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U.S. Department of Justice
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GAO

United States
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General Government Division

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April 11, 1991

The Honorable Joseph R. Biden
Chairman, Committee on the Judiciary
United States Senate

The Honorable Strom Thurmond
Ranking Minority Member
Committee on the Judiciary
United States Senate

The Honorable Jack Brooks
Chairman, Committee on the Judiciary
House of Representatives

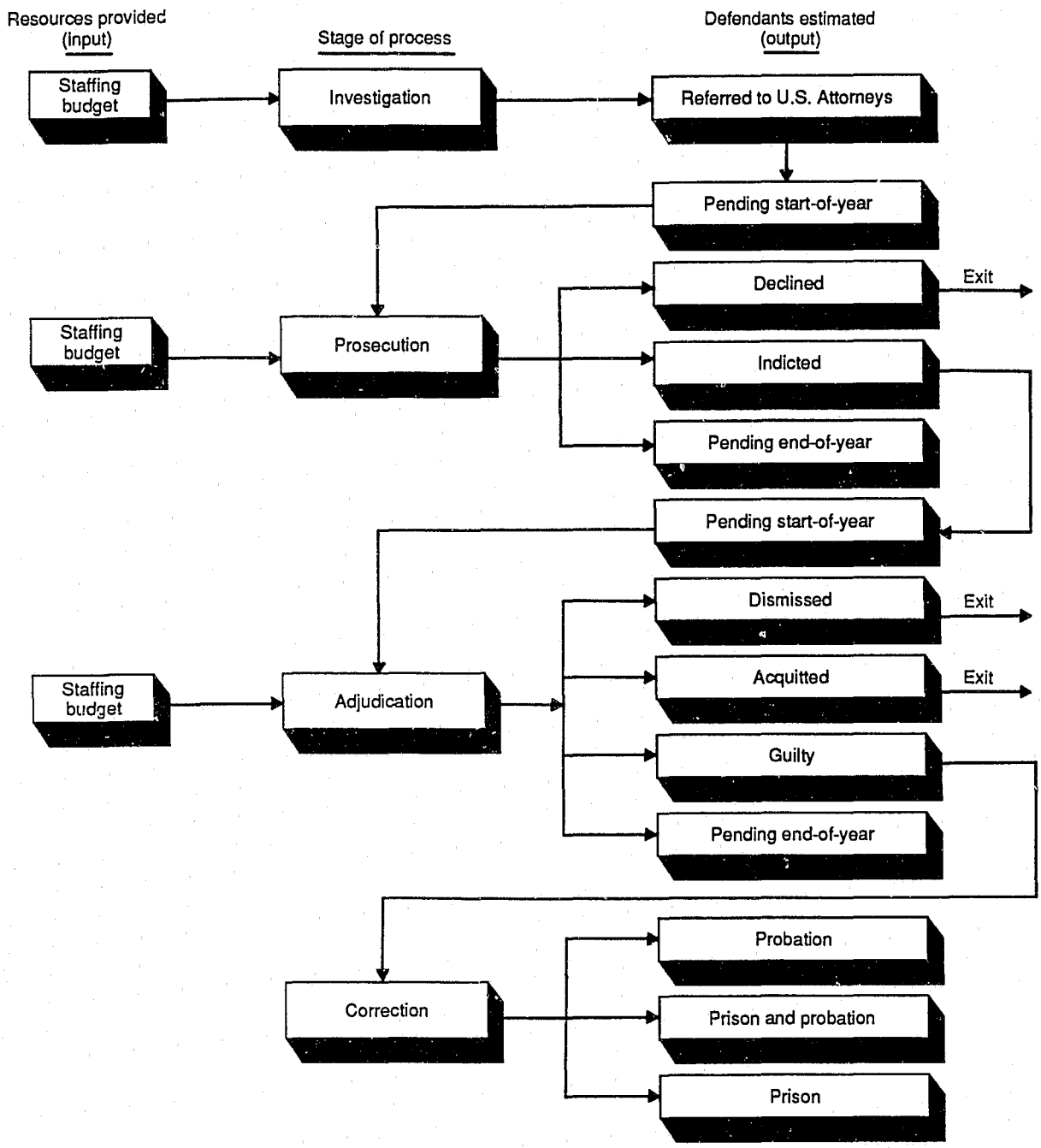
The Honorable Hamilton Fish, Jr.
Ranking Minority Member
Committee on the Judiciary
House of Representatives

The Anti-Drug Abuse Act of 1988 (21 U.S.C. 1501, 28 U.S.C. 509 note) directed us to develop a model that could be used to help "maintain balance" in the federal criminal justice system. The model's basic purpose is to assist Members of Congress and federal agencies to assess the potential effect that increasing or decreasing budgets or staff for part of the system, such as investigative agencies, would have on the rest of the system, such as prosecutors, the courts, and prisons. In this report, we describe the model we developed in response to the statutory mandate and demonstrate how it can be used for decisionmaking.

Background

The federal criminal justice system is complex, involving many agencies with a variety of responsibilities. Some 148 federal organizations (see app. VI) have at least some criminal law enforcement authority. One way of understanding the federal criminal justice system is to divide it into four distinct, sequential stages—investigation, prosecution, adjudication, and correction. Figure 1 shows the sequential relationships among the stages as depicted in the model and briefly described here.

Figure 1: Federal Criminal Justice System



Note: This flow chart represents the movement and processing of persons in the federal criminal justice system as used in the model.

Investigation

Agencies investigate suspected or reported crimes, make arrests, and refer suspects to U.S. Attorneys for possible prosecution. A relatively small number of federal agencies refer the majority of suspects. For example, just 10 agencies referred about 82 percent of the 96,000 persons referred to the U.S. Attorneys for possible prosecution in fiscal year 1989. The Federal Bureau of Investigation (FBI) and the Drug Enforcement Administration (DEA) together accounted for almost half (42.9 percent) of the total referrals.

Prosecution

The U.S. Attorneys and their staffs prosecute criminal defendants in federal courts.[1] When a person has been referred for prosecution, the U.S. Attorney may (1) decline to prosecute, perhaps referring the person to state/local authorities for possible prosecution; or (2) file formal charges against the defendant in federal court in the form of an indictment or information. The U.S. Attorney specifies the crime(s) for which the defendant will be prosecuted when charges are filed. In conjunction with the courts, the U.S. Attorney also decides whether or not to accept a guilty plea and on what terms.[2]

Adjudication

Once the U.S. Attorney has filed charges against a defendant in federal court, the court may dismiss the charges or adjudicate them. Possible adjudication results include acceptance of a guilty plea and acquittal or conviction after trial. Though limited by the sentencing guidelines,[3] judges exercise discretion in sentencing those found guilty.

[1]Some other Justice Department organizations, such as the Criminal and Antitrust Divisions, also prosecute criminal cases in federal courts. However, these cases account for only about 1 percent of all criminal defendants prosecuted in federal courts.

[2]The process of defense counsel and prosecutor negotiating the charges on which a defendant will be permitted to enter a guilty plea is commonly referred to as "plea bargaining." The great majority of criminal cases—more than 85 percent in federal courts—are disposed of in this way. Relatively few criminal defendants are tried.

[3]The Comprehensive Crime Control Act of 1984 (P.L. 98-473) established the United States Sentencing Commission, whose principal purpose was to establish sentencing guidelines for federal judges to use in sentencing offenders convicted of federal crimes. The guidelines are intended to reduce unwarranted sentencing disparities among offenders with similar criminal records who commit similar crimes. The guidelines took effect November 1, 1987, but their constitutionality was challenged in a number of federal courts. The Supreme Court affirmed the guidelines' constitutionality in January 1989.

Correction

Defendants found guilty may receive a term of probation, imprisonment, or both.[4] The Department of Justice's Federal Prison System is responsible for those sentenced to prison. Federal Probation Service personnel supervise persons paroled from prison and those on probation.

As this brief description suggests, agencies exercise discretion throughout the process, especially at each of the first three stages. Changes in the use of this discretion can affect the number of persons referred to the U.S. Attorneys, the number of persons referred who are subsequently indicted, the number of defendants dismissed by the courts, the number of guilty pleas accepted, and the sentences imposed on those found guilty.

Results in Brief

The model we developed is designed to provide Congress and federal agencies estimates of the potential effect that budgetary changes for part of the federal criminal justice system may have on the system as a whole.[5] For example, the model can estimate the effect that a major budget increase for the Drug Enforcement Administration may have on the workload of other key organizational components of the federal criminal justice system, such as the U.S. Attorneys, the courts, and the federal prisons.

Our model is a set of mathematical equations that define the basic relationships between resources (budgets and/or staff years) and workload (defendants processed) at each stage of the federal criminal justice system. These equations, and the workload estimates they produce, are based on the historic relationship between resources and workload for each agency included in the model. The model's estimates assume these relationships will not change significantly in the near future.

To use the model, one specifies the resources for each agency included separately in the model. The model then estimates the total number of persons (workload) who will move through the investigation, prosecution, and adjudication stages of the system during the fiscal year and the number who will enter the correction stage. If an agency's resources

[4]These are the outcomes the model estimates; such sentences accounted for about 90 percent of all sentences imposed in fiscal year 1990. Depending upon the crime, possible sentences also include fines, community service, electronic detention, and the death penalty.

[5]We plan to make the model available on diskette for use on a personal computer equipped with LOTUS software. (LOTUS is a trademark of the LOTUS Development Corporation.) The diskette permits a user to do some basic "what if" analyses to estimate the workload impact that user-defined budget choices may have on the federal criminal justice system as a whole.

remain the same as the previous fiscal year, the model estimates that the workload the agency produces will also remain the same.

The model also shows whether there is likely to be an increase in pending end-of-year workload at the prosecution and/or adjudication stages. When the model estimates such increases, it means that more defendants are expected to enter than exit the prosecution and/or adjudication stages during the year. This signals potential logjams in the system that may result from too few resources being provided.

We used the model to estimate the effects of enacting the President's fiscal year 1992 budget request, which included resource increases at all stages of the system. If the President's budget were enacted, the model's estimates suggest that the result would probably be to overload the courts. The model estimates that about 69,300 defendants would be pending in the courts at the end of fiscal year 1992, 22 percent more than the estimated number pending at the end of fiscal year 1991 (about 56,800). (In comparison, the actual number of defendants pending in the adjudication stage at the end of fiscal year 1990 was 49,400.[6]) The reason for the estimated court logjam is that in fiscal year 1992 about 13,000 more defendants would probably enter the adjudication stage (about 79,000) than would exit from it (about 66,000).

The model's adjudication stage estimates assume that district court judges would continue to spend, on average, about 40 percent of their time on their criminal workload.[7] Should they devote more of their time to criminal workload, the number of defendants adjudicated would probably be higher than the model estimates, thus reducing the number of defendants who would be pending in the courts at the end of fiscal year 1992.

Objectives, Scope, and Methodology

Our objective was to develop a model that could assist Congress and federal agencies and departments to estimate the potential workload impact that budgetary decisions affecting one or more parts of the federal criminal justice system, such as investigative agencies, may have on other parts of the system, such as prosecutors, courts, and prisons.

[6]It should be noted that the data used in the model cannot be compared with workload data found in the budget documents for agencies included in the model. For a discussion of the major differences, see appendix I, p.38.

[7]The measure used to determine the amount of time judges spend on criminal workload is a weighted 4-year average of criminal trials as a percent of total trials. See appendix II for a more detailed discussion.

We first evaluated existing criminal justice models and determined that they did not meet the needs mandated by Congress. They were either designed to address only a single part of the system or required data not routinely available at the federal level—for example, the number of hours investigative officers spend in court proceedings. We therefore decided to develop our own model.

The model we developed reduces the criminal justice system to its basic elements—the statistical relationships between resources and workload at each stage of the system. We defined "resources" as budget dollars and/or staff years. We defined "workload" as the number of persons (defendants) processed—that is, referred for prosecution, prosecuted (indicted), adjudicated—at each of the first three stages of the system. "Workload" at the correction stage is defined as the number of persons entering the federal prison and probation systems. Since judges determine the sentences imposed on those found guilty, the correction stage estimates are derived from the adjudication stage analysis.

We tested the assumption (see app. II) that the amount of resources agencies dedicate to federal criminal law enforcement affects the workload they produce (persons arrested, indicted, etc.). We found that more investigators normally result in more persons referred to U.S. Attorneys for possible prosecution; more U.S. Attorneys result in more defendants brought to court; and more judges increase the number of defendants whose cases are adjudicated. An increase in defendants adjudicated will generally result in more defendants being sent to prison, possibly resulting in overcrowding and a need for additional prison capacity.

We developed the model using fiscal years 1979-89[8] budget and staff year data[9] provided by the agencies included in the model. We did not verify these data. For each of the first three stages of the system, we used regression analysis—a statistical procedure often used in modeling—to relate specific budget and staff year resources to the total workload for the same fiscal year period.[10] This analysis identified the

[8]At the time we developed the model, fiscal year 1989 was the latest year for which actual budget, staff and workload data were available.

[9]Data for the FBI, Fish and Wildlife Service, and Internal Revenue Service were not available for fiscal years 1979 and 1980. The Organized Crime Drug Enforcement Task Force provided partial year data for 1983, its first year of operations, and complete data for subsequent years.

[10]Regression analysis uses historical data to compute the mathematical relationship between a dependent variable and one or more independent variables. Its use in making future predictions requires an assumption that the defined mathematical relationship will remain constant over time.

resource(s) that produced the "best" estimate of total workload at each stage. "Best" was generally defined as the resource(s) that most closely estimated fiscal year 1989 actual workload (see app. II for a discussion of the criteria we used to select these resource(s)). For example, at the adjudication stage we found that the resource that yielded the best estimate of the number of criminal defendants adjudicated was the average number of active district court judges (weighted by the estimated average amount of their time devoted to criminal defendants). At the prosecution stage, the resources that produced the best estimate of U.S. Attorney declinations and indictments were a combination of total U.S. Attorney budget and total staff years.

Table 1: Federal Agencies Included in Our Model

Investigation
Department of Justice Drug Enforcement Administration (DEA) Federal Bureau of Investigation (FBI) Immigration and Naturalization Service (INS) Organized Crime Drug Enforcement Task Force (OCDETF)[a]
Department of the Treasury Bureau of Alcohol, Tobacco and Firearms (BATF) Customs Service Internal Revenue Service (IRS) Secret Service
Department of the Interior Fish and Wildlife Service
Postal Service Postal Inspection Service
Prosecution
Department of Justice U.S. Attorneys
Adjudication
Judiciary U.S. District Courts
Correction
Department of Justice Federal Prison System
Judiciary Federal Probation Service

[a]The OCDETF Program constitutes a nationwide structure of regional Task Forces which use the combined resources and expertise of member federal agencies and state/local agencies to investigate major narcotic trafficking and money laundering organizations.

At the investigation stage, the model includes separately the 10 investigative agencies (see table 1) that referred more than 80 percent of the total U.S. Attorney referrals in fiscal year 1989, plus an "all other" category for total referrals from all other agencies. The model's prosecution

stage includes the U.S. Attorneys, who prosecute 99 percent of all criminal defendants in federal courts. At the adjudication stage, the model focuses on the federal trial, or district, courts. Regression analysis for each of these first three stages provides the equations used to estimate the total workload that would result from adding or subtracting resources.

At the fourth stage, correction, the model estimates the total number of persons who would enter the federal prison and probation systems from the courts. Because of limited experience under the sentencing guidelines, we based these estimates directly on fiscal year 1990 data, not on regression analysis. For example, if in fiscal year 1990, one-half of those found guilty were sentenced to prison, the model estimates that one-half of those found guilty in the future would also be sentenced to prison. Estimates of sentences likely to be imposed may vary over time as a greater proportion of defendants are sentenced under the guidelines.[11]

In addition to those caveats already mentioned, several others should be considered in using the model. First, we recognize that the model focuses only on portions of the federal criminal justice system, and therefore does not reflect the full complexity of the total system. Like most models, it oversimplifies reality. Second, the model provides national estimates based on national data and cannot be used for regional or district analysis. Third, each estimate has a specific margin of error, or confidence interval, as described in appendix IV. Fourth, the model is limited to criminal litigation; it does not assess the impact of increasing criminal workloads on civil litigation. Fifth, the model assumes that the historic relationship between resources and workload will not change significantly in the near future. That is, the model is only meaningful within the range of past experience. It cannot reasonably estimate, for example, the workload impacts of doubling resources at any stage. Nor can it estimate the impact of changes in law enforcement priorities, policies, and/or productivity that represent significant departures from prior experience.

