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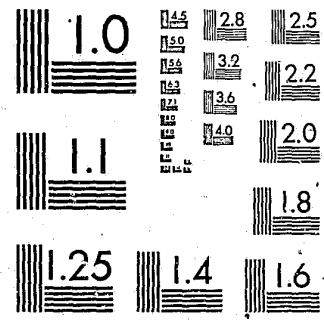
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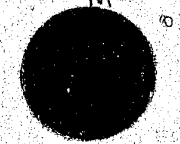
An Evaluation of the Jussim Model as a Tool for Policy Analysis within the Federal Criminal Justice System

The MITRE Corporation

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An Evaluation of the Jussim Model as a Tool for Policy Analysis within the Federal Criminal Justice System

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ABSTRACT

This report presents the results of a feasibility study which examines the potential use of JUSSIM in addressing policy issues concerning the federal criminal justice system. JUSSIM is an interactive computer program package, developed at the Carnegie Mellon University, which enables users to generate a computerized model of the operations of an organization, to specify the types and amounts of resources needed to process a variety of work units, and to calculate the total resource/cost requirements for a particular mix of input workload. Although JUSSIM is a general purpose modeling tool, it has been used primarily for developing criminal justice system models.

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ACKNOWLEDGEMENT

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EXECUTIVE SUMMARY

This report presents the results of a feasibility study which examined the potential use of JUSSIM in addressing policy issues concerning the Federal criminal justice system. JUSSIM is an interactive computer program package, developed at the Carnegie Mellon University, which enables users to generate a computerized model of the operations of an organization, to specify the types and amounts of resources needed to process a variety of work units, and to calculate the total resource/cost requirements for a particular mix of input workload. Although JUSSIM is a general purpose modeling tool, it has been used primarily for developing criminal justice system models. The study was conducted at the request of the Congressional Research Service (CRS) of the Library of Congress.

JUSSIM can be described as a system-wide resource and cost calculation model. Based upon information concerning the structure, workflow and component costs of a criminal justice system, the model permits a determination of the cost implications of making changes in the way the system operates. To use the model, the model-user creates a structured description of the particular criminal justice process under review including (1) the stages in criminal justice processing, (2) the flow paths between stages, (3) the possible release or drop out points in the system, (4) the rate at which work units (e.g., cases, offenders) drop out of the system at specified release points or continue on to subsequent processing stages, (5) the type and the amount of resources required to handle each work unit at each stage in the process, (6) the unit cost of each type of resource, and (7) the total availability of resources for the system. Once this information has been provided by the user, the model computes the resource requirements and the associated costs, either in aggregate or for individual components of the system, of processing a given mix of workloads or offender flows. The model-user then has the opportunity to make changes in certain of the input factors and to utilize the model to recompute resources/costs under this changed situation A comparison of these new costs with the original costs allows the model user to identify the costs associated with the changes. To the extent, then, that a model user is in fact able to translate policy decisions into changes in the operation of the criminal justice system, the resource/cost implications of these policy decisions can be estimated by the JUSSIM model.

Based on an examination of JUSSIM's capabilities and characteristics and on a review of past experience of JUSSIM model-users, four areas for consideration in determining the feasibility of implementing JUSSIM within the federal criminal justice system have been identified.

<u>The need to structure the criminal justice system description to
address varying policy questions</u>: The flexibility of the JUSSIM
program lies in the fact that the model software can be used to
describe, in a structured way, almost any criminal justice system.
However, this flexibility diminishes once a particular criminal
justice system description is developed, in terms of specific stages,
flow paths and subgroups of work units; that is, the main structural
features of the base case are rigid. This structure defines the
manner in which data are collected and confines the types of policy
questions which can be asked using the model as constituted. Hence
it is clear that (1) the nature of the policy questions to be addressed
directs the form of the criminal justice system description, (2) there
are innumerable alternative descriptions possible, and (3) a given
model based on one description may not allow the model-user to
address questions not originally anticipated.

<u>The need to translate policy questions into model changes</u>: To uti-
lize JUSSIM to assess the resources/costs associated with a proposed
policy initiative, the model-user must first be able to translate
that policy initiative into specific model changes. The JUSSIM pro-
gram provides the vehicle for examining the implications of these
changes, but it provides no guidance as to which parameters in the
model are likely to change as a result, direct or indirect, of the
policy initiative. Such a determination, which is clearly critical
to the use of JUSSIM as an analysis tool, must depend upon other know-
ledge bases, such as empirical studies or evaluations of similar pol-
icy actions or the informed opinion of the individuals who designed
the initiative or who will be impacted by it. With more involved
policy initiatives and more complex criminal justice system descrip-
tions, this translation task becomes potentially more difficult as
regards second and third order effects of a policy change when the
anticipated change has system-wide, long term implications. In any
case this translation task is rarely a straightforward endeavor.
The model-user is perhaps best advised to use the JUSSIM program to
develop a series of cost estimates based on differing expectations
of program effects on work flow and volumes of input workload. In
this way, the model can be used to generate estimates of upper and
lower cost boundaries of a given policy change.

<u>Data availability and quality</u>: The amount and detail of data required
for any model implementation is determined by the complexity of the
criminal justice description developed by the model-user. System
parameter and resource/cost data are required for each stage of the
criminal justice system as structured and for each sub-population of
input workload (e.g., crime type or administrative unit). The
ability of the model user to supply the needed data inputs has been
the single biggest problem in previous model implementations. The data

problem appears to be the biggest obstacle to the implementation of the
second generation JUSSIM program (JUSSIM II). The added features of
JUSSIM II include the capability to estimate recidivist feedback
effects to the criminal justice system. The data required to im-
plement JUSSIM II, including information on the criminal background
of offenders, the likelihood of recidivism of individuals re-
leased from the system at various points, among others, are more
detailed than is likely to be available. For this reason alone,
JUSSIM II does not appear, at this point, to be a good candidate
as an aid to federal policy analysis.

<u>The deterministic nature of the model</u>: Finally, no formal validation
of JUSSIM has been conducted, either by comparing base case cost
estimates generated by the model with actual costs incurred, or by
comparing model generated costs of a proposed policy with the costs
associated with the policy once implemented. For this reason, it is
recommended that some validity checks be made of any specific imple-
mentation in order to assess the degree of confidence which can be
placed in model results. Given the deterministic nature of the
model and the adaptive tendencies of human systems, it is quite
possible that under certain circumstances the linear cost calculation
methods of the program may not provide a valid representation of
reality.

In sum, JUSSIM offers a fairly straightforward computational
aid to assessing the criminal justice system-wide cost/resource
implications of proposed policy changes. To utilize this tool, the
potential model user must be able to develop a structured view of
criminal justice system operations both without and with the proposed
change and must have access to cost and operations data at a level
of detail commensurate with the policy change to be examined. Para-
doxically, the JUSSIM program appears to offer its greatest utility
as a computational tool in those situations in which data may be
more difficult to obtain and in which a clear-cut understanding of
the effects of a proposed policy—which the model will cost out—
may not be readily available. When general preconditions for use
are met, however, JUSSIM can offer a viable modeling tool to CRS or
criminal justice planning agencies for exploring the possible cost
implications of varying changes in system workload and operations.

1.0 INTRODUCTION

This report presents the results of a feasibility study of the potential of JUSSIM, an interactive, computerized system-wide modeling program,[1] to offer needed assistance in addressing national policy issues concerning the federal criminal justice system. JUSSIM is a computer program package, developed at the Carnegie Mellon University, which enables users to develop a computerized model of the operations of an organization, to specify the types and amounts of resources needed to process a variety of work units, and to calculate the total resource/cost requirements for a particular mix of input workload. JUSSIM is a general purpose modeling tool but it has been used primarily for developing criminal justice system models. The study was conducted at the request of the Congressional Research Service (CRS) of the Library of Congress.

The impetus for interest in the JUSSIM program is generally derived from several factors. First, in criminal justice as in other areas of federal concern it has become well-recognized that any policy change can have important implications beyond those directly intended by the policy-maker and attempts are continuously being made to anticipate and examine the potential effects of proposed policy initiatives. Computer modeling tools like JUSSIM have been designed to assist in this task. Second, it is now well understood that the various components of the criminal justice process (law enforcement, courts, prosecution, corrections) affect each other in important ways, with changes in any one component necessarily having some impact on others. Since the major component functions and work flow in a criminal justice system can be represented in a JUSSIM

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[1]Throughout this paper, the term model will be used to describe an individual application of JUSSIM. The JUSSIM software will be referred to as the JUSSIM program or the JUSSIM package.

model, one can, using the program, look across these components in a systematic way, with the expressed purpose of examining the effects of selected policies throughout the criminal justice system.

