

The project report begins with a brief historical description of simulation models utilized to forecast correctional populations, followed by an explanation of the advantages of the microsimulation model, utilized as the forecasting model by the Alabama Sentencing Commission. It is noted that prior to the widespread use of microsimulation modeling, other statistical and mathematical techniques were used to forecast correctional populations. However, these statistical and mathematical modeling techniques do not perform well in dynamic policy environments and for that reason do not compare favorably with microsimulation modeling.

Microsimulation is designed to mimic the flow of offender populations over the course of a specified timeframe. This is achieved through culling historical data and reviewing trends in the criminal justice system, with the ability to adjust the underlying assumptions of the model itself. Microsimulation provides users with the ability to test "what if" scenarios by altering actual or proposed policy, legislative, administrative, or practice changes that influence the path of individuals through the criminal justice system. The Alabama Sentencing Commission's decision to utilize a microsimulation model to project correctional populations was based on the model's flexibility to incorporate anticipated changes, the Commission's access to accurate, detailed individual offender records, and the ability to incorporate core assumptions.

The Sentencing Commission's development of Alabama's initial voluntary sentencing standards, based on offender and offense factors identified with statistical models and weights, was dependent on the construction of an effective and efficient simulation model that Commission staff could utilize without requiring complex, time-consuming programming. The Sentencing Commission contracted with consultants Applied Research Services, Inc. (ARS), to develop a simulation model to meet the Commission's needs.

Simulation Model Development

Development of the simulation model was undertaken in a three stage process consisting of: 1) development of a baseline projection of current practices for later comparison with projections made following implementation of the sentencing standards; 2) incorporating the initial sentencing standards into the simulation model; and 3) integrating disparate modules together into a user-friendly model interface.

PHASE 1. Simulating Alabama's Sentencing and Corrections System

Discrete-event simulation models, such as the model developed by ARS for the Alabama Sentencing Commission, are used in various fields, such as manufacturing, aviation, and transportation, to identify the best solutions to complex problems, providing an experimental platform to investigate hypothetical scenarios in a risk-free environment. In the context of criminal justice simulation, discrete-event methods are superior to flow models or ARIMA (Auto-Regressive Integrated Moving Average) statistical forecast models, because they can track actual offenders from one decision point to another and best describe movement of a particular type of offender through the criminal justice system.

To demonstrate the key concepts in a discrete-event model and its modeling logic, an example is provided utilizing airport security screening checkpoints, and discussing the impact of variables such as daily staffing, training, equipment, flight schedules, time of day, etc. on system operations and resources. Trial runs are discussed as a way of examining the probability of changes over time and the means of predicting the impact these changes will have on overall system performance.

Building a discrete-event simulation model first begins with data collection and analysis, varying in degree depending on the model's complexity. The analyst then must determine which statistical distributions (discrete or continuous) best fits the sample data. Once the best distribution is determined, Monte Carlo[1] sampling is employed to sample values under these distributions.

Discrete-event simulation models are considered superior to statistical projection techniques and flow models, especially when utilized for criminal justice applications because of the following factors:

- Offender Detail - Discrete-event models maintain the unique identity of all offenders as they travel through the system, with variables such as criminal history, current offense, and offender demographics, moving with the offender between each point in the system. This feature of offender detail allows the incorporation of system changes such as the adoption of guideline-based sentencing systems and the examination of population characteristics at different points in time.

- Randomness - Discrete-event simulation models provide the ability to introduce a random process anywhere within the model, mimicking "real world randomness" and also allow the incorporation of time-dependent probability distributions, enabling analysts to change the probability distribution depending on the time period.

- Repeated Trials - Discrete-event simulation models utilize repeated trials to capture the most probable outcomes and allow the user to test every aspect of a proposed policy change.

- Time Manipulation - Discrete-event simulation manipulates time by increasing the speed or slowing down the process, depending on whether the end result is sought or the analyst is interested in examining patterns of movement by the various objects in the model.

- NonIntrusive Testing - Discrete-event simulation allows the user to experiment with hypothetical changes to the system without utilizing resources or affecting the actual system.

Simulation Model Goals and Objectives

Three main objectives were identified in the process of developing a simulation model for Alabama. It was determined that the simulation model must be able to:

1. Support two sentencing models simultaneously, since the sentencing standards were based on a voluntary system and only covered 26 felony offenses, representing 87% of the most frequent felony offenses of conviction.

2. Accommodate offense/offender type worksheet recommendations consisting of points and scores translated into structured sentence recommendations.

3. Identify the best mix of prison vs. nonprison recommendations, worksheet factor points and sentencing ranges to guarantee that the more serious felony offenders are sentenced to longer prison terms and that nonviolent felons are sentenced to alternative forms of punishment.

After weighing the advantages of high-end programming simulation software against commercial off-the-shelf software programs, the Sentencing Commission chose from the latter category, purchasing the Simul8 Professional Edition platform. The major advantages of this type system were that it would be compatible with all Windows-based applications, utilized an easy-to-use internal programming language that did not require specialized training to make changes to the underlying logic, and was significantly less expensive than the competing products.

Utilizing the most preferred data source method, the Sentencing Commission imported offender records from existing sentencing and correctional databases. To develop the model, baseline data were collected from four primary criminal justice databases: the Administrative Office of Courts filing and disposition records; the Alabama Criminal Justice Information Center, containing arrest records of offenders in Alabama; the Alabama Department of Corrections database on felony offenders – consisting of prison admissions, releases, active inmate populations by facility and incarcerated offenders' length of stay; and the Alabama Board of Pardons and Paroles database on paroles and probation. In addition to the databases for these criminal justice agencies, the Sentencing Commission relied on information collected from presentence investigation reports and surveys of community correction programs and county jails.

The simulation model contains a commitment module which monitors the flow of offenders into the model based on prison admission projections. The model then randomly selects new commitments based on the commitment projection and continues to admit new offenders at this rate. The major objective of the Simul8 model is to identify variables and related probability distributions to predict whether convicted offenders will receive a prison term or non-prison sanction. If a prison term is predicted, the next decision point that the model must set is the sentence length.

The Simul8 model allows the Sentencing Commission to track the flow of offenders through sentencing, prison classification and parole board decision-making. In addition, the model can forecast how changes in sentencing practices or laws impact the various parts of the criminal justice system. In the future, other programs will be added as data becomes available to track offenders according to classification and to capture those that are diverted to community correction programs, whether on the front-end or through institutional diversions.

Prior to adoption of the initial "time-imposed" sentencing standards, the Commission relied on its new simulation model to answer specific questions in regard to the projected prison population over the next 5 years. Utilizing a status quo model, the effect on the prison population using current sentencing practices was compared to the projected population after adoption of the sentencing standards, utilizing various compliance rates.

PHASE 2. Incorporating Sentencing Standards into the Simulation Model

Phase 2 entailed expanding the simulation model to include modules needed to support development of the sentencing standards. This phase required an extensive amount of manual data collection by Commission staff, statistical analysis and simulation programming.

There were three primary tasks included in this phase of development of the simulation model. It was first necessary to determine whether the new offenders came within the purview of the sentencing standards. An offender would come under the purview of the sentencing standards if their conviction offense was one of the 26 felonies for which the standards are applicable. If the offender's conviction offense was not one covered by the sentencing standards, the offender was routed to the current module for sentencing estimates under the existing non-guideline system. The same culling process applied to cases that, while covered by the sentencing standards, did not comply with the standard recommendations. In some cases, even though the offender's conviction offense was one of the 26 covered offenses, it was known that the sentence given would fall outside of the recommendations made by the sentencing standards. It was assumed the cases falling within this latter category would make up 25% of the total felony convictions. The second module incorporated data from the presentence investigation data collection project undertaken to obtain vital information such as prior criminal history, weapon use, victim injury and other information that was not available from any existing database and was necessary to conduct a multivariate analysis. After these data were gathered, they were analyzed and converted into complex statistical distributions to estimate the offender's worksheet score under the proposed standards. Data were compiled on factors utilized for both the prison in-out decision and the prison length decision. The Commission then used these policy parameters to access the impact that different scores and cut-points would have on future prison populations, making modifications to provide longer prison terms for offenders convicted of personal offenses than felons convicted for property and drug possession offenses. The third and final module of the simulation model required sentencing standards cases to be routed to a parole release and good time component that assigned length of stay based on probability distributions according to release type, current offense, prior criminal history, type of sentence, sentence length, and other factors.

The factors utilized in the sentencing worksheets, the weights, cut points, sentence ranges and decision points utilized to recommend a prison or non-prison recommendation required over 500 adjustable policy parameters. Ad hoc amendments to the underlying logic were essential for the Commission's numerous revisions and were easily accomplished through use of the Commission's new simulation model.

PHASE 3. Integration of the Simulation Model and Model Enhancement Although the Sentencing Commission could boast of a newly developed simulation model, without assistance from the consultants who built the model, staff were unable to routinely forecast the affect of proposed changes in laws, frequently requested from the Legislature in the form of impact statements. Due to time constraints and inadequate training, Commission staff were unable to make necessary programming changes in the underlying simulation codes or prepare the data to be incorporated into the model to meet parameter requirements. In addition, there were several features that were not included in the original model that the Commission indicated would be essential for future revisions of the initial sentencing standards and development of the truth in sentencing standards originally scheduled for implementation in 2009 but which must be delayed until 2011.

Three major modifications were undertaken to convert the new simulation model into an easy-to-use simulation model that would meet the Commission's demands and that could be operated by Commission staff. First, to streamline the process of building the Department of Corrections Inmate Cohort and the Administrative Office of Courts Cohort, ARS added MS-SQL Desktop engine and Visual Basic.Net features to the simulation model to handle the data import and pre-processing tasks. These innovations have shortened the processing time required to build and update the AOC and ADOC databases to less than one hour, and have also provided a means for staff to obtain easier access to the cohort files to prepare routine Commission reports.

The second modification of the Simulation model involved the incorporation of easy-to-use application software that utilizes dialog boxes and drop-down menus to build new worksheets and modify existing worksheet parameters. Utilizing this user-friendly application, Commission staff will now be able to edit the worksheets, experiment with different cut points, and build new worksheets to cover additional offenses.

The final modification to the simulation model was the inclusion of a Scenario Manager. This is an integrated management tool that facilitates the building of new policy scenarios, and the archiving of these scenarios with their associated results. Archiving this information in a scenario library will provide ready access for reference by the Sentencing Commission in the future when it is necessary to recall the results of queries or compare them with others scenarios.

Conclusion

Development and enhancement of a user-friendly simulation model and acquisition of an in-house statistician, essential to any sentencing reform effort, have been utilized by the Sentencing Commission to develop the initial sentencing standards, as well as to produce impact projections to the Governor and Legislature. While these accomplishments alone are significant, collateral advances have been achieved during this process, many of which were resolving data collection and data entry problems.

During the baseline data collection procedure, court file information was required to be converted from case specific data to offender based data. This conversion effort led to the discovery of programming problems that had to be addressed, ranging from the reporting of multi-count indictments and dispositions to reconfiguing the sentencing screen to capture direct sentences to community corrections.

In addition to identifying and resolving AOC mainframe problems, data systems of other departments were modified at the request of the Sentencing Commission. Pardon and Paroles developed electronic pre-sentence investigation reports (e-PSIs) and the Department of Corrections revamped their monthly reports to more adequately reflect the offenders that, although technically under their jurisdiction, were serving their sentence in community corrections programs. Due to the continuous collaborative efforts of all criminal justice system departments and agencies, improvements in the information technology services are made on a regular basis,

Future projects include developing and implementing “truth in sentencing” standards based on time served data; incorporating the Department of Corrections new classification system into the simulation model, and expanding the simulation model to include alternative sentencing programs such as specialty courts.

Creation of the Alabama Sentencing Commission

Sentencing Commission Essential for Criminal Justice Reform

Alabama is a state that is generally considered slow to embrace innovative measures, even when facing problems that have reached crisis proportions. Like most major projects undertaken in our state, the initiation of criminal justice reform took time and required the strong support and leadership of key political figures and respected organizations. Because of that support, Alabama is now among the 23 jurisdictions that have an established Sentencing Commission,[2] one of the 22 jurisdictions that have sentencing guidelines,[3] and one of the 11 jurisdictions that have voluntary guidelines.[4]

Criminal justice reform in Alabama was initiated a decade ago, with its genesis as a project of the Alabama Judicial Study Commission (JSC), spearheaded by Alabama's Attorney General and Chief Justice of the Supreme Court. On January 23, 1998, a special committee of the Study Commission was created to study sentencing policies and practices in Alabama. This sentencing committee, charged with identifying and studying the strengths and weaknesses of Alabama's entire criminal sentencing system, met during calendar years 1998, 1999 and part of 2000. During this time, the committee members reviewed each area of Alabama's criminal sentencing structure, as well as other state and federal sentencing models. In conducting its investigation, the committee heard from local, state, and national experts[5] on current sentencing practices and reform efforts. The JSC, a broad-based group of criminal justice officials (judges, defense lawyers, prosecutors, corrections officials, district attorneys, and law enforcement leaders and victims' rights advocates) concluded that significant problems existed within the state's sentencing and corrections structure that demand immediate attention. As a result of this study, the JSC recommended the creation of the Alabama Sentencing Commission as a separate agency to serve as a permanent research arm of our state's criminal justice system. It was envisioned that the Commission would be responsible for acquiring, analyzing and reporting necessary information to officials and state agencies involved in the sentencing process and making specific recommendations to reform Alabama's criminal justice system, with primary emphasis on establishing truth in sentencing and eliminating unwarranted sentencing disparity.

Statutory Mandates of the Alabama Sentencing Commission

Following the recommendations of the Judicial Study Commission, the Alabama Legislature passed Act 2000-596, effective May 17, 2000, creating (but providing no initial funding) a permanent Sentencing Commission as a separate state agency under the Alabama Supreme Court. Pursuant to its enabling legislation, the Alabama Sentencing Commission is charged with reviewing and revising Alabama's sentencing laws and practices and recommending ways to resolve jail and prison overcrowding. The statutory mandates include establishing an effective, fair, and efficient sentencing system for Alabama's adult and juvenile criminal offenders that will: promote truth in sentencing; eliminate unwarranted sentencing disparity, prevent prison overcrowding and the premature release of prisoners; provide judges with flexibility in sentencing options and meaningful discretion in the imposition of sentences; and enhance the availability and use of a wider array of sentencing options in appropriate cases.

The Commission is also required to (1) "serve as a clearinghouse for the collection, preparation, and dissemination of information on sentencing practices;" (2) "make recommendations to the Governor, Legislature, Attorney General, and Judicial Study Commission concerning the enactment of laws relating to criminal offenses, sentencing, and correctional and probation matters" and (3) "review the overcrowding problem in county jails, with particular emphasis on funding for the county jails and the proper removal of state prisoners from county jails pursuant to state law and state and federal court orders, and make recommendations for resolution of these issues to the Governor, Legislature, Attorney General, and the Judicial System Study Commission… ." §12-25-9, *Code of Alabama* 1975.

The Sentencing Commission's major considerations for developing an effective, fair and efficient sentencing system were the criteria set out by the Legislature to construct a sentencing structure that would:

- Provide certainty and consistency in sentencing;
- Avoid unwarranted disparity between like offenders committing like offenses;
- Promote truth in sentencing by assuring that a sentence served bears a certain relationship to the sentence imposed;
- Provide proportionality in sentencing so that the sentence imposed reflects the severity of the offense relative to other offenses;
- Maintain judicial discretion and flexibility to permit individualized sentencing as warranted by mitigating or aggravating factors in individual cases;
- Enhance the availability and use of a wide array of sentencing options in appropriate cases and provide judges with flexible sentencing options and meaningful discretion in the imposition of sentences;
- Prevent prison overcrowding by recognizing those offenders who may best be punished, supervised, and rehabilitated through more cost effective alternatives to incarceration by alternative means;
- Prevent the premature release of inmates, recognizing the impact of crime on victims and concentrating on incarceration and incapacitation of those offenders who most egregiously harm the public by inflicting personal injury, emotional injury, and great economic injury on others;
- Provide restitution to the victim and the community; and
- Recognize current sentencing practices with adjustments to meet other goals.

Before pursuing the creation of a sentencing system that would fulfill these seemingly conflicting legislative goals, the Sentencing Commission was required to concentrate on data development, information sharing among criminal justice agencies, and ways to address major data obstacles. As with many state information systems, the Commission was required to work with incompatible systems whose unique designs were developed solely to meet the immediate needs of their particular department or agency without considering capabilities for data sharing, analysis and reporting.

Data Driven Reform

The first years of the Commission's existence were devoted to gathering sentencing data, identifying the deficiencies in Alabama's existing sentencing system and making recommendations for improved information sharing among criminal justice departments and agencies. Finding lack of reliable data to be a major obstacle for the development of a reformed sentencing system, the Commission obtained the services of a consultant to provide current statewide sentencing trends and develop a comprehensive statewide database. This initial database consisted of a three-year cohort of felony offenders obtained by combining information from the databases of the Administrative Office of Courts, Pardons and Paroles, Department of Corrections and Alabama's Criminal Justice Information Center.

The database was later expanded to a four-year cohort of 64,000 felony offenders and updated to include information obtained from a manual survey of presentence investigation reports, which required legislation to allow access by the Commission. This cohort is updated yearly by Commission staff, utilizing offense and offender information obtained from the Alabama Department of Corrections (ADOC), the Board of Pardons and Paroles (P&P), the Administrative Office of Courts (AOC), and the Criminal Justice Information Center (CJIC).