Finally, we recognize that changes in resources for the agencies included in our model may affect the workload and resource needs of important supporting agencies not included in our model, such as the U.S. Marshals Service, Defender Services, and the Federal Law Enforcement Training

[11]A revised method of estimating sentences can be developed once several more years of data are available on sentencing practices under the guidelines. Sentencing Commission data show that about two-thirds of the defendants sentenced in fiscal year 1990 were sentenced under the guidelines.

Center. The Marshals Service provides support services to agencies in all four stages of the federal criminal justice system. For example, it houses persons detained prior to trial, transports defendants to court appearances, and transports prisoners transferred from one federal prison to another. The Defenders Service provides legal representation to defendants who cannot afford their own attorneys. The Training Center provides training for a number of federal law enforcement agencies and has developed a model that estimates the impact on the Center's training programs of staff increases for agencies for which the Center provides training.

Appendixes I, II, and III are detailed technical descriptions of the model's development, capabilities, assumptions, and limitations. Appendix IV is a detailed description of the model's fiscal year 1991 and fiscal year 1992 estimates. Appendix V is a description of the model as it will be on diskette. Appendix VI is a list of the major federal entities with at least some criminal justice system responsibilities.

We did our work between March 1989 and January 1991 in accordance with generally accepted government auditing standards. We conferred with the affected agencies during the model's development.

How the Model Works

To use the model, one must enter new resources for all agencies included separately at each of the first three stages in the model (fiscal year budgets at the investigation and prosecution stages and the average number of active district court judges at the adjudication stage). All other information required to generate the model's estimates is part of the computer programs that operate the model. The model's estimates of the number of persons flowing into the correction stage are based on the adjudication stage analysis. Thus, it is unnecessary to enter correction stage resources to determine this number.

The model uses probabilities to distribute aggregate estimates of referrals, declinations, indictments, acquittals, and dispositions to each of six crime categories—corruption, drugs, organized, white-collar, immigration, violent—plus "other crimes." It also uses probabilities to distribute these same aggregate estimates (except for referrals) to each of the 10 referring agencies included separately in the model.

The user may alter these probabilities to see the potential effect that a change in the mix of crimes may have. The only limit on the user is that the total of the individual probabilities must always equal 100 percent.

Examples of Using the Model

To demonstrate how the model works, five basic examples are presented in this section. The first example shows the effects of changing resources for a single agency--DEA—at the investigation stage. The second example shows the effects of changing resources only at the prosecution stage (U.S. Attorneys). The third example changes resources only at the adjudication stage (changing the average number of active U.S. district court judges). In each of these examples, all other resources are held constant at fiscal year 1991 levels. The fourth example shows the potential effects of enacting the President's proposed fiscal year 1992 budget for all agencies in the model. The fifth, and final, example, shows how the user may change the mix of defendants among each crime type to identify the potential impact of this change on the system as a whole.

Table 2 shows the appropriated fiscal year 1991 and requested fiscal year 1992 budget resources each agency estimated it would use for domestic federal criminal justice activities. For the adjudication stage, the resource shown is the total number of active district court judges, the resource used for the model's estimates. The model weights this number by the estimated proportion of time, nationally, these judges would devote to their criminal workloads.

Table 2: Estimated Resources Devoted to Federal Criminal Justice Activities From Fiscal Year 1991 Appropriations and the President's Fiscal Year 1992 Budget

Dollars in millions

Investigation[a]	Resources FY 1991 appropriations	Resources President's FY 1992 budget	Increase/ decrease
FBI	$1,460.8	$1,750.1	$289.3
DEA	694.3	747.9	53.6
INS	290.9	325.1	34.2
OCDETF	265.2	316.3	51.1
BATF	220.5	240.9	20.4
Customs Service	716.7	777.0	60.3
IRS	313.0	331.5	18.5
Secret Service	118.6	105.6	−13.0
Fish & Wildlife	26.8	28.8	2.0
Postal Service[b]	225.8	239.3	13.5
Prosecution			
U.S. Attorneys	575.5	665.9	90.4
Adjudication[c]			
U.S. Courts			
Active District Court Judges	571	612	41

[a]Amounts shown for investigation and prosecution stages are agency estimates of the resources devoted to domestic federal criminal law enforcement activities. For various reasons, this is less than most agencies' total resources. Because agencies provided varying resource measures, it is not meaningful to total the individual entries.

[b]These figures are from the Postal Inspection Service budget, whose funds are derived from Postal Service fees, not congressional appropriations.

[c]Dollar resources are not shown for the courts because the average number of active district court judges, not appropriations, is the variable used in the model.

Correction stage resources are not shown because the number of persons flowing into the correction stage is based on the adjudication stage estimates. The resources for each example are taken from this table.

Example 1: Increase Resources for One Investigation Stage Agency Only

The first example increases DEA's budget by the amount proposed in the President's fiscal year 1992 budget (about $53.6 million, or about 8 percent), but keeps resources for all other agencies at their fiscal year 1991 appropriated levels. This $53.6 million increase would produce one workload change (increased referrals to U.S. Attorneys) and would also have further effects on the prosecution stage. First, the model estimates DEA would refer about 2,700 more persons to the U.S. Attorneys in fiscal year 1992 than it would in fiscal year 1991. With no additional resources for any other investigative agencies, DEA would be the only source of additional referrals to the U.S. Attorneys (prosecution stage).

Estimated FY 1991 referrals	Estimated FY 1992 referrals with DEA increase	Increase from DEA
101,600	104,300	2,700

The first downstream effect of this change is that total fiscal year 1992 workload at the prosecution stage would increase by the same 2,700 referrals. Since the prosecution stage receives no additional resources, the model estimates that the workload produced at this stage will remain unchanged from fiscal year 1991. Consequently, the second effect is that pending end-of-year prosecution workload would also increase by the same additional 2,700 referrals. There are no effects of the increased resources for DEA beyond the prosecution stage.

Example 2: Increase Resources at Prosecution Stage Only

The second example increases the prosecution stage budget by the amount proposed in the President's fiscal year 1992 budget for U.S. Attorneys (an increase of about $90.4 million, or about 16 percent). In this example, the number of persons referred to U.S. Attorneys is assumed to remain unchanged from fiscal year 1991 at about 101,600, since no additional resources would be provided to the investigative agencies that make the referrals. The model estimates that the total workload produced—the number of persons declined and indicted—would increase by about 14,500, or about 13 percent.

The number of referrals declined or indicted (about 129,500) is estimated to exceed the number of new referrals (about 101,600, the same as in fiscal year 1991). Thus, the U.S. Attorneys could reduce their pending end-of-year backlog of persons referred, but not yet declined or indicted, by about 27,900, compared to the number pending at the end of fiscal year 1991.

Estimated FY 1991 declinations and indictments	Estimated FY 1992 declinations and indictments with U.S. Attorney increase	Increase from U.S. Attorneys
115,000	129,500	14,500

The first effect at the adjudication stage would be that the incoming fiscal year 1992 workload would increase by about 9,500 indictments

(about 14 percent). The courts, given no additional resources (active district court judges), would dispose of the same number of defendants as they did in fiscal year 1991. With incoming workload up by about 9,500 defendants, and the number of defendants adjudicated and exiting the courts unchanged, the result would be an increase of 9,500 in the courts' pending end-of-year workload. There would be no effects on the correction stage because the model estimates that the courts' output would be the same as fiscal year 1991.

Example 3: Increase Resources at Adjudication Stage Only

Our third example assumes an increase in resources at the adjudication stage only. The resource the model uses at this stage is judges, and this example assumes an increase in the number of active judges. Active judges are the total number of authorized district court judgeships that are filled. The Judiciary Budget Estimate, as part of the President's fiscal year 1992 budget, estimates that 41 district court judicial vacancies would be filled in fiscal year 1992, bringing the average number of active judges to 612.

Because, in this example, no additional resources are provided to the U.S. Attorneys in fiscal year 1992, the model estimates the number of persons the U.S. Attorneys would indict, and who thus would enter the adjudication stage, would be the same as fiscal year 1991. With total indictments unchanged, the model estimates that the additional 41 judges would enable the courts to adjudicate about 4,400 additional defendants, thus reducing the courts' backlog of pending defendants by the same 4,400 persons by the end of fiscal year 1992. Of this total, the model estimates that (1) the charges against about 700 defendants would be dismissed, (2) 3,600 defendants would be found guilty by plea or trial verdict, and (3) 100 defendants would be acquitted.

Estimated FY 1991 dismissals and dispositions	Estimated FY 1992 dismissals and dispositions with 41 more judges	Increase from U.S. District Courts
61,800	66,200	4,400

Since a total of 800 persons (700 dismissed, 100 acquitted) would exit the adjudication stage, they would have no effect on the correction stage. However, about 3,600 additional persons would remain in the criminal justice system and enter the correction stage.

Example 4: Adopt the President's Fiscal Year 1992 Budget for All Agencies in the Model

The President's fiscal year 1992 budget calls for increases at all stages of the criminal justice system (table 2). The estimated effects, compared to fiscal year 1991, of adopting the President's fiscal year 1992 budget for the first three stages of the criminal justice system are shown in table 3.

Compared to fiscal year 1991, the President's budget would probably increase fiscal year 1992 outputs at the investigation, prosecution, and adjudication stages, as well as the number of persons entering the correction stage. The investigation stage would refer about 7 percent more potential defendants (from about 101,600 to about 108,900), the prosecution stage would indict about 14 percent more persons (from about 69,200 to about 78,700), and at the adjudication stage the number of defendants disposed of by the district courts would go up about 7 percent (from about 61,800 to about 66,200).

The number of persons referred to the U.S. Attorneys in fiscal year 1992 is estimated to be about 20,500 less than the number indicted or declined, permitting the U.S. Attorneys to reduce their backlog of persons referred, but not yet indicted or declined, by about 42 percent, compared to the backlog at the end of fiscal year 1991. Between fiscal years 1990 and 1992, the model estimates the U.S. Attorneys' backlog could decline by more than 50 percent (table 4).

Table 3: A Comparison of Estimated Defendant Workload for FY 1991 and FY 1992

Prosecution	Pending start of year	Received from investigation	Declined and indicted	Pending end of year
FY 1991	62,400	101,600	115,000	49,000
FY 1992	49,000	108,900	129,500	28,400

Adjudication	Pending start of year	Received from prosecution	Dismissed, acquitted, and guilty	Pending end of year
FY 1991	49,400	69,200	61,800	56,800
FY 1992	56,800	78,700	66,200	69,300

	Received from adjudication		
Correction	Prison	Probation	Prison plus probation
FY 1991	24,500	14,700	4,400
FY 1992	26,300	15,700	4,700

Table 4: Prosecution and Adjudication Backlogs

Stage	FY 1990 actual	FY 1991 estimate	FY 1992 estimate	Percent difference FY 1990-92
Prosecution	62,400	49,000	28,400	−54.4%
Adjudication	49,400	56,800	69,300	+40.3%

In contrast, the pending end-of-year workload at the adjudication stage could grow from about 56,700 in fiscal year 1991 to about 69,300 in fiscal year 1992, despite an increase of about 4,400 in the number of persons who are adjudicated—dismissed, acquitted, or found guilty—and exit the adjudication stage.

The estimated backlog increases because the model estimates that in fiscal year 1992 about five persons would enter the adjudication stage for every four persons who exit it. Overall, the adjudication stage backlog could grow about 40 percent between the end of fiscal years 1990 and 1992 (table 4). Because of the backlog at the adjudication stage, the model estimates only about 7 percent more persons would move into the correction stage in fiscal year 1992.

Example 5: Alter the Proportion of FBI "White-Collar" Crime Referrals

The model does not attempt to anticipate changes in law enforcement priorities and resource use. However, it does permit the user to estimate the potential impacts of such shifts. The user can do this by altering the proportion of investigative agency referrals attributable to each of the seven crime categories included in the model.

For example, based on actual fiscal years 1986-90 experience, table 5 shows the model's distribution of total estimated fiscal year 1992 FBI referrals among the model's seven crime categories. In this example, the user assumes the FBI will increase its white-collar crime referrals by 15 percent to 45.5 percent and decrease referrals for "other" crimes by the same amount to 31 percent. Referrals for the remaining crime categories are unchanged.

Table 5: Changing the "Mix" of Crime Types in Total FY 1992 Referrals by the FBI

Crime type	Model's FY 1992 estimate	User-defined distribution
Corruption	3.2%	3.2%
Drugs	11.7	11.7
Immigration	0.1	0.1
Organized	1.1	1.1
Other	46.0	31.0
Violent	7.4	7.4
White Collar	30.5	45.5
Total	**100.0**	**100.0**

Table 6: Effect of Changing FBI Crime Distributions

Crime type	Model's FY 1992 estimate	Estimate resulting from user change	Difference
Corruption	911	911	0
Drugs	3,330	3,330	0
Immigration	28	28	0
Organized	313	313	0
Other	13,093	8,823	−4,270
Violent	2,106	2,106	0
White Collar	8,682	12,952	+4,270
Total	**28,464[a]**	**28,464[a]**	

[a]Individual entries may not equal totals due to rounding.

As table 6 demonstrates, a change in the proportions for individual crime categories changes the distribution of the total referrals, but not the total itself. The model automatically calculates the effect of this change on all stages of the system so that the user could see how a change in the types of crimes for which persons are referred, indicted, and adjudicated could change the model's estimates.

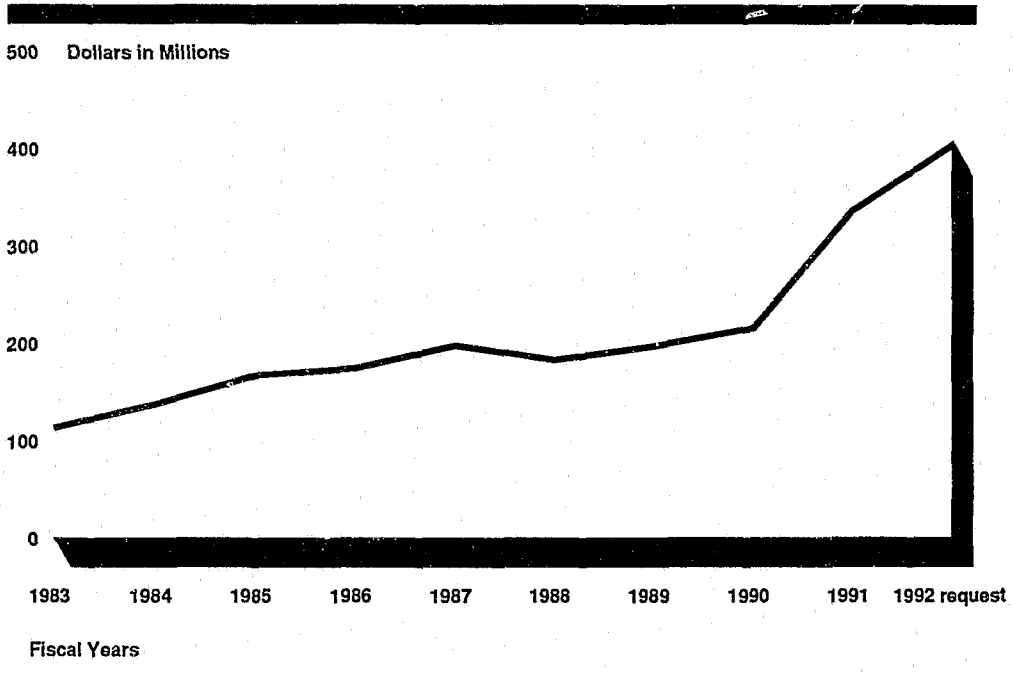
Some Recent Trends That May Affect the Model's Estimates

The model's fiscal year 1991 and fiscal year 1992 estimates are based on the relationship, using 11 years of data (fiscal years 1979-90), between resources and workload for each of the first three stages of the federal criminal justice system. A number of factors may limit the accuracy of the model's estimates of future workload, one of which is a significant change from the past budget and workload trends on which the model relies. For two agencies included in the model—OCDETF and the U.S. Attorneys—the fiscal year 1989-92 budget growth is much larger than for any 4-year period during fiscal years 1979-90, the years of actual

data used to develop the model's equations. The model's estimates are based on the assumption that these very large increases will not affect the historic relationship between resources and workload for these agencies.