Third, the JUSSIM program has flexible features which a planner can adapt to use with almost any criminal justice system, allowing varying levels of detail in both inputs and outputs, depending upon the type of policy questions the model user wishes to address. Given the variety of questions which arise concerning the federal criminal justice system, the flexibility of the JUSSIM program would appear to make JUSSIM a good candidate as an analytical tool to aid in policy analysis in this area.

Finally, and in more specific terms, agencies involved with the analysis of national policy in the area of criminal justice find that they are being faced with questions which they as policy analysts are having difficulty in addressing. These are the questions which, it is hoped, the JUSSIM program might address. To assist in this study, therefore, the CRS prepared a list of example policy questions of particular interest. These include:

(1) If the maximum sentence for various (specified) Federal crimes were increased, what would be the effect on Federal prison populations? Similarly, if the present statutory provisions for fines or probation were altered, how might such changes affect other aspects of the federal criminal justice system (such as, prison populations, probation or parole caseloads, etc.)? These questions, of course, would also involve monetary problems, such as increased manpower needs within the criminal justice system, increased prison costs due to population increases, etc.

(2) If the number of federal district judges were increased by a specified amount, how would this affect court caseloads,

plea bargaining, etc.? Or, put another way, how many district court judges would be sufficient to ease current court workloads?

(3) If the number of individuals committing certain types of federal crimes (auto theft, corporate bribery, selling narcotics, etc.) were to increase, what would be the consequence throughout the federal criminal justice system?

(4) If a large-scale program of pretrial diversion for certain offenses were enacted within the federal criminal justice system, what would be the results in terms of court caseloads, prison populations, or probation or parole caseloads?

(5) What would happen to other components of the Federal criminal justice system if parole were abolished, either assuming that parole were gradually phased out within a set time frame or that it were abolished completely within six months of the date the legislation was enacted?

A review of these questions suggests several things about the kinds of policy needs which are apparent at the federal level. First, the questions, as a group, span all components of the criminal justice system; they are not particular to the police, the courts, or corrections. Some individual questions (question 1 for instance) may be confined to a single area, but others cross-cut the traditional boundaries of function or agency administrative concern. Second, the types of policy initiatives which are suggested by these questions are both numerous and varied. Included are statutory changes in the penal code (question 1), potential increases in workloads throughout the system (question 3), and changes in the routine procedures of criminal justice processing either in part (question 4) or in a major way (question 5). Finally, the areas of impact suggested by the questions are also numerous. Some are

unspecified and can be interpreted as being broad and somewhat
exploratory in nature. Others are quite specific relating to areas
of growing concern such as prison populations and judicial caseloads.

In order to utilize any modeling tool to aid in addressing
policy issues, it is first of all necessary to reduce the question
at hand to terms that are specific and meaningful with respect to
the constructs of the modeling tool being used. In this way, all
the example policy questions can be seen as belonging to one
general type. They all ask, at least in part, the cost implications
(either in terms of dollar outlay, manpower or facility requirements)
of suggested changes in procedures, in processing or in criminal
caseloads. As the following discussion will show, JUSSIM can assist
the analyst in addressing these types of questions interpreted in
this way.

Section 2.0 of this report describes the JUSSIM program itself:
its background; its structure, assumptions and output; its data
requirements; and the costs associated with its implementation and
operation. Next, past experiences with the program are reviewed;
the primary uses and benefits of previous implementations and the
major difficulties encountered by previous users of the model are
summarized. Based on the material presented in those two sections
(on the model program package and its past use), four major areas
for consideration in determining whether this modeling tool is
applicable to use with the federal criminal justice system are out-
lined and discussed in Section 4.0. Conclusions and recommendations
are presented in Section 5.0.

The material presented in this report is based on several
sources. First, the understanding of the prospective uses which
the JUSSIM program would be expected to serve within the Federal

criminal justice system is based primarily on discussions with the
CRS. Second, first-hand discussions were held with the JUSSIM
program developer and the primary JUSSIM users, as they are dis-
cussed in the text. Known government agency purchasers of the
JUSSIM software package were contacted via telephone in an attempt
to solicit first-hand information concerning model use. Finally,
the available literature concerning the development, implementation
and use of the JUSSIM program was reviewed and information concern-
ing the availability of federal statistics was considered in the
preparation of this feasibility study.

2.0 THE JUSSIM PROGRAM: A DESCRIPTION

2.1 Overview

The JUSSIM model can be best described as a system-wide resource and cost calculation model. Based upon information concerning the structure, operations and component costs of a criminal justice system, the model permits the calculation of the cost implications of making changes in the way the system operates. To use the model, the model-user creates a structured description of the particular criminal justice process under review including (1) the stages in criminal justice processing, (2) the flow paths between stages, (3) the possible release or drop out points in the system, (4) the rate at which work units (e.g. cases, offenders) drop out of the system at specified release points or continue on to subsequent processing stages, (5) the type and the amount of resources required to handle each work unit at each stage in the process, (6) the unit cost of each type of resource, and (7) the total availability of resources for the system. Once this information has been provided by the user, the model computes the resource requirements and the associated costs, either in aggregate or for individual components of the system, of processing a given mix of workloads or offender flows. The model-user then has the opportunity to make changes in certain of the input factors and to utilize the model to recompute resources/costs under this changed situation. A comparison of these new costs with the original costs allows the model user to identify the costs associated with the changes. To the extent, then, that a model user is in fact able to translate policy decisions into changes in the operation of the criminal justice system, the resource/cost implications of these policy decisions can be estimated by the JUSSIM model.

2.2 Development of the Program

JUSSIM was developed by Jacob Belkin, Alfred Blumstein, and William Glass at the Urban Systems Institute at Carnegie Mellon University. It was initially conceptualized in the late 1960's under an LEAA grant to the Institute for Defense Analyses. The concept was first validated using data from California[2] and the first application of JUSSIM's modeling capabilities was in conjunction with the Connecticut State Planning Agency.[3] The JUSSIM program package became generally available in 1970.[4] Perhaps the best known application of JUSSIM was in Allegheny County (Pittsburgh, Pa.)[5] which was accomplished under the tutelage of the developers with students at the Urban Systems Institute providing the staff support in the model implementation process.[6]

[2] Blumstein, A. and R. Larson, "Models of a Total Criminal Justice System," Operations Research, Vol. 17, 1969, pp. 199–232.

[3] Chaiken, J. et al. Criminal Justice Models: An Overview, The Rand Corporation R1859-DOJ, October 1975.

[4] Belkin, J. and A. Blumstein, Methodology for the Analysis of a Total Criminal Justice System, Urban Systems Institute, Carnegie Mellon University, November 1970.

[5] For a description of this model see Cohen J., K. Fields, M. Lettre, R. Stafford, and C. Walker, "Implementation of the JUSSIM Model in a Criminal Justice Planning Agency," Journal of Crime and Delinquency, Vol. 10, No. 2, July 1973, pp. 117–131 and Cohen, J., M. Lettre, and R. Stafford, Analysis of the Allegheny County Criminal Justice System: Present Operations and Alternative Programs, The Urban Systems Institute, Carnegie Mellon University, February 1972.

[6] Those implementations which were spurred by direct involvement of the program developers were viewed as part of the development process. They have not been reviewed in the previous experience section (3.0) because it was felt that their close relationship with the model development have made their experiences unique and not a good basis for anticipating federal experience.

Following this initial development phase and in response to criticisms of the fact that JUSSIM provides only downstream cost estimates of selected criminal justice policies, adaptations in the program were instituted. The revised package, JUSSIM II,[7] is designed to incorporate certain effects of recidivism into estimates of successive yearly input arrest streams and to provide multi-year cost estimates of any policy change, cost estimates which reflect these recidivism feedback effects on offender or case flows. While the added features of JUSSIM II are of theoretical interest, they have shown little practical utility to date. The data required for JUSSIM II far exceed those needed for JUSSIM I. JUSSIM II requires offender-specific data, data concerning prior criminality in the form of contacts with the criminal justice system. Such data is often unreliable and difficult to obtain. Because little is understood about the process of criminal recidivism, JUSSIM II necessarily involves unsubstantiated and controversial assumptions. Further, the multi-year projections generated by JUSSIM II take into account only flow changes resulting from recidivism from year to year; no other effects over time are considered. As with any projection, the farther from the present the projected estimate moves, the more uncertainty it encompasses. Finally, there are no known implementations of JUSSIM II. For these reasons, it does not appear that JUSSIM II offers any real practical advantage over JUSSIM I and in fact may present certain disadvantages. Consequently the original JUSSIM program has been the focus of this study. It should be recognized that the JUSSIM II program essentially performs the same functions as JUSSIM I, with the major difference between the two being that

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[7] Belkin, J., A. Blumstein, and W. Glass, JUSSIM II, An Interactive Feedback Model for Criminal Justice Planning, Urban Systems Institute, Carnegie Mellon University, 1974.