During the FY 02, the Commission contracted with Applied Research Services to develop a discrete-event prison population/sentencing simulation model for Alabama to obtain forecasting ability, utilizing the felony database that had been developed. This model, which has had subsequent modifications made through this grant project, has assisted the Sentencing Commission in developing the initial set of voluntary sentencing standards.[6] The model will also be utilized in considering subsequent modifications to the initial "time imposed" standards, as well as the truth in sentencing (based on "time served") standards that are scheduled for later development and implementation. In addition to being an essential tool for standards development, the simulation model has also enabled the Commission to provide valuable impact analyses to legislators and policymakers for more informed correctional planning and assessment of proposed changes in criminal justice laws and practices.

Development and Implementation of Alabama's Initial Sentencing Standards

The major component of the Sentencing Commission's reform efforts - the initial voluntary sentencing standards - were developed to eliminate unwarranted disparity while allowing judges to retain meaningful discretion in felony criminal sentencing decisions. Alabama recognized the importance of relying on empirical data for the analysis of sentencing practices and procedures and used historical sentencing data to guide the development of the initial voluntary sentencing standards. The sentencing standards were constructed with data supplied from a variety of sources including the Administrative Office of Courts, Department of Corrections, Criminal Justice Information Center, and Pardons and Paroles.

Alabama chose to develop sentencing standards, patterned roughly on the voluntary sentencing guidelines used by Virginia. These standards do not govern all offenses but apply to the 26 non-capital felony offenses which represent 87% of the most frequent crimes of conviction in our state. Rather than a grid sentencing system, the sentencing recommendations in Alabama come from worksheets with scored factors reflecting the instant offense, prior criminal history, previous sentence history, prior revocations, and firearm/deadly weapon information. Alabama uses three *in/out* and three s*entence length* worksheets for three offense categories – drug, property, and personal – as opposed to Virginia's use of offense specific worksheets.

After consultation with national experts, it became evident that the development of Virginia type worksheets would require a large amount of offender and offense based information. In order to collect the necessary offender and offense detailed information, a massive data collection effort was undertaken by the Sentencing Commission to manually pull and code presentence investigation reports produced by Alabama probation and parole officers for persons convicted of felony offenses. This data collection effort took four months and involved Sentencing Commission staff pulling and coding over 7,000 presentence investigations with the assistance of probation and parole officers working overtime.

The information taken from the presentence investigation reports was used in conjunction with court, corrections, and arrest data to identify factors that were significant for judges in determining when an offender is or is not sentenced to prison, and in instances in which the offender is sentenced to prison, the sentence length. After the factors used in making these two sentencing decisions were identified, the next step in constructing Alabama's sentencing worksheets was to determine the weight to give each factor. This was done by assessing the relative impact of each factor to the other factors in making the two sentencing decisions – the *in/out* and *sentence length* decisions.

While data was heavily relied on as the basis for the construction of the sentencing standards, the Commission still needed the ability to modify cut points and factor weights in the standards that altered the in/out recommendation for imprisonment and the sentence length ranges. The use of the simulation model provided the means for the Sentencing Commission to test different scenarios and see what the projected impact would be on the prison population. By altering the scores of specific factors and/or thresholds for in/out and sentence length recommendations, the simulation model provided the Commission with prison population projections based on numerous combinations of factor scores and threshold recommendations. The simulation model served to bridge the gap between modifications of the worksheets and projecting associated changes in the prison population.

Essential Resources for Evidence-Based Sentencing Reform

The number of offenders in prison is a function of two factors – the number of offenders committed to prison (including those admitted based on probation, parole and community corrections revocations), and how long these offenders stay in prison. Both of these factors, however, are influenced by a vast array of variables. Accurate projections of correctional populations serve as critical tools to provide policymakers with information detailing ramifications of policy changes, as well as to better inform agencies of future needs that must be considered to sufficiently address forecasted shifts in the correctional population.

The simulation component developed and used to project the correctional population in Alabama is a microsimulation model. Microsimulation is designed to mimic the movement of both the current offender population, and expected admissions into the criminal justice population, over the course of the projection timeframe (Pew 2007). The model projects the flow of offenders through the correctional system by developing a set of assumptions outlining probability distributions of destinations for offenders and a corresponding length of stay for offenders in these destinations.

Prior to widespread use of microsimulation modeling, various statistical and mathematical techniques were employed to forecast correctional populations. Stephen Stollmack (1973) developed the first mathematical model used to forecast a correctional population using information on arrests, indictments, and convictions. At the time, Stollmack's model was a major improvement over the common method of the time – regression techniques (Sabol 1999). These statistical and mathematical techniques are not very accurate in dynamic policy environments because the data are grounded in policies and practices from previous years and are unable to incorporate newly implemented or proposed policy changes. For this reason, various statistical and mathematical technique projection approaches do not perform well attempting to forecast correctional populations as policy and practices shift.

The modeling technique most akin to, and the precursor of, microsimulation is the disaggregated flow model, which projects correctional populations by reviewing the movement of groups/clusters through the criminal justice system and determining the rates of transition of such groups through the various phases of the criminal justice system (GAO 1996, Butts & Adams 2001, Mears 2002). The primary weakness of flow models is that the projected figures are reliant upon stable rates of movement of individuals through various stages, which is not always the case as policies and practices change (Sabol 1999).

Microsimulation provides many advantages when producing correctional population forecasts, including flexibility to alter the underlying assumptions due to actual or proposed policy, legislative, or administrative changes influencing the path of individuals in the criminal justice system (GAO 1996). The ability to test different sets of assumptions (or "what if" scenarios) separates microsimulation models from other techniques used to forecast correctional populations.

The ability to modify assumptions is of paramount importance to achieving more accurate projections for correctional populations. The criminal justice system continuously becomes more complex, requiring projection mechanisms that are flexible and allow researchers to respond to the dynamic nature of the criminal justice system (Pew 2007). Microsimulation provides the necessary flexibility to modify assumptions and test different scenarios as the result of real or proposed policy changes. Of the most common modeling methods used to project correctional populations, microsimulation offers the greatest capability to adjust assumptions that influence the flow of offenders in the criminal justice system (Butts & Adams 2001). Statistical and mathematical technique approaches to projecting correctional populations are more rigid than microsimulation, and do not provide adequate flexibility to test scenarios based on different policies than those in place in the past.

While sound policy based on informed decisions requires the collection and accumulation of historical sentencing practices (Hunt 1998), microsimulation requires more data and information than do other models used to project correctional populations. Individual level of detail and information, rather than aggregate levels of information, is needed to provide microsimulation models with the type of data specificity needed to make accurate and reliable projections. This individual level of detail provides microsimulation models with the unique capability to replicate the flow of individuals through the criminal justice system (Scalia 2004). Microsimulation is the only modeling technique that requires that detailed information on individual offenders who have previously traveled through the system be collected to inform decisions for projecting future outcomes for similarly situated offenders in the model.

Butts & Adams (2001) emphasize that a "comprehensive forecasting effort" should include population projections and discussions that attempt to explain why policies have the effects they do when forecasting correctional populations to determine differences in projected versus actual results. Key stakeholders and policymakers in the Alabama criminal justice system provided valuable input which assisted in developing underlying assumptions that the microsimulation model used to analyze the effect(s) of policy changes and other changes on the correctional population. The cooperation and collaboration of criminal justice leadership is essential to identify and form consensus on the core assumptions for a correctional population projection technique (Mears 2002).

The quality of projections is directly proportional to the quality of the assumptions on which the projections are based (Sabol 1999). The quality and accuracy of projections are also dependent upon the ability of the model to incorporate anticipated changes that altering policies and practices will have on correctional populations (Scalia 2004). It is the combination of the quality of assumptions, flexibility to incorporate anticipated changes, and the accumulation of accurate, detailed individual offender records that enables microsimulation models to be effective mechanisms for projecting correctional populations. Alabama has been able to bring the key criminal justice stakeholders together through the Alabama Sentencing Commission, and was also able to retrieve historical and detailed individual offender records to allow a flexible microsimulation model to be created and used to gauge forecasted changes in the correctional population due to policy and practice shifts.

Alabama Simulation Model Development

Prior to 2003, the State of Alabama had no formal methodology to forecast prison populations, including a simulation model or statistical time-series and forecasting methods, such as auto-forecasting with autoregressive-moving average (ARIMA) models. Instead, the Alabama Department of Corrections relied on percent growth models, using the existing prison population to forecast future statewide prison populations. As Alabama moved toward a structured sentencing system, more precision was needed to investigate the impact statewide sentencing reform would have on the prison population. Adding to the need for more precise forecast methods, the Alabama Sentencing Commission intended to incorporate Virginia worksheet-style sentencing guidelines into its sentencing reform efforts. The Virginia sentencing guidelines uses offender and offense factors identified with statistical models and weights to guide sentence recommendations. Alabama required an analytical tool to guide the Commission during development of such a complicated sentencing system. To shepherd this process, the simulation model development project consisted of three phases.

Phase 1: Simulating Alabama's Sentencing and Corrections System

In the first phase, the Sentencing Commission needed a simulation tool to model the existing indeterminate sentencing system, along with its disparate legislative components, including the habitual offender act, split sentences, good time, and parole release. Unless the Commission could establish a baseline projection of current practice, it would be difficult to determine what impact, if any, the proposed sentencing reforms (sentencing standards) would have on the criminal justice system, particularly in terms of resource utilization and correctional alternatives. To date, the error rate for the simulation model is less than 2% after 39 months into the projection.

Phase 2: Incorporating Sentencing Standards into the Simulation Model

The second phase included expansion of the initial simulation model to include the functionality to model the Commission's proposed sentencing standards. During this process, the Commission investigated different offenses to be covered under the standards, offense and offender factors and weights, sentencing ranges, options, and decision points to guide the prison or non-prison sentence recommendation. With each revision, the simulation model was used to examine whether the revised standards were meeting the legislative goals enumerated in the Commission's enabling act, particularly whether the worksheets concentrated prison capacity among violent/chronic offenders, diverted less serious offenders to non-prison options, and ensured fiscal responsibility. At a minimum, the Commission sought to ensure the proposed sentencing standards were "bed space neutral" compared to the baseline forecast, and had the ability to determine the impact the standards would have under different judicial compliance scenarios. To this end, the Commission simulated several hundred different worksheet configurations (factors, weights, non-prison options, and prison term ranges). Because the new sentencing standards included offenses that account for 87% of the most frequent felony convictions, approximately 13% of the convictions would still fall under the existing sentencing system. Additionally, the Commission established a 75% voluntary compliance goal to assess successful utilization of the new standards.[7] To deal with the remaining 25% of worksheet cases, the simulation model still needs to include the baseline model to sentence these offenders under existing statutes (imposing statutory enhancements) which apply if judges sentence outside of the standards' recommendations. Given the successful forecast with the baseline model, the Commission and Legislature had confidence that the Commission's proposed sentencing reform would produce the intended results.

Phase 3: Creating a Seamless Simulation Model

Once the Alabama sentencing standards were adopted, the third phase integrated the disparate modules into a seamless simulation model, while also laying the foundation for the introduction of time-served sentencing standards scheduled for implementation in 2011. During the time the Commission was building the initial sentencing standards, the system mechanics were in a constant state of flux, changing almost weekly with new data, worksheet factors, weights, and other sentencing modules. To accommodate these changes, Commission staff and contractors had to rely on SPSS for data analysis, as well as ad hoc simulation programming, to accommodate the revisions at least until the Commission agreed on and adopted the mechanics.

Using the National Institute of Justice grant, Phase 3 was initiated to tie the disparate parts together into a user-friendly simulation model interface that could accommodate future Commission revisions using only dialog boxes and interfaces rather than specialized programming. In the past, Commission staff relied on a series of complex database management tasks and programming to prepare the data for simulation. Additionally, as the Commission modifies and creates new worksheets, adjusts factor weights, narrows or widens prison ranges, and expands non-prison (community corrections) options, in-house Commission staff will now have a user-friendly platform that performs many of these tasks. In Phase 3, the Simul8 model was integrated with Microsoft SQL-Server Desktop Engine (MSDE) and Visual Basic.Net to build a control dashboard to manage the hundreds parameters in Alabama's sentencing standards. These changes will allow for easy expansion as the Commission adds new worksheets, adds factors, adjusts weights, and modifies sentencing ranges.

Validation of the Simulation Model

The first prison projection of the Alabama Sentencing Simulation model was conducted in December 2004, and was based on the assumption that prison admissions would remain relatively constant over the next five years. Comparing this forecast of projected prison populations over 24 months later, it was determined that the prison population projected by the simulation model was only off by .87% from the actual prison population - an error rate of only .87% in the projection model. A year later, the error rate had increased to 2.13%; however, as of March 2008, there was a decrease in the error rate to 1.60. The greatest error rate over a 40-month period has been 2.79% and the smallest error rate has been -.01%.

Phase I: Simulation Development: Defining Simulation

Operation researchers rely on discrete-event simulation models to mimic the operation of a real-world process over time (Banks, Carson, and Nelson, 1999). As an inter-disciplinary branch of mathematics and statistics, operation researchers rely on these discrete-event tools to identify the best solution to a complex problem that improves and maximizes system performance. These models are frequently utilized to simulate real world operations in manufacturing, aviation, aerospace, telecommunications, healthcare, financial planning, environmental planning, and transportation.

In criminal justice, researchers also rely on common tools to examine processes over time, especially in the arena of projecting future prison populations. Most population projection methods rely on aggregate offender information to forecast populations. In these models, offenders are grouped into homogenous groups based on selected criteria and incorporated into a flow model or in a statistical (ARIMA) forecast. In a discrete-event model, actual offenders (entities) move through the system from one decision point to another. Depending on the application, the entity could represent a person, shipping containers, airport baggage, medical charts, or any other widget that moves from one place (state) to another. Discrete-event methods offer the best analytical solution to replicate actual operations to simulate plans (in such fields as architecture and engineering) to assess the impact and identify the best operational solution to optimize a system. Planners rely on the models to provide policymakers with an experimental platform to investigate a wide range of “what if” scenarios in a risk-free environment. That is, simulation models allow users to assess proposed solutions (policies) without jeopardizing system integrity, utilizing resources or introducing irretrievable problems into the actual operation.

A discrete-event system is one in which the “state” of the system changes at discrete, albeit random, time points, referred to as event times (Schriber and Brunner, 1998). For example, the number of inmates in a prison system represents a discrete system state variable that changes with each new discrete event – arrival or departure of an inmate. More than other simulation tools, discrete-event models best describe how offenders move through the criminal justice system, beginning with conviction and ending with release from prison or community supervision.

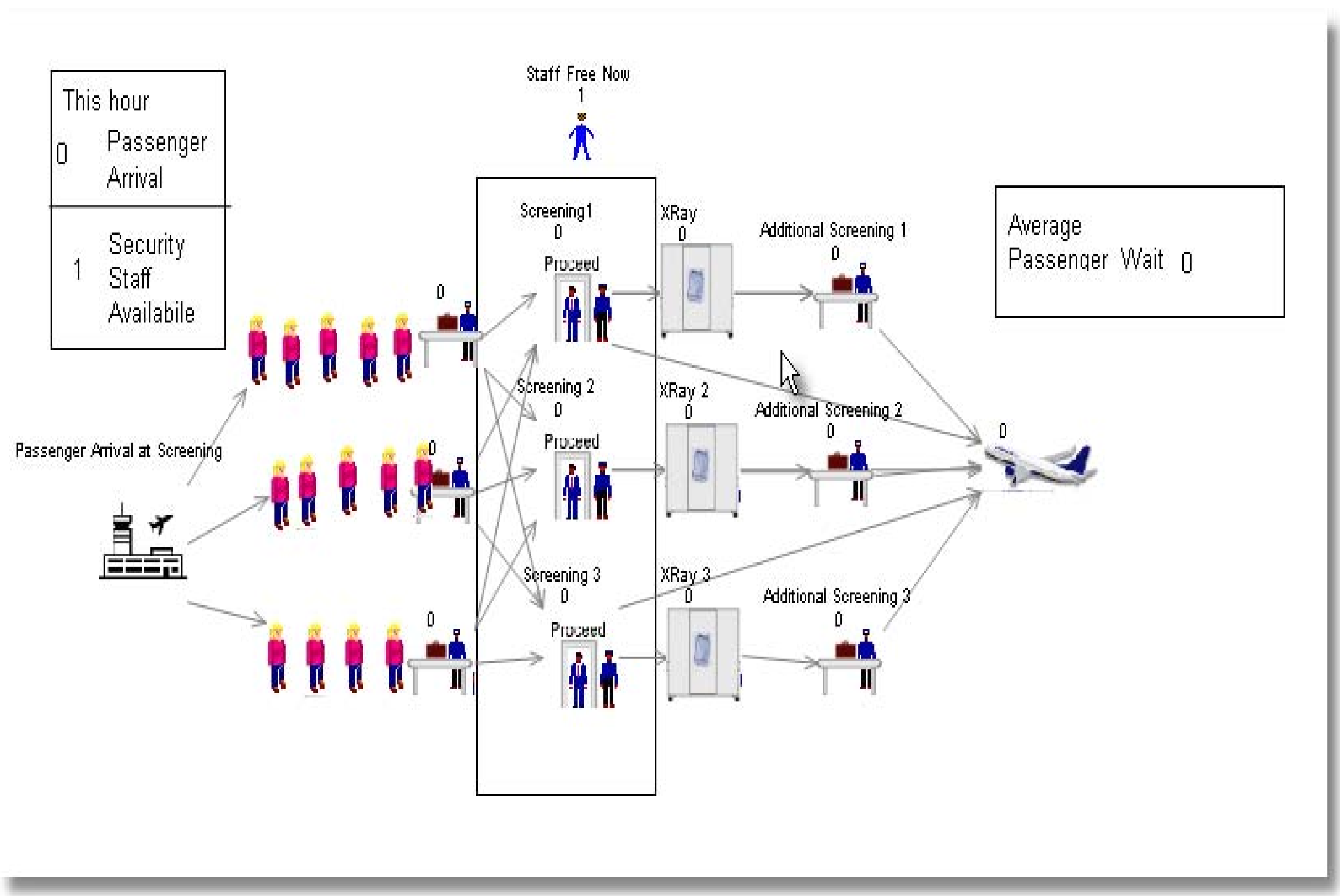
Example: Applying Discrete-Event Software Tools

Before delving into the details of the Alabama Sentencing and Correctional Simulation Model, we present a less complex case to demonstrate key discrete-event concepts and modeling logic – airport security screening. Airport security checkpoints have two competing goals. Security personnel must ensure that passengers and carry-on baggage are searched and secured, while at the same time they must also maximize the speed at which passengers pass through screening. The entire system depends on optimizing the solution to a mathematical problem that ensures secure screening at the highest throughput possible based on available resources (screeners, x-ray machines, metal detectors). This is similar to the criminal justice system. The sentencing/correctional system must move as many people as possible expeditiously through the system, provide sufficient punishment and rehabilitation, and do so in an often unpredictable and resource constrained environment.