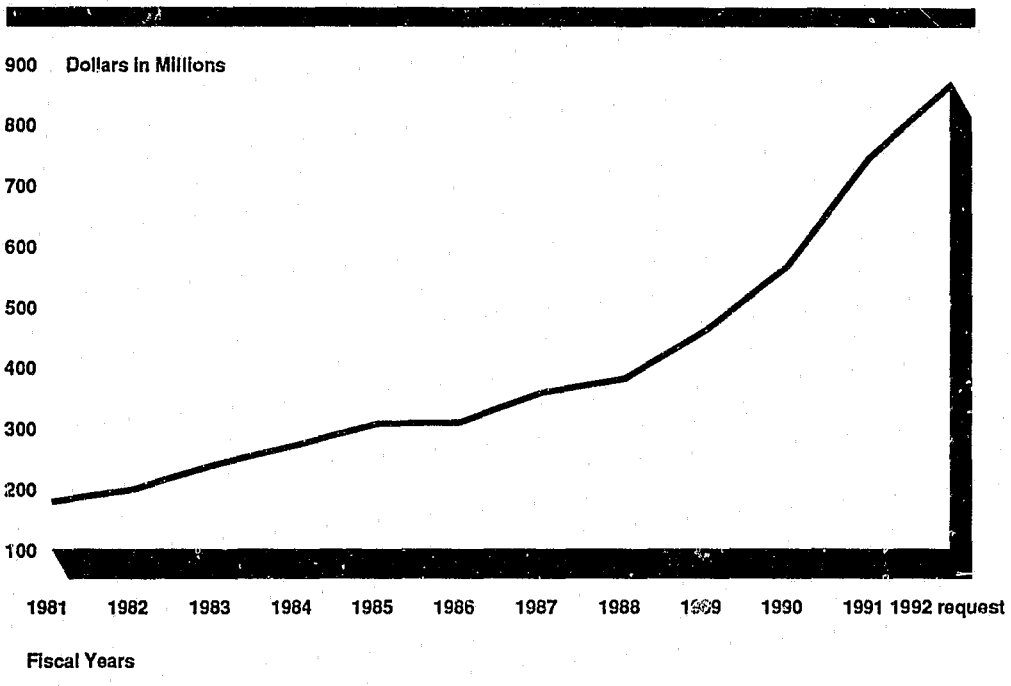
Should the President's budget be enacted, the fiscal year 1989 to fiscal year 1992 OCDETF budget would grow 105 percent (from $196.3 million to $402 million, see fig. 2). Total budget growth between fiscal year 1984, the first full year of OCDETF's existence, and fiscal year 1988 was 33 percent. Second, from fiscal year 1989 to fiscal year 1992, budget authority for the U.S. Attorneys would grow from $460 million to $862 million, or 87 percent (fig. 3). During the previous 4 years, from fiscal year 1985 to fiscal year 1988, the budget grew only 23 percent, from $308 to $380 million. In fiscal year 1989 and fiscal year 1990, Congress authorized an additional 1,115 Assistant U.S. Attorneys, a 41-percent increase, and most of these positions were filled by the end of the fiscal year in which they were authorized (see fig. 4). Many of these positions were targeted for specific types of prosecutions (such as 423 of the fiscal year 1989 positions for drugs).

Figure 2: OCDETF Budget Authority: Fiscal Years 1983-92



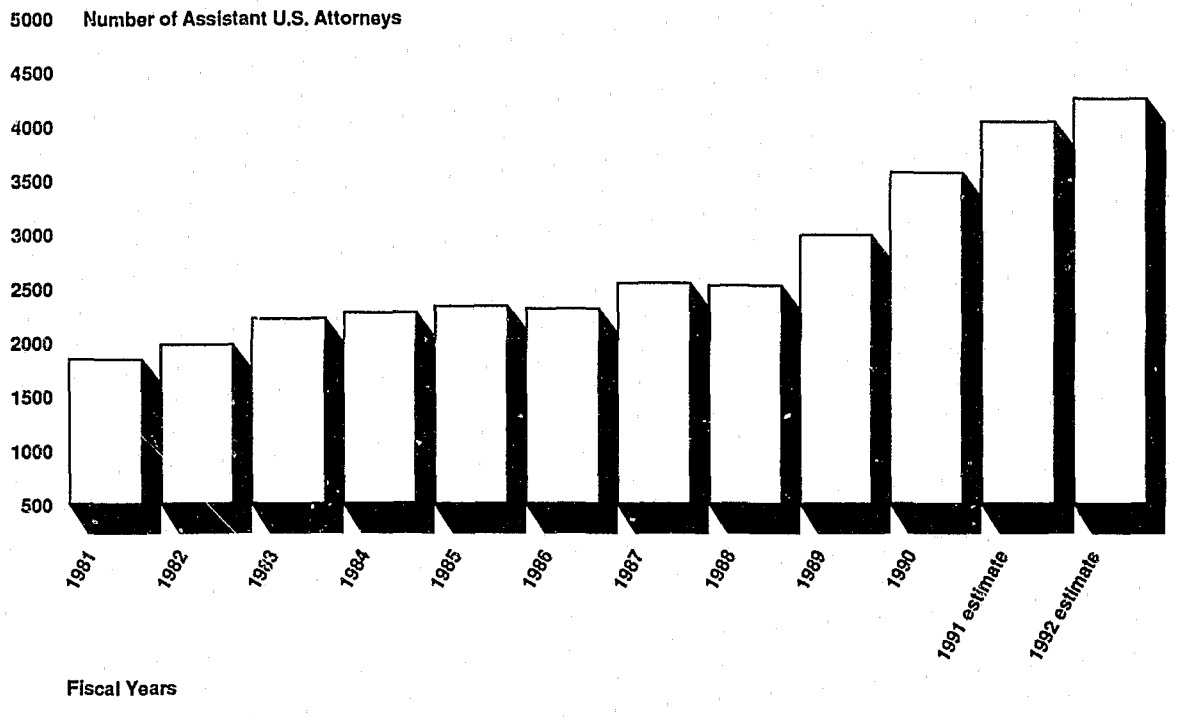
Source: FY 1992 Justice Department budget request.

Figure 3: Budget Authority for U.S. Attorneys: Fiscal Years 1981-92



Source: FY 1992 Department of Justice budget request.

Figure 4: Number of Assistant U.S. Attorneys at End of Fiscal Years 1981-92



Source: FY 1992 Justice Department budget request.

The model's estimates incorporate the actual fiscal year 1989 and fiscal year 1990 impact of these budgetary changes in the data used to develop the equations that produce the model's estimates. However, because they have no parallel in the historic data on which the model's estimates are based, the very large fiscal year 1991 and 1992 resource increases could result in actual OCDETF and U.S. Attorney workload higher or lower than that the model estimates. In part, this depends on how the additional resources are used. If the additional resources are used largely as resources have been in the past, the model's estimates could prove to be reasonably accurate. However, if the new resources are targeted for specific purposes, as were the 423 assistant U.S. Attorney posiitions in 1989, the model's estimates would vary from actual results.

Conclusions

The model we developed can be used to provide Congress and the federal agencies and departments better information on the potential consequences of various budgetary options for the federal criminal justice system. The model's estimates are indicators of general trends and useful for identifying potential major workload imbalances between the four stages of the federal criminal justice system.

If the necessary data were updated annually, and the model reviewed and revised as appropriate, it could be refined, its estimates improved, additional variables could perhaps be included, and its usefulness for congressional and executive branch decisionmaking enhanced. Part of this annual revision and refinement could be an exploration of the possible causes of actual results that vary significantly from those the model estimates, based on its historical data.

Matter for Consideration of Congress

Congress may wish to consider charging a specific agency, such as the Office of Management and Budget, with the responsibility of maintaining and enhancing the model.

Copies of this report are being sent to the Attorney General; Secretary of the Treasury; Secretary of the Interior; Postmaster General; Director, Office of Management and Budget; and other interested parties.

The major contributors to this report are listed in appendix VII. If you have any questions, please call me on (202) 275-8389.

Lowell Dodge
Director, Administration
of Justice Issues

Contents

Figures

Abbreviations

BATF	Bureau of Alcohol, Tobacco and Firearms
DEA	Drug Enforcement Administration
FBI	Federal Bureau of Investigation
INS	Immigration and Naturalization Service
IRS	Internal Revenue Service
OCDETF	Organized Crime Drug Enforcement Task Force

Modeling Methodology

Section 9201 of the 1988 Anti-Drug Abuse Act (21 U.S.C. 1501; 28 U.S.C. 509 note) directed GAO to conduct a study to develop a model that could be used to help "maintain balance in the federal criminal justice system." The model's purpose was to assist Members of Congress and federal departments and agencies to assess the potential impact that increasing or decreasing budgets (staff and dollars) for part(s) of the system, such as investigative agencies, would have on the rest of the system, such as prosecutors, the courts, and prisons. Such a model could be used to help determine the level of staff and budget resources that may be needed to keep the entire system "in balance." This technical appendix describes the work we did to explore potential modeling procedures and determine the feasibility of developing the required model. (Apps. I through III describe the model that was developed to satisfy the statutory requirement.)

Summary of Our Modeling Approach

We first examined existing models to determine whether there were any that could satisfy the statutory requirement. We found these models were either designed to address only a single part of the system (usually corrections), required data not available at the federal level, or required data more detailed than could be obtained with reasonable effort. One model, JUSSIM, developed for use by local governments, appeared to offer promise because it was designed to cover the entire criminal justice system, from arrest to sentencing. But after detailed review, we determined that federal data were not available at a level of detail sufficient to support the JUSSIM model.

We identified available federal data sources, developed the assumptions needed to build a model based on that data, and determined whether a model based on these assumptions and data would respond to the act.

How GAO's Model Fits Within Existing Criminal Justice Models

To understand the model we developed, it is useful to place it in the context of existing criminal justice impact models. For operational and budgetary reasons most models, including ours, oversimplify reality.

A recent survey of existing criminal justice impact models—those that have been used to project policy impacts on the criminal justice system—groups these models into three basic types:[1]

[1]William Rhodes, Models of the Criminal Justice System: A Review of Existing Impact Models, Abt Associates, June 1990.

- Statistical models use data to discern past trends (patterns) and project those trends into the future. Most statistical models assume that the trends revealed by the statistical analysis will continue into the future.
- Disaggregated simulation models classify units of analysis into groups (such as burglary defendants or cases) and simulate criminal justice operations by modeling flows between important processing stages, such as arrest, arraignment, and guilty plea/trial verdict.
- Microsimulation models process units of analysis, such as defendants or cases, one at a time rather than in groups and often require very detailed data about the crime and/or defendant (such as age, sex, race, and prior convictions).

Models may combine attributes of more than one of these types. They may also focus on the entire process from arrest through parole, or only a portion of the process (most frequently corrections). Models may attempt to estimate flows and/or stocks at one or more steps in the process. Flows are estimates of the number of cases/defendants who move from one step to the next (such as arrest to indictment) during a particular period of time (such as month or fiscal year). Stocks are estimates of the inventory of cases/defendants at one or more steps in the process (such as total prison population) at a point in time (such as end of month or fiscal year). Estimating stocks generally requires knowing (1) how many cases/defendants there are at the beginning of the period, (2) how many enter during the period, and (3) and how many exit during the period.

Models also vary in the data used. The level of detail a model requires is dependent in large part on the purposes for which the model was developed and how difficult it is to get the necessary data. Some microsimulation prison projection models require very detailed data on the characteristics of the crime committed (such as whether a gun was used) and the defendant (such as prior criminal record). JUSSIM, the model we initially considered adapting, generally requires detailed data on the resources used at each stage of the process.

The model we developed combines features of both statistical and disaggregated simulation models. It is a statistical model in that it uses statistical (regression) analyses of resource and workload data to develop most of its aggregate estimates, such as the total number of persons the U.S. Attorneys indict in a given fiscal year. The model assumes that the relationships those statistical analyses identified will remain constant in the near term.

It is also a disaggregated simulation model in that it estimates the total number of persons[2] who will move (flow) through the investigation, prosecution, and adjudication stages of the criminal justice system during the fiscal year and enter the correction stage. The model breaks these totals into seven major crime types and estimates the flows using branching ratios in the form of probabilities. For two stages of the process—prosecution and adjudication—it also estimates stocks in the form of the total number of defendants pending at the end of the fiscal year. These estimates reflect potential "imbalance" in the system. Significant growth in these pending end-of-year workloads may indicate that insufficient resources are available to keep up with incoming workload at the prosecution and/or adjudication stages of the federal criminal justice process.

Evaluating Existing Models

If possible, we wanted to use or adapt an existing model rather than develop our own. To evaluate existing models, we established several ground rules. We wanted a model that Congress and federal agencies could use with relative ease. We preferred a model that could be used on a personal computer for basic "what if" analyses. We also preferred a model that used readily available data, thus minimizing the difficulty of gathering data to update the model periodically.

Because the JUSSIM model encompasses the entire criminal justice process—from arrest to sentencing—we initially focused on the potential of adapting JUSSIM for use in the federal system. The generic JUSSIM model has been modified and adapted in several jurisdictions. One such adaptation was PHILJIM, developed in Philadelphia through cooperation between the U.S. Department of Justice and the city government. More recent adaptations are used in Dade County, Florida; San Diego County, California; Santa Clara County, California; and Montgomery County, Maryland.

Although adaptations of JUSSIM have been used primarily at the local level, we originally thought that with major adaptations to the original computer program, JUSSIM might serve as a foundation for developing the desired federal model. We therefore obtained a copy of the computer source code and the relevant documentation and met with representatives from Santa Clara County and Montgomery County to discuss their

[2]We use persons (defendants), rather than cases, as our workload measure because "defendants" is the only useful measure at the correction stage and, thus, the only useful measure common to all four stages. A case may include more than one defendant. According to the Administrative Office of the U.S. Courts, there is an average of about 1.4 defendants per federal criminal case.

work. We also reviewed the work of Abt Associates, who studied the amount of time required to move defendants charged with different crimes through the criminal justice process.

From these reviews, however, we determined that all of the adaptations of JUSSIM require the detailed time and unit cost data similar to that shown in table I.1. We found such detailed data are neither routinely available nor readily collectable at the federal level. As a result, we examined the possibility of developing a GAO model that would satisfy the statutory mandate.

Data Availability

To evaluate the potential applicability of existing models, we had to identify the types of workload and resource data each model required and the availability of such data in the federal government. Once we had determined that available federal data would not support any existing model, we had to determine whether we could develop our own model using existing federal data. The following sections discuss our assessment of available federal workload and resource data, including their usefulness for model development.

Databases on Total Federal Criminal Justice System Workload

We identified two databases that contained governmentwide data on federal criminal justice workload and outcomes. The first is maintained by the Executive Office of U.S. Attorneys[3] and the other by the Administrative Office of the U.S. Courts.

Table I.1: Example of Data Requirements for JUSSIM-Type Models for a Simple Robbery Crime

Available resources	Units per year	Cost per unit	Fringe benefits
Detective	1,700 hours	$13.50	25%
Patrolman	1,700 hours	10.30	20%
Magistrate	205 days	175.00	30%
Clerk	1,776 hours	7.50	25%
Public defender	220 days	50.00	0%
Judge	135 days	225.00	35%
Corrections officer	365 days	155.00	45%

(continued)

[3]This source maintains two databases, one referred to as the Central System and the other as the Docket and Reporting System. The first of these has only been in existence since fiscal year 1988; therefore, we used the Docket and Reporting System database for our model development. Minor differences exist in terms of overall contents of the two databases; however, by using the same system over time we were able to maintain consistency.

Action	Resource	Required unit hours	Probability of continuing to next stage of justice system
Stage 1			64.1%
Investigation			
	Detective	15.15 hours	
	Patrolman	4.75 hours	
Report Preparation			
	Detective	8.00 hours	
	Patrolman	1.50 hours	
Stage 2			58.2
Arrest			
	Detective	7.25 hours	
	Patrolman	3.15 hours	
Stage 3			65.4
Preliminary hearing			
	Magistrate	2.15 days	
	Detective	3.75 hours	
	Patrolman	1.00 hours	
Stage 4			37.5
Arraignment			
	Magistrate	2.00 days	
	Detective	1.00 hours	
	Clerk	10.00 hours	
	Defender	21.80 hours	
Stage 5			
Detention			
	Defender	5.00 hours	
	Corrections	30.00 days	

Source: JUSSIM, An Interactive Computer Program for Analysis of Criminal Justice Systems.