JUSSIM II factors in recidivist feedback effects into yearly cost estimates following the first year. Hence the following assessment of JUSSIM I pertains equally to JUSSIM II. JUSSIM II is discussed in more detail in Appendix A for those readers who may have a particular interest in this program.

2.3 The JUSSIM Program

2.3.1 Model Structure

2.3.1.1 Structuring the Criminal Justice System Description. In the first step in the implementation of a JUSSIM model, the model-user is asked to structure the criminal justice system into a series of discrete, interrelated processing stages (see Figure 1). The stages are selected to reflect a structured view of the criminal justice system at a level of detail commensurate with the type of policy analysis questions that the user intends to address with the model. For example, if correctional policies are of major interest to the user then the police and courts subsystems may be represented in a simplified manner as single processing stages with the corrections subsystem described in much finer detail. Flow paths that represent movement of cases or defendants from stage to stage are then specified as are those flow paths which lead to the release of the defendant from the criminal justice system (i.e., release points). The rate at which the case or offender flow moves along alternative flow paths is next indicated. This information--in the form of branching ratios--is also shown on the schematic in Figure 1.

A branching ratio represents the proportion of units at a given stage which moves along a given flow path. If, for instance, the prosecutor releases one quarter of the cases he received without further prosecution, the branching ratio for the flow path from the prosecutor screening to arraignment will be .75, since seventy-five percent of all criminal matters follow this path.

It should be noted that the schematic in Figure 1 has been kept simple for illustrative purposes. In actual application, the structured descriptions of the criminal justice system are far more complex. For an example see Figure 2 which presents the criminal justice system description developed for the JUSSIM application in Allegheny County, Pennsylvania.

2.3.1.2 Crime Types or Subgroups. Once the structure and processing flows of a system are specified, the user then proceeds to describe the inputs to the system, e.g., to describe the flow of the total case or offender load of the system. In addition, JUSSIM has the capability of handling subpopulations of cases or offenders individually. The same criminal justice system description structure is followed including the stages, flow paths and release points. However, individual branching ratios and case flows can be unique and must be provided by the model user for each subgroup. In the program documentation, this feature is used to isolate various types of criminal offenses; however, this feature can be used to separate out any groups of interest (male/females, juveniles/adults, individual district courts, regions, etc.).

This subgroup feature allows the user to focus on thos groups of specific interest for policy analysis purposes; whether they be different offense types as suggested in CRS question (3) or

FIGURE 1
SIMPLIFIED MODEL OF STAGES AND FLOW

*BR = Branching Ratio

Court of Common Pleas Subsystem

Corrections Subsystem

ACQUITTED
1,941

Minor Judiciary
Subsystem

DISMISSED
7,272

IGNORED

DISMISSED
834   1,056

RELEASE
234

RELEASE
772

Police Subsystem

BAIL
11,409

BAIL

BENCH
TRIAL
4,562

INSTITUTION
1,206

PAROLE
972

COMMIT
CRIME
96,885

ARREST
42,979

PRELIMINARY
ARRAIGNMENT
15,548

PRELIMINARY
HEARING
15,138

BILL OF
INDICTMENT
8,276

GUILTY
PLEA
1,618

SENTENCE

4,305

VIO.

DETAINED
3,729

DETAINED

PROBATION
1,767

INSTITUTION
326

VIO-
LATION

SUMMARY
HEARING
19,083

PRELIMINARY HEARING WAIVED
409

JURY
TRIAL
206

1,641

182

Juvenile Subsystem

RELEASE

RELEASE

CERTIFIED
9

61

ACQUITTED

JUVENILE
INSTITUTION
530

RELEASE
184

JUVENILE
COURT
INTAKE
8,263

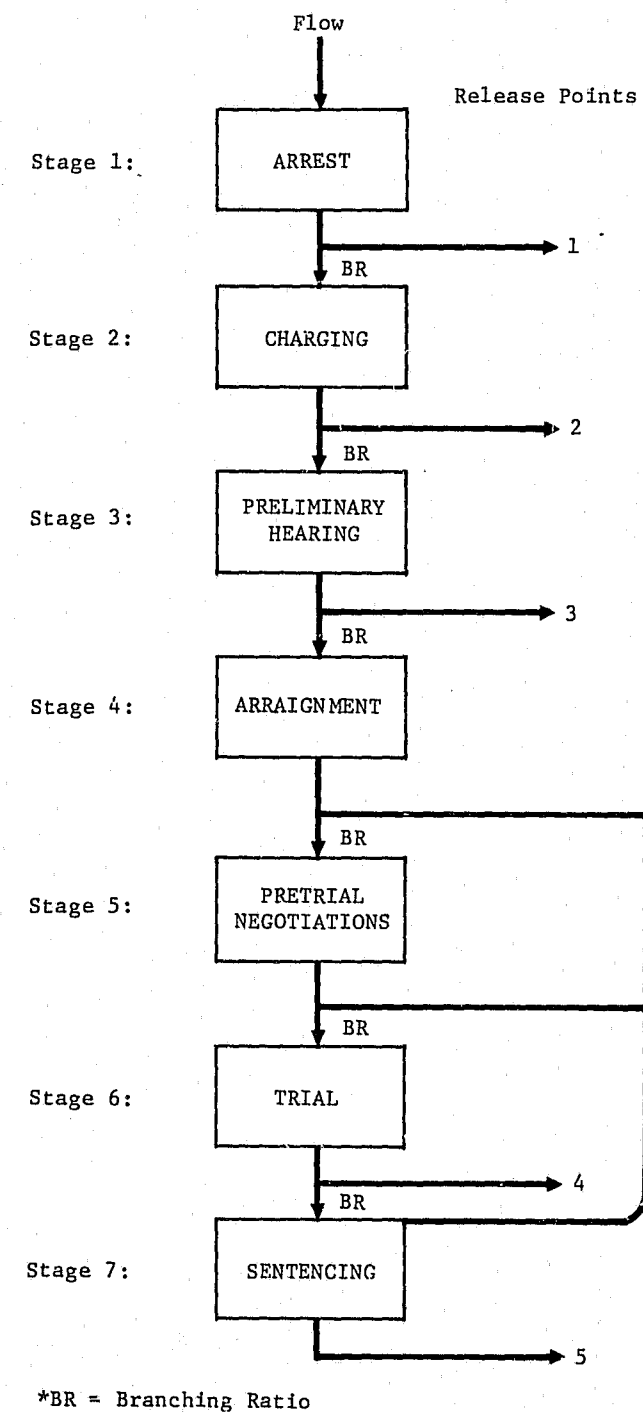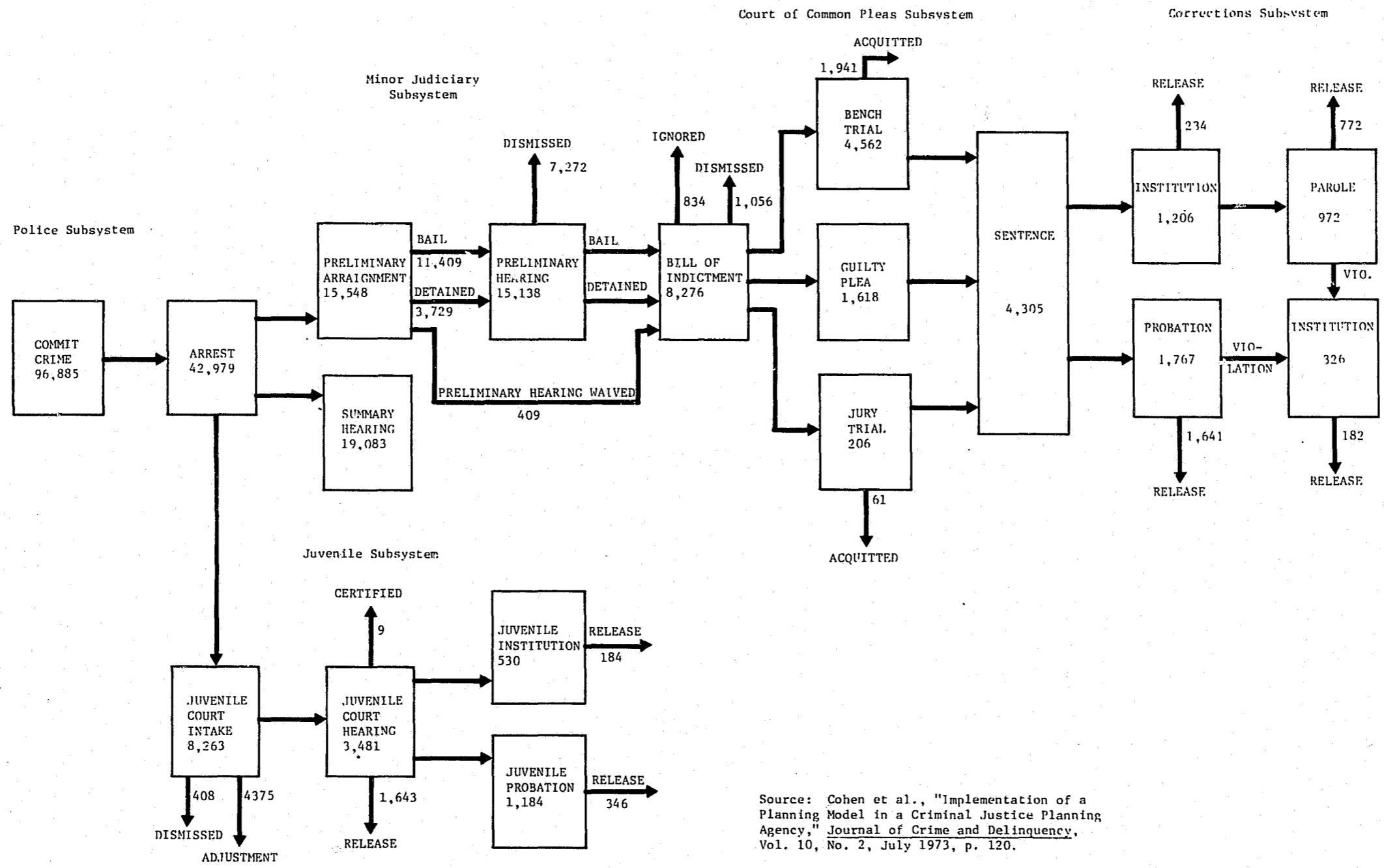JUVENILE
COURT
HEARING
3,481

