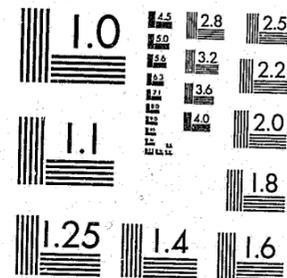


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SURVEY OF PROJECTION TECHNIQUES

November 3, 1980

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COMMONWEALTH OF KENTUCKY
DEPARTMENT OF JUSTICE
Bureau of Corrections

Office of Administrative and Fiscal Affairs
Division of Management Information Systems
Research and Evaluation Unit

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SURVEY OF PROJECTION TECHNIQUES

The Research and Evaluation Unit of the Kentucky Bureau of Corrections is presently engaged in a study to develop a method of accurately predicting the future prison inmate population. In an effort to identify the population projection methodologies currently being utilized, the Research and Evaluation Unit has conducted a survey of the corrections agencies in each state and the District of Columbia. The results of the survey provide a comprehensive view of the current "state-of-the-art" in projecting prison populations.

The purpose of this report is to provide an overview of projection methodologies currently being utilized throughout the nation, including a description of the techniques and information used to generate the projection. In addition to comparing and contrasting current methodologies, the existence of a similar survey of projection techniques conducted in 1977 by the Florida Department of Offender Rehabilitation¹ enables us to view the progress and/or changes that corrections agencies have made in this area in the last three years.

Survey Description

A survey questionnaire was mailed to corrections agencies in each state and the District of Columbia. The questionnaire asked the agencies to respond to the following questions:

1. Does your agency utilize a method(s) of population estimation or prediction?
2. Method(s) used?
3. Are current methods being revised or new methods being developed?

¹ A Survey of Population Projection Methodologies in the States and the District of Columbia, Florida Department of Offender Rehabilitation, Bureau of Planning, Research and Statistics, September, 1977.

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4. Are methods being used (or going to be used) for long or short-range projections?
5. How are (or will) projections be used?
6. How frequently are projections prepared?
7. How would you rate the reliability of your predictions?

In addition, each agency was asked to provide any existing and relevant materials to further document their methodology.

Fifty of the fifty-one corrections agencies surveyed sent replies, for a remarkable response rate of 98%. In addition, fifteen of the responding states also sent materials documenting their projection methodology. A keen interest in the area of population projection was conveyed by the respondents, a majority of whom requested a copy of the survey results. The Research and Evaluation Unit greatly appreciates the efforts of those who took time to answer the survey.

Projection Techniques

A report by the National Institute of Law Enforcement and Criminal Justice states that no precise methods of predicting population exists, and that "the task is complex and pioneering."² The truth of this statement becomes very apparent when reviewing the results of the survey. There is no single methodology which has been adopted by a majority of the states, nor has any one technique consistently supplied the most reliable predictions.

Methodologies presently being utilized range in sophistication from a "best guess" or "business-as-usual" approach to computer-based multiple regression and simulation models. For the purposes of this report, the

²Prison Population and Policy Choices, Volume 1: Preliminary Report to Congress, National Institute of Law Enforcement and Criminal Justice, September, 1977, p. 5.

projection methodologies were grouped into five general categories. The categories are listed below, followed by the number of states utilizing that type of method. The numbers total more than the 51 agencies included in the survey because several states utilize more than one methodology.

The categories are:

1. Linear Regression - 17
2. Ratio - 10
3. Multiple Regression/Regression Analysis - 13
4. Simulation Model - 15
5. No formal or informal method of population prediction or estimation utilized. - 8

The descriptions of projection techniques which follow review the underlying assumptions on which the projections are based, as well as the advantages and limitations of each of the respective methodologies. Comparisons of methodologies and reliability of predictions among states using similar projection techniques can be made by referring to the state-by-state descriptions in Appendix C.

Linear Regression

Linear regression projects population based on trends in historical data. The reliability of these projections depends on the validity of three key assumptions:³

1. Present trends will continue at the same rate.
2. Population is a function of time, not other underlying factors.
3. Trends or changes in other areas of the system will not affect population growth.

³The Art and Methods of Criminal Justice Forecasting, by Allen R. Beck, Sam Houston State University, May, 1978, p. 147.

Other methods of prediction which utilize projection based on historical trends and which may be included in the general category of linear projection are curvefitting, trend analysis, "business-as-usual", and line of best fit.