Optimizing a system, however, often comes with constraints that must be taken into consideration. While airport officials can control some of these extraneous factors, uncertainty permeates the system: daily staffing, personnel funds, staff training and equipment qualifications, equipment availability (# checkpoints), equipment readiness and reliability, time-of-day, day-of-week, high volume holidays, airline flight schedules, passenger characteristics (e.g., number of business/leisure, children, and elderly passengers). The purpose of discrete-event models is to incorporate structured observational, as well as airport operations, data to reproduce a simulated checkpoint screening point, complete with passengers who mimic actual passengers in terms of carry-on baggage, profiles, children and strollers, as well as other features that eventually influence the efficiency in which passengers move through the screening without delay.

Figure 1 shows the simulation objects in a hypothetical airport screening operations. The graphical objects (people, screening points, x-ray) all contain stored data, formulae, and statistical distributions that meter the flow of passengers through the system in a way that mimics actual screening operations.

Figure 1. Hypothetical Airport Screening Example



Most airports do develop a predictable equilibrium where wait-times are minimized and performance appears optimized. However, each factor mentioned above does vary within a low and high range. Given the nexus among these factors, traditional analytical tools cannot account for this uncertainty, particularly over time. What happens when an innocuous new security policy is implemented during a brief two-week test period and the wait-times experienced no apparent increase? There is only one problem. Did the pilot test experience the full range of possibilities that are likely to occur over the long term: equipment failure, staff shortage, unexpected increase in arrivals (drop in ticket fares, new destinations), or loss of services at a nearby airport? That is, was the new policy tested under panoply of reasonable scenarios?

In the real world, it is impossible to test these scenarios without risking an operational meltdown. With discrete-event simulation models, analysts can run the same simulation model thousands of times (referred to as trials) to examine the probability that measurable events of interest will occur over time, ensuring that all probable events are tested. In the airport screening example, while a worst case scenario is possible, planners need to know what the probability is that this wors case event will occur and whether it is cost justified to plan and fund for such a contingency. As this example demonstrates, discrete-event models allow analysts to manipulate the model as a way to predict the potential impact changes could have on system performance without putting actual resources and operations in jeopardy.

Understanding Data Sources Required for Discrete-Event Models

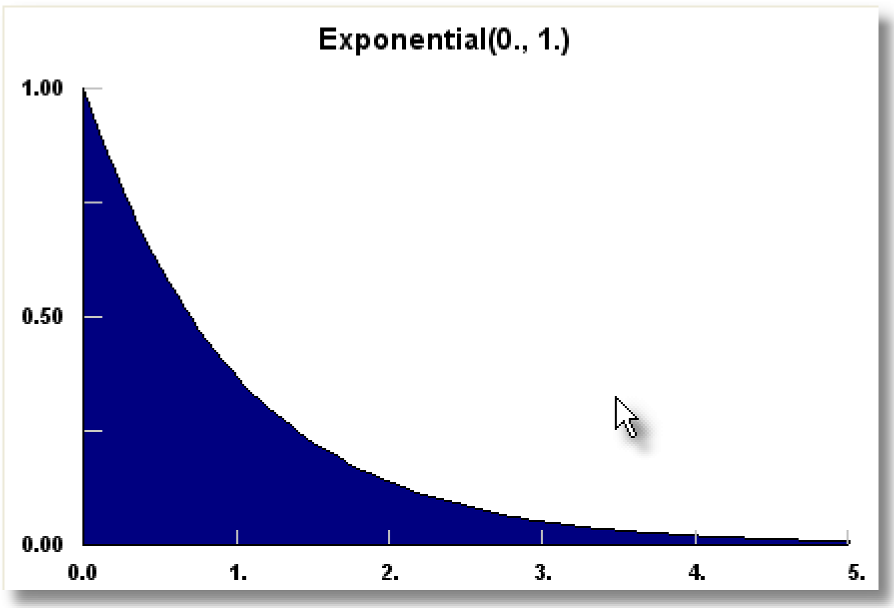
- Building a discrete-event simulation model, depending on model complexity, does entail extensive data collection and analysis. How the data are collected and what analysis may be required varies across models. In the airport screening model, for example, security officials at each airport would probably need to rely on both automated data and samples of observational data collected over time. In the manufacturing sector, operations researchers refer to this as time-in-motion studies. Automated tools, such as handheld devices with customized software, are available to collect timing data on the movement of people through the screening checkpoints, as well as passenger characteristics.

In addition to observational data, analysts can also incorporate statistics from official databases, including equipment outages, staffing, airlines scheduling information, estimated passenger volume connecting from other flights, and other operational data. These data elements represent a snapshot of possible parameters airport officials could capture as part of their data collection project. The next question is how this “sample data” is translated into actual simulation model data.

The analyst moves to the next phase to find statistical distributions (discrete or continuous) that best fit the sample data. Once the best distribution is identified, Monte Carlo sampling methods are used to sample values under these distributions. While statistical fitting software is often used to find the best fit, existing literature or studies conducted could provide the solution. In building simulated records, statistical distributions play an important role in ensuring that the model replicates reality.

To illustrate this point, the exponential distribution shown in Figure 2 below describes the number of minutes it takes to pass through screening successfully for passengers with one carry-on and traveling without children. The observational data collected on passenger screening serve as the parameters for the exponential distribution.

Figure 2. Sample Exponential Distribution Used to Meter Passenger Arrivals During the First 6-hours of the Day



As evident, most passengers will arrive early in the morning while tapering off five hours later. Similar to this example, other distributions and data are used to inform all aspects of the model. Together, the model can be run over a 7-day period and should, if specified correctly, mirror actual passenger screening operations. At this point, the model is ready to accept experimental policies and other processes to measure the impact such changes will have on normal operations. In a criminal justice setting, the same modeling concepts apply. The objective is to build a process model that mimics the flow of offenders through the system, beginning with conviction and continuing through release from prison or other correctional programs. Like the airport example, this model can be built with a modular design, allowing analysts to add additional components and complexity as new issues emerge

Advantages of Discrete-Event Simulation

Banks (1998) enumerates a number of advantages to discrete-event simulation, many of which have important implications for criminal justice applications:

Maintains Unique Offender Identities

Unlike statistical projection techniques and flow models, discrete-event models maintain the unique identity of all offenders as they move through the system. Offender attributes or variables (demographics, prior criminal history, current offense, risk level) move with the offender from point to point in the system. This feature accrues a number of benefits. First, such offender detail in the model provides the ability to implement any rule-based system regardless of complexity, such as determinate, indeterminate, or guideline-based sentencing models. More specifically, it is possible to implement thousands of hierarchical decision trees, probability distributions, and complex rule structures to mimic the actual flow and decisions that form the decision-structure of the criminal justice system. Second, it is possible to examine overall population characteristics at any time during the simulation run of any population (jail backlog, prison, probation, parole) or capture the population characteristics at different points in time (including the future) to assess the changes over time.

Stochastic Processes

Discrete-event simulation models provide the ability to introduce a random or “stochastic” process anywhere in the model using the most appropriate continuous or discrete statistical distribution. In typical software applications used in criminal justice population projections, model parameters are treated as constants because the model does not support random variables at key decision points. To illustrate, consider the probability of receiving a probation or prison sentence. In most cases, analysts are forced to treat this probability as a constant (one probability value for all cases). However, in many jurisdictions, this probability will likely fluctuate over time within a specified range (especially jurisdictions without sentencing guidelines). Discrete-event models allow the analyst to introduce “real world randomness” at any place in the model.

Moreover, discrete-event simulation provides the ability to incorporate time-dependent probability distributions. Such distributions represent situations where the analyst wants the model to automatically change the probability distribution depending on the time-period. It is possible that judges are more likely to sentence an offender to probation if the jurisdiction is faced with a jail-overcrowding problem. Under such conditions, discrete-event models can monitor the local jail census during the simulation run while automatically changing the sentencing parameters to reflect this time-dependent pressure on the system.

Repeated Trials

Discrete-event simulation allows the user to test every aspect of a proposed policy change. In a stochastic model, one simulation run will produce one set of results based on one draw from one random number stream. If a second run is conducted, another random number set is used, thus producing a second set of results. The concept behind simulation is that automatic repeated trials (multiple runs) will cover all highly probable outcomes while providing the user with the ability to test the sensitivity of the model.

Manipulation of Time

By compressing and expanding time, analysts can speed-up or slow-down a process in order to study the system thoroughly. If the objective of a simulation run is to review the aggregate figures at final destination points in a model, then the model can be sped up to run more quickly to reach the conclusion of the run. However, if the objective is to analyze the flow of objects and their movements, then the speed at which the objects flow through the model may be slowed down to more closely examine patterns of movement by the objects in the simulation model.

System Experimentation

Discrete-event simulation allows the user to assess the impact of new policies on system resources, processing times, and the potential for bottlenecks without incurring the expense or time of experimenting with the actual system. Given the complex inter-relationships among system parts, experimenting with the simulation model provides the ability to detect and identify potential problem areas that may be masked by other system events.

Discrete-Event Simulation in Criminal Justice: A Hypothetical Model

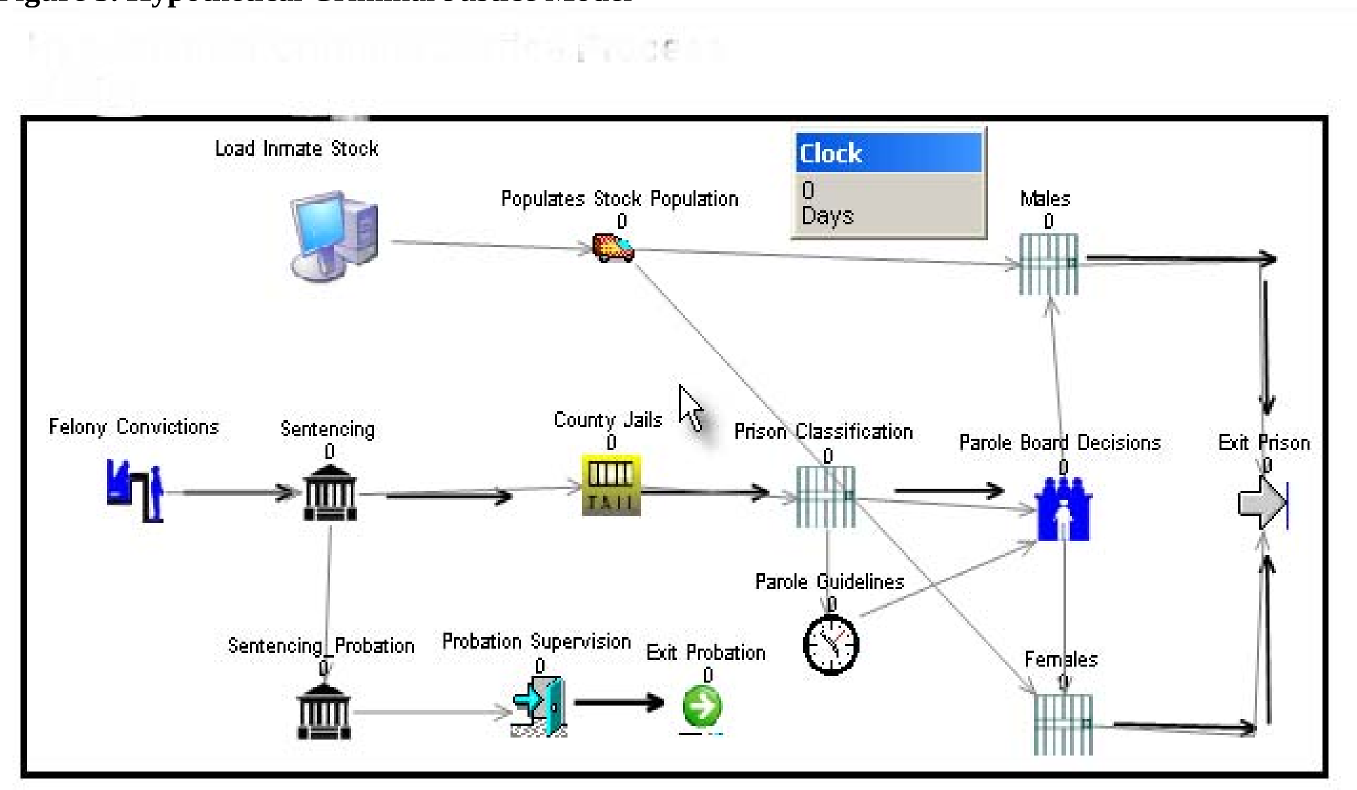
As discussed earlier, a discrete-event system is one in which the "state" of the system changes at discrete, albeit random, time points, referred to as event times (Schriber and Brunner, 1998). In the airport example, the state of the system changes with each new passenger who arrives and departs the screening checkpoint. The same concept applies to a prison system. The number of inmates in a prison system represents a discrete system state variable that changes with each new discrete event – arrival or departure of a new inmate. More than other models, discrete-event models best represent how offenders move through the criminal justice system. Discrete-event simulation models reflect transaction-based systems where units of traffic or entities (offenders) that utilize system resources move (flow) from point to point in the system (Schriber and Brunner, 1998).

In other words, the discrete-event simulation models can replicate the decision-points, offender attrition, and resource utilization of the "classic" criminal justice flow diagram that undergraduates can find in dozens of introductory criminal justice texts. These simulation models consist of a set of assumptions concerning the operation of the system. Such assumptions are grounded in historical observations and data, which are eventually translated into 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).

The discrete event simulation model developed for the Alabama Sentencing Commission was created with Simul8® software. The Simul8® software was selected for the many benefits that it provides users including compatibility with all Windows-based applications, easy-to-use internal programming language, network of trainers and consultants, equivalent functionality to more expensive simulation software, supporting continuous and discrete probability functions, ability to sample from internal data, and the cost effectiveness of the software. This simulation software provides design and programming features that do not require extensive knowledge of computer simulation architecture or the ability to program using high-end languages.

Prior to delving into the details of the Alabama Sentencing Simulation Model, a criminal justice specific hypothetical model provides the best method to explain how key discrete-event concepts are applied later in the larger and more complex Alabama Model. The model will provide specific criminal justice details as a primer for discussing the structured sentencing model. Figure 3 displays an example of a hypothetical discrete-event simulation model to demonstrate key modeling concepts. This model is a graphical representation of the system translated into object-oriented discrete-event simulation software (Simul8®) objects. This figure reflects the object-oriented working palette showing the objects of the hypothetical prison system and their links. This model is organized into six parts: commitments, judicial disposition, sentencing, non-prison, prison, parole, and sentence expiration.

Figure 3. Hypothetical Criminal Justice Model



The links represent the actual path that offenders (entities) will flow along through the system. In the upper right-hand corner, the model displays the system clock. In this prison example, the model runs on a daily unit of time. All transactions (offender movements) occur on a daily basis. For example, if a prison admits 1,500 new inmates per month, the simulation would generate 50 inmates records (entities) a day (including weekends). This daily unit is an arbitrary decision, although a daily time unit does not suggest that these models can perfect macro-level prison population projections to the day. Between the Simul8® objects the arrows indicate a visual representation of a defendant moving from one decision point to the next. In actuality, the defendant's official file containing key variables are traveling along the paths from one decision object to the next until the offender reaches the final destination.

If discrete-event models allow individuals (offenders) to move through the model, what data is used to drive the model and how is it incorporated into the decision-making system? Two methods available in Simul8® are used to introduce new offenders into a simulated criminal justice system. Each option is described below.

Data Source Method #1: Creating Synthetic Offenders Using Probability Distributions

To visualize this method, you have to imagine a blank entity (file) that represents an unpopulated record in a database. Similar to the airport screening example, the model relies on statistical distributions to create offenders synthetically. Based on extensive historical analysis, it is possible to use the probability distribution to assign offender attributes. Below is an example of the possible variables defined for each offender:

- Gender
- Race
- Age
- Offense Type
- Prior Criminal History
- Current Offense(s)
- HIV Status
- Mental Health Status

As offenders enter the module, Simul8® will assign values to the variables based on historical data and appropriate statistical distributions. The creation of synthetic offenders is hierarchical in nature, with assignment of each variable based on the values of the previous variables. For example, the first variable assigned is gender. By nesting distributions within each other, the goal is to ensure that the model's offender characteristics mirror the actual offender population on all variables of interest.