408   4375

1,643

JUVENILE
PROBATION
1,184

RELEASE
346

DISMISSED

RELEASE

Source: Cohen et al., "Implementation of a
Planning Model in a Criminal Justice Planning
Agency," Journal of Crime and Delinquency,
Vol. 10, No. 2, July 1973, p. 120.

ADJUSTMENT

FIGURE 2
FLOW DIAGRAM OF THE ALLEGHENY COUNTY CRIMINAL
JUSTICE SYSTEM

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different offender characteristics as would be required for planning
for prison facilities. Once a subpopulation breakdown is selected
all data input (flows, branching ratios, costs) for model operation
will be organized along those subpopulation lines. Only further
aggregations of subpopulations will be possible once the subpopula-
tion structure is established.

2.3.1.3 Resource Consumption and Availability. The next step
in the implementation process is to specify the type and the amount
of resources consumed per unit processing at each stage in the criminal
justice process for each specified subgroup of inputs. (This in
JUSSIM terminology, is a "unit workload.") Resource requirements
may be tracked for total subsystems (i.e. the Courts) if such
aggregation is suitable for the planned analyses or resource require-
ments can be broken down into more detailed elements (i.e. within
the courts subsystem, the resource requirements of certain elements
such as magistrates, prosecutors, judges, etc. may be considered
separately).

In order for the model to determine the cost of processing
a given workload the user must specify the unit cost of each type of
resource used in the system, e.g., dollar cost per judge year. The
user has the same flexibility in tracking costs as with resource
requirements.

Finally, indicators of total resource availability for each
resource type are supplied by the model user in the form of annual
time availabilities and capacity constraints (e.g. the number
of working days per judge per year and the number of sitting judges
in a system). This resource availability information is used by the
model to alert the model user when, in any model run, the resources
available are exceeded.

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2.3.1.4 <u>Base Case and Test Case</u>. Once the model has been structured and the parameters concerning current or base operations of the criminal justice system (flows, branching ratios, unit costs, resource availability) have been entered, what is termed the <u>base case</u> has been constructed. This base case and its associated costs serve as the point of comparison for any changes in the system that the model user chooses to examine. The user may change certain parameters of the system (the input workloads, branching ratios, unit costs, resource availabilities) to create what is termed as a <u>test case</u>. The JUSSIM model will then calculate the costs associated with the <u>test case</u> in the aggregate or by the component (police, courts, corrections), element (detective, patrolman, etc.), or subgroup (burglars, robbers, etc.). These <u>test case</u> costs are then compared to the base case costs, with the difference being interpreted as the costs related to the changes. This base case--test case comparison is a basic method used in employing the model to examine cost implications of proposed changes.

2.3.2 <u>Model Operations and Model Output</u>

The model is designed to operate on an interactive basis. In interactive processing mode, the computer queries the user, sitting at a computer terminal for required data items in a logical sequence and the user puts data specific to the criminal justice system under review directly into the terminal. While no knowledge of computer language per se is required to work with JUSSIM, a working understanding of the JUSSIM structure and terminology is clearly needed if a user is to satisfactorily operate JUSSIM interactively. JUSSIM also permits operation via batch mode, (in which the user prepares a series of inputs to the computer and submits the inputs to a computer center for processing like a mail-order service without the necessity of direct intereaction at a terminal). This allows for the testing of a series of test cases without the need to cycle through the full interactive sequence.

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As is described above, the major outputs of a JUSSIM model are cost/resource estimates. These cost estimates may be broken down in several ways--by subgroup (i.e., crime type, etc.), by subsystem (i.e. police, courts, corrections), by element within a subsystem. or any combinations of these. They may involve information describing a single case or information comparing a base case and a test case. Copies of sample output, taken from the program documentation, are shown in Tables I-III.

2.3.3 <u>Data Requirements</u>

The data required by JUSSIM can be categorized as being of two types: 1) data to estimate system parameters and 2) resource consumption and availability data.

System parameter data refers to the data needed to estimate the branching ratios. JUSSIM accepts this data in aggregate form for each branching point for each subgroup. No offender-specific data is required. Data of this type is often used by individual agencies for management purposes and, as such, is often maintained by courts or prosecutors at some level of aggregation for cross-sections of the system. Based on this cross-sectional data, individual branching ratios can be estimated. If data on certain components of the system or data concerning subgroups are not available, it may be possible to compile them based on a retrospective analysis of individual offender or case materials; however such primary data collection activities can be both time-consuming and expensive, especially if the criminal justice system involved is large and the subgroups are numerous.

The second type of data involves resource consumption and availability data. Acquiring the resource availability data is often a straightforward matter. Such information as the total

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TABLE I

SAMPLE OUTPUT:

SUMMARY RESULTS FOR POLICE

		BASE	TEST	CHANGE	o/o CHANGE
COSTS IN THOUSANDS					
PATROLMAN		622.3	628.9	6.6	1.1
DETECTIVE		1316.3	1330.0	13.7	1.0
TOTAL		1938.6	1958.9	20.3	1.0
WORKLOADS					
PATROLMAN	HRS.	81774.0	82641.7	867.7	1.1
DETECTIVE	HRS.	156329.1	157961.3	1632.1	1.0
RESOURCE REQUIREMENTS					
PATROLMAN		48.1	48.6	0.5	1.1
DETECTIVE		92.0	92.9	1.0	1.0
FLOWS					
PATROLMAN		25009.8	25223.8	214.0	0.9
DETECTIVE		25009.8	25223.8	214.0	0.9

Source: Belkin, J., A. Blumstein and W. Glass, JUSSIM II, An Interactive Feedback Model for Criminal Justice Planning, Urban Systems Institute, Carnegie Mellon University, June 1973, p. 47.