The U.S. Attorney criminal database contains information regarding all persons referred to them if the amount of time required to handle the complaint exceeds 1 hour.[4] This database includes information relating to all actions taken from the date of the referral through final adjudication, with the exception of the type and length of sentence imposed. The database also identifies a single investigative agency as the source of each referral. We used this agency code to identify the federal investigative agencies that accounted for 85 percent of the total referrals to U.S.

[4]Persons whose complaints are disposed of in less than 1 hour exit the federal criminal justice system and are not included in the database.

Attorneys in fiscal year 1988 (the most recent data available during initial model development). We focused our initial work at the investigative stage on these 12 agencies, but subsequently dropped 2 agencies (see app. I, p. 37).

The U.S. Court criminal database, the Master Criminal File, contains information about defendants who enter the adjudication phase of the process. Generally, U.S. Attorneys have obtained indictments against these defendants or have filed other formal charges in the courts. The U.S. Court database differs from the U.S. Attorney database in three important aspects. The U.S. Court database (1) does not contain information identifying the investigative agency, (2) has more crime codes, and (3) includes information about the type and length of sentence given those defendants who either pled or were found guilty.[5]

Data Reliability Assessment

To see if we could use these databases for model development, we conducted a reliability assessment of the data. Given our resources, it was not feasible to audit the accuracy of data entry for either of the databases.

To perform the basic initial tests, we obtained copies of data files from the U.S. Attorneys and U.S. Courts for fiscal years 1987 and 1988.[6] The data maintained in both databases are input by clerks at local district offices from information contained in paper files. Data elements are added to each computerized record as a defendant proceeds through the system. Although data are entered as soon as possible after an event takes place, delays may occur. For this reason, both databases include two date fields for each event. One field shows the actual occurrence date and the other the date of entry into the computer system.[7] Since our goal was to relate resources to workload, we used the date of occurrence to reflect the actual timing of events.

[5]Sentences for criminal charges generally consist of either a prison term, a term of probation, or a combination of the two.

[6]At the time of our assessment, these were the most recent data available. If these data were not usable for model development, then we could proceed no further.

[7]For reporting purposes, both agencies use the date of entry as the control date. This difference in terms of the controlling date prevents direct comparisons between counts generated by the agencies and those used in our model.

The reliability assessment first included an examination of the internal editing controls that are built into both databases. Both data entry programs provide control checks to ensure that all required information is recorded. When required data have been omitted, corrections are mandatory before data entry may continue. For example, a clerk cannot enter a sentencing code unless codes showing the judge, the date of the indictment, and other appropriate elements have already been entered in the database.

The amount of "missing" data—the number of fields without an entry—initially appeared to be a problem. But further examination showed that these missing data were not missing because of a failure to enter data that should be in the database. Rather, the missing data were omitted because no entry was appropriate for those particular fields. For example, if the U.S. Attorney declines to pursue a referral, no entry for any subsequent activity is appropriate or permitted.

As part of the reliability assessment we conducted a relationship test of the fields in the fiscal year 1987 database that we identified as essential for model development. This test was designed to check whether data in each field fell within the allowable parameters specified for the field. For example, was a month coded as 0 or 13 when only values of 1 to 12 were allowed, or did a code indicating the referring agency fall outside the allowable codes? We also performed an attribute test to determine whether data were missing when they should have been part of the record. On the basis of the information shown in table I.2, we concluded that further testing was not needed.

Table I.2: Reliability Assessment of U.S. Attorney Database Using FY 1987 Data

Data field tested	Number of records failing test[a]	
	Attribute test	Relationship test
Crime code	0	1106
Referring agency	0	72
Prosecuting agency	0	280
Date referred		
Month	0	0
Year	60[b]	0
Status date		
Month	0	0
Year	46[b]	0
Date indicted		
Month	0	0
Year	40[b]	0

[a]There were a total of 217,998 records in the fiscal year 1987 database. An error rate could not be computed because more than one error could occur within a single data record.

[b]These were considered errors because the year recorded is prior to 1960.

With the exception of information regarding the type and the length of the sentence, the U.S. Attorney database contained all the information we required for model development. Therefore, we limited the scope of the reliability assessment for the U.S. Court database to only these two items.

At the conclusion of the reliability assessment we were satisfied that the available data from both the U.S. Attorney and U.S. Court databases were sufficiently complete and accurate for our purposes. We therefore requested data files from both sources for fiscal years 1979 through 1986 and for fiscal year 1989.[8]

An examination of the new data files revealed two problems, both of which were addressed during model development. The first problem was that the U.S. Attorney database crime codes were not comparable over the 10-year period. During fiscal years 1979 and 1980 only 10 crime categories were identified. The number of these codes expanded over the next 5 years to the 57 categories used in fiscal years 1988 through 1990. However, it was possible to collapse the 57 crime codes identified in the U.S. Attorney database into the seven generic crime categories the U.S.

[8]Because the U.S. Court database is maintained on a July 1 through June 30 statistical year, we asked the Administrative Office of the U.S. Courts to create computer files that corresponded to the federal fiscal year, October 1 through September 30.

Attorneys use for reporting time and attendance—corruption, drugs, immigration, organized crime, violent, white-collar, and other. In order to have comparable data we similarly aggregated the 150 crime codes used in the U.S. Court database into the same seven generic crime types.

A second problem was that prior to fiscal year 1985 many records contained a significant amount of truly missing data. A discussion with the Executive Office of the U.S. Attorneys confirmed that this was a problem.[9] For this reason, we relied upon the data from fiscal years 1979 through 1984 solely for overall workload counts, such as total indictments, and not for information at greater levels of specificity, such as indictments by crime types.

Data on Resources Used for Federal Criminal Justice Activities

Because our model was supposed to estimate the impact of resource (budgetary) changes, the resource data available was an important determinant of our modeling approach. At the investigation, prosecution, and adjudication stages of the criminal justice process, we faced the simple threshold problem of obtaining data on the total staff years and dollars devoted to criminal investigations and cases.[10] Many investigative agencies, the U.S. Attorneys, and the courts have both civil and criminal responsibilities and do not necessarily routinely track the resources used for each. When necessary, the agencies estimated the resource allocation between civil and criminal for us. We did not validate the accuracy of these estimates; our goal was to determine if a model could be developed using readily available data. The model's estimates are based on the assumption that these data are a reasonably accurate reflection of actual resource usage.

[9]Their database was not automated until the mid-1980s; prior to that time manual records were sent to headquarters, where the information was entered into the computer database. However, few edit controls were in place because it was virtually impossible to correct missing information under this type of system, since the actual records were spread out over the entire country.

[10]At the corrections stage, all resources are used to support the federal criminal justice system.

e I.3: Major Sources of U.S.Attorney
kload in Fiscal Year 1988

Department/ jurisdiction	Agency	FY 88	Percent
Justice	DEA	31,330	14.5
	FBI	68,721	31.8
	INS	13,234	6.1
	OCDETF	7,068	3.3
	Marshals Service[b]	3,913	1.8
Treasury	BATF	9,103	4.2
	Customs Service	8,423	3.9
	IRS	9,830	4.5
	Secret Service	10,187	4.7
Postal Service	Postal Service	14,735	6.8
Interior	Fish & Wildlife Service	3,150	1.3
District of Columbia[a]	Metropolitan Police[b]	4,192	1.9
Total		**183,886**	**85.0**

[a]Felony cases in the District of Columbia are tried by the U.S. Attorney.

[b]Marshals Service and D.C. Police were subsequently dropped due to insufficient resource data.

lection of vestigative Agencies cluded Separately in .e Model

Practical considerations prevented the separate inclusion of resource data from all 148 agencies charged with responsibility for some aspect of federal criminal investigations. To select the investigative agencies to be individually included in the model, we used the U.S. Attorney database to determine how many defendants were referred by each investigative agency during fiscal year 1988, the latest year for which actual data were available. Table I.3 lists each agency that accounted for at least 1.5 percnt of U.S. Attorney workload during the period. Together, these 12 agencies accounted for 85 percent of the workload during fiscal year 1988. Two of the agencies, the U.S. Marshals Service and the D.C. Metropolitan Police Department were later eliminated from inclusion in the final model due to insufficient resource data. The final model included the 10 agencies that accounted for 81 percent of U.S. Attorney workload for fiscal year 1988 and 82 percent for fiscal year 1989.

To capture the rest of the investigative agency workload, we aggregated the remaining agencies (including the U.S. Marshals Service and the D.C. Police Department) into an "All other" category. Workload for this all other category is estimated using a different technique than that used for the 10 agencies for which separate resource data were obtained. (See app. II, p. 46.) In this way, the final model includes all referrals to the U.S. Attorneys.

Resource Data Provided by Agencies Included Separately in the Model

Each of the 12 investigative agencies identified in table I.3 provided us with available budget, staffing, and workload data related to criminal law enforcement for fiscal years 1979 through 1989. We requested similar information from the U.S. Attorneys, the U.S. Courts, and the Federal Prison System. The data supplied were not consistent in content or format. Consequently, the data could not be compared across agencies or totaled for investigative agencies or for the criminal justice system as a whole. However, since we intended to make individual workload estimates for each agency based on its own data, this did not pose an impediment to model development.

Creating a Consistent Set of Workload Data for Analysis

We edited the workload data provided by the U.S. Attorneys and the U.S. Courts to make the data comparable over time and to increase the comparability between the two databases. First, we deleted all traffic cases from the U.S. Court database. These are traffic violations that occur on federal property, such as military bases and national parks. Such cases are not prosecuted by the U.S. Attorneys. Deleting these made the U.S. Court workload counts more comparable to those in the U.S. Attorney database. There were about 8,000 traffic defendants in fiscal year 1989.

Second, to avoid doublecounting a defendant, we deleted records marked as transfers. These are defendants whose cases have been transferred from one judicial district to another. Since both the transferring and receiving district count the case, deleting the transfers eliminated this doublecounting.

Third, our data excludes appeals and remands; the U.S. Attorney and U.S. Court databases include such cases. We deleted these cases because our goal was to estimate the number of new defendants that would enter the prosecution and adjudication stages as a result of changes in resources.

Fourth, we deleted records whose indictment date was at least 8 years before the start of the fiscal year, unless the defendant was a fugitive. Action on such cases had been indefinitely suspended. Fifth, we deleted records where the indicated disposition date was prior to the start of the fiscal year defined by the file. Action on these records was completed, and did not affect workload during the fiscal year of the file on which the records were found.

Finally, the U.S. Attorney and U.S. Court databases do not count a defendant's case as closed until the cases of all defendants in that case are closed. We count a defendant as adjudicated when that specific defendant's case has been closed. For model development, we believe this is a more useful measure of actual workload in a fiscal year.

Together, these deletions did not exceed 10 percent of the total records on the file for any year.

Selection of Modeling Methodology

A wide variety of forecasting techniques are available ranging from purely qualitative methods to purely quantitative statistical procedures. When selecting a modeling method, the goal is to maximize the accuracy of estimates within the limits of resources available for development and maintenance of the model. At the same time the method employed must be understandable and useful to the user (in this case, Congress and the affected agencies). The method must also be appropriate to the available data. In the case of statistical models it must be sufficiently robust to be unaffected by the failure of some or all of the data to meet the assumptions normally associated with statistical analyses.

We considered the advantages and disadvantages of several different techniques. One qualitative modeling procedure we examined involved using one or more experts in conjunction with personal computer software to establish numeric priorities subjectively and then allocate resources proportionate to these priorities. We also considered the use of moving averages, a method that assumes that past patterns or trends in workload would continue into the future independent of changes in resources. This is a technique frequently used in business and is based upon an analysis of trends and cyclical fluctuations. Another procedure we examined simply uses the percent change over time to estimate the next point in time. The assumption of consistency over time, which is critical for this method to produce satisfactory results, was not satisfied by the data.

We concluded that regression analysis met the criteria for an acceptable methodology because (1) it is appropriate to the available data, (2) it provides unbiased objective results, (3) its usefulness for modeling purposes has been well documented, and (4) it provides a measure of the relative accuracy of its estimates. Regression analysis uses historical data to compute the mathematical relationship between a dependent variable and one or more independent variables. Its use in making future

predictions requires an assumption that the defined mathematical relationship will remain relatively constant over time.

In our model the dependent variable is the number of defendants processed through each of the major decision points in the criminal justice system; the independent variable is agency staff and/or budget resources. Our analysis revealed that there is a linear relationship between resources and overall criminal justice workload—that is, as resources increase or decrease there is a measurable increase or decrease in workload.[11]

Assumptions of Our Model

We applied the following set of assumptions for developing our model.

1. Historic trends are useful predictors of future events; the historic relationships observed will continue into the near future.[12] This is a basic assumption of all quantitative modeling.

2. The resource data provided by agencies included in the model is a reasonably accurate reflection of actual resource usage during fiscal years 1979-89.

3. The investigative agency identifier in the U.S. Attorney data base accurately reflects the principal agency responsible for the referral.

4. The number of persons received at each stage of the system is an appropriate measure to use in assessing the impact of changes in resources because this number reflects flow through the system. "Persons (defendants) received" at each stage shows the number of individuals who proceed from one stage of the system to another during a fiscal year. Also, an individual is the only measure that can be tracked throughout the entire criminal justice process from investigation through corrections. Cases may be investigated and prosecuted with one or more persons involved, but only individuals receive sentences and enter the corrections stage.

[11]A corollary of this relationship is that if the resources available to an agency remain unchanged, the model estimates that the workload produced will also remain unchanged.

[12]During testing, we used fiscal years 1979-88 data to predict actual fiscal year 1989 workload. The accuracy of that prediction and the strength of the relationships observed between resources and workload for fiscal years 1979 through 1988 were used as the basis for concluding that historic resource data could be used to estimate future workload.

5. The "best" estimators of future activity are those that most accurately reflect actual experience. We defined best according to a set of criteria described in appendix II. The actual choice of one estimator over another involved using both standard statistical requirements and subjective decisionmaking that considered the potential consequences associated with possible erroneous decisions.

6. The distribution of certain types of criminal justice activity, such as determinations of guilt or innocence, are more appropriately predicted by means of probabilities derived from historic experience than by resource availability. This procedure is described in detail in appendix II.

7. The supply of criminal suspects is infinite, with available resources the primary limitation on how many persons will be arrested and prosecuted.

Model Development and Initial Testing

In developing the model, we tested the assumption that the amount of resources (staff years, dollars) agencies dedicate to federal criminal law enforcement generally affects their workload (arrests, indictments, etc.). In other words, more investigators normally result in more persons sent to the U.S. Attorneys for possible prosecution; more U.S. Attorneys result in more defendants brought to court; and more judges increase the number of defendants whose cases are adjudicated. An increase in defendants adjudicated will result in more defendants being sent to prison, possibly resulting in overcrowding and a subsequent need for additional prison capacity.

Estimates for Agencies Included Separately in the Model

For each agency included separately in the model (see app.II, p. 43), we developed regression equations that define the mathematical relationships between budget and/or staff year resources and the number of persons processed at each stage of the system. We then tested these equations, which used data from fiscal years 1979 through 1988, by comparing the model's fiscal year 1989 workload estimates to actual workload for fiscal year 1989.

We explored the data to identify potential relationships among various resource measures—such as the number of law enforcement agents, direct and indirect costs—and the number of persons processed using different regression techniques and varying lag times.[1] We also tested potential regression equations both with and without an intercept.

Regression equations without an intercept represent a situation where if an agency has no funding or resources it produces no workload for the next stage in the criminal justice system. For example, if the FBI had no funding or staff, the agency would refer no one to the U.S. Attorneys for prosecution. In regression equations without an intercept, an agency produces workload at any given level of resources. However, regression equations with an intercept represent a situation where some minimum level of resources is expended without the production of any workload. For example, there is some minimum fixed level of budget and staff required before the FBI will produce any referrals to the U.S. Attorneys.