Using probability distributions to create synthetic offenders can yield very accurate simulation results. This approach works well for less complex models or in cases where there is only anecdotal sample data available. Unfortunately, in most criminal justice sentencing/correctional models this approach is simply not feasible. Offender characteristics are so intertwined and related to sentencing and correctional decisions, it is almost impossible to build probabilities that realistically to reflect the diverse prison population.

Data Source Method #2: Actual Inmate Records

The preferred method is to import actual offender records from existing sentencing and correctional databases. This approach ensures that offender attributes and prevalence are consistent with reality. In this hypothetical prison example, only two data sources are required: the existing prison (stock) population and the rate of historical prison admissions. The stock population is the inmate population currently under the jurisdiction of the correctional authority. More complex models allow analysts to include correctional subpopulations based on classification levels, status (work-release, jail backlog) and other variables of interest. The analyst must decide what variables to incorporate into the model, based on both model objective and data availability. In addition to the stock population, the simulation model imports new prison commitments. The model samples records containing the same variables as the stock population, from the commitment database and introduces them for sentencing and processing as if it were a new case. Sampling methods are available to ensure that the same records are not introduced in the same time period.

How Do Discrete-Event Models Control Commitment Rates?

The commitment module is where offenders enter the criminal justice system as a new court commitment. A new court commitment is an offender who is receiving a new sentence for a new crime (does not include revocations of defendants on probation or parole, but could include defendant's on probation or parole who are subsequently convicted and sentenced for committing a new crime). The purpose of the commitment module is to meter the flow of offenders into the model based on admission projections. In all discrete-event models, projected commitments are identified outside the simulation model. ARIMA and other statistical methods of projecting admissions to the model are appropriate and allow expert opinion and judgment about such issues as judicial staffing, law enforcement economy, and policy direction. The simulation model randomly selects new commitments on a monthly basis according to the commitment projection and continues to admit new offenders at the established rate. This provides analysts with the capability to test different admission rates to measure the impact on the overall prison population. Such scenarios could include, for example, a no-growth, 1% growth, or a growth rate derived from a statistical forecasting technique.

Sentencing

Continuing with the hypothetical criminal justice example, sentencing is the next step in the process. At this critical juncture, judges decide whether defendants will receive a prison term or non-prison (probation) sanction. In Simul8® the objective is to identify variables and corresponding probability distributions that predict this decision point. Because the model maintains the unique identity of the offender, sentencing decisions may be directed by an established rule-based system. This would include statutory mandatory minimums that automatically route select offenders to prison or diversionary programs. Rule-based systems give the analyst the opportunity to apply hundreds of complex rules to control the movement of offenders through the system.

The process of designing the sentencing module is specific to each jurisdiction depending on the set of variables that best predict sentences. The objective is to identify a set of offender characteristics that, when taken together, reduces the variance in sentence length, thus providing an accurate estimate of sentence length for each offender in the model. If the defendant is sentenced to a prison term, the next decision point is to set the court-imposed sentence length using appropriate rules specific to each offense and offender record and the sentencing model under investigation (determinate, indeterminate, guidelines) and/or the most likely length-of-stay. At this point, the analyst needs to be very familiar with the data.

Theoretically, the exponential distribution shown earlier is often viewed as the best fit when describing sentencing patterns among a homogenous group of offenders. Unfortunately, in the real world, very few sentencing patterns follow the clean, continuous shape of the exponential or even the similarly shaped lognormal distribution. Instead, sentence distributions are often characterized by peaks and valleys with most sentences clustering around three, five, and seven year increments (judges tend to pick numerically odd year sentences). Thus, judicial prison terms do not mirror continuous statistical distributions, but rather reflect distributions that best fit a discrete probability profile. If the observed distribution is impossible to model, one can use discrete-event models to sample values from the actual sentencing database. In Simul8®, the data supporting the statistical distributions reside in an internal database populated at the beginning of a simulation run. When a specific value needs to be assigned, the model can randomly sample values from the population of historical prison admissions.

In our hypothetical criminal justice example, the Simul8® objects demonstrate the flow of offenders through sentencing, prison classification, and parole board decision-making. Other programs and system paths can be added if the data are available: intermediate sanction programs, short-term incarceration, intensive probation supervision, community corrections diversions, and post-release parole supervision. These objects represent "storage bins" where new, synthetically created offenders and stock population are held during the course of the simulation run. Offenders remain in these bins until their individual "time-to-serve value" expires (referred to as "shelf-life" in Simul8®). Upon shelf-life expiration, the offender moves to the next decision point in the model. If the offender spent 100% of his court-imposed sentence in prison, the defendant will be discharged from prison to the community. If the offender is released early (prior to 100% time served), the inmate moves to the post-release supervision bin to spend the balance of his sentence. In some jurisdictions, such as Alabama, offenders may be required to spend time on probation following their prison supervision period (split sentence), spend time in an intermediate sanctions program or, as envisioned under Alabama's proposed truth in sentencing standards, serve a specific mandatory term of post-incarceration supervision as a part of the sentence imposed.[8] In such cases, the simulation logic would route the offender to the appropriate storage bin depending on their sentence. Simul8® does not impose any limits on the number of offenders serving time in a storage bin or in the number of storage bins in the model.

Simul8® also permits multiple release policies to be in effect simultaneously, with each policy tailored to individual offender groups. This is typically found in systems where inmates are sentenced under different statutes or sentencing systems – determinate, indeterminate, or guidelines. The following list highlights selected release policies that can be in effect simultaneously for any combination of offender characteristics:

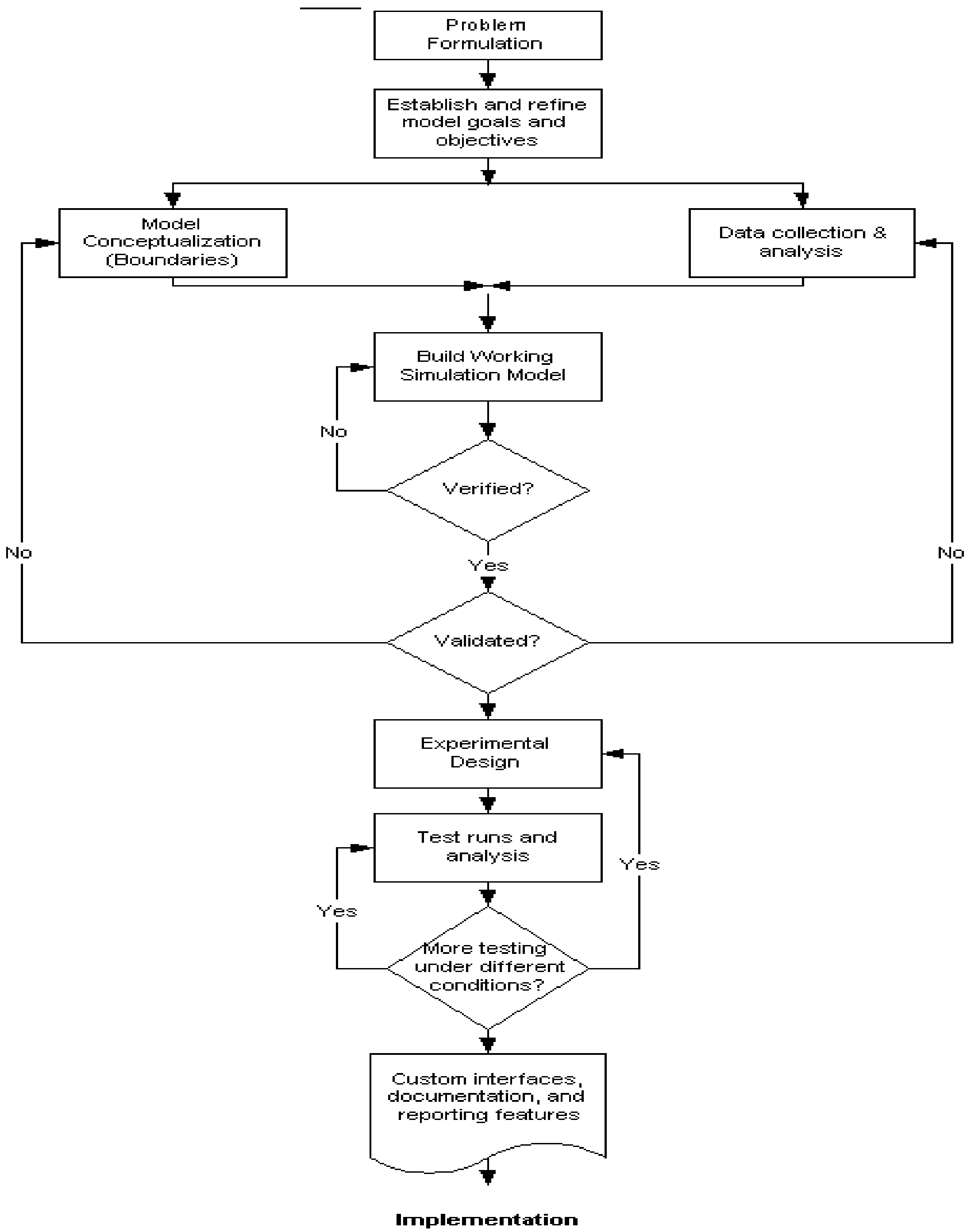
- Expiration of court imposed sentence
- Release based on percent (%) of time served
- Release based on minimum time (months) served
- Release date set with sentencing or parole guidelines
- Releases dates set based on prison operating capacity and inmate characteristics

This flexibility allows the user to replicate a system under transition where the prison population is likely to have inmates sentenced under two to three different sentencing systems (discretionary parole release, good-time eligibility, determinate, presumptive guidelines, etc.).

Design of the Alabama Sentencing Simulation Model

Banks, Carson, and Nelson (1996) recommend a specific algorithm to follow when building simulation models, which has become the *de facto* industry standard to design and build simulation models (see Figure 4 on the following page). This algorithm served as the outline for the development of the Alabama Sentencing Simulation Model. The following discussion describes each step in the design process.

Figure 4. Recommended Simulation Model Algorithm



Adapted from Discrete-Event System Simulation, 2nd ed, Banks, Carson, and Nelson (1996)

Problem Formulation

Problem formulation is perhaps the most critical phase in simulation modeling. Until this simulation model, Alabama did not have a scientific methodology to forecast prison populations. Without a proven projection platform, the Alabama Sentencing Commission faced significant problems as it undertook a project to overhaul the State's indeterminate sentencing system and replace it with voluntary, structured sentencing standards. There was a critical need for an accurate tool to forecast the prison population under the current system, while at the same time building a tool with the flexibility to experiment with a new, yet to be developed, structured sentencing system. These requirements posed formidable problems. On one level, the State needed a model to forecast the future prison populations under the status quo system in the event the Legislature failed to embrace structured sentencing. At the same time, the State needed a flexible platform to build a new system with requirements that could be revised easily as the Alabama Sentencing Commission and the Legislature deliberated over mechanics and the structure of the proposed sentencing standards.

Goals and Objectives

The next step was to establish a detailed plan describing specific simulation model objectives. Given the almost unlimited capabilities of discrete-event models to mimic a system, establishing clear objectives and system boundaries is essential. Three principal objectives were defined:

1. Develop a simulation model that can support two sentencing models simultaneously (current and proposed). As a voluntary system, some judges may embrace the sentencing standards while others will continue sentencing under the legacy system.

2. Develop a simulation model that can accommodate Virginia-style judicial worksheet sentence recommendations where worksheet points and scores are translated into structured sentence recommendations.

3. Identify the optimal mix of prison/non-prison recommendations, worksheet factor points, and sentencing ranges to guarantee that violent and sex offenders spend more time in prison, while also making the overall system bed-space neutral.

As the starting point, these objectives were guided by hypothetical scenarios that both the Sentencing Commission and Legislature would inquire about prior to instituting a voluntary, structured sentencing system. The model would be required to answer very specific questions:

1. If Alabama does nothing (status quo), what is the projected prison population over the next 5 years, including work-release, incarcerated offenders and other state inmates under the jurisdiction of the Department of Corrections?

2. What is the impact on the projected prison population of adopting Virginia-style sentencing worksheets?

3. What worksheets, factor weights, and in-out thresholds should be modified to ensure that violent and habitual offenders would serve more time in prison, while identifying less serious offenders for alternative, non-prison sanctions?

4. What is the projected prison population impact of each worksheet modification?

5. If adopted, what level of judicial compliance would be required to reduce the projected prison population growth compared to the status quo model?

6. What is the projected impact on the prison population if the structured sentencing standards are adopted, judicial compliance reaches 75%, and there are no changes in parole practices and prison good-time credits?

7. How can the model ensure that judges who do not comply with the new standards continue with historical sentencing practices?

Model Conceptualization

Based on the problem formulation and goals, the next phase was to build an abstract representation of the system. This includes a series of mathematical and logical relationships that define the system structure under investigation. This phase included drafts and edits of flow charts, diagrams, and actual mock-up simulation models. During this phase, the project team established system boundaries to ensure the model did not include non-relevant system processes. This phase included identification of model decision points, logical relationships, data inputs, offender flow and decision processes, and system rules and operating criteria.

As a design principle, Banks (1998; 2000) recommends the construction and validation of a limited model. This limited model represents the backbone of the full simulation model. Once validated and proven, the basic model can be expanded to include all remaining model components and decision processes. Such an approach constitutes a modular design method, which makes it easier to test and validate each module before incorporating it into the larger model. A valid baseline is the critical benchmark by which all proposed changes are evaluated for impact. As each module is validated, another layer is added until the structured sentencing system is finally incorporated

Baseline Model Construction

Using the data and goals and objectives, the first step was to build a simulation model to mimic the flow of offenders under the status-quo or baseline model. Because Alabama did not have an existing projection model, the baseline model was needed to measure the impact the proposed voluntary sentencing guidelines would have on the system if implemented. The baseline data collection phase consisted of a detailed inventory of the data needed to support a model. After an extensive review, the following agency databases were selected to develop the model:

1. The Administrative Office of Courts (AOC) maintains court records for all felony convictions including filing, disposition, and sentence information. AOC is charged with: providing centralized, state-level administrative support necessary for the operation of Alabama's court system; the development of procedures and systems to enhance the operational capacity of the courts; and the collection and dissemination of information necessary for the development of policies to promote the more efficient operations of the courts.

2. The Alabama Criminal Justice Information Center (CJIC) is the Alabama state agency responsible for gathering and providing critical information for law enforcement and the criminal justice community. The Commission specifically obtains arrest records of offenders in Alabama.

3. The Alabama Department of Corrections (ADOC) is responsible for confining, managing and providing rehabilitative programs for convicted felons in Alabama. ADOC maintains data on the felony offenders who are admitted to prison, actively serving a prison sentence, and released from prison. This data includes active inmate populations by facility, prison admissions and releases, and incarcerated offenders' length of stay.

4. The Alabama Board of Pardons and Paroles provides adult probation and parole services for Alabama. Parole data includes paroles, pardons, restoration of voting rights, presentence, pre-probation, youthful offender and other investigations and reports provided to the sentencing court. The Board collects data on offenders ordered to serve probation as a condition of their sentence and offenders released under parole supervision. Parole data also captures pre-/post-sentence investigative reports that are required to be completed for all convicted felons, which captures offender demographics, details of the offense, prior criminal history, and current and past use of drugs and alcohol.

5. The Sentencing Commission relied on existing data maintained by various agency information systems, as well as initiating a number of data collection projects to fill gaps in Alabama's existing records system. This included collection and analysis of defendant presentence investigative reports and surveys of county jails, community corrections programs, and drug court programs.

Data gathered from these sources were used to build several cohorts to feed the discrete-event simulation model:

1. *Admission Cohort*. The simulation model utilizes the ADOC's most recent one year of admissions to describe demographics, jurisdiction, and type of admission (new court commitment, probation/parole revocations, date of admission, date of first release, sentence length, most-serious offense, risk classification data, and other offender characteristics). To measure prior criminal history, the AOC and the CJIC were used to identify prior convictions and arrests.

2. *Stock Population.* This population represents the actual inmate population under ADOC's jurisdiction. The file is imported at the time the model generates a projection. In terms of variables, this cohort is identical to the admission cohort, with an additional field measuring the time-served since last admission.

3. *Release Cohort*. To estimate length-of-stay (LOS), a cohort of ADOC's historical prison releases is used to describe offenders released over the past 24 months. To measure LOS, several key measures are required: admission type (revocation, new court), sentence length, effective sentence date, date of first release, most-serious offense, AOC/CJIS measures of prior history measures, and release type (expiration-of-sentence, parole release, and split sentence release).

Supplement Data Sources and Issues

To estimate whether an offender received a prison or non-prison sanction, the model utilized the AOC's transaction database. This database captures whether offenders were sent to prison or given a non-prison sanction, such as probation or community corrections. However, a problem was identified. Many offenders who were sentenced to prison were never actually admitted at the main prison classification facility. These offenders either spent their incarceration term in jail or the judge later amended their sentence. To ensure the model determined properly what factors influenced the prison vs. non-prison decision, an extensive statistical analysis and matching project was undertaken to merge AOC data with actual ADOC admissions.