Although linear regression has been the most common method of predicting population within the criminal justice system, the unreliability of these predictions has, in many instances, raised questions about the validity and utility of this technique. Critics of linear regression point out that because it fails to consider the composition of the inmate population in terms of sentence length and other demographic variables, as well as external factors such as legislative changes, total population trends, etc., which influence the prison population, linear regression cannot accurately predict population when changes occur or are about to occur.⁴

Of the states responding to the survey, the largest number, seventeen, utilize linear regressions in preparing population projections. However, only seven of these states utilize linear regression as the sole method of projecting the future inmate population. The remaining states supplement linear projections with other projection methods, such as combining them with assumptions about future changes in the system or by using data produced by a linear regression to generate a multiple regression or a simulation model.

Because linear regression has the greatest potential for success in projecting for a term of "from one to five years,"⁵ perhaps the general acceptance

⁴Inmate Population Projections - Short and Long Range Estimates - 1977-1980 and 1977-2000, Florida Department of Offender Rehabilitation, Bureau of Planning, Research and Statistics, July, 1977, pp. 7, 13.

⁵Beck, p. 147.

of linear regression projections by most of the corrections agencies is due to the time frame of their projections. All but four of the states attempt to project the future population for a maximum of five years. It may be reasonable to conclude, therefore, that the states with "acceptable" projections do not experience drastic changes in trends between projection revisions, or that the projections are revised to take into consideration any changes in trends.

Ratios

One method of population projection which was not included in the previous Florida survey is the use of ratios. The underlying assumption of this methodology is that the prison population will vary in proportion to some other factor, for example, the state's "population-at-risk", the subsection of society which according to statistics is most likely to commit crimes. Ten of the surveyed states utilize this method, five exclusively and five in conjunction with other methods.

Multiple Regression

Multiple regression is a popular method used by thirteen states to project the prison population. Regression analysis is used to identify predictor variables which affect the prison population, which are then used in a regression formula to project the population. When multiple regression is used to predict key components within the system, such as future commitments, the projections can alert administrators to drastic changes in population trends.⁶

⁶"Analysis of Population Projection Methods", Pat Ray Reese, Kentucky Bureau of Corrections, Research and Evaluation Unit, December, 1977.

Although it is a more sophisticated projection technique than linear regression, multiple regression projections are subject to a number of limitations. Since multiple regression predicts linearly, projections may miss turning points and fluctuations in the prison population.⁷ Also, due to a lack of data, indicators identified by regression analysis are often selected according to convenience rather than potential validity. Even if a high correlation exists between a predictor variable and the population, prison population growth cannot be adequately represented by a single factor because one indicator cannot represent all of the forces at work in a complex social system. The use of predictor variables is further complicated by the fact that even though the predictor variables and the population may be positively correlated, mathematical relationships do not necessarily imply casual relationships.⁸

Simulation Models

Simulation modeling involves an attempt to replicate statistically the movement of offenders through components of the justice system over a period of time. The hypothesis of this technique is that future prison populations can be predicted by combining future admissions with the current population and subtracting future releases. Expressed as a formula, this would read:

$$\text{Future Population} = \text{Current Population} + (\text{Future Admissions} - \text{Future Releases})$$

Fifteen of the states utilize some form of simulation modeling. There is a wide range of sophistication among the methods used to project the components

⁷Ibid.

⁸Beck, pp. 209-210.

of the model. These range from simpler methods of estimations or linear regressions to more complex techniques, such as multiple regressions and matrices of outcome probabilities, to project future commitments and releases. By far, the most prevalent means of projecting admissions is by the use of assumptions to produce scenarios of how the commitment rate will change. The most common method of projecting rate of releases is based on an analysis of actual time served by past releasees to determine how long an offender can be expected to stay in the institution or system. This flexibility in projecting the components allows the agency to choose methods which provide the most reliable results and/or which ones are most feasible based on available resources.

No Projections

Seven of the responding states reported that they do not attempt to project future prison populations. Two of these states, Iowa and New Hampshire, stated that projections are no longer prepared because those prepared in past years had been so unreliable. West Virginia explained that they do not prepare population projections because of constant revisions to their criminal code.