TABLE I (Continued)

SUMMARY OF RESULTS FOR TOTAL SYSTEM

	BASE	TEST	CHANGE	o/o CHANGE
COSTS IN THOUSANDS				
POLICE	1938.6	1958.9	20.3	1.0
CRIME GROUP 1	99.9	104.9	5.0	5.0
CRIME GROUP 2	231.7	243.3	11.6	5.0
CRIME GROUP 3	569.5	570.9	1.3	0.2
CRIME GROUP 4	1037.4	1039.8	2.4	0.2
MAGISTRATE	180.6	182.3	1.7	1.0
CRIME GROUP 1	7.1	7.5	0.4	5.0
CRIME GROUP 2	20.2	21.2	1.0	5.0
CRIME GROUP 3	41.8	41.9	0.1	0.2
CRIME GROUP 4	111.6	111.8	0.3	0.2
COURT	1270.5	1284.1	13.6	1.1
CRIME GROUP 1	110.6	116.2	5.5	5.0
CRIME GROUP 2	111.6	117.2	5.6	5.0
CRIME GROUP 3	643.9	645.4	1.5	0.2
CRIME GROUP 4	404.4	405.3	0.9	0.2
CORRECTIONS	6483.9	6556.9	73.0	1.1
CRIME GROUP 1	640.1	672.1	32.0	5.0
CRIME GROUP 2	573.9	602.6	28.7	5.0
CRIME GROUP 3	3460.4	3468.5	8.1	0.2
CRIME GROUP 4	1809.4	1813.7	4.2	0.2
TOTAL	9873.6	9982.3	108.7	1.1
FLOWS				
POLICE	25009.8	25223.8	214.0	0.9
CRIME GROUP 1	745.6	782.9	37.3	5.0
CRIME GROUP 2	2516.5	2642.3	125.8	5.0
CRIME GROUP 3	4340.9	4351.1	10.2	0.2
CRIME GROUP 4	17406.8	17447.6	40.8	0.2
MAGISTRATE	19869.4	20038.3	168.9	0.8
CRIME GROUP 1	425.1	446.3	21.3	5.0
CRIME GROUP 2	2141.6	2248.7	107.1	5.0
CRIME GROUP 3	2483.5	2489.3	5.8	0.2
CRIME GROUP 4	14819.2	14853.9	34.7	0.2
COURT	4704.8	4756.4	51.6	1.1
CRIME GROUP 1	236.5	248.3	11.8	5.0
CRIME GROUP 2	615.3	646.1	30.8	5.0
CRIME GROUP 3	1382.4	1385.6	3.2	0.2
CRIME GROUP 4	2470.5	2476.3	5.8	0.2
CORRECTIONS	3750.7	3787.6	36.9	1.0
CRIME GROUP 1	185.4	194.7	9.3	5.0
CRIME GROUP 2	404.2	424.4	20.2	5.0
CRIME GROUP 3	1067.8	1070.3	2.5	0.2
CRIME GROUP 4	2093.2	2098.1	4.9	0.2

TABLE II

SAMPLE OUTPUT:
RESULTS FOR DET ARREST

	BASE	TEST	CHANGE	o/o CHANGE
COSTS IN THOUSANDS	1316.3	1330.0	13.7	1.0
WORKLOAD IN HRS.	156329.1	157961.3	1632.1	1.0
RESOURCE REQUIREMENTS	92.0	92.9	1.0	1.0
FLOWS	25009.8	25223.8	214.0	0.9

RESULTS FOR PROBATION

	BASE	TEST	CHANGE	o/o CHANGE
COSTS IN THOUSANDS	214.7	217.2	2.5	1.2
CRIME GROUP 1	14.9	15.6	0.7	5.0
CRIME GROUP 2	27.1	28.5	1.4	5.0
CRIME GROUP 3	88.4	88.6	0.2	0.2
CRIME GROUP 4	84.4	84.6	0.2	0.2
WORKLOAD IN YRS.	3111.7	3148.0	36.3	1.2
CRIME GROUP 1	215.6	226.4	10.8	5.0
CRIME GROUP 2	393.1	412.7	19.7	5.0
CRIME GROUP 3	1280.5	1283.5	3.0	0.2
CRIME GROUP 4	1222.5	1225.4	2.9	0.2
RESOURCE REQUIREMENTS	88.9	89.9	1.0	1.2
CRIME GROUP 1	6.2	6.5	0.3	5.0
CRIME GROUP 2	11.2	11.8	0.6	5.0
CRIME GROUP 3	36.6	36.7	0.1	0.2
CRIME GROUP 4	34.9	35.0	0.1	0.2
FLOWS	1319.1	1334.5	15.4	1.2
CRIME GROUP 1	76.4	80.2	3.8	5.0
CRIME GROUP 2	181.0	190.1	9.1	5.0
CRIME GROUP 3	457.4	458.5	1.1	0.2
CRIME GROUP 4	604.3	605.7	1.4	0.2

Source: Belkin, J., A. Blumstein and W. Glass, JUSSIM II, An Interactive Feedback Model for Criminal Justice Planning, Urban Systems Institute, Carnegie Mellon University, June 1973, p. 49.

TABLE III

SAMPLE OUTPUT:
FLOWS THRU STAGE 3 – COURT

	BASE	TEST	CHANGE	o/o CHANGE
TOTAL INPUT	4704.8	4756.4	51.6	1.1
OUTPUTS				
GUILTY PLEA	1026.0	1037.1	11.1	1.1
TRIAL	2931.3	2963.3	31.9	1.1
NOLLE	747.4	756.0	8.6	1.1
OTHER	0.0	0.0	0.0	00.0

FLOWS THRU STAGE 4 – TRIAL

	BASE	TEST	CHANGE	o/o CHANGE
TOTAL INPUT	2931.3	2963.3	31.9	1.1
CRIME GROUP 1	135.1	141.8	6.8	5.0
CRIME GROUP 2	390.8	410.3	19.5	5.0
CRIME GROUP 3	790.2	792.1	1.9	0.2
CRIME GROUP 4	1615.3	1619.1	3.8	0.2
OUTPUTS				
GUILTY	1816.9	1836.5	19.6	1.1
CRIME GROUP 1	95.7	100.5	4.8	5.0
CRIME GROUP 2	226.6	238.0	11.3	5.0
CRIME GROUP 3	560.3	561.6	1.3	0.2
CRIME GROUP 4	934.2	936.4	2.2	0.2
NOT GUILTY	1114.5	1126.8	12.3	1.1
CRIME GROUP 1	39.3	41.3	2.0	5.0
CRIME GROUP 2	164.1	172.3	8.2	5.0
CRIME GROUP 3	229.9	230.5	0.5	0.2
CRIME GROUP 4	681.1	682.7	1.6	0.2

Source: Belkin, J., A. Blumstein and W. Glass, JUSSIM II, An Interactive Feedback Model for Criminal Justice Planning, Urban Systems Institute, Carnegie Mellon University, June 1973, p. 50.

number of personnel and facilities of various types and their component costs is usually available in agency annual reports and budgets. Resource consumption data is more difficult to obtain. Often available on an aggregate basis, this type of information many times is unavailable in a subgroup, stage-specific, detailed form. For example, the model may require a figure for the manpower costs in hours of processing a guilty plea to a robbery charge by the judge and the prosecutor, as contrasted with the cost of a similar action for a plea to a burglary charge, etc. Such figures may be difficult to derive depending on the way the model is structured and on the type of management statistics which are routinely available. Users are cautioned against any direct extrapolation, such as, simply dividing the number of prosecutor hours devoted to plea negotiations by the number of guilty pleas, since the model assumes flow and workload to be independent. Alternatives for deriving these resource consumption figures include questioning individuals who actually conduct the particular task and developing estimates on the basis of their responses. This approach involves certain reliability problems but it may be the only feasible alternative available. It is of course possible to directly collect this type of information. There are methods available, such as random time sampling, which can produce unbiased estimates of the necessary figures. However, again, primary data collection can be expensive; also, to collect data of this type may require an extended period of time.

2.3.4 Model Costs

There are three types of costs associated with implementing a JUSSIM model: 1) costs of data collection or compilation, 2) computer expenses, and 3) professional staff salaries. While the actual dollar outlay in each area may vary a great deal considering the complexity of the model application and the current data

situation, there are certain factors which contribute to the level of each type of cost.

As is indicated above, if data required by the model cannot be developed from already compiled sources to the level of detail dictated by the analysis questions, the costs of primary data collection may be prohibitive. If the model-user is in a position to require submission of the required data by the component agencies, this may be less of a concern. However, even if there exists an established data base which includes all of the required data items, there are costs associated with restructuring that data into a form usable by JUSSIM. For example, data compiled by one agency on a quarterly basis will need to be aggregated to be made comparable to the yearly figures of another agency or data broken down by statutory code may require restructuring to conform to established crime types. This data manipulation will take varying amounts of staff resources and time depending on the size of the data base and the amount of data manipulation required. In general, the more complex the model (in terms of number of stages, numbers of alternative flow paths, number of subgroups) the more costly the data collection effort (and other efforts) will be.

The JUSSIM computer program is written in FORTRAN IV. It can be used on any machine with a FORTRAN capability and a memory storage capacity of 32K (K = 1024) words of storage. The large portion (two-thirds) of the storage is devoted to data; simpler models will require less storage space. While the model is designed to run interactively it can be run on batch mode. Because the mathematical computations made by the model are simple, the computer costs of the model are closely related to the time required by the user to input information and to the amount of output requested. A copy of the

JUSSIM program is available from the Urban Systems Institute for a fee of $200[8] and model documentation in the form of a user's manual is available independently for a nominal charge.[9]

Two types of professional staff are required to effectively implement the JUSSIM model once it has been determined that there exists a need for such a modeling tool. First, professional staff familiar with criminal justice systems and policy are required from the outset to insure that the structure of the criminal justice system established in the model application is appropriate for examining the policy issues of concern, to monitor data inputs to the model, and, once the model is implemented, to serve as translators of the questions posed by policy makers into changes in JUSSIM model parameters. In addition, a staff member familiar with computer systems at the working level is important, especially at the early implementation stage. The model is designed to be user-oriented, once instituted; to get to that point, however, technical expertise is required.