Because the discrete-event model uses recent prison admission as model input, estimating LOS in prison is a challenge. The easiest LOS estimates are based on established legislation governing LOS, such as mandatory minimums that dictate a minimum sentence for specific offenses. Because the simulation will be used primarily to generate five year projections, offenders with mandatory minimums exceeding five years present no estimation problems because they will remain in the stock population. To estimate LOS for the remaining offenders, a complex set of probability distributions were built to take into consideration admission type, admission offense code, release type, sentence length, and prior criminal history. Each distribution reflected the percentage of time served of the original sentence and/or the amount of time left to serve if the offender was revoked from probation or parole. Together, there are over 150 distributions used to estimate LOS in the Alabama model.

Selected Simulation Software

Today, simulation software falls into two general categories. The first category consists of general-purpose, high-end programming languages (e.g., SIMAN) similar to C++. These programming languages demand extensive in-house expertise and knowledge of computer simulation architecture and design. Such languages serve as the programming backbone for commercial-off-the-shelf packages, or they are used to build specialized models in high-end simulation environments (e.g., Department of Defense).

The second category consists of commercial-off-the-shelf software structured for end-users to design, build, and operate simulation models without extensive knowledge of computer simulation architecture (e.g., Simul8®, ProModel®, ARENA®, Witness®). These packages have a proprietary programming language that facilitates design and programming. The Alabama model was built using Simul8® Professional Edition as the platform. Simul8® was selected for several reasons:

- Simul8® has an open architecture and is thus compatible with all Windows-based applications, such as Excel and common enterprise-wide databases and programming languages, such as Access, Oracle, SQL server, and Visual Basic. Simul8® can also operate within Visual Basic programs or front-end applications.

- Simul8® has an easy-to-use internal programming language (Visual Logic), making it easy for the end-user to make ad hoc changes to the underlying logic without specialized training.

- Simul8® is an internationally recognized software application with an extensive network of trainers, consultants and on-line support, ensuring that the Commission staff will always have access to national/international experts and training if the need arises.

- Simul8® has all of the functionality of other, more expensive simulation packages. In fact, the principal architect and designer behind Simul8® was the chief software engineer behind Witness®, a high-end, AT&T simulation product.

- Simul8® supports a Business Viewer application (similar to Adobe Acrobat) that allows users who do not own Simul8® to run and operate simulation models or to run the model on a web site.

- Simul8® supports 25 continuous and discrete probability density functions, as well as the technical capability to sample from actual data stored in an internal spreadsheet if existing distributions do not fit the data adequately.

- Simul8® Professional Edition is significantly less expensive than competing products, making upgrades or multiple licenses affordable for government agencies.

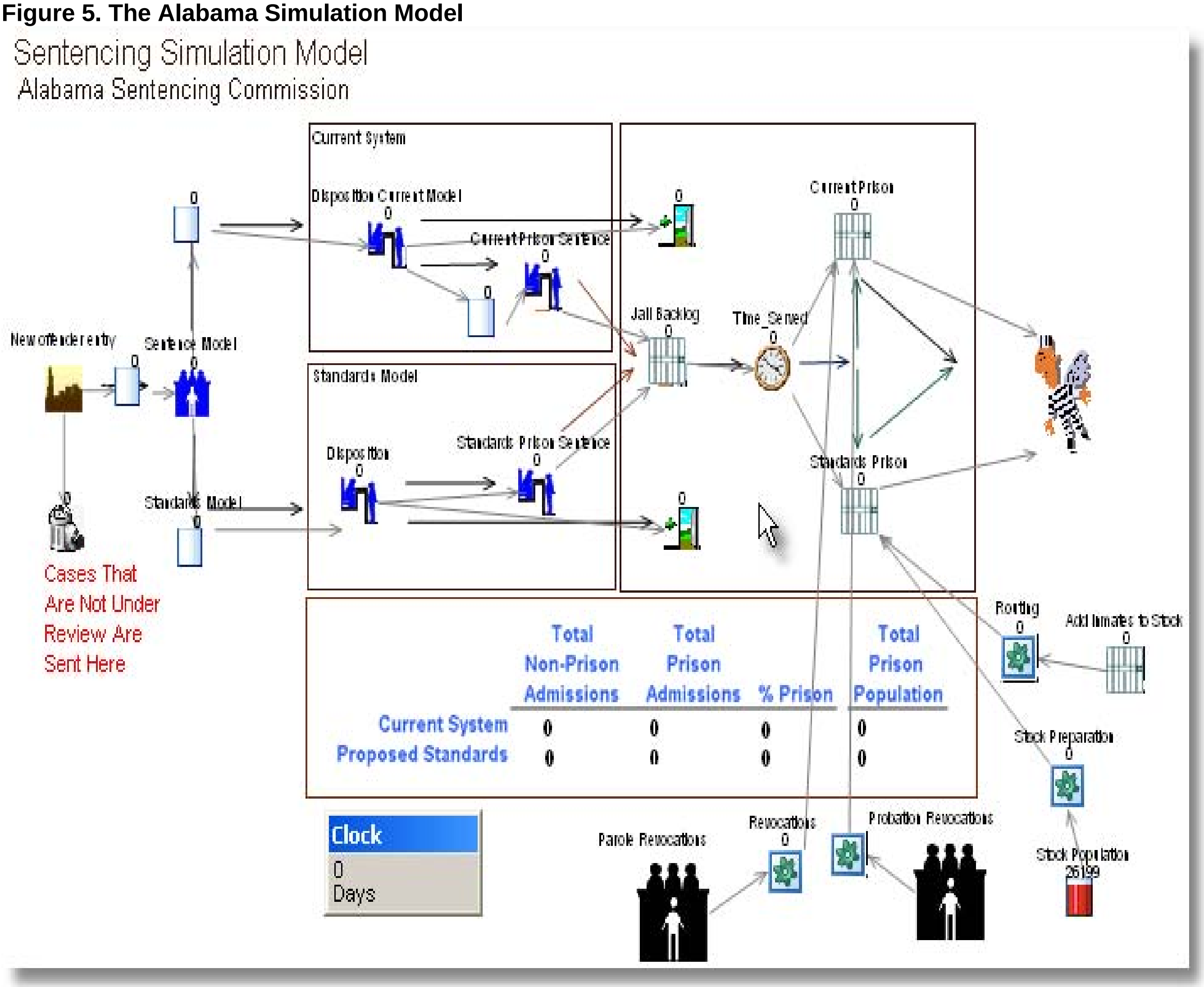
<u>Ad-Hoc Amendments to Underlying Model Logic</u>

As Alabama considers different sentencing reforms, it is essential for the Sentencing Commission staff to be able to make ad hoc changes to the simulation application without the need for additional consulting contracts or technical assistance. Simul8® provides the building blocks required to make model changes. The Alabama Simul8® model is not designed like other products that may consist of C++, FORTRAN, Visual Basic.Net, or SIMAN simulation programming code. In those products, it is impossible, even with extensive knowledge of the language, to decipher the source code given the proprietary nature of the internal logic, algorithms, sub-routines, and overall design structure of the model. If developers provided the source code, which is unlikely, it would take considerable time and assistance from the developers to modify the model. On the other hand, Simul8® is designed to accommodate ad hoc amendments to a simulation model. Simul8® provides the user with drop-down dialog boxes, menus, and end-user programming language (Visual Logic) allowing subsequent modifications to the model. Simul8® offers the user a wide range of dialog boxes to build the model, make changes, and build customized user prompts and displays.

The Alabama Sentencing Simulation Model

Figure 5 below displays the Alabama Sentencing Simulation Model. While the model started with a baseline configuration it has been amended to include objects and programming logic to support analysis of the proposed voluntary sentencing standards.

Figure 5. The Alabama Simulation Model



In the model, the Alabama Sentencing Commission can test the impact of different proposed sentencing standards against a baseline (status-quo) model. As the simulation paths reflect, in cases where the judge elects not to sentence the defendant under the guidelines, the offenders are re-routed to the "current system" model for sentencing based on existing historical practice. This feature gives the Sentencing Commission the opportunity to test different standards while also manipulating expected and desired compliance.

Baseline Model Validation

The Alabama Sentencing Simulation Model produced its first baseline projection in December 2004. This allowed for a validation period of the past 39 months in order to compare projected and actual prison populations. This extended validation period provides sufficient data to evaluate whether the simulation is performing as intended. In December 2004, the baseline projection assumed relatively constant prison admissions over the next five-year period. Evidence at the time suggested that much of the Alabama prison population growth stemmed from mandatory sentencing practices, parole release practices, and other sentencing options that increased LOS. While fully expecting a new projection would be required to adjust for changing commitments, the trends over the first 30 months remained stable and the projection was not adjusted.

Figure 6 compares the projections made in December 2004 to the actual prison population over the past three years. The projection model remains very close to the actual prison population while never exceeding an error rate of 3%. The highest error rate occurred in the summer of 2007 when Alabama experienced an unexplained spike in prison admissions (the Sentencing Commission is currently working with the ADOC and the AOC to account for this increase).

Since 2007, commitments have returned to their pre-2007 commitments rates, resulting in a steady decrease in the difference between the actual and projected populations. In March 2008, 40 months after preparation, the projection model error rate was 1.6%.

Figure 6. Baseline Performance of the Alabama Simulation Model

Month	Error Rate %	Month	Error Rate %	Month	Error Rate %
Jan-05	0.88%	Feb-06	0.15%	Mar-07	-0.72%
Feb-05	0.34%	Mar-06	-0.59%	Apr-07	0.86%
Mar-05	0.12%	Apr-06	-0.24%	May-07	1.62%
Apr-05	0.20%	May-06	-0.69%	Jun-07	2.36%
May-05	0.54%	Jun-06	-1.05%	Jul-07	2.79%
Jun-05	-0.01%	Jul-06	-1.54%	Aug-07	2.06%
Jul-05	0.44%	Aug-06	-1.53%	Sep-07	2.36%
Aug-05	-0.18%	Sep-06	-1.43%	Oct-07	2.63%
Sep-05	-0.74%	Oct-06	-1.78%	Nov-07	2.52%
Oct-05	-0.26%	Nov-06	-1.31%	Dec-07	2.13%
Nov-05	-0.23%	Dec-06	-0.87%	Jan-08	1.89%
Dec-05	-0.32%	Jan-07	-0.71%	Feb-08	2.30%
Jan-06	0.07%	Feb-07	-0.92%	Mar-08	1.60%

Phase 2: Incorporating Sentencing Standards into the Simulation Model

In Phase 2, the baseline simulation model was expanded to include the modules needed to support the Sentencing Commission's development of sentencing standards. This model component involved extensive manual data collection, statistical analysis, and simulation programming. As shown in Figure 5, the baseline simulation model includes a separate set of programming objects that score cases under proposed sentencing standards. In this module, the model has three essential tasks.

First, the model must determine whether the new offenders fall under the purview of the sentencing standards because not all felony cases are covered under the standards. If the case is not eligible, the offender is routed to the baseline (current) simulation module for sentencing and time-served estimation under the existing system. The same applies to cases randomly selected for judicial non-compliance, choosing instead to sentence the offender under the existing system and not the sentencing standards. The initial assumption was that judges would sentence outside the new standards in 25% of the cases.

The second module is far more complex and incorporates data from a year-long data collection effort to cull critical data from manual presentence investigation reports, such as prior criminal history, weapon use, victim injury, and other factors not available in the existing AOC or ADOC databases. These data were analyzed and translated into a series of complex statistical distributions (discrete and continuous) to estimate the worksheet score the offender would receive if scored under the proposed standards.

The first worksheet uses individual offense and offender characteristics to estimate a score which is used to recommend whether the judge should impose a prison or non-prison sanction. This decision was based on an adjustable model parameter with a Commission defined threshold. Offenders who scored under the Commission defined threshold would receive a non-prison recommendation while scores above this threshold would receive a prison sentence recommendation. The Commission used this adjustable policy parameter extensively in the simulation model for different offender groups (personal, drugs, property) to assess the impact different scores and cut-points would have on future prison populations. This interactive modeling process occurred throughout Commission deliberations.

If the offender was assigned a prison recommendation, the model routed the offender to the next sentencing phase and worksheet. Similar to the worksheets used to produce a prison or non-prison sanction, the simulation model relied on extensive worksheet factors and probability distributions to assign a worksheet score. This score is used in conjunction with a prison term recommendation table to assign a sentence. Without any data to guide how judges will sentence an offender within the recommended range, the Commission experimented with several statistical distributions (e.g., uniform, triangular, normal, beta, and truncated exponential).

In the final module of the simulation model, the cases scored under the sentencing standards were routed to the existing parole release and good time credit module where a LOS was assigned based on probability distributions unique to release type, current offense, prior criminal history, sentence length, habitual offender, split/non-split, and other factors. In the initial set of standards, the Legislature established recommended sentences to provide uniformity across the state with respect to the court imposed sentence. During this preliminary phase, the existing release mechanisms (parole, good-time) will still be in effect, at least until Alabama moves to the last phase – time-served standards.

Given all these individual decisions, the discrete-event simulation methodology was the only way to account for detailed sentencing rules unique to individual offenders. At the same time, the Commission was engaged in an extensive and ever changing process to investigate different offender factors and weights, sentencing ranges, options, and decision points to guide the prison or non-prison sentence recommendation. Overall, there were over 500 adjustable policy parameters reflecting worksheet factors, weights, cut points, prison ranges, and other elements. Given the flexibility of the simulation model, ad hoc amendments to the underlying logic were essential to accommodate the hundreds of Commission revisions. The NIJ-funded portion of Phase 2 allowed the Commission to continually modify the model and adjust its parameters to identify the best set of standards that met Alabama's legislatively mandated goals.

Phase 3: Seamless Integration of the Simulation Model

During Phase 2, the simulation model was in a constant state of flux as analysts responded to changing Commission requirements and standards. To accommodate these changes, Commission staff were required to make frequent programming changes to the underlying simulation code, as well as use statistical software tools (SPSS) and Excel to prepare the data to support the model in terms of data requirements. Until the Commission adopted a final framework, it was not cost-effective and was a misuse of staff time to institute any permanent programming changes or incorporate user friendly interfaces. While analysts did rely on Simul8 capabilities to create temporary dialog boxes and user interfaces, Phases 1 and 2 identified several new functional requirements related to data management and preparation, as well as features desirable to support future and inevitable revisions to the sentencing standards. As a result, the Sentencing Commission identified the following three model enhancements to integrate the disparate components seamlessly into an easy-to-use simulation model that meets the specific Commission demands.

Model Enhancement #1: Front-End Data Pre-Processing

Commission analysts currently spend a substantial amount of time using SPSS and other tools to pre-process correctional and court databases in order to support the simulation model. This pre-process includes extraction of raw data from various computer systems (with varying platforms), data cleaning and editing, and quality control processes to transform the data into variables that can be analyzed and fed into the model. The creations of the ADOC inmate cohort and the AOC offender cohort are two of the major tasks that must be completed to supply the simulation model with the needed information to make prison population projections.

The first critical database that is utilized to support the simulation model is the ADOC inmate cohort. This database analyzes prison data such as demographic information, the number of previous incarcerations per inmate, the number of sentences per incarceration per inmate, and each movement the inmate makes throughout the prison system. There are four main ADOC data tables used by Commission staff to create the ADOC inmate cohort: (1) general information table, (2) inmate table, (3) initial sentence table, and (4) transfer leave table. The general information table includes information on the inmate's race, sex, education level, family status, military service, and employment status. The inmate table includes information on the inmate's incarceration including admission type, total sentence length to serve, minimum release date, maximum release date, good time credit, and institutional placement. The initial sentence table includes a record for each sentence per incarceration per inmate. For each sentence record, this tables includes the specific offense information for each incarceration, sentence length for each incarceration, county of conviction, and if this inmate is a habitual offender. The transfer leave table contains a record for every movement the inmate makes within the correctional system. For example, if the inmate is processed at the receiving center and then moved to a prison facility, this counts as one movement (one record). If the inmate is then transferred to a work release program, this counts as a second movement. In addition, this table also captures all release types by the inmate (e.g., parole, expiration of sentence, the beginning of the probation portion of a split sentence). The variables contained in the ADOC inmate cohort are listed in Tables 1 - 4 of Appendix B.

The second critical database that is utilized to support the simulation model is the AOC offender cohort. This database contains offender conviction and sentence information. This cohort identifies the most serious offense at conviction and the sentence given in the particular sentencing event. There are two main data tables within AOC: (1) disposition table, and (2) sentence table. The disposition table includes information such as the arrest date, filing date, indictment date, offense literal, offense classification, court action, and court action date. The sentence table includes information such as the sentence date, begin date of the sentence, sentence imposed, probation imposed, and court ordered programs. The variables contained in the AOC offender cohort are listed in Table 5 of Appendix B.

The following outline summarizes the steps involved in building and preparing the ADOC inmate cohort that supports the simulation model, as well as the data needed to support general Commission reporting. Together, these steps require approximately one to two weeks of staff time.

Steps to Build the ADOC Inmate Cohort

1. Read raw data files from four tables:
    a. General Information – contains demographic data for each offender.
    b. Inmate – contains multiple incarcerations per offender.
    c. Initial Sentence – contains multiple sentences per incarceration per offender.
    d. Transfer Leave – contains multiple records per offender for each movement an inmate makes within ADOC.
2. Prepare Inmate file:
    a. Compute total sentence length in months.
    b. Compute active inmate's field.
3. Prepare General Information file.
4. Prepare Initial Sentence file:
    a. Create file with new habitual field.
    b. Match to 'Master ADOC Severity' table.
    c. Select only records for which sentence information is present.
    d. Identify the most serious offense:
        i. Total the other offenses (class A, B, C).
        ii. Total the other offenses (category 1-7).
    e. Create file with only most serious offense (IS_MS).
    f. Create file with all other offenses (IS_OS).
    g. Merge data from habitual & IS_OS to most serious file.
5. Prepare Transfer Leave file:
    a. Compute new release field.
    b. Find the first release date.
6. Merge Initial Sentence MS (IS_MS) and General Information files to Inmate table.
7. Create Active Inmate file.
8. Create Admissions and Releases file.