How Projections Are Used

The uses of projections are fairly standard among the states. Listed below are the purposes for which the projections are most often used:

1. To plan the budget;
2. To determine facility/capital development needs;
3. To aid in policy/program planning;
4. To determine bed space requirements;
5. To determine the impact of legislative changes;
6. To estimate staffing requirements;

7. To ascertain projected probation and parole caseloads; and
8. To obtain a profile of the offender population.

Information Used to Generate Projections

Numerous factors or variables which are believed to affect the prison population are utilized to generate the projections. The factors or combination of factors vary as much from state-to-state as do the projection methods used. The information utilized, listed from most frequently used to least frequently used, is as follows:

1. commitment rate;
2. "population-at-risk";
3. previous inmate population;
4. length of stay;
5. state population;
6. sentence length;
7. unemployment rate;
8. legislative or policy changes;
9. release rate;
10. Parole Board actions;
11. jail backlog;
12. loss of good time;
13. revocation rate;
14. arrest rate;
15. past release performance;
16. number of indictments;
17. parole eligibility dates;
18. bed space capacity; and
19. U.S. military strength.

Reliability of Projections

The open format of the questionnaire allowed responding states to rate the reliability of their projections according to what they consider to be a logical gauge of reliability. This resulted in some states rating their projections as falling within a percentage of error, while others rated theirs according to such terms as fair, good, and poor. These two distinct measures of reliability allow only a limited degree of comparability. A relative assessment of the projection's reliability by the agency is the only determination that can be made based on the survey's responses. For the purpose of this report, the following measures will be used to rate the reliability of projections:

- GOOD: The projections are consistently accurate with an acceptable margin of error.
- FAIR: Projection figures are used and are acceptable within a limited set of circumstances.
- POOR: Projection figures are unacceptable and/or are not used.

Most of the responding states which utilize population projections report a fair to good degree of reliability in their projections. It was observed that the reliability rating of the projection tended to improve slightly as the sophistication of the projection technique increased. In addition, much of the discontent with linear and multiple regression methodologies reported in Florida's 1977 survey was not evident in the responses to this survey.

Of the seventeen states using linear regressions, eight states feel their projections are fair, while four view their projections as being good. Only two states, Kentucky and Indiana, rank their projections as being poor. Surprisingly, two of the four agencies which rate their projections as being

good, Connecticut and Maine, generate their projections based solely on past inmate populations.

Feedback on the reliability of projections in states utilizing a multiple regression technique is also generally favorable. Eight of the eleven states report the reliability of their projections as being either good or fair; while only two, Mississippi and Oregon, rate theirs as being poor. Few assumptions can be drawn from the ratings of reliability of those states using the ratio method of projection. There are almost an equal number of states who rate their projections as being good, fair, and poor. The technique which exhibits the most reliability in prediction is simulation modeling. Eight of the fifteen states utilizing simulation models rate their projections as being good; while only one state feels their projections are poor.

However, it should be pointed out that many of the agencies which rated their projections as being good qualified their statements by explaining that their projections are usually only accurate for short-range projections. Also, since most of these projections are revised on a regular basis, often monthly, their ratings actually apply to projections which cover only a few months at the most.

Size of Incarcerated Population

The size of the prison population in each state was examined to determine if there was any relationship between population size and the type of methodology chosen or the degree of success experienced. Because the number of inmates varies greatly from state to state, some logical means of ranking prison populations was desired for comparative purposes. The following ranking system was used in this report:

Population Size

Low	- less than 1,000 inmates
Low - Medium	- 1,000 to 4,999 inmates
Medium - High	- 5,000 to 9,999 inmates
High	- 10,000 or more inmates

There seems to be no consistent relationship between the size of the inmate population and methodology used or reported reliability of projections. When population is categorized according to low, low-medium, medium-high, and high, there is no single projection technique which dominates within any one classification, nor does any one size class report a higher degree of reliability than does another. However, if the two lower categories are combined and the two higher categories combined, it can be seen that of the states utilizing linear regression methodologies, twelve of seventeen fall into the class of states with smaller prison populations. Furthermore, all eight of those states which do not attempt to project future prison population also fall into the smaller population category. Fifteen of the nineteen states falling into the larger population category have adopted either a multiple regression or simulation model methodology.

There is little distinction between the larger and smaller population groups on ratings of reliability of projections. Thirteen of the larger states rate their projections as being good or fair, while the ratings of the smaller states are distributed evenly throughout categories of the rating scale.

Comparison With 1977 Florida Survey

The "state-of-the-art" in prison population projection has changed quite dramatically in the three years since the Florida Department of Offender

Rehabilitation surveyed projection techniques in 1977. Although increasingly sophisticated projection methodologies are being more widely adopted, the general dissatisfaction with the reliability of projections indicates that the science of prediction has actually advanced little in three years.