[1]Lag time refers to the amount of time that elapses after the occurrence of an event until the impact of that event is measurable. Regression analysis allows for the automatic inclusion of specific lag times when modeling. In this instance the event is the infusion of additional resources, and the effect is an increase in the number of persons processed.

Each equation tested was unique to a particular agency because the measures of staffing and budget we obtained differed among the agencies. We tested more than 100 potential regression equations for each agency, depending on the measures of staffing and budget data the agency provided.

To select the best fitting equation, we used a sequential process. We first applied the statistical standards for regression modeling by rejecting any equation with an F statistic (goodness of fit of the model) significance level over 0.10, or with an R^2 of less than 0.75.[2] The appropriate regression coefficients derived from fiscal years 1979-88 data were applied to resource data for fiscal year 1989 to compute estimates of workload for fiscal year 1989. We compared the results of this process to the actual data for fiscal year 1989. During this process we answered the following questions:

1. By how much did the estimates of the number of persons processed differ from the actual number processed?

2. Was the actual number of persons processed within the confidence interval for the estimate?

3. How wide was the confidence interval?

4. For each estimate, what was the R^2 (the amount of variance accounted for by the independent (estimator) variable(s))?

We weighted the responses to each question, varied the relative importance assigned each response, then, based on this information, selected equations that best satisfied these requirements when compared to the actual data. When two or more equations were equal in terms of the accuracy of the fiscal year 1989 estimates, we applied the following criteria:

1. Simple rather than complex regression procedures were preferred.

2. An equation that produced an overestimate of the flow of persons into the next stage was preferred, though not always achieved.

[2]These are statistical standards by which to judge the usefulness of any regression model. While statisticians disagree about the need to adjust the R^2 statistic when the intercept term is set to zero, we did not base any of our final decisions as to the best-fitting model on this statistic. Therefore, it was not necessary to address this issue in our model development.

3. The format of the independent variable(s)—the budget and staff year data—must be either the same as, or easily converted to, the format used in federal budget submissions.

The first of these criteria simplified the interpretation of the results and thereby improved usability. The second criterion ensured, where possible, conservative estimates of the number of persons pending action at any stage of the system. That is, we preferred to err on the side of overestimating rather than underestimating the end-of-year pending workload. The third criterion made the computer model more user friendly by allowing the user to specify budget data in a familiar format.

Our tests confirmed the basic assumption that the variance in the number of persons processed by the criminal justice system can be explained by the budget and staff resources provided to the system. Our tests also indicated that simple regression, without lag times and without an intercept term, estimated the number of persons processed at each stage of the system as accurately as more complex methods.

For the first two stages, investigation and prosecution, the independent variable selected was directly related to staff years and/or budget resources. However, at the adjudication stage, these measures did not accurately estimate workload produced. We found that the "best" estimator of workload produced at the adjudication stage was the number of active district court judges weighted by the proportion of total trials that were criminal trials. The Administrative Office of the U.S. Courts provided the information on the proportion of trials that were criminal for fiscal years 1980 through 1990.

Table II.1 shows the independent variables and statistical characteristics of the final equations used for each agency at each stage of the system during the test phase of model development.

Table II.1: Estimators and Statistical Characteristics of the Models Used for Investigative Agencies, U.S. Attorneys, and U.S. Courts

	R^{2a}	Beta[a]	Standard error[a]
Workload measures for U.S. Attorney referrals			
DEA-Direct criminal obligations	.990	.055	.002
FBI-Total criminal staff years	.998	1.472	.024
INS-Total criminal staff years	.928	2.089	.183
OCDETF-Total obligations and staff years	.969	−.280[b] .017	.823 .013
BATF-Total budget authority	.910	.015	.002
Customs Service-Total criminal direct obligations and staff years	.989	−.090[b] .008	.070 .001
IRS-Total criminal staff years	.972	.600	.034
Secret Service-Total criminal staff years	.995	3.382	.077
Postal Service-Total criminal obligations and staff years	.992	.019 .878	.005 .277
Fish & Wildlife Service-Total criminal staff years	.984	5.282	.214
Workload measures for U.S. Attorney actions			
Declinations-Total obligations and staff years	.989	2.241 .042	.994 .017
Indictments-Total obligations and staff years	.996	20.900 −.150[b]	1.570 .027
Workload measures for U.S. Court actions			
Dismissals-Average number of active district court judges weighted by percent of criminal caseload[c]	.974	28.942	1.484
Dispositions-Average number of active district court judges weighted by percent of criminal caseload	.980	196.400	8.930

[a]The "R^2" is the proportion of the variance in the independent variable explained by the dependent variable(s). The beta coefficient is the ratio of change in the independent variable to change in the dependent variable(s). The standard error (SE) is the average squared error of the regression estimates.

[b]Negative beta weights may result from the lack of a consistent relationship between budget and staff years; that is, as budgets increase, there is not necessarily a corresponding increase in staff years.

[c]The Administrative Office of the U.S. Courts provided data approximating how much time judges spend on criminal versus civil activities based on the percent of total district court trials that are criminal.

Estimates for "All Other" Investigation Stage Agencies

It was not practical to obtain budget and staff data for the 138 investigation stage agencies we combined into the "All other" category. We therefore did not have the independent resource variables to use in regression analysis. However, together these agencies account for about 18 percent of the total number of persons referred to the U.S. Attorneys in any year, too large a number to omit from our model. We employed an estimation technique commonly used in marketing analysis called "exponential smoothing," a form of moving averages, to estimate the number

of persons referred by "All other" agencies. The basic assumption upon which this procedure operates is that past patterns of highs and lows will continue into the future. The mathematical calculations utilize periodic fluctuations to compute patterns of occurrence.

We tested the results of using exponential smoothing for fiscal years 1979-88 to estimate the fiscal year 1989 actual results and found the method produced an accurate estimate. Although this procedure is less sensitive, and therefore more prone to error over time, we found it was the best procedure given the fact that resource data were not available. Like regression analysis, exponential smoothing provides measures of the confidence intervals for the estimates.

Weighting Procedure Used for Adjudication Stage

At the adjudication stage, we tested the assumption that workload produced could be predicted by the average annual number of active district court judges (independent) variable. This is the average number of authorized judicial positions filled in a fiscal year. We used active judges because this is the best measure of the actual number of judges available to adjudicate cases. An authorized, but vacant, judicial position is of no assistance in processing cases.

However, we also knew that judges do not spend all of their time on criminal cases. Therefore, we needed some way to measure the proportion of time judges spend on criminal workload. The Administrative Office has two measures—the proportion of total trials that are criminal and the proportion of total trial hours that are criminal. The Administrative Office provided this data for statistical years (July 1-June 30) 1980 to 1990.[3] A trial is defined as any contested proceeding in which evidence is introduced (excluding sentencing hearings). Thus, this definition of "trial" is fairly broad.

We used a weighted average for the 4 most recent years (statistical years 1985-88), weighting the 2 most recent years (statistical years 1987 and 1988) at twice that of the 2 earlier years (statistical years 1985 and 1986). Thus, the formula would be:

$$P = [C1985 + C1986 + 2(C1987 + C1988)]/6$$

[3]We recognize the anomaly of using fiscal year data for all analyses except this one. However, the courts were unable to convert the statistical year data on trials to fiscal years. In any event, the measure we used is an approximation of the actual time district judges devote to their criminal workloads. The courts do not keep data on the time judges spend on all aspects of criminal cases.

Where: P = The estimated proportion of time district court judges spend on criminal defendants.

C = The proportion of criminal trials each statistical year (July 1-June 30) that are criminal trials.

We applied this weighted average to the average number of active judges to estimate district court workload—dismissals and dispositions.

Distribution of Regression Estimates by Agency and Crime Type

For the model to satisfy the statutory mandate, we found it desirable to be able to distribute the aggregate workload estimates obtained using regression analysis according to the originating investigative agency and crime type.[4] However, the resource data available did not permit the use of regression analysis to estimate workload by crime type at any stage or by investigative agency beyond the initial referrals to the U.S. Attorneys. Therefore, we used historic probabilities to distribute the aggregate regression estimates of the total number of persons processed at each stage of the criminal justice system by crime type and by investigative agency at the prosecution and adjudication stages.

Specifically, we used this technique at the investigation stage to estimate the number of persons referred to U.S. Attorneys according to six general crime types (drugs, corruption, immigration, violent, white-collar, organized) plus "other" crimes. At the prosecution stage it is used to estimate the number of persons declined and indicted for each investigative agency and for each type of crime. At the adjudication stage historic probabilities are used to estimate the total number of defendants who plead guilty, are acquitted, and who receive trial verdicts, each of which is then distributed further according to the crime type. Finally, we used this method to distribute sentences for those who pled or were found guilty by each type of crime.

During the testing phase of model development, we used data from the four most recent years, fiscal years 1985-88, to compute the probabilities for both crime type and referring agency. Using the following formula, we gave a greater weight to fiscal years 1987 and 1988 data to reflect more recent time periods.

[4]This procedure permits the user of the model to modify the probabilities to reflect increased emphasis on particular crime categories. It also allows the model to produce estimates of what would happen if an investigative agency were to shift its law enforcement efforts.

$$P = \frac{[R1985 + R1986 + 2(R1987 + R1988)]/6}{[T1985 + T1986 + 2(T1987 + T1988)]/6}$$

Where: P = Historic probability used to distribute aggregate estimates of referrals, indictments, dispositions, and sentences by crime type; and indictments, dispositions, and sentences by referring agency.

R = Number of persons referred by each agency or each crime type in the fiscal years indicated.

T = Total number of persons referred in the fiscal years indicated.

An example of how the estimates obtained from regression analyses are distributed is presented in tables II.2 and II.3. The example assumes that regression analysis had produced an estimate of 37,951 for the total number of persons declined.

Table II.2: Derivation of Crime Type Estimates

Referring agency[b]	Crime type	Historic probability		Total estimated declinations[a]		Derived estimate
DEA		.056	x	37,951	=	2,125
	Corruption	.007	x	2,125	=	15
	Drugs	.928	x	2,125	=	1,972
	Immigration	.001	x	2,125	=	2
	Organized	.002	x	2,125	=	4
	Other	.055	x	2,125	=	117
	Violent	.000	x	2,125	=	0
	White collar	.007	x	2,125	=	15
FBI		.399	x	37,951	=	15,142
	Corruption	.047	x	15,142	=	712
	Drugs	.062	x	15,142	=	939
	Immigration	.001	x	15,142	=	15
	Organized	.013	x	15,142	=	197
	Other	.523	x	15,142	=	7,919
	Violent	.027	x	15,142	=	409
	White collar	.327	x	15,142	=	4,951

[a]Total estimated declinations for all agencies = 37,951

[b]Estimates for each of the other eight investigative agencies, plus the "all other agency" category are computed using the same methodology. Individual estimates are then combined to provide a total estimate for each crime type, as shown in table II.3.

Table II.3: Total Crime Type Estimates Developed From Derived Estimates

Crime type	DEA		FBI		Crime type estimate
Corruption	15	+	712	=	727
Drugs	1,972	+	939	=	2,911
Immigration	2	+	15	=	17
Organized	4	+	197	=	201
Other	117	+	7,920	=	8,037
Violent	0	+	409	=	409
White collar	15	+	4,952	=	4,967

Correction Stage Estimates

Recent legislation changed the correction stage of the federal criminal justice system. Federal sentencing guidelines include mandatory minimum sentences for a number of crimes. The guidelines, which were to take effect on November 1, 1987, were challenged in a number of federal courts. They were upheld by the U.S. Supreme Court in January 1989.[5]

Because of the sentencing changes incorporated in the guidelines, experience prior to the guidelines' implementation is no basis for predicting sentencing outcomes. A U.S. Sentencing Commission study found that in the 9 months following the Supreme Court's decision upholding the guidelines, about one-half of the criminal defendants found guilty were sentenced under the guidelines. Given this limited experience under the guidelines, we were unable to test our model's fiscal year 1989 estimates against actual fiscal year 1989 sentencing data. Therefore, the model's estimates are based on the most recent year's actual sentencing data.

The basic assumption of the model's sentencing estimates is that if one-half of those sentenced in the previous year were sentenced to prison, then one-half of those sentenced in the next year would also be sentenced to prison. As the number of defendants sentenced under the guidelines grows, the guidelines' full impact on the federal prisons will become more clear, and the methodology for making estimates should be refined.

Summary

The model we developed is based on ordinary least squares regression analysis with a zero intercept and no lag times. Regression analyses produced a set of mathematical equations that defined the relationships between budget and staff years and the number of persons entering and

[5]Mistretta v. United States, 109 S.Ct. 647 (1989).

exiting three of the four stages of the criminal justice system. The model uses budget and staff years as the independent variables in regression equations to produce estimates of (1) the number of persons referred by each of 10 investigative agencies to U.S. Attorneys for prosecution, (2) the number of persons declined and indicted by U.S. Attorneys, and (3) the number of defendants dismissed and disposed of by U.S. District Court judges. The model then distributes these estimates using historic probabilities into categories for each of six crime types (plus "other crimes") at all stages and for each investigative agency at the prosecution and adjudication stages. Using the most recent actual sentencing data, the model produces estimates of the type and length of sentence imposed on persons entering the correction stage of the system.

Results of Model Testing

This appendix describes the results of the testing phase. During this phase we determined whether the results of the model would provide useful information. As discussed in the preceding appendix and shown in figure II.1, we used several methods to produce the model's estimates. First, we performed regression analyses using data for fiscal years 1979 through 1988. These analyses yielded the coefficients (see app.II, table II.1) that, when applied to fiscal year 1989 resource data, produced point estimates and confidence intervals for the following:

- the number of referrals to U.S. Attorneys from each of the 10 investigative agencies,
- the total number of declinations by U.S. Attorneys,
- the total number of indictments by U.S. Attorneys,
- the total number of dismissals by U.S. Courts, and
- the total number of dispositions (guilty pleas plus trial verdicts) by U.S. Courts.

Exponential smoothing provided estimates of the number of referrals expected from the "all other" category of investigative agencies.

The model then used the probability calculations to distribute the regression results according to the generic crime types and among the referring agencies. The probability weights used data for fiscal years 1985 through 1988 to make the estimates of fiscal year 1989. All estimates were compared to the actuals for fiscal year 1989 and the differences computed by subtracting the actual from the estimate. The results of the test of the model's accuracy are presented in this appendix.[1]

[1]It should be noted that estimated totals in the tables by crime type and investigative agency may differ slightly. This occurs because all decimal digits beyond .1 of 1 percent are deleted from the computations as part of the weighting process.