In addition to the ADOC inmate cohort, the Sentencing Commission also relies on dispositions from the AOC. To build this cohort database, which includes both prison and non-prison sanctions, approximately 14 steps are required. Typically three weeks of staff time are required to complete the steps listed below.

Steps to Build the AOC Offender Cohort

1. Import raw data of indictment and conviction records from the AOC Mainframe.
2. Select only felony conviction cases (Master Cases).
3. Create a person file from the Master Cases file (Master People).
4. Match Master People file to P&P file to add the FBI field:
    a. Match by SSN.
    b. Match by court case.
5. Match Master People file to CJIS prior arrest records.
6. Define indictment offenses and count offenses at indictment & define most serious offense.

7. Define conviction offenses and count offenses at conviction & define most serious offense.
8. Spread the convictions into one record per offender.
9. Merge most serious charge at indictment and conviction to person file.
10. Import raw data from AOC Mainframe of sentence records.
11. Create new variables to define sentence information.
12. Compute new variables to compile sentence types.
13. Merge sentence records to conviction records.
14. Add new conviction records to existing cohort.

Given the delay associated with building these databases, data currency lags well behind actual AOC and ADOC real-time data. Although monthly data may not be needed for population projections, the Commission does rely on these data for judicial and legislative requests for information.

SQL Front-End Integration Solution

To streamline this process, enhancements to the current simulation model include MS-SQL Desktop engine and Visual Basic.Net to handle all import and data pre-processing tasks. The first screenshot in Figure 7 on the following page illustrates the import feature to access the ADOC databases. Once the user specifies the location of the databases, the import feature will read the various databases and conduct all AOC and ADOC processing tasks described above. ***During preliminary data runs, total processing time has been reduced from days to less than one hour.*** Although this use of MS-SQL prepares the data for the simulation model, these same cohort files can be accessed easily using SPSS to support routine preparation and distribution of Commission reports.

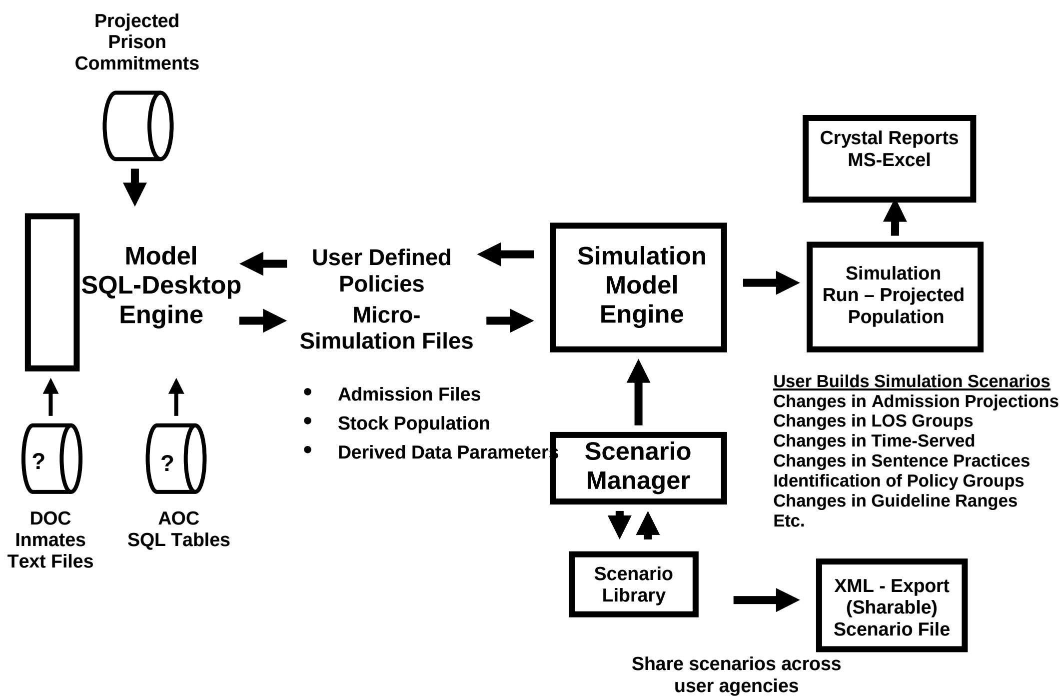
Model Enhancement #2: Simulation Model User Interfaces

In the current simulation model, Commission staff relies on Simul8 simulation programming language to build, modify, and manipulate model parameters or to build new worksheets, incorporating new weights, factors or crimes. This additional workload represents significant staff time, as well as continued dependence on consultants. The second model enhancement incorporates easy-to-use application software (Visual Basic.Net) that utilizes user-friendly dialog boxes and drop-down menus to build new worksheets and modify worksheets parameters. This part of the model gives Commission staff the capability to add, delete, and edit worksheets while also experimenting with different weighting schemes and cut points (see Figure 7 on next page). With this interface, users can build entirely new worksheets as the Commission expands the crimes covered under the Sentencing Standards.

Model Enhancement #3: Scenario Manager

The third simulation model upgrade includes a Scenario Manager designed to create a catalog of different policy scenarios tested with the model. During development of the current sentencing guidelines it became very difficult to manage all the proposed options tested for the Commission. To manage this process in the future, the model now includes an integrated management tool that makes it easy to build and archive new policy scenarios, as well as store separate scenarios with the estimated impact associated with each scenario (simulation results). This gives users the ability to create a new policy scenario, analyze the impact, and save the policy details and results in a library, which always remains available for future Commission meetings or legislative sessions.

Figure 7. Simulation Model Architecture



One reason Alabama adopted discrete-event simulation was the need to incorporate two disparate sentencing systems simultaneously within the same model: an indeterminate system and new sentencing standards. This requirement stemmed from two issues. First, a baseline projection was needed to ensure that the new standards were consistent with the Commission's need to link the standards to correctional resources. Without the baseline, there was no way to know whether the proposed worksheet weights, offender and offense risk factors, and sentence recommendations would not increase criminal penalties and exacerbate an already crowded prison system. The second need for a model that could run two disparate systems simultaneously stemmed from the offenses covered under the proposed standards. The Alabama standards do not cover all criminal offenses so an indeterminate sentencing system module was still needed to generate projections for this population.

Unfortunately, the overall complexity of the model becomes burdensome in terms of data management and analysis. To resolve this problem, Phase III incorporated a new front-end processing component and scenario manager to minimize staff data analysis and model data pre-processing. Figure 7 shows an overview of the simulation model. The source data for the simulation model comes from the Department of Corrections and the Administrative Office of the Courts. These data files contain individual offender records on recently sentenced offenders as well as historical data on previous prison releases, as well as the active (stock) prison population (See codebooks for details). Because Simul8, the discrete-event simulation engine, cannot manage these massive data sets, the simulation model relies on Microsoft SQL Desktop Engine (MSDE) to import and pre-process the records. The MSDE is a desktop version of the same MS-SQL database used in large, enterprise wide database management systems. However, MSDE has no licensing fees and is a free download from Microsoft. It has all the features of its network version but has some development limitations which still require the MS-SQL development version.

Once imported, the MSDE performs hundreds of pre-processing operations required to prepare the data for Simul8 (See Model Enhancement #1, beginning on page 42), including preparation of over 3,000 probability distributions used to estimate length-of-stay in prison. As shown in this figure, data are passed back and forth between SQL, Simul8, and the Visual Basic .Net (Scenario Manager).

The Scenario Manager (see screenshots in Appendix A) is where the model captures and stores different user defined policy scenarios. This might include, for example, new worksheets, worksheet weights, new mandatory minimum sentences, or other legislative or policy changes that could affect sentencing and time-served. After creating a specific scenario, the user executes the scenario which passes commands and user parameters to the SQL Desktop Engine instructing it on what type of analysis is required. For example, if the scenario adds a new factor to the sentencing worksheet, this information is passed to the SQL Engine where it now rebuilds the sentencing records to include this new factor. At this point, SQL rebuilds data while taking into account the proposed policy. After processing the data, the data are formatted and made available to Simul8, which the user imports when ready to conduct a simulation run. In another example, if the legislature passes a statute imposing a new mandatory minimum, the SQL engine will pass this information to Simul8 to ensure that offenders falling under this new statute have sentences that meet the new mandatory minimum requirement. In addition to analyzing and supplying data to the simulation model, Simul8 also passes projection results to the SQL desktop engine where projection results (e.g., monthly prison population count) are permanently stored, along with the scenario used to create the particular set of results. Stored in a SQL table, pre-programmed crystal reports can access the results for reporting or further analysis.

Sharing Policy Scenarios: XML Export

As a stand-alone desktop application (SQL, Visual Basic .Net, and Simul8), there are times when the staff may need to share scenarios with others or download scenarios to their laptop for conducting simulation while traveling. Because some scenarios can be quite complex and detailed, the Scenario Manager has an XML export feature so the user can export specific policy scenarios. Only data about the specific scenario are exported while the data remains on the workstation. It is possible back-up the entire simulation data using SQL back-up feature.

Conclusion

While development and enhancement of the simulation model and the acquisition of an in-house statistician were requisites for the Alabama Sentencing Commission's reform efforts, it is recognized that these are only the first steps in the expected expansion of evidence-based practices throughout Alabama's Criminal Justice System. Agencies and programs throughout Alabama's criminal justice system now realize the importance of stringent data analysis that can only be realized through structured data collection. Through the collaborative efforts of the Sentencing Commission, the Department of Corrections, the Board or Pardons and Paroles, the Administrative Office of Courts, and Association of Community Corrections, the following projects have already begun:

- The complete overhaul of the Department of Correction's database from an antiquated mainframe system to a SQL platform.
- Revision of the Department of Corrections classification system, which can later be incorporated into the Commission's simulation model to forecast the types, as well as the number of beds, that are needed.
- Enhancing the Board of Pardons and Parole's Electronic Presentence Investigation (E-PSI) Reports, which are now statutorily, mandated for all convicted felony offenders.
- Electronic Transcripts (E-Transcript) created from court clerk's offices sent to the Department of Corrections rather than delivery of paper documents.
- Electronic Sentencing Standards Worksheets (E-Worksheets) made available to designated users.

- Improvement and expansion of MIDAS, a case management system for community corrections and court referral programs, to include drug courts.

- Enhancement of NameMaster in the State Judicial Information System, which provides designated users with intrastate criminal history and arrest information.

- Inter-agency discussions concerning further development of information technology services that are responsive to system-wide needs, rather than merely the needs of a particular agency.

Additional improvements and modifications are certainly needed to continue enhancement of the Sentencing Commission's simulation model and to advance other aspects of Alabama's Criminal Justice System. Many of such projects have already been identified and are in the planning or construction phases. However, considering the short period of time in which advances have already been realized, the Sentencing Commission is encouraged and anticipating many more achievements in its future endeavors.

Acknowledgements

Grant funding enabled the Sentencing Commission to secure the services of experienced personnel in data analytics, Applied Research Services, Inc. (ARS), to conduct quantitative analyses during the formative years of the Sentencing Commission and when it did not have a staff statistician. The grant that enabled the Commission to contract with ARS was critical to help establish credibility with the Alabama Legislature, through assistance in data analysis and simulation projections. As a newly created and established agency, this funding was essential to enable the Commission to survey the existing criminal justice system and produce projections of changes to the system, which would result if specific reforms were implemented.

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[1] Monte Carlo sampling methods are stochastic techniques using probability distributions and the selection of random numbers.

[2] United States, Alabama, Arkansas, Connecticut, Delaware, Washington D.C., Kansas, Louisiana, Maryland, Massachusetts, Minnesota, Missouri, Nevada, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Utah, Virginia, and Washington.

[3] U.S. - Federal Guidelines, Alabama, Alaska, Arkansas, Delaware, Washington D.C., Kansas, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, North Carolina, Ohio, Oregon, Pennsylvania, Tennessee, Utah, Virginia, Washington, and Wisconsin.

[4] The jurisdictions that have voluntary guidelines are Alabama, Arkansas, Delaware, Washington DC, Maryland, Missouri, Ohio, Tennessee, Utah, Virginia and Wisconsin. Of these, Maryland, Ohio and Wisconsin do not have Sentencing Commissions.

[5] Michael Tonry, Professor of Law and Public Policy, University of North Carolina; Rick Kern, Executive Director of the Virginia Sentencing Commission; Nick Turner of the Vera Institute of Justice; Barb Tombs, then-Director of Kansas Sentencing Commission and Vera Associate; Mark Bergstrom, Executive Director of the Pennsylvania Commission on Sentencing; and Robert Guy, Director of the Division of Community Corrections of the North Carolina Department of Corrections.

[6] Because of opposition to mandatory guidelines such as the federal sentencing guidelines and North Carolina's guideline structure, the President of the Alabama Circuit Judges' Association recommended referring to our recommended sentences as sentencing "standards" to avoid opposition by judges and prosecutors.

[7] The Commission established the 75% compliance figure as an initial goal for following the standards' recommendations. The 75% figure was determined by consulting with national experts in sentencing and examining the expected results of achieving this level of compliance with the standards on the prison population. This figure was also chosen because it also left enough room for judicial departures (both upward and downward) from the standards' recommendations and was close to the compliance rate of Virginia at the time (with which the Sentencing Commission had used as a mentor throughout the entire process of creating sentencing standards). Compliance with the sentencing standards can be categorized in two different ways – when the In/Out worksheet recommends an "Out" sentence, and when the In/Out worksheet recommends an "In" sentence. If the recommendation is "Out", any sentence not consisting of prison incarceration is considered compliant. If the recommendation is "In", the judge must impose prison incarceration time to be served and follow the corresponding sentence recommendation on the Sentence Length worksheet to be considered compliant.

[8] § 12-25-37, *Code of Alabama* 1975.