The changes in projection methodologies have been numerous. The Florida survey identified only three types of projection methodologies which were being utilized in 1977; linear regression, multiple regression, and simulation models. Of these, linear regression was the technique used by the vast majority of the states. Since 1977, a fourth technique, utilizing ratios, has been adopted by a number of states. In addition, corrections agencies have become less dependent on linear regression, with much more emphasis currently being placed on the use of simulation models which analyze the interaction of components within the corrections system to project future population (see Appendix A).

In all, thirty of the fifty responding agencies had adopted a different projection methodology in 1980 than the one they used in 1977. Three states which formerly did not prepare projections three years ago now do, and seventeen others have adopted more sophisticated methodologies. Conversely, seven states which prepared predictions in 1977 no longer do, and three others have abandoned their previous techniques in favor of a simpler, less sophisticated method of population projection. Reasons that were given for abandoning a specific methodology or for rejecting population projections altogether included the lack of reliability for projections, difficulty in identifying key variables or in obtaining information on these variables, changes in relevant legislation, and the opening or closing of an institution. Along with the changes in projection methodologies, the time frame of projections has undergone substantial change. Twelve states prepare their projections to cover a longer period of

time than they did in 1977, while eleven states have reduced the scope of their projections.

Despite the many changes which have occurred in the realm of population projection in the past three years, the "state-of-the-art" has by no means reached an ultimate resolution. With the proliferation of computerized information systems and the continuing desire for more and better information and predictability, it can safely be assumed that population projection techniques will continue to undergo refinement. This probability is evidenced by the fact that projection techniques in fourteen states are subject to constant revision, and fourteen others are presently either planning to develop or are in the process of developing new methodologies. It would seem, therefore, that while the exact nature of future population projections is uncertain, it is certain that the next three years will produce much new information.

Summary

Perhaps the bottom line concerning prison population projection is that no one methodology has yet been developed which will consistently produce valid, reliable predictions for all systems. It appears that any given method is capable of producing fairly accurate results on short-range projections if they are revised to compensate for changes in population trends and errors in past predictions. But even this data manipulation cannot, in most instances, predict when policy or population trends will change. Thus, two very important factors necessary for accurate predictions about future inmate population are not subject to control.

The most promising method of projection currently being utilized seems to be the simulation model which projects population based on admission/release analysis. This methodology is most likely to accurately project population

because it considers so many possible predictive variables. When multiple regression or influencing variables are used to project admissions and either an analysis of time served or Parole Board actions is used to project releases, the corrections agency can most adequately utilize information on the many factors which affect the population, in a manner which more accurately represents the workings of the system. This methodology should improve the ability to adequately predict future population figures as better information systems are developed to provide the necessary data, and more variables are identified which signal changes in population trends.

TABLE A

Projection Techniques Used By Corrections Agencies*

<u>NONE</u>	<u>LINEAR REGRESSION</u>	<u>RATIO</u>	<u>MULTIPLE REGRESSION</u>	<u>SIMULATION MODELS</u>
Idaho	Alaska	Alaska	Alabama	Alaska
Iowa	Connecticut	Arkansas	Arizona	Arizona
Kansas	Delaware	New Mexico	District of Columbia	California
New Hampshire	District of Columbia	Ohio	Hawaii	Colorado
North Dakota	Hawaii	Oregon	Illinois	Florida
Oklahoma	Indiana	South Dakota	Mississippi	Georgia
Rhode Island	Kentucky	Tennessee	Missouri	Maryland
West Virginia	Louisiana	Vermont	Nevada	Michigan
	Maine	Washington	North Carolina	Minnesota
	Massachusetts	Wyoming	Oregon	Montana
	New Jersey		South Carolina	New York
	New Mexico		Texas	South Carolina
	Pennsylvania			Virginia
	Utah			Washington
	Vermont			
	Virginia			
	Wisconsin			

*Several states use a combination of techniques.