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[8] A copy of the JUSSIM II program costs $1000.

[9] Belkin, J., Al. Blumstein and W. Glass, JUSSIM, An Interactive Computer Program for Analysis of Criminal Justice Systems, Urban Systems Institute, Carnegie Mellon University, November, 1970.

3.0 PREVIOUS IMPLEMENTATIONS

While the JUSSIM program has generated a great deal of interest among criminal justice researchers, planners, and practitioners, there are only a handful of government agencies which, independent of the program developers, have implemented the model past a pilot stage. A number of agencies were reported in 1975[10] to have purchased the program software. An attempt was made to contact personnel in these agencies to obtain first hand information concerning JUSSIM implementation. This survey produced only limited results. In several of the agencies which were contacted, current personnel are unaware of the JUSSIM model and reportedly can find no information concerning its implementation in their office files.[11] Other agencies[12] report either considering purchasing but not having done so or having actually purchased the program but never having used the model's planning capabilities, largely due to data problems. None of these agencies are currently using JUSSIM or plan to do so. On the other hand, two examples were located of successful implementations of JUSSIM; these experiences offer some empirical basis for assessment of the potential benefits and problems facing a federal implementation of the program.

The most developed, current application of JUSSIM which was located is operated by the Maryland Governor's Commission on Law Enforcement and the Administration of Justice (the Maryland State Planning Agency).

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[10] Chaiken, et al. Criminal Justice Models: An Overview, The Rand Corporation, R 1859-DOJ, October 1975.

[11] These include the Denver Regional Council of Governments and the California Council of Governments.

[12] These agencies include the Washington Council of Governments, the Governor's Commission on Crime Control and Prevention in Montpelier, Vermont and the Governor's Commission on Crime Control and Prevention in St. Paul, Minnesota.

Maryland's is a statewide application of JUSSIM. The crime type or subgroup feature offered by the program was used to distinquish among the workloads of the twenty-four counties[13] in the state with the major purpose of the model being statewide cost accounting and resource allocation planning.

The Governor's Commission began working with JUSSIM in mid-1977. The Maryland model was ready for its first run in January 1978 and is currently on-line.[14] This implementation used only compiled or automated data for system parameters. Various sources of resource data were used including agency annual reports and questionnaires to local personnel. Even with only limited primary collection activities, six months were required to restructure the available data to make it amenable for use with JUSSIM.

In this implementation, JUSSIM was adapted to allow for consideration of court backlog and other inactive states in the system, a feature not found in earlier implementations. These adaptations were made not in the software, but rather in the way the criminal justice system description was structured with certain "stages" instituted for specified inactive states.

The major problems encountered in attempting to implement JUSSIM in Maryland involve difficulties in compiling the data which, although

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[13]Actually, there are 23 counties and Baltimore City.

[14]For further information see Governor's Commission on Law Enforcement and the Administration of Justice, A Jurisdiction-Based Description of the Maryland Criminal and Juvenile Justice System, September 1978.

to improve the existing data base rather than to initiate any special collection activities.

The greatest utility that the JUSSIM model application has served in Maryland, as perceived by the local personnel, has been to permit the state, and its constituent counties, to structure the available data base in such a way that individual counties could be compared on the same basis; thus, for the first time allowing for comparable analyses of criminal justice system operations and costs across the state.

In addition to these descriptive functions, Maryland's JUSSIM model has been used in conjunction with a stochastic arrest projection model to estimate statewide costs and cost distributions among Maryland counties over time. This application was utilized to calculate projected prison populations, information which was employed by the Maryland state legislature in planning for the state corrections system. Other than this, which was an admittedly ad hoc, albeit important, input to the state planning process, the model has not yet been used in any routinized planning.

The second example of an implementation of JUSSIM is the Canadian Government's CANJUS model. CANJUS, an adaptation of JUSSIM, was developed in 1973-74.[15] It is a national model, benefiting from the uniform national criminal code in Canada. Here the subgroup feature was used to distinguish among offense types. The general purpose behind the Canadian modeling effort was to develop a basic model of expenditures within the criminal justice system for use in planning for resource allocation.

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[15]Blumstein, A., R.G. Cassidy and J. Townsend, Implementation of a System Approach to the Canadian Justice System, Ministry of the Solicitor General, Government of Canada, Ottawa, Canada, April 1974.

The system parameter estimates for CANJUS were developed from data reports routinely prepared by Statistics Canada (the Canadian equivalent of the U.S. Bureau of Census) and from specially generated tables from Statistics Canada raw data. Resource consumption and availability estimates were compiled from agency reports from all levels of government.

In this process, numerous data problems were encountered. The available data were old; the most up-to-date statistics available in 1974 were for fiscal year 1971. There was found to be a great deal of variation in the reliability of much of the information. Data incompatibility from one subsystem to another was also a problem. Much of the material which Statistics Canada had compiled had never been extensively utilized before this project, consequently a number of heretofore unrecognized difficulties with the data surfaced as part of the process. Further, some of the resource consumption information was unavailable. These difficulties in compiling the necessary data base spurred considerable interest in the state of national-level criminal justice statistics in Canada and specific recommendations for their improvement were a by-product of the CANJUS implementation process.[16]

A data base was compiled and several studies were conducted using the CANJUS model. These include an analysis of the costs associated with involvement of immigrants in crime in Canada[17] and

several studies to predict penitentiary populations.[18] Other models, specifically designed to examine prison-related issues, are reportedly now being used for further analysis of the correctional system. CANJUS is still available but it is not now in active use.

To summarize, it appears, first, that the JUSSIM program has made its greatest contribution by providing a structured way of utilizing criminal justice data and, in Maryland particularly, by serving as a basis for making cross-jurisdictional (county) comparisons. It is seen by users to be best suited as a descriptive tool for understanding the current state of affairs; only limited examples of any actual policy analysis using the model were found.

The past experience of JUSSIM users further suggests that problems with obtaining and using data should not be minimized. The users themselves point out that the model estimates are only as good as the data.[19] It is generally felt that the development of a new data base for JUSSIM alone is too costly to be justified and presents problems of credibility among the users of model results. It is also felt that using an available data base, while preferred over primary collection, can involve a considerable amount of data restructuring, and problems of data incompatibility are not uncommon.

[16] Cassidy, R.G. and R.G. Hopkinson, _Information and Statistics on the Canadian Criminal Justice System. Problems and Recommendations_ (second edition), A CANJUS Project Report #12, Ministry of the Solicitor General, June 7, 1974.

[17] Rose, Marvin, _An Estimate of the Present and Future Costs and Involvement of Immigrants in Crime in Canada_, A CANJUS Project Report #13, Ministry of the Solicitor General, July 1, 1974.

[18] R.G. Cassidy, C. Fuller, R.G. Hopkinson, _Prediction of Penitentiary Population_, A CANJUS Project Report #10, Ministry of the Solicitor General and Secretariat of the Treasury Board, February 11, 1974.

[19] Dougherty, D. Footnote to Blumstein's "A Model to Aid In Planning for the Criminal Justice System," in _Quantitative Tools for Criminal Justice Planning_, U.S. DOJ, LEAA, pg. 146-7.

4.0 MAJOR CONSIDERATIONS

Based on an examination of JUSSIM's capabilities and character-
istics and on a review of past experience of JUSSIM model users, as
reported above, four areas for consideration in an analysis of the
feasibility of implementing JUSSIM within the federal criminal justice
system have been identified.

- The need to structure the criminal justice system
  description to address varying policy questions.

The flexibility of the JUSSIM program lies in the fact that the
model software can be used to describe, in a structured way, almost
any criminal justice system. However, this flexibility inheres
essentially in the model software and does not necessarily extend
to particular applications of the model. Once a given criminal jus-
tice system description is developed, stages and flow paths are
specified and subgroups are identified, the main structural features
of the base case are established. This structure defines the manner
in which data are collected and confines the types of policy questions
which can be asked using the model as constituted. Hence, it is
clear that (1) the nature of the policy questions to be addressed
drives the form of the criminal justice description, (2) there are
innumerable alternative descriptions possible, and (3) a given model
based on one description may not allow the model-user to address
questions not originally anticipated.