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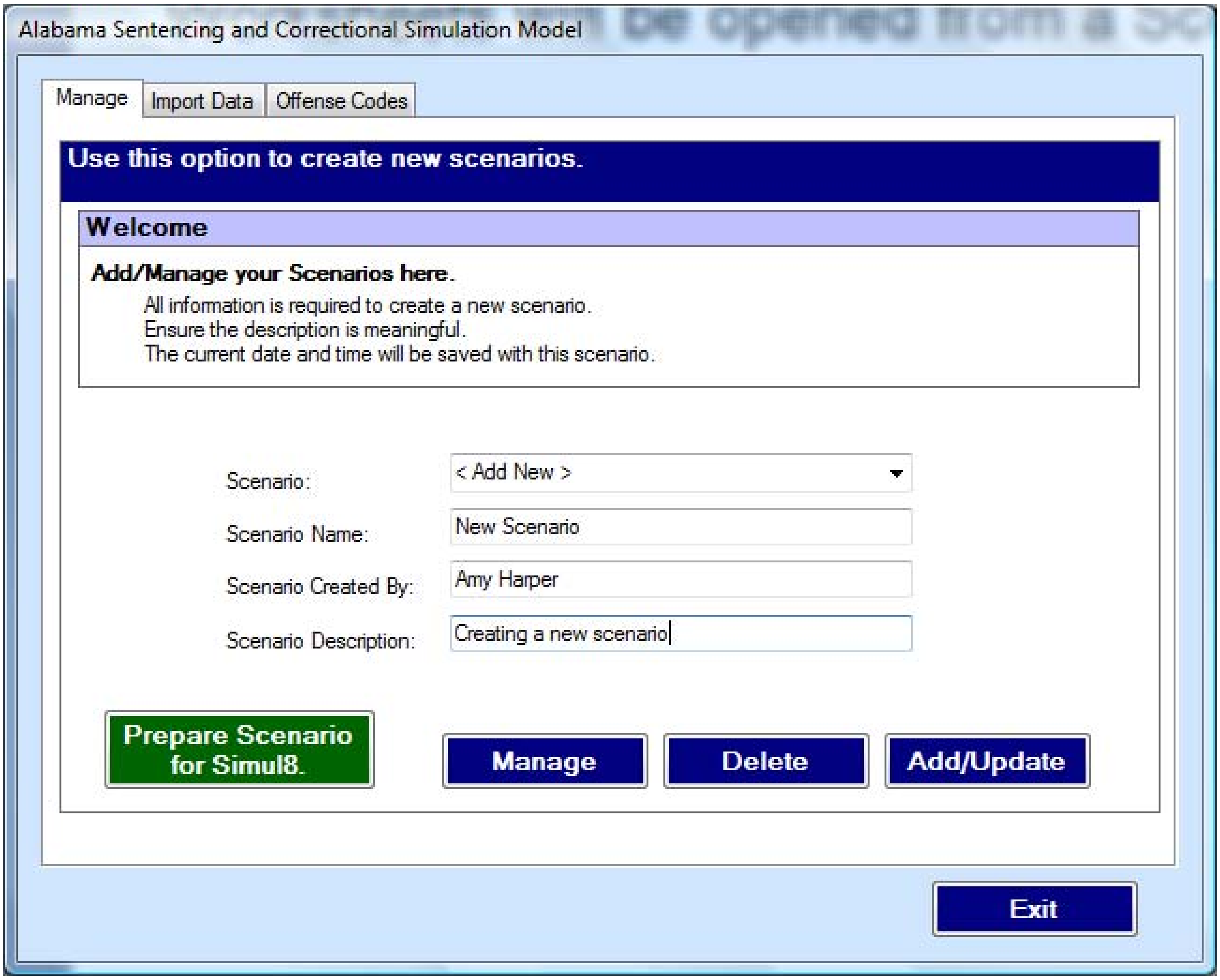
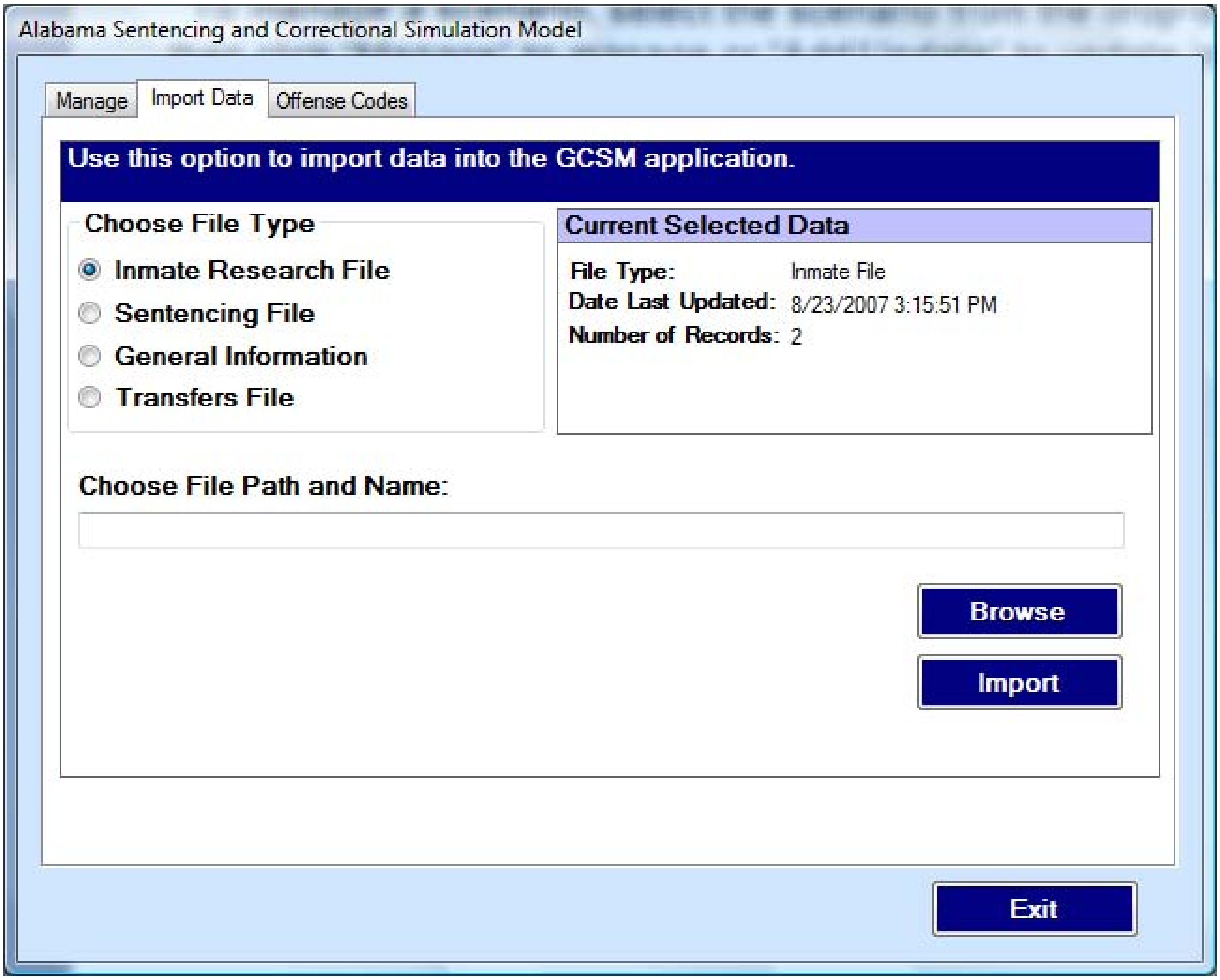
APPENDIX A

The Alabama Simulation Model User Interface



The Alabama Simulation Model User Interface: Import Data Tab



The Alabama Simulation Model User Interface: Sample Sentence Length Table

Work Sheets

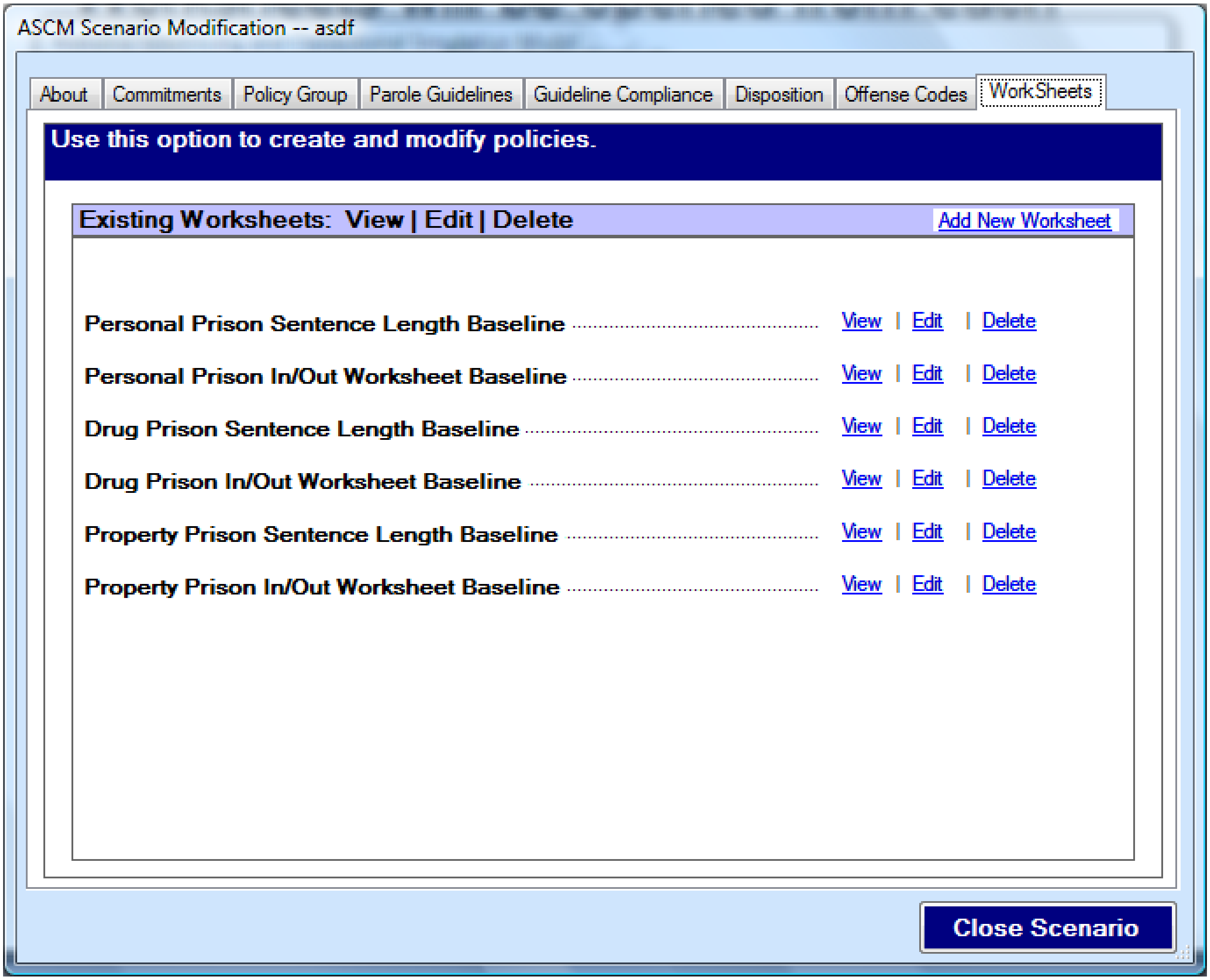
SENTENCE LENGTH RANGES FOR: Drug Prison Sentence Length Baseline

	Total Sentence			Time to Serve on Split			
Score	Low +/- mnts +/- %	Mid +/- mnts +/- %	High +/- mnts +/- %	Low +/- mnts +/- %	Mid +/- mnts +/- %	High +/- mnts +/- %	
42	13	22	32	6	9	12	edit/delete
49	13	22	32	6	9	13	edit/delete
52	13	22	32	6	9	13	edit/delete
56	13	22	32	6	9	13	edit/delete
57	13	22	32	6	9	13	edit/delete
59	13	22	32	6	9	13	edit/delete
62	13	22	32	6	9	13	edit/delete
64	13	22	32	6	9	13	edit/delete
66	13	22	32	6	12	18	edit/delete
67	13	22	32	6	12	18	edit/delete
69	13	22	32	6	12	18	edit/delete
70	13	22	32	6	12	18	edit/delete
71	13	22	32	6	12	18	edit/delete
72	13	22	32	6	12	18	edit/delete
73	13	22	32	6	12	18	edit/delete
74	13	22	32	6	12	18	edit/delete
76	13	38	64	6	12	18	edit/delete
77	13	38	64	6	12	18	edit/delete
78	13	38	64	6	16	27	edit/delete
79	13	38	64	6	16	27	edit/delete
80	13	38	64	8	17	27	edit/delete
81	13	38	64	8	17	27	edit/delete
82	13	38	64	8	17	27	edit/delete
83	13	38	64	8	17	27	edit/delete
84	13	38	64	8	17	27	edit/delete
86	13	38	64	8	17	27	edit/delete
87	13	38	64	8	17	27	edit/delete

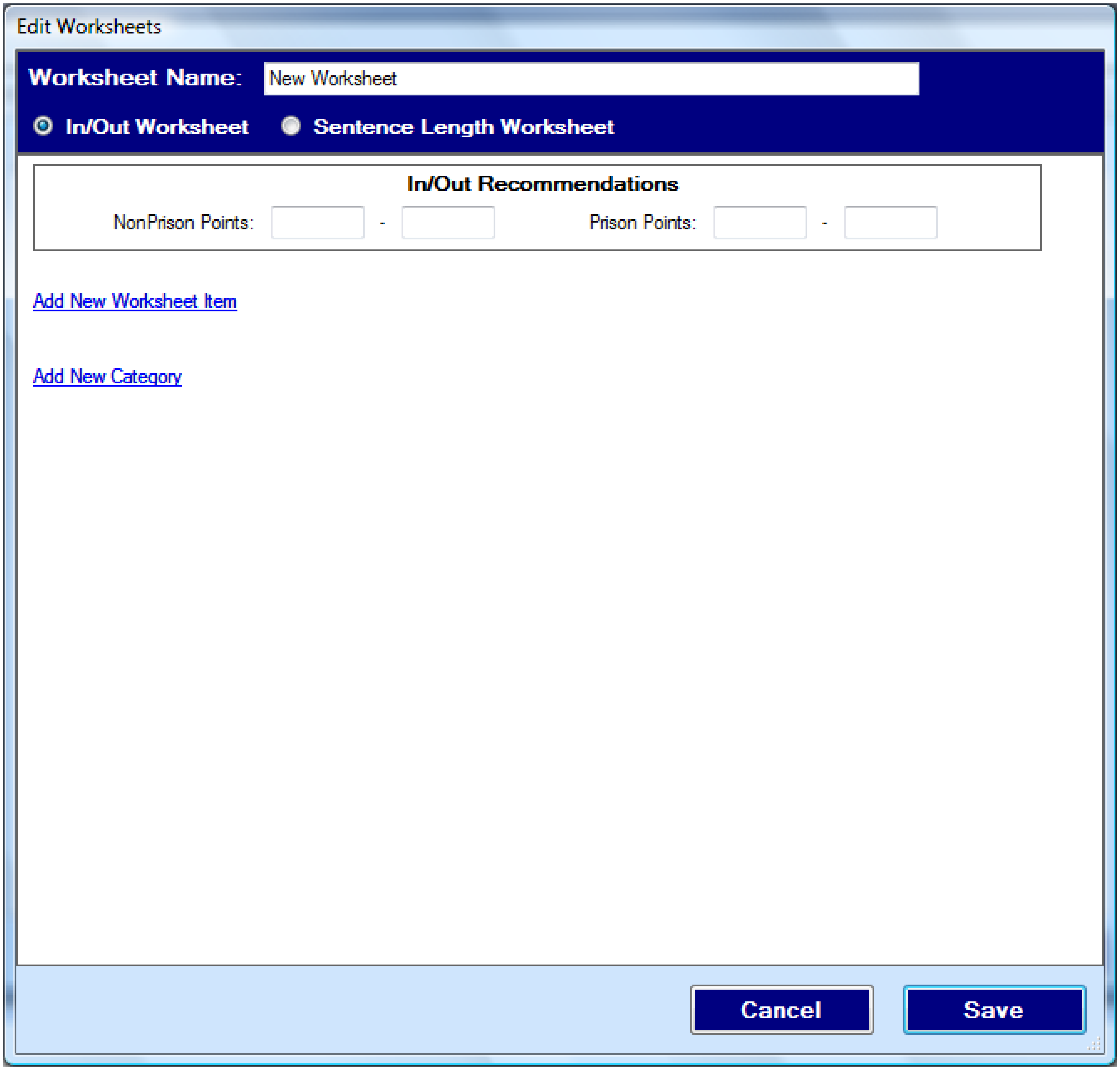
Add New Score   pages: 1 2

Cancel   Save

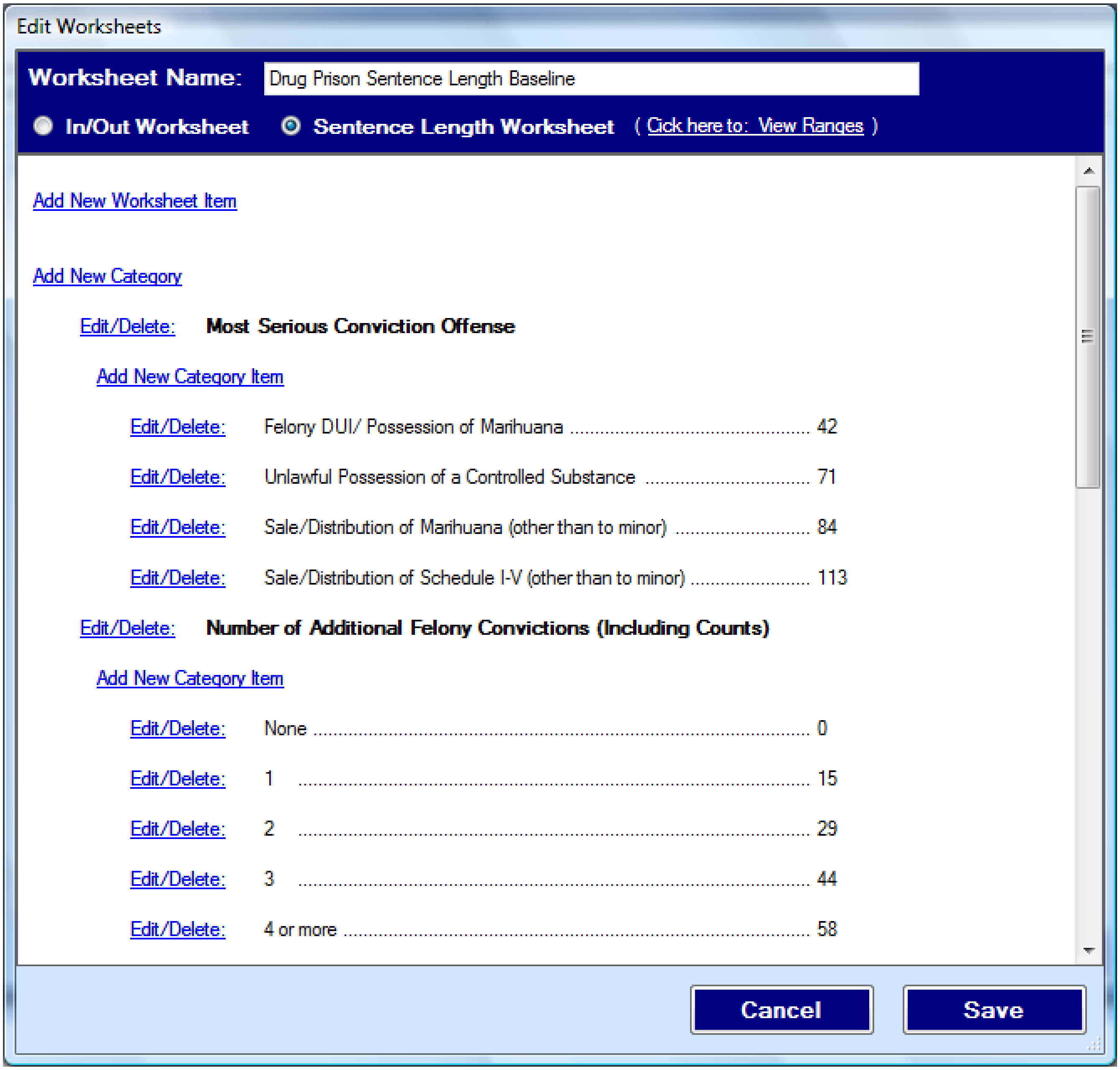
The Alabama Simulation Model User Interface: Worksheet Modification Tab