TABLE B

Classification of States According to Size of Prison Population*

LOW (LESS THAN 1,000)

Alaska
 Hawaii
 Idaho
 Maine
 Montana
 New Hampshire
 North Dakota
 Rhode Island
 South Dakota
 Utah
 Vermont
 Wyoming

LOW - MEDIUM (1,000 - 4,999)

Arizona
 Arkansas
 Colorado
 Connecticut
 Delaware
 District of Columbia
 Iowa
 Kansas
 Kentucky
 Massachusetts
 Minnesota
 Mississippi
 Nebraska
 Nevada
 New Mexico
 Oklahoma
 Oregon
 Washington
 West Virginia
 Wisconsin

MEDIUM - HIGH (5,000 - 9,999)

Alabama
 Indiana
 Louisiana
 Maryland
 Missouri
 New Jersey
 Pennsylvania
 South Carolina
 Tennessee
 Virginia

HIGH (10,000 OR MORE)

California
 Florida
 Georgia
 Illinois
 Michigan
 New York
 North Carolina
 Ohio
 Texas

*Based on population figures of December 31, 1979, National Prisoner Statistics Bulletin, May, 1980.

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Alabama	multiple regression and time-series analysis	methodology is currently under revision	long-range: 10 years short-range: 2-5 years prepared as variables change	1) construction forecasting 2) budget	moderate reliability due to the number of unknown variables
Arizona	Time-series analysis, using ARIMA (p,d,q) model, is used to forecast admissions, average length of stay, and releases. These factors are combined to form the projections.	Model is constantly being refined to identify better "lead indicators".	5 years no standard interval for preparing projection	1) budget 2) construction/remodeling 3) staffing	projections appear to be very reliable
Arkansas	The prison population is assumed to increase in proportion to the increase in the "population-at-risk". Predictions also consider recent legislative changes in parole eligibility.	New methods are currently being developed and should be operable in early 1981.	through 1980. last project was prepared in 1977		The error in prediction for the first 8 months of 1977 ranged from .08% after 1 month to 6.28% after 8 months. For May of 1980, the predicted population was 3,727 while the actual population of May 22, 1980 was only 2,757.
California	Input/release analysis is used to predict future population. Future admission and release rates are determined using assumptions developed from examinations of historical trends in the following variables: 1) "population-at-risk" (males-ages 18-49) 2) rate of parole release 3) rate of parole revocation 4) median length of time served 5) incidents resulting in good-time loss 6) jail credit 7) sentence length				
Colorado	Three sets of predictions (low, most likely, and high) are used to project future admissions and releases. The predictions are prepared using a statistical model driven by key assumptions which consider the following variables: 1) unemployment rate	constant review	5 years prepared semi-annually or annually, depending upon violation of any of the assumptions used in the previous projection	1) budget 2) facility planning 3) program planning	very good, although the assumptions have under-estimated actual population changes.

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Colorado (CONT.)	2)percentage of commitments with con- secutive sentences 3)distribution of sentences within the presumptive range 4)average length of incarceration 5)other legislative, judicial, or admin- istrative changes.				
Connecticut	linear regression, using one year, 18 months, 24 months, and 36 months data bases		1.5 years prepared monthly	1)budget 2)construction	good
Delaware	linear predictions, modified somewhat by studying past trends	Improved methods will be developed as more data is received. Presently, the Offender Based State Corrections Information System (OBSCIS) is under development.	5 years no standard frequency of projection	1)construction 2)to develop an alter- native to incarceration program	fairly reliable for short-range predic- tions
District of Columbia	Multiple regression and linear regress- ion		long-range: 3 years prepared semi-annually short-range: 1 year prepared quarterly	1)budget 2)to assess resource needs of the Depart- ment	Most projections have been within a 5% error range, but recent policy shifts and the closing of one facility will cause a much higher level of error.
Florida	The simulated Losses/Admissions Model (SLAM) is presently in its second phase. This model projects admissions using a multiple regression of the "population- at-risk" and the unemployment rate. Releases are determined using a series of probability functions for each of fourteen length-of-sentence classes to represent the probability of an offend- er remaining incarcerated at the end of each month over the period of his sentence.	SLAM will be revised because of new objective parole guidelines. Pre- sumptive parole release dates will be input to the model when data is available.	long-range: 20 years short-range: 5 years prepared annually	1)budget 2)construction	The model was very reliable (within .05% after 31 months) when there were no major policy changes.