Figure III.1: How the Model's Estimates Were Developed

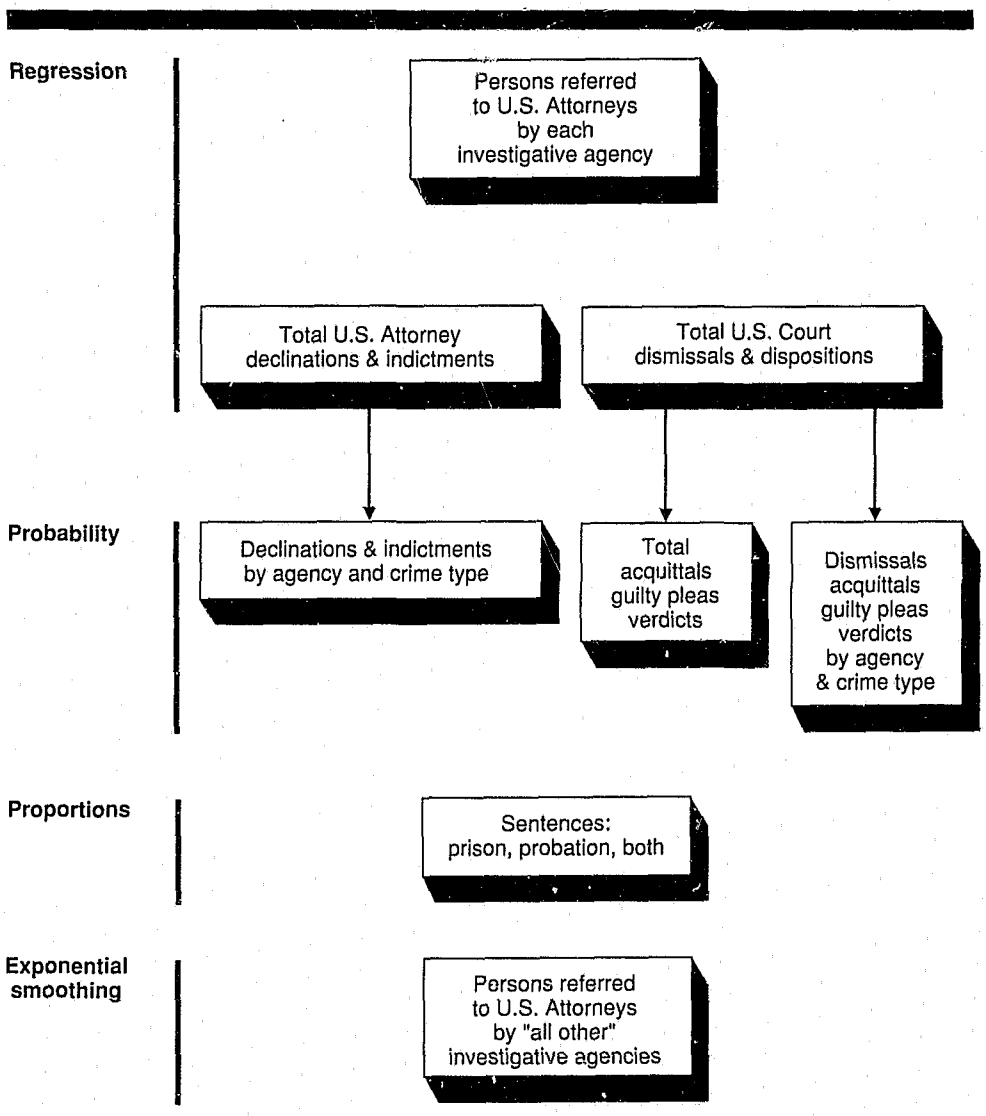


Table III.1: Estimated FY 1989 Referrals to U.S. Attorneys Compared to the Actual FY 1989 Referrals

Agency	Actual	Point estimate	Difference[a]
FBI	27,111	28,327	1,216
DEA	14,107	15,841	1,734
Postal Service	5,743	6,189	446
IRS	3,114	3,013	−101
Secret Service	4,336	4,478	142
Fish & Wildlife	1,597	1,653	56
OCDETF	2,776	3,307	531
BATF	4,998	3,653	−1,345
Customs Service	5,400	4,774	−626
INS	9,614	12,156	2,542
"All other"	17,179	16,410	−759
Total	**95,975**	**99,800**	**3,825**

95% Confidence Intervals for the Estimates

Agency	Point estimate	Lower limit	Upper limit
FBI	28,327	27,860	28,795
DEA	15,841	15,351	16,330
Postal Service	6,189	4,375	8,002
IRS	3,013	2,844	3,181
Secret Service	4,478	4,376	4,580
Fish & Wildlife	1,653	1,586	1,720
OCDETF	3,307	−130	6,743
BATF	3,653	3,297	4,009
Customs Service	4,774	3,633	5,916
INS	12,156	11,091	13,221
"All other"	16,410	12,992	19,828
Total	**99,800**		

[a]Difference = estimate minus actual.

Analysis of Test Results—Investigation Stage

Comparisons between estimated and actual numbers of referrals from each investigative agency are shown in table III.1. The model's total estimate of referrals was 99,800, or 4 percent above the actual number during fiscal year 1989. Point estimates for each agency as well as the 95-percent confidence interval are provided in the second part of the table. Statistically, we were 95-percent confident, before examination of the actuals, that the actual total number of referrals to U.S. Attorneys for fiscal year 1989 would fall between 112,326 and 82,275.

The estimates by crime types that were derived using the probability computations are shown in table III.2.

Table III.2: Estimated FY 1989 Referrals to U.S. Attorneys Compared to the Actual FY 1989 Referrals by Type of Crime

Crime type	Actual	Estimate	Difference[a]
Corruption	1,570	1,659	89
Drugs	28,608	27,255	−1,353
Immigration	8,933	11,269	2,336
Organized	410	675	265
Other	32,192	35,018	2,826
Violent	2,443	2,326	−117
White collar	21,820	21,580	−240
Total	**95,976**	**99,782**	**3,806**

[a]Difference = estimate minus actual.

Analysis of Test Results—Prosecution Stage

Table III.3 provides a comparison of the estimates for U.S. Attorney declinations and indictments to the fiscal year 1989 actuals. The second part of the table shows the point estimates and the 95 percent confidence intervals for U.S. Attorney declinations and indictments.

Table III.4 shows the comparison of the estimated number of declinations to the actual number for fiscal year 1989 according to investigative agency and crime type. The estimate was 5.4 percent below the actual. With the exception of the FBI, all agency estimates of declinations are lower than the actuals. For drug-related crimes the model underestimates the number of declinations.

Table III.3: Estimated FY 1989 U.S. Attorney Actions Compared to the Actual FY 1989 Actions

Action	Actual	Point estimate	Difference[a]
Declinations	34,885	32,994	−1,891
Indictments	60,999	60,291	−708
95 Percent Confidence Intervals for the Estimates for U.S. Attorney Actions			
Action	**Point estimate**	**Lower limit**	**Upper limit**
Declinations	32,994	18,906	47,083
Indictments	60,291	38,100	82,482

[a]Difference = estimate minus actual.

Table III.4: Estimated FY 1989 U.S. Attorney Declinations Compared to the Actual FY 1989 Declinations

Agency	Actual	Point estimate	Difference[a]
FBI	12,786	13,594	808
DEA	1,965	1,848	−117
Postal Service	2,124	1,980	−144
IRS	1,185	1,023	−162
Secret Service	1,472	1,452	−20
Fish & Wildlife	950	508	−442
OCDETF	612	396	−216
BATF	1,598	1,056	−542
Customs Service	1,277	891	−386
INS	5,158	4,949	−209
"All other"	5,758	5,312	−446
Total	**34,885**	**33,009**	**−1,876**

Crime type	Actual	Point estimate	Difference[a]
Corruption	1,081	868	−213
Drugs	4,906	3,879	−1027
Immigration	5,022	4,770	−252
Organized	224	198	−26
Other	13,687	13,835	148
Violent	426	431	5
White collar	9,539	9,035	−504
Total	**34,885**	**33,016**	**−1,869**

[a]Difference = estimate minus actual.

Table III.5 shows the comparison between estimates for indictments and the corresponding actual numbers by agency and by crime type for fiscal year 1989. The estimate is 1.2 percent below the actual. These calculations show that the model's estimates related to drug crimes and the agencies responsible for their investigation are consistently lower than the actuals.

Table III.5: Estimated FY 1989 U.S. Attorney Indictments Compared to the Actual FY 1989 Indictments

Agency	Actual	Point estimate	Difference[a]
FBI	15,439	16,459	1,020
DEA	13,369	11,033	−2,336
Postal Service	3,771	3,798	27
IRS	1,825	1,990	165
Secret Service	2,791	3,497	706
Fish & Wildlife	472	904	432
OCDETF	2,569	1,748	−821
BATF	3,354	2,291	−1,063
Customs Service	3,609	1,929	−1,680
INS	4,058	5,125	1,067
All other	9,742	11,516	1,774
Total	**60,999**	**60,290**	**−709**

Crime type	Actual	Point estimate	Difference[a]
Corruption	733	731	−2
Drugs	24,212	18,365	−5,847
Immigration	3,844	4,888	1,044
Organized	277	313	36
Other	17,658	19,614	1,956
Violent	2,198	1,833	−365
White collar	12,077	14,541	2,464
Total	**60,999**	**60,285**	**−714**

[a]Difference = estimate minus actual.

Analysis of Test Results—Adjudication Stage

The number of dismissals by U.S. Courts is small compared to the frequency of other criminal justice activities. Court dispositions include those defendants who had a guilty plea accepted and those whose cases were tried and a verdict rendered. The model's estimate of dismissals exceeded the actual by 6.6 percent; for dispositions the estimate was under by 13 percent. Table III.6 shows the actual and the estimated number of court actions for fiscal year 1989, as well as the corresponding confidence intervals.

Table III.6: Estimated FY 1989 U.S. District Court Actions Compared to the Actual FY 1989 Actions

Action	Actual	Point estimate	Difference[a]
Dispositions	46,223	40,182	−6,041
Dismissals	9,530	10,162	632

(continued)

95 Percent Confidence Intervals for the Estimates of U.S. Court Activity			
Action	**Point estimate**	**Lower limit**	**Upper limit**
Dispositions	40,182	38,063	42,300
Dismissals	10,162	9,619	10,705

[a]Difference = estimate minus actual.

Despite the small number of defendants whose cases are dismissed, to complete our model we calculated these estimates by investigative agency and by crime type. These estimates are reported in Table III.7. The distribution of U.S. Court dispositions according to investigative agency and crime type is shown in table III.8.

Table III.7: Estimated FY 1989 U.S. District Court Dismissals Compared to the Actual FY 1989 Dismissals

Agency	**Actual**	**Point estimate**	**Difference[a]**
FBI	2,325	2,480	155
DEA	1,667	1,778	111
Postal Service	581	620	39
IRS	353	376	23
Secret Service	658	701	43
Fish & Wildlife	143	152	9
OCDETF	314	335	21
BATF	419	447	28
Customs Service	305	325	20
INS	600	640	40
All other	2,163	2,307	144
Total	**9,528**	**10,161**	**633**

Crime Type	**Actual**	**Point estimate**	**Difference[a]**
Corruption	101	108	7
Drugs	2,667	2,844	177
Immigration	521	555	34
Organized	39	42	3
Other	3,634	3,875	241
Violent	300	320	20
White collar	2,261	2,411	150
Total	**9,523**	**10,155**	**632**

[a]Difference = estimate minus actual.

Table III.8: Estimated FY 1989 U.S. District Court Dispositions Compared to the Actual FY 1989 Dispositions

Agency	Actual	Point estimate	Difference[a]
FBI	9,198	7,996	−1,202
DEA	7,118	6,188	−930
Postal Service	2,912	2,531	−381
IRS	1,664	1,447	−217
Secret Service	2,773	2,411	−362
Fish & Wildlife	1,063	924	−139
OCDETF	1,294	1,125	−169
BATF	1,664	1,447	−217
Customs Service	1,479	1,286	−193
INS	9,290	8,077	−1,213
All other	7,765	6,751	−1,014
Total	**46,220**	**40,183**	**−6,037**

Crime type	Actual	Point estimate	Difference[a]
Corruption	528	459	−69
Drugs	11,943	10,382	−1,561
Immigration	8,883	7,722	−1,161
Organized	211	183	−28
Other	13,794	11,991	−1,803
Violent	1,336	1,161	−175
White collar	9,533	8,287	−1,246
Total	**46,228**	**40,185**	**−6,043**

[a]Difference = estimate minus actual.

Correction Stage Estimates

As discussed in appendix II the nationwide implementation of the Sentencing Guidelines following the Supreme Court's January 1989 decision upholding their constitutionality resulted in significant changes in the existing patterns of sentences both in terms of type and length. Therefore, sufficient data were not available to permit us to test the accuracy of the model in estimating the number of persons entering the correction stage.

Interpretation of Test Results

After examining the test results of the model, we were satisfied that the model would provide reliable information to decisionmakers regarding the impact of resource changes for one or more criminal justice agencies on the numbers of defendants processed.

Comparisons for certain crime types and investigative agencies identified several apparent differences between the estimated number of

defendants and the actual number. BATF estimates beginning with the number of referrals to U.S. Attorneys through U.S. Attorney indictments were underestimates (see tables III.1, III.4, and III.5). On the other hand, referrals and indictments from INS were overestimates. For drug-related crimes, the estimates were consistently underestimates. In our opinion, these discrepancies may be related to common factors: (1) the increasing number of defendants who are charged with drug-related crimes, and (2) the increasing frequency with which firearms are apparently involved in drug-related crimes. This second factor could also contribute to our underestimates for BATF.

Drug-related crime estimates were below the actual number of defendants (see tables III.2, III.4, and III.5). A partial explanation for this difference may lie in the fact that OCDETF, one source of drug-related referrals, is a funding program for agencies involved in the war on drugs. Arrests attributed to OCDETF are the result of cooperative efforts by multiple agencies, both federal and state and local. For OCDETF, resources may not be as indicative of workload as they are for some other agencies included in the model (such as FBI and DEA, both of which are also sources of drug-crime referrals).

The Fish and Wildlife Service is also unique in terms of the crimes referred to U.S. Attorneys. For the most part, these individuals represent only a small part of the overall workload, and they are charged with offenses that differ from those that the other agencies investigate. Persons referred by Fish and Wildlife are charged with such violations of federal statutes as those dealing with agriculture, game conservation, migratory birds, etc. As a consequence, they may require a lower level of resource expenditures than do some other types of crimes, such as drugs or white-collar.

Despite these variances between the model's estimates and actual workload, the model can be useful for estimating the impact of resource changes both on the agency directly affected by the change and on all agencies at subsequent stages of the process.

Limitations

In addition to the specific problems discussed above, there are a number of general limitations inherent in the use of models to make estimates of future events. This section briefly discusses some limitations as they apply to this criminal justice model.

1. The accuracy of estimates depends on the accuracy of the underlying data. The agencies involved in the criminal justice process were the sources of resource information. When obvious discrepancies were identified, we asked for verification from the agency officials who provided the original information. However, we did not independently verify the data provided.

2. The model does not address the effect upon the civil portion of the workload that results from increased emphasis on criminal defendants/cases.

3. We used general crime categories to help make the model useful. Many of the more specific crime types account for such a small portion of the total that detailed estimates would have been extremely unreliable. The use of broad crime categories is a drawback if the user wants to estimate the impact of changes in resources for a particular crime type that has been combined with others to form a generic classification. For example, the model cannot differentiate among the various types of fraud crimes (such as bank or credit card fraud) but deals with them as a single category.

4. Point estimates are frequently used to make it easier to interpret the results. However, the user should keep in mind the fact that the estimates derived from regression analyses and the exponential smoothing procedure have upper and lower confidence intervals. The model uses a 95 percent confidence level to establish these intervals.

5. The model provides only national estimates. This obscures differences among individual judicial districts.

6. The model does not attempt to address the potential workload impact that federal and state/local criminal justice systems may have on each other.

7. The model can only provide reliable estimates of the impact of resource changes within reasonable limits. For example, if resources were increased by 50 percent in a single year the estimates produced by the model would be unreliable.

8. In order to provide useful results over time, the model will require annual updating of the mathematical formula upon which it operates. This is necessary to reflect changes in the criminal justice system that may affect the relationships between resources and outputs.

Model Applications

Following the test of the accuracy of the model's estimates, we concluded that it would meet the requirements specified under the act. The next step was to use the model in two applications: (1) to produce workload estimates for fiscal year 1991 based upon congressional appropriations for that year and (2) to develop workload estimates for fiscal year 1992 based upon the proposed presidential budget. To do this, it was necessary to update the model with actual fiscal year 1990 resource and workload data, as well as obtain agency resource estimates for fiscal years 1991 and 1992. We retested the accuracy of the model's estimates by using fiscal years 1979-89 resource data to estimate actual fiscal year 1990 workload. The model was adjusted as necessary; we then developed detailed fiscal years 1991 and 1992 estimates based on the fiscal years 1991 and 1992 resource data provided by the agencies included separately in the model.

In this appendix, we (1) show the results of testing the model's estimates for fiscal year 1990, (2) show the detailed fiscal year 1991 and 1992 estimates for each stage, and (3) describe other applications that can use the type of information generated by the model.

Testing the Model's Fiscal Year 1990 Workload Estimates

In order to apply the model to make estimates for fiscal year 1990, we added fiscal year 1989 data and recomputed both the regression equation coefficients and the probability calculations upon which the model operates. Statistically, the inclusion of the additional year's data increased the accuracy of the model by reducing the standard errors of the estimators. It also permits the model to reflect recent changes in resources and workload.

Examination of the new regression coefficients provided further evidence that the model would produce reliable estimates over the near future. The fact that the regression coefficients used in the equations to generate the model's estimates (the beta coefficients and their associated standard errors) remained basically unchanged indicated consistency. In fact, as might be expected, the standard errors decreased slightly as a result of the addition of the new data.