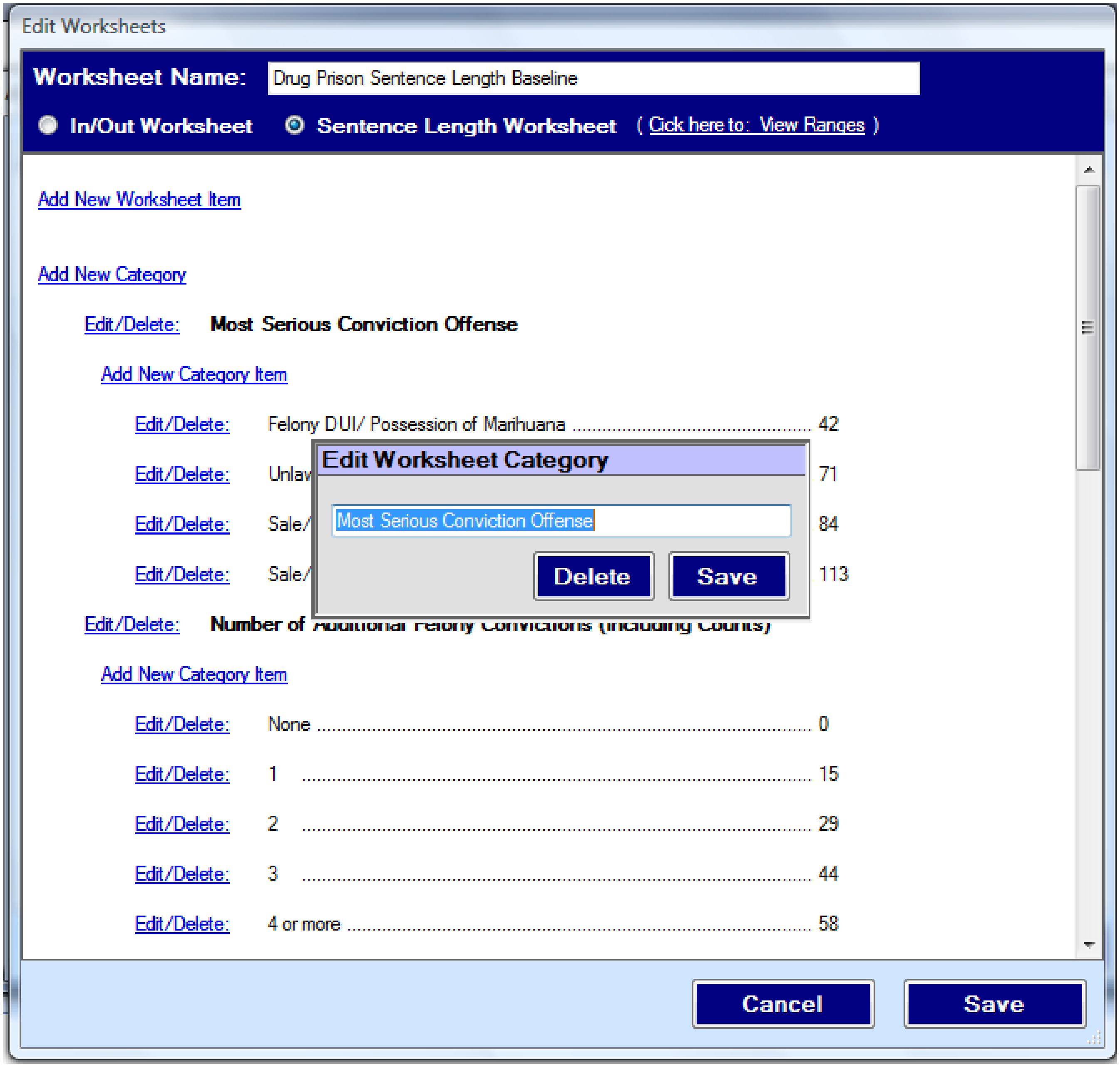
The Alabama Simulation Model User Interface: Edit New Worksheet Tab



The Alabama Simulation Model User Interface: Edit Existing Worksheet Tab



The Alabama Simulation Model User Interface: Edit Existing Worksheet Tab – Edit Factor



APPENDIX B

Table 1. Variable List for ADOC General Information Table

Variable	Label
yo_off	Youthful Offender Status
status	DOC Current Status Code
smt1	Scars, Marks, Tatoos1
smt2	Scars, Marks, Tatoos2
smt3	Scars, Marks, Tatoos3
tot_cmt	Number of Incarcerations
oth_conv	Number of other Convictions or Sentences
fst_arst_yy	First Arrest Year
fel_con_pty	Number of felony crimes against property
fel_con_per	Number of felony crimes against persons
marital	Marital Status
living_arg	Living Arrangements
reared_by	Reared By
nbr_sibling	Number of Siblings
nbr_depend	Number of Dependents
educ_lvl	Education Level
citizen	Citizen
veteran	Military Service
milentr_dt_yr	Military Entry Date_year
milentr_dt_mo	Military Entry Date_month
milentr_dt_da	Military Entry Date_day
mildis_dt_yr	Military Discharge Date_year
mildis_dt_mo	Military Discharge Date_month
mildis_dt_da	Military Discharge Date_day
mil_dis_type	Military Discharge Type
arr_dt_yr	Arrest Date_year
arr_dt_mo	Arrest Date_month
arr_dt_da	Arrest Date_day
pri_emp_occ	Primary Employment
sec_emp_occ	Secondary Employment
pre_emp_cl	Employment Status
inc_source	Income Source
lst_trn_dt_yr	Last Update Date_year
lst_trn_dt_mo	Last Update Date_month
lst_trn_dt_da	Last Update Date_day

Table 2. Variable List for ADOC Inmate Table

Variable	Label
admit_yr	Admit Date_year
admit_mo	Admit Date_month
admit_da	Admit Date_day
adm_type	Admit Type
reldt_yr	Release Date_year
reldt_mo	Release Date_month
reldt_da	Release Date_day
rel_type	Release Type
cnty	County where offense Committed
ncic	NCIC Code
sent_yr	Sentence Date_year
sent_mo	Sentence Date_month
sent_da	Sentence Date_day
max_yrs	Long Release Date_year
max_mos	Long Release Date_month
max_dys	Long Release Date_day
mod_yrs	Minimum Release Date_year
mod_mos	Minimum Release Date_month
mod_dys	Minimum Release Date_day
dead_yr	Dead Time_year
dead_mo	Dead Time_month
dead_dy	Dead Time_day
gtrec_yr	Good Time Received_year
gtrec_mo	Good Time Received_month
gtrec_da	Good Time Received_day
gtrev_yr	Good Time Revoked_year
gtrev_mo	Good Time Revoked_month
gtrev_da	Good Time Revoked_day
pretime	Jail Days
cur_cust_st	Custody ID
cur_cust_dt_yr	Custody Date_year
cur_cust_dt_mo	Custody Date_month
cur_cust_dt_da	Custody Date_day
inst_nbr	Institutional ID
dorm	Dorm ID
prog_dt_yr	Progress Date_year
prog_dt_mo	Progress Date_month
prog_dt_da	Progress Date_day
nxt_hrg_dt_yr	Actual Hearing Date1_year
nxt_hrg_dt_mo	Actual Hearing Date1_month
nxt_hrg_dt_da	Actual Hearing Date1_day
nxt_hrg_dec	Actual Hearing Decision1

orig_parl_dt_yr	Original Hearing Date_year
orig_parl_dt_mo	Original Hearing Date_month
orig_parl_dt_da	Original Hearing Date_day
next_parl_dt_yr	Scheduled Hearing Date_year
next_parl_dt_mo	Scheduled Hearing Date_month
next_parl_dt_da	Scheduled Hearing Date_day
last_parl_dt_yr	Next Parole Hearing Date_year
last_parl_dt_mo	Next Parole Hearing Date_month
last_parl_dt_da	Next Parole Hearing Date_day
parl_hrg_dt_yr	Actual Hearing Date2_year
parl_hrg_dt_mo	Actual Hearing Date2_month
parl_hrg_dt_da	Actual Hearing Date2_day
parl_hrg_dec	Actual Hearing Decision2
lst_trn_dt_yr	Update Date_year
lst_trn_dt_mo	Update Date_month
lst_trn_dt_da	Update Date_day
comments	Comments
cit_review_dt_yr	Correctional Institution Time Review Date_year
cit_review_dt_mo	Correctional Institution Time Review Date_month
cit_review_dt_da	Correctional Institution Time Review Date_day
cit_begin_dt_yr	Retro Correctional Institution Time Date_year
cit_begin_dt_mo	Retro Correctional Institution Time Date_month
cit_begin_dt_da	Retro Correctional Institution Time Date_day
tot_yrs	Total Term_year
tot_mos	Total Term_month
tot_dys	Total Term_day
readmit_dt_yr	Readmit Date_year
readmit_dt_mo	Readmit Date_month
readmit_dt_da	Readmit Date_day
recap_dt_yr	Recaptured Date_year
recap_dt_mo	Recaptured Date_month
recap_dt_da	Recaptured Date_day
parl_rvk_why	Parole Revoked Reason
parl_rvk_dt_yr	Parole Revoked Date_year
parl_rvk_dt_mo	Parole Revoked Date_month
parl_rvk_dt_da	Parole Revoked Date_day
t446_cust_dt_yr	Class Date_year
t446_cust_dt_mo	Class Date_month
t446_cust_dt_da	Class Date_day
tt446_sent	Inmate Sentenced under New Law
tt446_serving	Inmate serving a New Law Sentence
med_exam_dt_yr	Medical Exam Date_year
med_exam_dt_mo	Medical Exam Date_month
med_exam_dt_da	Medical Exam Date_day
comp_dt_yr	Computation Date_year
comp_dt_mo	Computation Date_month

comp_dt_da	Computation Date_day
serving_cas	Serving Case
haboff	Habitual Offender
comp_boot_camp	Completed Boot Camp

Table 3. Variable List for ADOC Initial Sentence Table

Variable	Label
crim_cd	Casenumber Prefix
caseyy	Casenumber Year
goc	General Offense Code
ncic	NCIC Code
sent_lit	Comments
typ_cls	Sentence Enhancement
county	County of Conviction
cc	Consecutive or Concurrent Sentence
ct_cst	Court Cost
fine	Court fine
restut	Restitution
pre_time	Jail Days
post_dt_yr	Posted Date_year
post_dt_mo	Posted Date_month
post_dt_da	Posted Date_day
trans_dt_yr	Transcript Received Date_year
trans_dt_mo	Transcript Received Date_month
trans_dt_da	Transcript Received Date_day
eff_dt_yr	Sentence Date_year
eff_dt_mo	Sentence Date_month
eff_dt_da	Sentence Date_day
term_yrs	Sentence Term Years
term_mos	Sentence Term Months
term_dys	Sentence Term Days
seq_nbr	Sequence Number
obts1	Is LWOP
arr_dt_yr	Arrest Date_year
arr_dt_mo	Arrest Date_month
arr_dt_da	Arrest Date_day
off_dt	Attorney's Fee
off_loc	Offense Location
ltd_dt_yr	Last Update Date_year
ltd_dt_mo	Last Update Date_month
ltd_dt_da	Last Update Date_day
s754	Split Sentence
act446	Sentence under New Law
off	Alabama Offense Code
offense#	Alabama Offense Code Literal
pre_yr	Mandatory Years
pre_mo	Mandatory Months
pre_da	Mandatory Days
offhab	Habitual Offender

restrict	Restrictions

Table 4. Variable List for ADOC Transfer Leave Table

Variable	**Label**
req_reas	Cell Block Assignments
ver_dt_yr	Insert Date_year
ver_dt_mo	Insert Date_month
ver_dt_da	Insert Date_day
tl_from	Transfered From Institution ID
tl_to	Transfered To Institution ID
seq	Sequence Number
ret_yr	Return Date_year
ret_mo	Return Date_month
ret_da	Return Date_day
disc_pay	Discharge Pay
recap_dt_yr	Recapture Date_year
recap_dt_mo	Recapture Date_month
recap_dt_da	Recapture Date_day
xfr_type	Single Cell number
ltd_dt_yr	Update Date_year
ltd_dt_mo	Update Date_month
ltd_dt_da	Update Date_day
dorm_to	ToDormID
dorm_fr	FromDormID
toll_dt_yr	Time Reinstated for Dead Time_year
toll_dt_mo	Time Reinstated for Dead Time_month
toll_dt_da	Time Reinstated for Dead Time_day
move_yr	Transfer Date_year
move_mo	Transfer Date_month
move_da	Transfer Date_day
rel_yr	Release Date_year
rel_mo	Release Date_month
rel_da	Release Date_day
comm	Comments

Table 5. Variable List for AOC Disposition and Sentence Table

Variable	Label
sex	Sex
race	Race
file_yr	Case Filing Year
file_type	Charge at Filing Type
casestat	Defendant Status Code
trial_type	Type of Trial
jury_dem	Demand for Jury Trial
jury_typ	Jury Type
off_dt_yr	Offense Date_year
off_dt_mo	Offense Date_month
off_dt_da	Offense Date_day
arr_dt_yr	Arrest Date_year
arr_dt_mo	Arrest Date_month
arr_dt_da	Arrest Date_day
app_dt_yr	Appeal Date_year
app_dt_mo	Appeal Date_month
app_dt_da	Appeal Date_day
file_dt_yr	Filing Date_year
file_dt_mo	Filing Date_month
file_dt_da	Filing Date_day
rel_dt_yr	Release Date_year
rel_dt_mo	Release Date_month
rel_dt_da	Release Date_day
ind_dt_yr	Indictment Date_year
ind_dt_mo	Indictment Date_month
ind_dt_da	Indictment Date_day
ct_act	Court Action
cadate_dt_yr	Court Action Date_year
cadate_dt_mo	Court Action Date_month
cadate_dt_da	Court Action Date_day
indicts	Number of Indictment Offenses
msindoff	Most Serious Offense at Indictment
msind_type	Most Serious Offense at Indictment Type
msind_class	Most Serious Offense at Indictment Class
msind_cat	Most Serious Offense at Indictment Category
msind_score	Most Serious Offense at Indictment Score
convicts	Number of Conviction Offenses
con_cts	# Counts at Conviction (all offenses)
msoff	Most Serious Offense at Conviction
msoff_type	Most Serious Offense Type
msoff_class	Most Serious Offense at Conviction Class
msoff_cat	Most Serious Offense at Conviction Category

msoff_score	Most Serious Offense at Conviction Score
county	County of Conviction
circuit	Judicial Circuit
urban	County is Urban (Census SMSA)
sent_dt_yr	Sentence Date_year
sent_dt_mo	Sentence Date_month
sent_dt_da	Sentence Date_day
beg_dt_yr	Sentence Begin Date_year
beg_dt_mo	Sentence Begin Date_month
beg_dt_da	Sentence Begin Date_day
prob_dt_yr	Probation Begin Date_year
prob_dt_mo	Probation Begin Date_month
prob_dt_da	Probation Begin Date_day
up_dt_yr	Last Update Date_year
up_dt_mo	Last Update Date_month
up_dt_da	Last Update Date_day
conf_imp	Confinement-Imposed (mos)
conf_sus	Confinement-Suspended (mos)
conf_tot	Confinement-Total (mos)
jailcr	Jail Credit (mos)
lic_susp	License Suspended (mos)
prob_tot	Probation-Total (mos)
gang_day	# of Days Sentenced to Chain Gang
boot_day	# of Days Sentenced to Boot Camp
emon_day	# of Days Sentenced to Electronic Monitoring
bond_amt	Bond Amount
hab_no	# of Habitual Offender
fine_imp	Fine Imposed
fine_sus	Fine Suspend
drgf#	Drug Docket Fees Flag
cserv#	Community Service Flag
costs#	Costs Flag
fine#	Fine Imposed Flag
crime_v#	Crime Victim Flag
recoup#	Attorney Fees Flag
wccs#	WC Fee (85%) Flag
wcda#	WC Fee (DA) Flag
lcos#	Municipal Court Cost Flag
jfee#	Jail Fee Flag
sus_fee#	License Suspend Fee Flag
prelim#	Preliminary Hearing Flag
drug#	Demand Reduction Penalty Flag
remb#	Removal Bill Flag
hist#	Criminal History Fee Flag
r1#	Restitution 1 Flag
r2#	Restitution 2 Flag

r3#	Restitution 3 Flag
r4#	Restitution 4 Flag
r5#	Restitution 5 Flag
r6#	Restitution 6 Flag
pent#	Penitentiary Flag
life_wo#	Life Without Parole Flag
life#	Life Flag
death#	Death Flag
split#	Split Flag
rev_split#	Reverse Split Flag
jail#	Jail Flag
concur#	Concurrent Sentence Flag
consec#	Consecutive Sentence Flag
coterm#	Coterminous Sentence Flag
boot#	Boot Camp Flag
gang#	Chain Gang Flag
jaildvr#	Jail Diversion Flag
iprob#	Informal Probation Flag
aa#	Alcohol Anonymous Flag
dui#	DUI School Flag
ddc#	Defensive Driving School Flag
drug_ct#	Drug Court Flag
pretrl#	Pretrial Diversion Flag
bcsch#	Bad Check School Flag
mental#	Mental Health Flag
cro#	Court Referral Program Flag
altsent#	Alternative Sentencing Flag
anger#	Anger Management Program Flag
hab_off#	Habitual Offender Flag
eproj#	Drug Related Conviction Near a Housing Project Flag
edrug#	Drug Enhancement Flag
esch#	Drug Related Conviction Near a School Flag
vic_dob#	Victim's Date of Birth
cvc3#	$ Over Minimum CVCC Flag
cnot#	Sex Offender Community Notification Flag
emon#	Electronic Monitoring Flag
warr#	Warrant Flag
subp#	Fine Suspended Flag
doc#	DOC Substance Abuse Program Flag