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Georgia	A computer simulation model is used which employs data on the following variables: 1)admissions 2)time served by sentence length 3)projections of the future state population Projections can be run using available data or by introducing hypothetical "scenarios". The projections <u>do not</u> assume: a)population growth will be constrained by available space, or b)sentencing or release policy will be significantly altered to control population growth.		10 years Projections are altered as sentencing or release policies are changed.	Projections are used to forecast potential demand for bedspace.	
Hawaii	linear regression, multiple regression, and several non-linear models	A criminal justice flow model is currently being developed to provide case process statistics on past, present, and future configurations of the system.	long-range: 20 years short-range: 2 years prepared quarterly, annually	1)budget 2)program planning 3)resource allocation	In the past, the projections have proven to be adequate for planning. The statistical reliability has been low, but actual outcomes have not differed significantly.
Idaho	none				
Illinois	Projections based on a combination of graphic solutions and multiple regression. Variables used to estimate admissions are: 1)"population-at-risk" 2)unemployment. 3)previous admissions rate	Method to project the release rate from actual data on committed persons (on the order of Florida's SLAM) is being developed.	long-range: 5 years short-range: 6-24 months prepared annually, with quarterly updates	1)bedspace 2)program planning 3)budget	Project for first 6 months (ending in July, 1979) was adequate.
Indiana	predictions prepared based on a "business-as-usual" assumption		2 years prepared as the need arises	to plan for the potential impact of determinate sentencing.	Unreliable. In the past 10 months, four records have been set for new commitments. Commitments for 9 of the 10 mon. were much

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Iowa	none	The development of a projection technique has been discussed with an outside consultant.			
Kansas	none				
Kentucky	linear regression	A study is underway to develop a computerized projection model that will forecast changes in population trends and generate more reliable projections.	long-range: 5 years short-range: 2 years projections are updated on request	1) budget 2) impact of legislation 3) program and policy planning	current projections have been inadequate for meeting departmental needs
Louisiana	linear regression		long-range: 5 years short-range: 1 year prepared annually.	1) planning 2) budget	acceptable
Maine	The previous year's population data is converted to the number of inmate days for each quarter. These figures are then expressed as a percentage of the total inmate days for that year. The mean of these four percentages is calculated and inserted into a linear regression equation to determine the predicted population for the forthcoming year. This figure is broken down to quarterly populations according to the previous year's proportions.	As each quarter's population figures become available, the percentage difference between the actual and the predicted population is calculated. This percentage is used to adjust the predicted populations of succeeding quarters.	1 year prepared semi-annually to test for accuracy	1) bedspace 2) funding	within a \pm 5% error margin
Maryland	An input/output analysis of future projections of the arrest rate, the probability of incarceration, and the length of stay is utilized. Linear regression projections which were used in the past indicated a need to double or triple the available bedspace.		16 years	bedspace needs	From 1970-76, the correlation coefficient of actual population to projected population was .98. This suggests that projections are reasonable provided that the criminal justice system does not change radically.

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Massachu- setts	estimates of future prison population based on trend analysis of past commitments and the makeup of the prison population		long and short-range estimations no standard frequency of projection	1)to determine full utilization of institutions 2)to obtain a profile of the inmate population	no problems
Michigan	Intuitive assumptions about intake are combined with a mathematic model of past release performance to prepare computerized predictions of future releases.	Changes in legislation affecting intake or release rates require changes in the release paradigm.	2 years prepared semi-annually or annually	1)bedspace 2)operating costs	Some predictions have been very accurate, while others have been off by several hundred.
Minnesota	predictions based on projected commitments and estimated length of stay	Under new sentencing guidelines, length of stay will be known, but the impact of the guidelines on commitments will not be known for a year or more.	5 years prepared as needed	1)institutional needs 2)capital budgets 3)biennial budgets	fair to good on short-range projections
Mississippi	Projections are developed utilizing regression analysis of the average inmate populations in previous years and their relationship to changes in both the state population and the number of indictments.	More dynamic methodology for predicting future inmate population is currently under development.	long-range: 5 years short-range: 2 years The first projection was prepared in December, 1978. The second is in progress.	1)fiscal planning 2)program planning 3)capital outlay	The department has expressed dissatisfaction with current projections, as the predicted average daily population for 1980 of 3,364 is substantially lower than the current population of 3,800.
Missouri	linear multiple regression model	The current model is being refined.	Long-range: 5 years short-range: 1 year prepared quarterly	1)budget 2)capital improvements	very accurate, error less than .5%
Montana	Projections are made using a simulated admissions and release model (SARM). An incarceration ratio is applied to an "at-risk" group (males, ages 18-60) to project admissions. Analysis of time served was used to develop a release matrix. Releases are calculated by taking the number admitted in a year and locating the release factor for that year on the matrix to determine	Refinements include the use of more accurate population forecasts and the application of weighting for the probability of certain age groups to commit crimes.	long-range: 5 years short-range: 1 year prepared at varying intervals currently, soon to be every other month.	1)to choose between policy alternatives 2)construction needs	fair - only accurate for short-range projections