When we recalculated the probabilities using data for fiscal years 1985 through 1989, we continued the increased emphasis on the current time period by using the following weighting procedure:

$$P = \frac{[R1986 + R1987 + 2(R1988 + R1989)]/6}{[T1986 + T1987 + 2(T1988 + T1989)]/6}$$

Where: P = Historic Probability used to distribute aggregate estimates of referrals, indictments, dispositions, and sentences by crime type; and indictments, dispositions, and sentences by referring agency.

R = Number of persons referred by each agency or each crime type in the fiscal year indicated.

T = Total number of defendants for fiscal year indicated.

We also recalculated the weighted average for estimating the proportion of time district court judges would spend on their criminal workload:

$$P = [C1986 + C1987 + 2(C1988 + C1989)]/6$$

Where: P = The estimated proportion of time district court judges spend on criminal workload.

C = The proportion of trials that are criminal trials in the judicial statistical year (July 1-June 30) indicated.[1]

Table IV.1 shows the levels of resources (both staff and budget) that were used in the model to make fiscal year 1990 estimates. These resources reflect agency estimates of the fiscal year 1990 appropriated funds that would be used for federal criminal justice activities.

The principal objective of these analyses was to determine whether overall the fiscal year 1990 estimates were reliable indicators of actual fiscal year 1990 workload at the major stages in the process. For each of the first three stages, table IV.2 shows the model's estimated fiscal year 1990 workload, the actual workload, and the difference between the estimated and actual workload.

The fiscal year 1990 estimates represent an improvement over the fiscal year 1989 estimates for the investigation and adjudication stages (table IV.3). At the prosecution stage, the model underestimated actual fiscal year 1989 workload but overestimated it for fiscal year 1990. This may indicate a shift to an emphasis on more complex drug and white-collar

[1]As noted in appendix II, we recognize that there is an anomaly in using federal fiscal year data for all calculations and analysis but this one. However, the courts could not readily convert their trial data to fiscal years. In any event, the trial data is only an approximation of the amount of time that district court judges spend on their criminal workload. The courts do not have data on the amount of time judges spend on all aspects of their criminal workload.

crime cases, compared to the past. Assuming no major changes in policy or priorities, additional years of data should further improve the accuracy of the model's estimates.

Table IV.1: FY 1990 Regressors Used in the Model

Dollars in millions

Stage	Staff	Budget
Investigation		
FBI	17,727	N/A
DEA	N/A	$281,338
Postal Service[a]	2,776	210,030
IRS	5,210	N/A
Secret Service	1,475	N/A
Fish & Wildlife Service	321	N/A
OCDETF	2,755	214,921
BATF	N/A	264,071
Customs Service	6,648	810,011
INS	5,648	N/A
Prosecution		
U.S. Attorneys	6,872	513,864
Adjudication		
U.S. District Court Judges	539[b]	N/A

[a]Postal Service resources used for criminal law enforcement activities are not appropriated by Congress; they are derived from Postal Service revenues.

[b]Average number of active district court judges.

Table IV.2: FY 1990 Estimated and Actual Workload for the Investigation, Prosecution, and Adjudication Stages

Stage	Actual	Estimate	Difference[a]
Investigation			
Number of referrals	101,340	99,942	−1,398
Prosecution			
Number of declinations	34,536	37,951	3,415
Number of indictments	64,904	67,416	2,512
Adjudication			
Number of dismissals	10,245	10,489	244
Number of dispositions	46,924	42,971	−3,953

[a]Difference = estimate minus actual.

Table IV.3 Accuracy of Model's FY 1989 and FY 1990 Estimates Compared to Actuals

Stage	FY 1989 differences		FY 1990 differences	
	Number	Percent	Number	Percent
Investigation				
Referrals	3,825	3.9	−1,398	−1.4
Prosecution				
Declinations	−1,891	−5.4	3,415	9.9
Indictments	−708	−1.2	2,512	3.9
Adjudication				
Dismissals	632	6.6	244	2.4
Dispositions	−6,041	−13.1	−3,953	−8.4

Revised Foundation for the Model

Having tested the accuracy of the model's fiscal year 1990 estimates, we added fiscal year 1990 data to our model and recomputed both the regression equation coefficients and the probability calculations upon which the model operates. These new equations are used to estimated fiscal year 1991 and 1992 workload. Statistically, the inclusion of the additional year's data increased the accuracy of the model by reducing the standard errors of the estimators. It also permits the model to reflect recent changes in resources and workload.

Examination of the new regression coefficients provided further evidence that the model would produce reliable estimates over the near future. The fact that the regression coefficients used in the equations to generate the model's estimates (the beta coefficients and their associated standard errors) remained basically unchanged indicated consistency. In fact, as might be expected, the standard errors decreased slightly as a result of the addition of the new data.

When we recalculated the probabilities using data for fiscal years 1986 through 1990, we continued the increased emphasis on the current time period by using the following weighting procedure for distributing aggregates estimates by each of our 7 crime categories and 10 referring agencies:

$$P = \frac{[R1987 + R1988 + 2(R1989 + R1990)]/6}{[T1987 + T1988 + 2(T1989 + T1990)]/6}$$

Where: P = Historic probability used to distribute aggregate estimates of referrals, indictments, dispositions, and sentences by crime type; and indictments, dispositions, and sentences by referring agency.

R = Number of persons referred by each agency or each crime type in the fiscal year indicated.

T = Total number of defendants for fiscal years indicated.

We also recalculated the weighted average for estimating the proportion of time district court judges would spend on their criminal workload:

$$P = [C1987+C1988+2(C1989+C1990)]/6$$

Where: P = The estimated proportion of time district court judges spend on criminal workload.

C = The proportion of trials each judicial statistical year (July 1-June 30) that are criminal trials.

Estimates for fiscal years 1991 and 1992 are presented in the same tables in this appendix. The estimates are provided in formats similar to those provided directly by the model—national totals, and totals by investigative agency and by the seven generic crime types. Estimates show the number of defendants who are expected to exit the criminal justice system at each step of the process, the number who will proceed into the next stage, and the number who will remain within the prosecution and adjudication stages.

Table IV.4 shows the levels of resources (both staff and budget) that were used in the model to make fiscal year 1991 and 1992 estimates. These resources reflect agency estimates of the fiscal year 1991 appropriated funds and of the President's fiscal year 1992 proposed budget that would be used for federal criminal justice activities (see app. II for the type of data provided by each agency included in the model). Thus, the figures shown below are not the same as those found in the actual budget documents.

Table IV.4: FY 1991 and FY 1992 Regressors Used in the Model

Dollars in millions

	FY 1991		FY 1992	
Stage	**Staff**	**Budget**	**Staff**	**Budget**
Investigation				
FBI	$17,793	N/A	$19,278	N/A
DEA	N/A	$342,674	N/A	$393,227
Postal Service[a]	2,852	225,771	2,852	239,317
IRS	4,825	N/A	4,863	N/A
Secret Service	1,137	N/A	1,013	N/A
Fish & Wildlife Service	432	N/A	439	N/A
OCDETF	2,790	265,167	3,219	316,276
BATF	N/A	220,519	N/A	240,970
Customs Service	6,734	716,716	6,786	777,046
INS	4,595	N/A	4,855	N/A
Prosecution				
U.S. Attorneys	8,131	669,998	8,362	779,256
Adjudication				
U.S. District Court				
Average number of active judges[b]	571	N/A	612	N/A

[a]Postal Service resources used for criminal law enforcement activities are not appropriated by Congress, they are derived from Postal Service revenues.

[b]The total average number of active district judges is weighted by the estimated proportion of the time they will devote to criminal workload. See appendix II for a discussion of how this weight was developed.

Table IV.5: FY 1991 and FY 1992 Estimated Referrals to U.S. Attorneys: 95% Confidence Intervals for the Estimates

Agency	Point estimate	Lower limit	Upper limit
	FY 1991		
FBI	26,271	25,843	26,700
DEA	18,402	17,888	18,916
Postal Service	6,288	4,771	7,805
IRS	3,017	2,855	3,179
Secret Service	3,816	3,739	3,894
Fish & Wildlife	2,216	2,130	2,302
OCDETF	5,027	1,748	8,305
BATF	4,013	3,550	4,477
Customs Service	5,575	4,588	6,562
INS	9,465	8,746	10,184
"All other"	17,520	14,355	20,686
Total	**101,610**	**90,213**	**113,010**
	FY 1992		
FBI	28,464	27,999	28,929
DEA	21,116	20,526	21,706
Postal Service	6,476	4,906	8,046
IRS	3,041	2,877	3,204
Secret Service	3,400	3,331	3,470
Fish & Wildlife	2,252	2,164	2,339
OCDETF	6,122	2,266	9,978
BATF	4,386	3,880	4,892
Customs Service	6,128	5,090	7,166
INS	10,001	9,241	10,761
"All other"	17,520	14,355	20,686
Total	**108,906**	**96,635**	**121,177**

Table IV.6: Estimated Number of Referrals to U.S. Attorneys Based on FY 1991 Appropriations and the President's FY 1992 Budget

Agency	FY 1991 appropriations	FY 1992 President's budget
FBI	26 271	28,464
DEA	18,402	21,116
Postal Service	6,288	6,476
IRS	3,017	3,041
Secret Service	3,816	3,400
Fish & Wildlife Service	2,216	2,252
OCDETF	5,027	6,122
BATF	4,013	4,386
INS	9,465	10,001
Customs Service	5,575	6,128
"All other"	17,520	17,520
Total	**101,610**	**108,906**
Crime type		
Corruption	1,602	1,683
Drugs	34,743	37,046
Immigration	8,833	9,331
Organized	410	439
Other	34,743	36,350
Violent	2,254	2,440
White collar	21,013	21,604
Total	**101,599**	**108,893**

Applications—Investigation Stage

Table IV.5 shows the estimated number of referrals that the model estimates the U.S. Attorneys will receive during fiscal year 1991 and FY 1992 and the confidence intervals for those estimates. Table IV.6 displays these estimates by both referring investigative agency and each of seven generic crime types. The agency estimates are calculated by means of regression equations and the crime type distribution from the probability formula. As explained in appendix III, the summations by investigative agency and by crime type are not identical because of the weighting process.

Application—Prosecution Stage

Table IV.7 provides the estimates of declinations and indictments expected from U.S. Attorneys for fiscal year 1991 and fiscal year 1992. The second section of table IV.4 repeats the point estimate and provides

the upper and lower confidence intervals assuming a 95 percent confidence level.

Table IV.7: Estimated Number of U.S. Attorney Actions Based on FY 1991 Appropriations and the President's FY 1992 Budget

Actions	FY 1991 appropriations	FY 1992 President's budget
Declinations	45,862	50,792
Indictments	69,168	78,710

	95 Percent Confidence Intervals for the Estimates		
FY 1991	**Point estimate**	**Lower limit**	**Upper limit**
Declinations	45,862	32,092	59,632
Indictments	69,168	49,259	79,355
FY 1992			
Declinations	50,792	35,578	66,006
Indictments	78,710	56,716	100,703

To allocate the total estimated declinations and indictments shown in table IV.7 to individual investigative agencies and to crime types, the model employed the probability procedure described in appendix III. Table IV.8 shows these allocations for declinations and table IV.9 the allocations for indictments.

Table IV.8: Estimated Number of U.S. Attorney Declinations Based on FY 1991 Appropriations and the President's FY 1992 Budget

Agency	FY 1991 appropriations	FY 1992 President's budget
FBI	18,253	20,215
DEA	2,981	3,301
Postal Service	2,889	3,200
IRS	1,697	1,879
Secret Service	2,064	2,286
Fish & Wildlife Service	780	863
OCDETF	780	863
BATF	2,018	2,235
Customs Service	1,468	1,625
INS	4,953	5,486
"All others"	7,934	8,787
Total	**45,816**	**50,741**

Crime type	FY 1992 appropriations	FY 1992 President's budget
Corruption	1,259	1,395
Drugs	6,867	7,605
Immigration	4,737	5,247
Organized	275	304
Other	18,876	20,905
Violent	658	729
White collar	13,127	14,538
Total	**45,800**	**50,724**

Table IV.9: Estimated Number of U.S. Attorney Indictments Based on FY 1991 Appropriations and the President's FY 1992 Budget

Agency	FY 1991 appropriations	FY 1992 President's budget
FBI	16,946	19,284
DEA	13,577	15,427
Postal Service	4,150	4,723
IRS	2,283	2,597
Secret Service	3,389	3,857
Fish & Wildlife Service	899	1,023
OCDETF	2,559	2,912
BATF	3,597	4,093
Customs Service	3,182	3,621
INS	7,193	8,186
"All others"	11,482	13,066
Total	**69,237**	**78,788**

Crime type	FY 1992	FY 1991 President's appropriations budget
Corruption	791	900
Drugs	24,269	27,617
Immigration	6,873	7,821
Organized	299	340
Other	20,193	22,979
Violent	2,244	2,553
White collar	14,556	16,564
Total	**69,225**	**78,775**

Application—Adjudication Stage

Table IV.10 provides the results of the regression analyses that estimate the number of dismissals and dispositions likely to be made by the U.S. Courts. Both point estimates and 95 percent confidence limits are shown in the second part of the table.

Table IV.10: Estimated Number of U.S. District Court Actions Based on FY 1991 Appropriations and the President's FY 1992 Budget

Action	FY 1991 appropriations	FY 1992 President's budget
Dismissals	11,192	11,996
Dispositions	50,581	54,213

	95 Percent Confidence Intervals for the Estimates		
FY 1991	Point estimate	Lower limit	Upper limit
Dismissals	11,192	10,285	12,100
Dispositions	50,581	49,425	51,737
FY 1992			
Dismissals	11,996	11,024	12,969
Dispositions	54,213	52,974	55,452

Table IV.11 presents the estimated distribution of dismissals by U.S. Courts according to generic crime type and investigative agency. Table IV.12 shows the distribution of U.S. Court dispositions according to crime type and investigative agency. This category of defendants includes those who plead guilty, who have guilty verdicts rendered by either judges or juries, and those acquitted by either judges or juries. Table IV.13 shows the distribution of dispositions by type of disposition—guilty pleas, guilty trial verdicts, and acquittals.

Table IV.11: Estimated Number of U.S. District Court Dismissals Based on FY 1991 Appropriations and the President's FY 1992 Budget

Agency	FY 1991 appropriations	FY 1992 President's budget
FBI	2,966	3,179
DEA	2,026	2,171
Postal Service	649	696
IRS	302	324
Secret Service	448	480
Fish & Wildlife Service	112	120
OCDETF	414	444
BATF	582	624
Customs Service	761	816
INS	761	816
"All others"	2,171	2,327
Total	**11,192**	**11,996**

Crime type	FY 1991 appropriations	FY 1992 President's budget
Corruption	128	137
Drugs	3,691	3,956
Immigration	654	701
Organized	46	49
Other	4,384	4,698
Violent	320	343
White collar	1,973	2,114
Total	**11,195**	**11,999**

Table IV.12: Estimated Number of U.S. District Court Dispositions Based on FY 1991 Appropriations and the President's FY 1992 Budget

Agency	FY 1991 appropriations	FY 1992 President's budget
FBI	11,178	11,981
DEA	9,155	9,813
Postal Service	3,338	3,578
IRS	1,922	2,060
Secret Service	2,731	2,928
Fish & Wildlife Service	708	759
OCDETF	1,922	2,060
BATF	2,630	2,819
Customs Service	1,973	2,114
INS	6,930	7,427
"All others"	8,144	8,728
Total	**50,632**	**54,267**

Crime type	FY 1991 appropriations	FY 1992 President's budget
Corruption	621	666
Drugs	16,372	17,548
Immigration	6,478	6,943
Organized	206	221
Other	14,232	15,271
Violent	1,722	1,846
White collar	10,974	11,762
Total	**50,606**	**54,257**

Table IV.13: Distribution of U.S. District Court FY 1991 and FY 1992 Dispositions

Type of disposition	FY 1991 appropriations	FY 1992 President's budget
Guilty pleas	42,640	45,593
Guilty verdicts	6,272	6,777
Acquittals	1,720	1,843
Total	**50,632**	**54,213**

Application—Correction Stage

As discussed in appendix III, due to the recent implementation of the federal sentencing guidelines, the model's sentencing estimates are based solely on actual fiscal year 1990 sentencing data. Table IV.14 presents the model's estimates based upon fiscal year 1990 actual data for types of sentence during fiscal years 1991 and 1992 according to crime type.[2] Table IV.15 shows the estimated length of sentences that the model produced for fiscal years 1991 and 1992. These estimates again are based upon a single year's experience.