For example: If an accounting of the cost effects of certain
policy changes on the distribution of resources among all federal
judicial districts is of interest, the model can be structured such
that each district is treated as a "crime type" or subgroup. In this
way, a processing model representative of all district courts could be
developed and estimates of the national, regional, and local cost impact of
certain policies could be examined. On the other hand, if interest

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focused on the downstream criminal justice system costs of a change
in enforcement policies and priorities of a specific agency (e.g.,
Treasury Department) the crime type feature could be used to distin-
guish among agency input streams, and model calculations could be
made on an agency by agency as well as a total basis. While both
alternatives are theoretically feasible, as are many others, each is
a separate model application, involving specific data compilation for
system parameters and for resource consumption.

- The need to translate policy questions into model changes.

As has been discussed above, the basic approach to using a
JUSSIM model to calculate the cost effects of a proposed policy is
to compare the costs of a base case (without the new policy) with
those of a test case (which incorporates the new policy). It is
the job of the model user to translate a proposed policy into a
change in the model by adjusting selected system parameters (i.e.,
case or offender flows, or branching ratios, etc.) to reflect the
anticipated results of the new policy.

In some cases this translation process is, on the surface, a
fairly direct one. If increases in drug or other arrests are sought,
for example, then--assuming a model with crime type subgroupings--
the model user merely increases flows for each specified subgroup.
However, by making only this one change (an increase in selected
flows), the model-user is presuming that the other parameters of the
system will remain constant. If one wishes to examine the cost effects
of a change in the operations of the system such as a more stringent
plea bargaining policy, it is necessary for the user to estimate which
branching ratios will change and how much (i.e., how much will the
proportion of cases disposed by plea change? Will there be secondary
effects on the charging decision? Is the trial conviction rate likely
to change and how much? etc.). The model per se provides no guidance

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concerning these and other second-order effects. The model-user must
rely on other sources--empirical analysis, expert judgment, the com-
posite view of a task force--to identify what first, second, and
third order effects a proposed policy change might have. This signi-
fies that, depending upon the nature of the policy question, once the
proposed policy change has been examined sufficiently to interpret
the change in model terms, the critical part of the analysis will
have been completed and the model-generated calculations may be trivial.

● Data availability and quality.

It is clear from the foregoing discussion that data problems
are the most serious stumbling blocks with which any potential user
must cope. In the first place it is generally conceded that primary
data collection for a JUSSIM model alone cannot be justified. In
the case of the federal criminal justice system, however, it appears
that extensive data is maintained and published by a number of
federal agencies involved in the processing of defendants in the
federal criminal justice system, including the Administrative Office
of the U.S. Courts, the Attorney General's Office, the U.S. Attorney's
Office, and the Federal Bureau of Prisons.

In using this available data for a JUSSIM application, however,
there are questions which reach beyond the routine ones that any
data user might ask concerning the availability, reliability and
validity of needed data. The potential JUSSIM user should also con-
sider whether more than one year (or other period) of data is available.
Because the branching ratios, and other parameters which input to
the model, essentially represent the "current" situation, it is impor-
tant for the user to know whether or not these "current" values are
stable. While only one point is needed for input to the model,

multiple points allow for an assessment of stability. Based on the
experiences of past users, it may be critical to determine whether
the data are compatible across subsystems in definition, or in time
period of compilation, especially if data are drawn from more than
one source. Past experience of the CRS suggests that there may be some
differences in the ways different agencies categorize and com-
pile their data and in timeliness of agency figures.

It appears that crime incidence and arrest data may pose certain
difficulties in the federal system not found in local jurisdictions.
Because of the special nature of many federal criminal offenses,
it may be difficult to develop a meaningful estimate of total inci-
dence for use as an initial input flow (estimates of kidnappings
for instance). In addition, in many cases (as with certain state
law offenses), the frequency of arrests for federal offenses is
less a function of the occurrences of arrestable incidents and
more a function of the policies of the enforcement agencies.
Previous uses of the JUSSIM model to generate long-term estimates
of prison populations or other criminal justice system resource
needs are based on linkage of JUSSIM with stochastic crime gener-
ation models; there is some question, given the nature of the
crimes handled by the federal criminal justice system and the variety
of routes for entering the system, whether this method would be
appropriate for a federal model application. Further, because there
are a number of independent agencies (F.B.I., Treasury, IRS, etc.)
making arrests for offenses which are adjudicated in the federal
criminal justice system, the most feasible starting point for any
model of the federal criminal justice system may be the point at
which a filing is made with the U.S. Attorney's Office.

- The deterministic nature of the model.

The JUSSIM program essentially provides a framework for the analyst to describe the criminal justice system and to examine the implications of prescribed policy changes on the costs and resource requirements of operating the system. These resource/cost estimates are based on several assumptions: first, costs are calculated in a linear fashion such that the cost of processing two guilty pleas equals twice the cost of processing one. Further, it is assumed that a prosecutor with a caseload of, for instance, ten cases uses one-tenth the amount of resources (hours, etc.) as does one with a caseload of one hundred.

It seems clear that in reality things do not work so linearly and adaptation may be more the rule than the exception. It is likely that prosecutors, judges, and police officers budget their time according to their workload and will consequently allow more time for some tasks if they have fewer other things to do than they might otherwise. An analytic model like JUSSIM takes none of this into account when multiplying workload by the cost per unit consumption by resource costs to calculate total costs. Further, and more importantly, the extent to which these model assumptions invalidate the results of the model is unknown, since there are no known efforts to validate the program.

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5.0 SUMMARY AND RECOMMENDATIONS

This paper has presented a framework for the potential user of the JUSSIM modeling tool for assessing whether JUSSIM is applicable to a particular policy analysis problem and whether an implementation of the program is likely to be feasible given the data and time available for the analysis. In the process an attempt has been made to clearly define what the JUSSIM program is and what it does, what it requires in terms of data and staff resources and how past users have fared in their attempts to utilize the program.

Based on the material presented in the preceding sections the following general conclusions can be made:

- The JUSSIM model is most appropriate for addressing questions of resource allocation. Above all, JUSSIM is a cost/resource calculation modeling tool which considers cost as a function of policy and is designed to estimate the costs associated with different policies.

- JUSSIM model implementations are only as sophisticated as the users, who because of the unstructured, flexible character of the JUSSIM program, must bear the responsibility for development of the framework (i.e., structuring of the description of the criminal justice system) for any policy analysis conducted using JUSSIM. It is the user who must conceptualize the current or base situation and it is the user who must translate the policy initiatives to be examined into changes in the base description. The model simply provides the software for conducting cost calculations according to the parameters specified by the user.

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- This high level of involvement on the part of the user has two general implications. First, the fact that any model implementation is molded by the specific user suggests that the potential utility of the model is quite wide. Model implementations may encompass a variety of perspectives and policy problems since the program can be adapted and used in a manner suited to the specific needs of the user. Second, however, this flexibility in model development exists primarily at the program software level. Once the structure of a specific model implementation has been established by the user, this structure guides all data collection and data input. Any policy analysis must necessarily be based on this established structure. Hence the flexibility of any model implementation depends largely on the characteristics of that implementation and not on the JUSSIM program per se.

- The cost calculations performed by the model software are quite simple. As a consequence, if the structure of the criminal justice system as envisioned by the user is not complex and the policy changes in the system are straightforward, the JUSSIM program may offer little to the user in the way of a computational aid. If, on the other hand, the structured view of the system is more complex and the system changes to be examined are both involved and numerous, involving expected repeated testing of the cost implications of these changes under varying conditions, the JUSSIM modeling tool could be a valuable asset.

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- While theoretically JUSSIM is best suited for examining the cost/resource implications of multiple changes across various elements or functions in a complex criminal justice environment, it is just such more complex models which face the most serious implementation difficulties. These difficulties are of two types: data problems and difficulties in translating policy questions into model changes.

- The amount and detail of data required for any model implementation is determined by the complexity of the criminal justice description developed by the model user. System parameter and resource/cost data are required for each stage of the criminal justice system as structured and for each sub-population of input workload (e.g., crime type or administrative unit). The ability of the model user to supply the needed data inputs has been the single biggest problem in previous model implementations.

- Because the cost estimates generated by the JUSSIM program are a function of the way different components of the system workload are handled by the system (e.g., guilty pleas vs. dismissals vs. trials), the unit costs which are supplied as data input by the user must be similarly structured. Depending on the form of the system description and on the manner in which available management statistics are maintained, certain data inputs (such as the cost of dismissing a burglary case as compared to the cost of dismissing a rape case) may pose problems. Because the model-generated cost estimates are a direct computational result of these unit cost data inputs, if the

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model-user is required to make gross assumptions in order to estimate a sizeable number of these unit inputs, the reliability of the model results will be greatly affected. Under such circumstances the model user is advised to consider other alternatives for cost/resource estimation.