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
Nebraska					
Nevada	A computer multiple regression model has been utilized since January, 1980. Previous attempts to project prison population using the computer model S.P.A.C.E. (Simulation of Population from Arrest to Corrections Exit), were unsuccessful due to the inability to provide the vast amount of data needed to run the model.	Trying to develop a computer model that will project not only prison population, but parole and probation data as well.	long-range: 3 years short-range: 1 year prepared quarterly	1)budget 2)bedspace 3)respond to legislative requirements 4)program planning	Short-term projections seem to be successful. Evaluations of long-term projections cannot be made until January, 1983.
New Hampshire	None. Past projections have been so poor as to be meaningless. An increase in prison population is anticipated to correspond to increases in the general population.				
New Jersey	Statewide projections by age and race are compared to institutional admission trends by age and race and a linear relationship is established. Weighting is given to factors in unusual or abnormal circumstances.		5 years prepared for each fiscal year		satisfactory
New Mexico	linear regression and population ratio	A request for proposals has been made to update methods of projections. The project should be finished in July of 1980.			
New York	Several methods are used to project 18 various admission/release categories. The overall method is a dynamic model utilizing decay matrices and regression analysis to examine both demographic growth patterns in the total state population, as well as existing and changing law, administrative practices, and policies that govern the operations of the many agencies of the criminal jus-	A methodology is being developed to provide a specific anticipated time to be served based not only upon the sentence and parole eligibility, but also on the the specific commitment offense and prior criminal record.	long-range: 10 years short-range: 2 years Projections are prepared at the close of the legislative session each year to incorporate the effect of new laws on the criminal justice system. Projections are monitored throughout the year to	1)capital construction/ land acquisition 2)program/inmate requirements 3)legislative/policy changes 4)budget	Projections generally fall within a 5% range of actual experience. The continuing utilization of these figures by various agencies attests to their usefulness.

STATE	METHOD(S) OF PROJECTION	HOW METHOD(S) ARE BEING REVISED/ NEW METHOD(S) BEING DEVELOPED	LENGTH AND FREQUENCY OF PROJECTIONS	AREAS WHERE PROJEC- TIONS ARE USED	HOW AGENCY ESTIMATES THE RELIABILITY OF ITS PROJECTIONS
New York (Cont.)			changes to provide up-to- date figures.		
North Carolina	Multiple linear regression of stock population against the product of sen- tence length and admission rates, lagged one and two years.	Methodology, revised in February, 1980, provides for trend analysis of annual admissions and average sentence lengths, predictions of releases by a "life-table" approach, and the addi- tion of predicted net-change to the previous year's population.	10 years prepared biennially	1) budget 2) departmental planning	fairly good for as long as present trends continue
North Dakota	None				
Ohio	Predictions based on: 1) plotting commitments from court on a monthly basis and observing the ratio of commitments to total cases handled by state courts. 2) subjective identification of influ- encing variables 3) long-range forecasts within the unified Ohio Correctional Master Plan.		2-4 years prepared biennially	1) budget 2) bedspace 3) confinement and community corrections needs	very good on short- range forecasts, de- pending upon influ- encing variables being identified prior to their impact. (e.g. permissiveness, career criminal pro- jects, crime cycles, etc.)
Oklahoma	None - During the 1980 session of the Oklahoma State Legislature a bill was passed which set a limit on the depart- ment's population capacity. The estab- lishment of strict capacity levels has tended to negate the need for project- ing populations.				
Oregon	Three methods are utilized: 1) historical: population of the system varies directly with the risk group (males, ages 15-29), inversely modi- fied by U.S. military strength, dir- ectly modified by the unemployment level 2) Analysis of intake patterns, coupled with Parole Board actions	The computer-based system is very new. Other methods are continuously reviewed.	Projections made at three levels: 1) for remainder of 1979-81 biennium 2) for the 1981-83 biennium 3) through the year 2000 prepared biennially	1) budget 2) program/organization- al planning 3) facility construction	fair at best - the predicted population seldom comes within 5% of the actual pop- ulation for any pro- jection beyond 1 year. Too many factors impinge which are un- predictable (shifts