[2]Referring agency data are not available at this level of adjudication. To make estimates regarding referring agency requires a particular type of application that is described later in this appendix.

Table IV.14: Estimated FY 1991 and FY 1992 Sentence Types According to Crime Type

	FY 1991		
Crime type	**Prison**	**Probation**	**Combined**
Corruption	184	334	70
Drugs	13,160	2,251	1,430
Immigration	1,761	845	232
Organized	326	176	82
Other	4,816	6,015	1,053
Violent	1,621	193	223
White collar	2,653	4,889	1,317
Total	**24,520**	**14,703**	**4,407**
Crime type		**FY 1992**	
Corruption	197	358	75
Drugs	14,119	2,415	1,535
Immigration	1,889	907	249
Organized	350	189	88
Other	5,167	6,454	1,130
Violent	1,739	207	239
White collar	2,847	5,245	1,413
Total	**26,308**	**15,775**	**4,728**

Table IV.15: Estimated FY 1991 and FY 1992 Length of Sentence

	FY 1991		Combined	
Length	Prison	Probation	Prison	Probation
1–6 months	3,783	917	1,557	49
7–12 months	3,011	2,767	550	324
13–24 months	4,163	2,602	616	532
25–36 months	2,530	4,970	409	1,634
37–48 months	1,599	472	230	276
49–60 months	2,420	2,926	305	1,514
61–120 months	3,948	34	473	69
121–180 months	1,454	3	126	4
over 180 months	1,613	10	141	4
		FY 1992		
1–6 months	4,059	984	1,670	53
7–12 months	3,231	2,969	590	348
13–24 months	4,467	2,792	661	571
25–36 months	2,715	5,332	439	1,753
37–48 months	1,715	506	247	296
49–60 months	2,597	3,139	328	1,625
61–120 months	4,236	36	507	74
121–180 months	1,560	3	136	5
over 180 months	1,731	11	152	5

Application—Measuring Imbalance

The application of the model as a indicator of imbalance is shown in table IV.16. The model estimates a decline of about half in the pending end-of-year workload for U.S. Attorneys from fiscal years 1991 to 1992. The fiscal year 1992 pending workload is estimated to be only about one-quarter of the workload pending at the end of fiscal year 1990.

By contrast, the district courts estimated pending end-of-year workload would be about 13 percent higher in fiscal year 1992 than it was at the end of fiscal year 1991. The ability to estimate this type of imbalance makes the model a useful tool for decisionmakers.

Table IV.16: Comparison of Pending End-Of-Year Workloads: FY 1990 Actual and FY 1991 and FY 1992 Estimates

Pending workload	Prosecution	Adjudication
FY 1990 actual	62,400	49,400
FY 1991 estimate	49,000	56,800
FY 1992 estimate	28,400	69,300

The model does not identify the corrective action to be taken to correct such imbalances. However, the model can be used to estimate the probable impact on all stages of the process using different levels of resources. For example, given the situation described above the decisionmaker could use the model to measure the impact of various alternative courses of action.

Based upon this information the decisionmaker would have several options available for resolving the problem. One option might be to decrease resource allocations to the U.S. Attorneys. Given a defined new level of funding for U.S. Attorneys, the model would show the magnitude of estimated change in terms of a reduction in the number of declinations and indictments. As a consequence of this reduction, it would also show that the U.S. Attorneys' pending workload would increase and the pending workload in the U.S. Courts would decline. The court workload would decline because the reduced number of indictments would reduce the number of persons entering the adjudication stage and, thus, the courts.

A second option might be to increase resource allocations to the U.S. Courts. Given this proposed resource increase, the model would estimate that this option would lead to a decline in the pending workload for the U.S. Courts and an associated increase in the number of dismissals and dispositions. It would also indicate the estimated increase in the number of individuals entering the corrections stage of the process.

Table IV.17: Sentencing Probability According to Crime Type for FY 1992 Estimates

Crime type	Total referrals	Probability			
		Prison	Probation	Combined	Total
Corruption	1,602	12.3%	22.4%	4.7%	**39.4%**
Drugs	32,743	43.1	7.4	4.7	**55.2**
Immigration	8,833	21.4	10.3	2.8	**34.5**
Organized	410	85.3	46.2	21.6	**153.6**[a]
Other	34,743	14.9	18.6	3.3	**36.8**
Violent	2,254	77.1	9.2	10.6	**96.9**
White collar	21,013	13.5	25.0	6.7	**45.2**

[a]When a percent total exceeds 100 percent, it indicates that all referrals are expected to result in a sentence. The time lag causes the summed percents to exceed the number of referrals during the single year.

Additional Applications

The model is also useful as a basis for other types of analyses. For example, by combining the information available from table IV.6 with that from table IV.14, one can obtain estimates of the likelihood of each sentence type according to crime type. This analysis is provided in table IV.17. While these results may be tentative given the fact that estimates of sentencing are based solely upon fiscal year 1990 experience, the example is intended as an example of how the results of the model can be used for analytical purposes beyond the measurement of imbalance.

Table IV.17 shows there is a clear relationship between the likelihood of receiving a sentence and crime type. Those individuals referred to U. S. Attorneys on an organized or violent crime charge are almost certain to receive either a prison term, a period of probation, or a combination of the two. Only one-third of the defendants who are referred on either an immigration or "other" crime receive a sentence, but those convicted of "other" crimes are about twice as likely to receive a prison term as those convicted of immigration crimes. On the other hand, about 55 percent of those referred on a drug-related charge receive a sentence, with fewer than 8 percent receiving only probation.

Table IV.18: Estimated Length of Sentence in Months According to Crime Type for FY 1992

			Combined	
Crime type	**Prison**	**Probation**	**Prison**	**Probation**
Corruption	1–6	25–36	1–6	25–36
Drugs	61–120	25–36	1–6	49–60
Immigration	1–6	25–36	1–6	25–36
Organized	1–6	25–36	1–6	49–60
Other	13–24	7–12	1–6	25–36
Violent	61–120	13–24	61–120	25–36
White collar	1–6	25–36	1–6	49–60

Table IV.18 takes the analysis a step further to examine the average length of sentences imposed under the three conditions. This type of analysis could be useful in a variety of situations, including the monitoring of the application of minimum sentencing and the sentencing guidelines as well as for planning relating to prison needs.

From this analysis it is apparent that judges are imposing significantly longer prison and probation sentences on individuals convicted of violent crimes than on other crime types. Drug crimes are receiving longer prison terms when that is the sole sentence but not longer probation periods or longer combined sentences. Individuals convicted of

white-collar crimes receive short prison terms but probation periods similar to those of individuals convicted of other crime types.

Analyses of this general type can be performed using various portions of the model's overall estimates. For example, based upon the distribution of indictments by investigative agency, differences in the probabilities of indictment according to the investigative agency can be examined. The only restriction in this area is in terms of sentences, where investigative agency is not part of the output from the model.

The model can also be used to identify those areas within the federal criminal justice system where current activity deviates from what would be expected given historic trends. This type of analysis is dependent upon a comparison of estimated numbers of defendants to actual numbers.

Summary

In this appendix we have demonstrated how the model can be used to answer a number of questions relating to the impact of changes in resources, the measurement of imbalances in the workload, and to respond to issues of a more general nature regarding the federal criminal justice system. It can serve as a guideline to assist decisionmakers to forecast within a known level of accuracy what will happen given specific changes to budget and staffing in any of the agencies included directly in the model. While the model cannot provide answers to operational or managerial questions about the best course of action, it can give greater precision to the questions decisionmakers must answer by estimating workload impacts.

A Description of the Model as Designed for Use on a Personal Computer

The model is being prepared for use on a personal computer. It will consist of a set of mathematical equations and computer instructions stored on either 5-1/4 inch or 3-1/2 inch floppy diskettes. The programs that operate the model are written in LOTUS Command language for an IBM (or compatible) personal computer. The model will operate on any IBM or compatible personal computer that is equipped with LOTUS 2.01 or later versions. The model will be a user-friendly software program that looks and acts like any LOTUS worksheet. The user need not be proficient in using LOTUS to use the model, but should have a basic understanding of how to use spreadsheets.

The model uses the resource and workload data described in this report, including the fiscal year 1991 appropriations and fiscal year 1992 President's budget described in appendix IV.

How to Run the Model

The user must provide as input to the model proposed budget authorization for all investigative agencies and for the U.S. Attorneys. For the U.S. Courts, the input required is the number of active judges. The model includes the necessary conversion formula for transforming this input into the resources directly applied to the regression coefficients to make the estimates.

In addition to being able to control resources, the user may choose to modify the distribution of investigative agency referrals among the seven generic general crime types used in the model. The only restriction in this context is that the total of the percentages attributed to each crime type must always equal 100. This change in crime type distributions is only permitted at the investigation stage. The model then calculates the impact of the user-specified changes by crime type for each succeeding stage—prosecution, adjudication, correction. To do this, the model uses probabilities derived from historic experience (a weighted average).

What the Model Produces

The user may choose the desired output from several options. Options include number of defendants at any or all of the major decision points in the process—referrals to U.S. Attorneys, U.S. Attorney declinations or indictments, U.S. Court dismissals or dispositions, or types and lengths of sentences. At the investigation, prosecution, and adjudication stages the user may request output either according to crime type or investigative agency. For type and lengths of sentence information may only be retrieved by crime type.

The user may also request summary statistics. This permits a comparison of changes in the pending end-of-year workload at the prosecution and adjudication stages of the process. This option is of particular importance to decisionmakers because it represents the measure of imbalance in the system.

In the near future, we plan to make copies of the diskette and the necessary documentation available upon request from the General Government Division of the General Accounting Office.

Federal Organizations With Some Law Enforcement Functions[1]

Executive Branch

Department of Agriculture	1. Agricultural Marketing Service 2. Agricultural Stabilization and Conservation Service 3. Animal and Plant Health Inspection Service 4. Federal Crop Insurance Corporation 5. Federal Grain Inspection Service 6. Food and Nutrition Service 7. Food Safety and Inspection Service 8. Foreign Agricultural Service 9. Forest Service 10. Office of Inspector General 11. Packers and Stockyards Administration
Department of Commerce	12. Economic Development Administration 13. National Institute of Standards and Technology 14. National Marine Fisheries Services 15. Office of Security 16. Office of Export Enforcement 17. Office of Inspector General
Department of Defense	18. Defense Intelligence Agency 19. Defense Investigative Service 20. Defense Logistics Agency 21. Defense Mapping Agency 22. Defense Protective Service 23. National Security Agency 24. Naval Investigative Service 25. Office of Inspector General 26. United States Air Force 27. United States Army 28. United States Marine Corps 29. United States Navy

[1]The term "federal organizations," as used above, refers to components of federal agencies, departments, quasi-official agencies, independent establishments, government corporations, and the legislative and judicial branches that have at least some police and/or criminal investigative functions.

Department of Education	30. Office of Inspector General
Department of Energy	31. Federal Energy Regulatory Commission 32. Office of Inspector General
Department of Health and Human Services	33. Alcohol, Drug Abuse and Mental Health Administration 34. Centers for Disease Control 35. Food and Drug Administration 36. Health Care Financing Administration 37. Health Resources and Services Administration 38. National Institutes of Health 39. Office of Inspector General 40. Social Security Administration
Department of Housing and Urban Development	41. Fair Housing and Equal Opportunity 42. Office of Inspector General
Department of the Interior	43. Bureau of Indian Affairs 44. Bureau of Land Management 45. Bureau of Reclamation 46. Geological Survey 47. National Park Service 48. Office of Inspector General 49. Office of Surface Mining, Reclamation and Enforcement 50. United States Fish and Wildlife Service
Department of Justice	51. Antitrust Division 52. Bureau of Prisons 53. Civil Rights Division 54. Criminal Division 55. Drug Enforcement Administration 56. Executive Office for U.S. Attorneys 57. Federal Bureau of Investigation 58. Immigration and Naturalization Service 59. Land and Natural Resources Division 60. Office of Inspector General 61. Tax Division

	62. United States Marshals Service 63. United States Parole Commission
Department of Labor	64. Employment and Training Administration 65. Employment and Standards Administration 66. Labor Management Services Administration 67. Mine Safety and Health Administration 68. Occupational Safety and Health Administration 69. Office of Inspector General
Department of State	70. Bureau of Diplomatic Security 71. Bureau of Oceans and International Environmental and Scientific Affairs 72. Office of Inspector General
Department of Transportation	73. Federal Aviation Administration 74. Federal Highway Administration 75. Federal Railroad Administration 76. Maritime Administration 77. National Highway Traffic Safety Administration 78. Office of Inspector General 79. St. Lawrence Seaway Development Corporation 80. United States Coast Guard 81. United States Merchant Marine Academy
Department of Treasury	82. Bureau of Alcohol, Tobacco and Firearms 83. Bureau of Engraving and Printing 84. Internal Revenue Service 85. Office of Inspector General 86. United States Customs Service 87. United States Mint 88. United States Secret Service
Department of Veterans Affairs	89. Office of Inspector General

Independent Establishments and Government Corporations

90. ACTION, Office of Inspector General
91. Agency for International Development, Office of Inspector General
92. Appalachian Regional Commission, Office of Inspector General
93. Board of Governors of the Federal Reserve System, Office of Inspector General
94. Board of International Broadcasting, Office of Inspector General
95. Central Intelligence Agency, Office of Security
96. Central Intelligence Agency, Office of Inspector General
97. Commodity Futures Trading Commission, Office of Inspector General
98. Consumer Product Safety Commission, Office of Inspector General
99. Corporation for Public Broadcasting, Office of Inspector General
100. Environmental Protection Agency, Office of Criminal Investigations
101. Environmental Protection Agency, Office of Inspector General
102. Equal Employment Opportunity Commission, Office of Inspector General
103. Farm Credit Administration, Office of Inspector General
104. Federal Communications Commission, Office of Inspector General
105. Federal Deposit Insurance Corporation, Office of Inspector General
106. Federal Election Commission, Office of Inspector General
107. Federal Emergency Management Agency, Office of Inspector General
108. Federal Emergency Management Agency, Security Division
109. Federal Home Loan Bank Board, Office of Inspector General
110. Federal Labor Relations Authority, Office of Inspector General
111. Federal Maritime Commission, Office of Inspector General
112. Federal Trade Commission, Office of Inspector General
113. General Services Administration, Office of Inspector General
114. General Services Administration, Office of Physical Security and Law Enforcement
115. Interstate Commerce Commission, Office of Inspector General
116. National Aeronautics and Space Administration, Office of Inspector General
117. National Archives and Records Administration, Office of Inspector General
118. National Credit Union Administration, Office of Inspector General
119. National Endowment for the Arts, Office of Inspector General
120. National Endowment for the Humanities, Office of Inspector General
121. National Labor Relations Board, Office of Inspector General
122. National Science Foundation, Office of Inspector General
123. Nuclear Regulatory Commission, Office of Inspector General

124. Office of Personnel Management, Office of Inspector General
125. Panama Canal Commission, Office of Inspector General
126. Peace Corps, Office of Inspector General
127. Pension Benefit Guaranty Corporation, Office of Inspector General
128. Railroad Retirement Board, Office of Inspector General
129. Securities and Exchange Commission, Office of Inspector General
130. Small Business Administration, Office of Inspector General
131. Tennessee Valley Authority, Land Between the Lakes Patrol
132. Tennessee Valley Authority, Office of the Inspector General
133. Tennessee Valley Authority Public Safety Service
134. United States Information Agency, Office of Inspector General
135. United States International Trade Commission, Office of Inspector General
136. United States Postal Service, Office of Inspector General

Quasi-Official Agencies

137. Amtrak Northeast Corridor Police
138. Amtrak, Office of Inspector General
139. Legal Services Corporation, Office of Inspector General
140. Smithsonian Institution National Zoological Park
141. Smithsonian Institution, Office of Inspector General
142. Smithsonian Institution, Office of Protection Services

Legislative Branch

143. General Accounting Office, Office of Special Investigations
144. Government Printing Office
145. Library of Congress Police
146. United States Capitol Police

Judicial Branch

147. United States Supreme Court Police
148. Federal Judicial Center

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