- Data appears to be the biggest obstacle to the implementation of the second generation JUSSIM program (JUSSIM II). The added features of JUSSIM II include the capability to estimate recividist feedback effects to the criminal justice system. The data required to implement JUSSIM II, including information on the criminal backgrounds, of input flows of offenders, the likelihood of recidivism of individuals released from the system at various points, among others, are more detailed than is likely to be available. For this reason alone, JUSSIM II does not appear, at this point, to be a good candidate as an aid to federal policy analysis.

- To utilize JUSSIM to assess the costs associated with a proposed policy initiative, the model-user must first be able to translate that policy initiative into specific model changes. The JUSSIM program provides the vehicle for examining the implications of these changes, but it provides no guidance as to which parameters in the model are likely to change as a result, direct or indirect, of the policy initiative. Such a determination, which is clearly critical to the use of JUSSIM as an analysis tool, must depend upon

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other knowledge bases, such as empirical studies or evaluations of similar policy actions or the informed opinion of the individuals who designed the initiative or who will be impacted by it. With more involved policy initiatives and more complex criminal justice system descriptions, this translation task becomes potentially more difficult as regards second and third order effects of a policy change when the anticipated change has system-wide and long term implications; in any case, however, this translation task is rarely a straight-forward endeavor. The model user is perhaps best advised to use the JUSSIM program to develop a series of cost estimates based on differing expectations of program effects. In this way, the model can be used to generate estimates of upper and lower cost boundaries of a given policy change.

- Finally, no formal validation of JUSSIM has been conducted, either by comparing base case cost estimates generated by the model with actual costs incurred, or by comparing model generated costs of a proposed policy with the costs associated with the policy once implemented. For this reason, it is recommended that some validity checks be made of any specific implementation in order to assess the degree of confidence which can be placed in model results. Given the deterministic nature of the model and the adaptive tendencies of human systems, it is quite possible that under certain circumstances the linear cost calculation methods of the program may not provide a valid representation of reality.

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In sum, JUSSIM offers a fairly straightforward computational
aid to assessing the criminal justice system-wide cost/resource
implications of proposed policy changes. To utilize this tool, the
potential model user must be able to develop a structured view of
criminal justice system operations both without and with the proposed
change and must have access to cost and operations data at a level
of detail commensurate with the policy change to be examined.
Paradoxically, the JUSSIM program appears to offer its greatest
utility as a computational tool in those situations in which data
may be more difficult to obtain and in which a clear-cut understanding
of the effects of a proposed policy--which the model will cost out--
may not be readily available. When general preconditions for use
are met, however, JUSSIM can offer a viable modeling tool for
exploring the possible cost implications of changes in system work-
load and operations.

APPENDIX A
JUSSIM II PROGRAM

As is discussed in the text (Section 2.0) the JUSSIM II program
offers a number of additional features over those offered by the
original JUSSIM features at the cost of increased data requirements.
The assessment in the body of this report relates directly to the
potential usefulness of JUSSIM II as well as JUSSIM I, in that if
JUSSIM I is found to be either inappropriate or infeasible then
JUSSIM II is not likely to be found suitable either. This appendix
describes the added features of JUSSIM II and the additional data
required to implement a JUSSIM II model.

The major, new structural characteristic of JUSSIM II is that
it incorporates the feedback of recidivist offenders into future
input flows to the system (see figure A1.) Some individuals who
are released from the system at various points may return to the
system, through rearrests, at some specified rate. This rate of
return is essentially included in a model as an additional set of
branching ratios. These returns to the system, when combined with
virgin arrests constitute the input flow for a subsequent time
period. Because the rate of recidivism to the system will vary
over time, it is necessary to also input the average time to
rearrest, so that these recidivism inputs can be paced according to
their estimated system effect.

If separate input flows are to be considered for different crime
types it is not sufficient to only predict at an aggregate level how
many offenders will recidivate in a specified time period. It is
necessary to indicate which crime types they will commit. Hence, an
estimate must be made of the probability that an individual originally
processed for the commission of one crime type will be arrested for
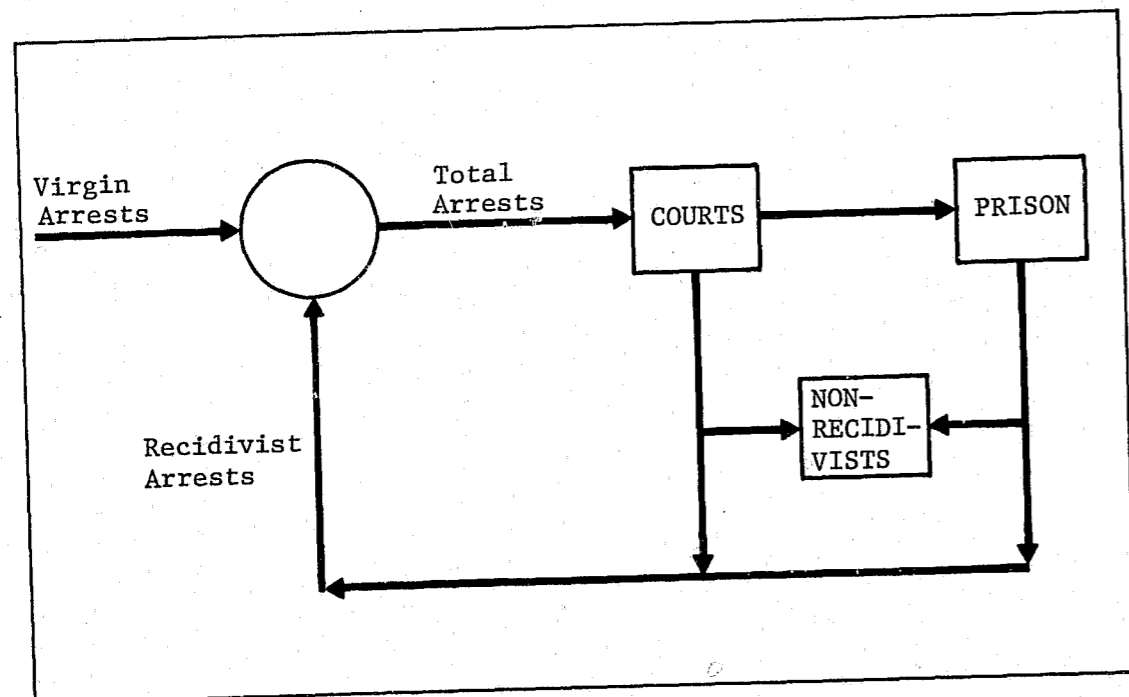
JUSSIM II

From: Blumstein, A. "A Model to Aid in Planning for the Total Criminal Justice System" in Quantitative Tools for Criminal Justice Planning, U.S. D.O.J., p. 139.

FIGURE A1
BASIC FEEDBACK MODEL

another. A matrix (called a "crime switch matrix" see figure A2) which is composed of the composite set of probabilities that an individual will either be arrested for the same offense or "switch" from one crime to another, from one arrest to the next is prepared by the user as an input to JUSSIM II.

Once a JUSSIM II model is implemented, the model-user has several additional capabilities over the JUSSIM I user. Changes in the recidivism branching ratios can be made and system cost implications of those changes can be examined. System resource/cost estimates can be generated for several time periods with each successive time period registering the recidivism feedback effect of the previous time period.

The problems with JUSSIM II are both analytical and practical. First, JUSSIM II is based on many of the same assumptions of linearity and non-adaptivity of the original JUSSIM program (discussed in Section 4.0) and, as with the original program, the validity of the JUSSIM II model results should be viewed with caution for this reason. Further, the methods used in JUSSIM II to estimate feedback effects are based on assumptions which are now under scrutiny in the criminal justice community. No consensus currently exists as to what constitute valid estimation procedures in this area; thus additional threats to validity have been introduced with the new features of JUSSIM II.

Second, the data demands of JUSSIM II far exceed that of JUSSIM I. The JUSSIM II user must supply information on the criminal history of the input population including: the proportion of arrests which represent virgin arrests for each subpopulation; the probability of rearrests for either the same offense or another

Next Offense

Last Offense	Crime A	Crime B	Crime C	Crime D
Crime A	.5	.3	.1	.1
Crime B				
Crime C				
Crime D				

Probability that an individual previously arrested for Crime Type A will be arrested for Crime Type D in the future.

FIGURE A2
ILLUSTRATION OF CRIME SWITCH MATRIX

offense; and the average time until rearrest. These basic data requirements are more demanding than most situations will support. It is perhaps for this reason more than any other that there exist no government agencies who have implemented JUSSIM II.

END