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Oregon (Cont.)	3)computer-based regression analysis of associated factors (offense and arrest patterns, risk group, etc.).				in judicial decision making, legislative changes, changes in Parole Board policies, etc.)
Pennsylvania	linear regression		long-range: 20 years short-range: 5 years prepared semi-annually	budget	predictions have been fairly accurate
Rhode Island	None				
South Carolina	Regression analysis is used to determine the future admissions rates of three groups: regular offenses, youthful offenders, and others (parole violators, transfers, etc.). Predictors used in the regression analysis are "population-at-risk" and unemployment. Future releases are determined by a matrix of parole eligibility dates and earned-work credit release dates.	The methodology is refined as additional data becomes available.	long-range: 10 years short-range: 2 years	1)capital improvements 2)budget 3)program needs	The predicted average population for FY 1979 was 7,767, which compared to the actual average population was 98.1% accurate. The predicted average population for FY 1980 was 7,928, and after 8 months, the actual average population was 7,724.
South Dakota	The prison population is estimated by observing changes in the population of those in the "law-breaking" age bracket and the number of people in county jails.		predictions are prepared annually	budget	fair
Tennessee	The National Clearinghouse prepared the most recent projection based on prior prison and state populations. Previous predictions were based on past commitment trends and the projected growth in the state's population of persons aged 18-29.	There is currently discussion in regard to adopting formalized methods of population projection to be used on a consistent basis.	long-range: 5 years short-range: 1 year last projection was prepared in 1977	1)capital construction 2)budget	

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Texas	As of July, 1978, a composite curve with lead indicators has been used.		3-5 years updated at the end of each of each year	1)budget 2)capital construction	± 5% maximum error since implementation
Utah	Long-range projections are based on an examination of linear regression of past prison and state populations. Methods used to make short-range projections are: 1)use of the previous year's increase 2)in/out analysis 3)modification of base population to correspond with policy changes.	constant revision to arrive at a best estimate	long-range: 10 years short-range: 1 year prepared when it seems appropriate	1)to identify the effects of changes in policy and practices 2)facility and staff needs	not bad
Vermont	Projections based on 3 factors: 1)linear regression of past population 2)public sentiment and the size of the "population-at-risk" 3)number of beds available.	Other states will be contacted to revise the current model or develop a new one.	3-5 years prepared when requested	1)construction needs 2)staffing needs 3)planning needs	too early to tell
Virginia	A series of linear regressions are used to project those factors which affect the growth of the prison population. These include the number of new commitments, their break-down according to sentence, the proportion of those paroled as opposed to those remaining incarcerated, and the actual length of stay for each of these groups. In addition, other related agencies are monitored to guard against being unprepared to deal with any sudden changes in the system.	New projections must be developed to adjust for the impact that recent legislative changes will have on the prison population.	long-range: 5 years short-range: 3 months prepared at the end of each fiscal year	Short-term projections are used to evaluate and emphasize the effects of short-term policy changes.	Projections have been accurate to within + 0.1% of the actual population figures for periods up to three years in the future.
Washington	In/out analysis which projects admissions on the basis of their ratio to the "at-risk" population and by offense grouping. Projected monthly admissions and the current resident population are run through a length-of-stay probability distribution based on data on recent releases to estimate monthly re-	The main thrust at this time concerns refining the present methodology, although a project to review prediction methodologies will begin soon.	long-range: through FY 2000 short-range: through FY 1985 prepared annually - interim adjustments made to coincide with changes in law, policy, etc.	in preparation of both operating and capital budgets	quite good (especially in comparison with former estimates), although predictions tend to be somewhat conservative

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Washington (Cont.)	Leases. The resulting baseline pro- jection is adjusted to account for the estimated impact of anticipated diver- sion programs or changes in law and/or policy.				
West Virginia	None	The legislature has been in the pro- cess of revising the criminal code for several years. Until that pro- cess is complete, no reliable pre- dictions can be prepared.			
Wisconsin	The average population for 16 quarters analyzed using the statistical package for the social sciences (SPSS). The slopes and standard error of estimate are used to calculate a linear extra- polation. This projection is used as a starting point for the corrections staff, who use their knowledge of pro- grams, policies, laws, and other influ- encing factors to arrive at their best prediction.	Slight modifications to projections are made based on administrative policy decisions.	16 quarters maximum prepared quarterly	1) budget 2) general information	not estimated
Wyoming	Current rates of incarceration (per 1,000 people in general population) are compared with projections of the gen- eral population which are promulgated by public utilities.		long-range: 10 years short-range: 2 years prepared quarterly, annually	1) budget 2) program planning 3) resource allocation	Previous projections have been 92% reliable.