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# Alaska Correctional Requirements: A Forecast of Prison Population through the Year 2000

Allan R. Barnes and Richard McCleary

### *Suggested citation*

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### *Summary*

The growth of the Alaska prison inmate population over the past fifteen years has been substantial. According to available statistics there were 482 institutionalized adult prisoners under control of the Alaska Division of Corrections in January 1971; by January 1980 this population had increased to 770 inmates; and between 1980 and 1985, the number of Alaska inmates almost tripled, rising from 770 to 2,073. Accurate forecasts of the future size and makeup of the prison population are needed as a basis for long-range programs and capital planning. This report presents long and short-term forecasts of the Alaska incarcerated prisoner population and bedspace needs of the Alaska Department of Corrections through the year 2000. The forecasts were developed by taking into consideration historical facts and status quo assumptions. Attention is also given to the impact of the 1980 Alaska criminal code revision on unsentenced and sentenced populations. The forecast derived from this study provides evidence of the need for additional institutional capacity in Southcentral Alaska by 1990. Planning should proceed for a capacity of 1,000 beds to be available for use by 1990.

### *Additional information*

This report is part of the Fire Island Prison Feasibility Study, a project conducted jointly by the School of Justice and School of Engineering at University of Alaska, Anchorage under contract to the Alaska Department of Corrections. The project undertook to assess the feasibility of locating a correctional facility on a 4,240 acre tract of land on Fire Island, which lies in Upper Cook Inlet about three miles off Point Campbell within the Municipality of Anchorage. The project was divided into three major phases: (1) an assessment of future bed space needs of the Alaska Department of Corrections; (2) an evaluation of the physical site and cost estimates for prison construction and operation; and (3) a public opinion survey and open discussion.

The project's three major reports include:

- *Alaska Correctional Requirements: A Forecast of Prison Population through the Year 2000* by Allan R. Barnes and Richard McCleary (1986);

- *Engineering Feasibility Study of Fire Island as a Location for a Future Correctional Facility: Final Report* edited by David C. Junge (1986);
- *Fire Island Public Opinion Survey: Summary of Findings* by Allan R. Barnes (1986).

Additional reports include:

- *Alaska Correctional Requirements: A Forecast of Prison Population through the Year 2000 — Executive Summary* by UAA School of Justice (1986);
- *Technical Memorandum: Site Assessment and Site Evaluation* by UAA School of Engineering (1986);
- *Fire Island Feasibility Study: Summary Report — Final Report* by UAA School of Justice and UAA School of Engineering (1986).

# ALASKA CORRECTIONAL REQUIREMENTS: A FORECAST OF PRISON POPULATION THROUGH THE YEAR 2000

## JUSTICE CENTER

University of Alaska, Anchorage
Anchorage, Alaska

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# A FORECAST OF PRISON POPULATION

# THROUGH THE YEAR 2000

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## SUMMARY OF STUDY

The number of prisoners incarcerated by Alaska has nearly tripled over the past five years from approximately 750 in 1980 to approximately 2200 in 1985. At the present time correctional facilities in the state of Alaska are overcrowded, and construction and renovation projects have been initiated in an effort to relieve the situation. To have a basis for long-range programs and capital planning, officials of the Alaska Department of Corrections (ADOC) have sought to obtain reliable forecasts of the size and makeup of the population who will be under ADOC custody in future years.

### Purpose and Scope

Under contract with ADOC, the University of Alaska, Anchorage School of Justice and School of Engineering have undertaken an assessment of the feasibility of locating a correctional facility on a portion of Fire Island, a 4,240 acre tract of land located in upper Cook Inlet about three miles off Point Campbell. The project was divided into three major phases: (1) an assessment of future bed space needs, (2) an evaluation of the physical site, and (3) a cost assessment based on a comparison of costs at various prison sites.

This document is the final report for the first phase. It contains long and short-term forecasts of the Alaska incarcerated prisoner population and, hence, of bedspace needs of the Alaska Department of Corrections through the year 2000.

## Forecast Approach and Results

The model used in these forecasts was developed by Richard McCleary, Ph.D. who has developed similar models which have been successfully used in such states as Oregon and New Mexico to predict prison population growth.[1] The McCleary model is constructed from (1) factors which historically have had an impact on the prison population in a statistically significant manner, e.g., length of sentences and (2) which have shown a statistically significant relationship with the prison population, e.g., unemployment rates. Various assumptions about past and future population growth, unemployment rates and historic prison growth have also been incorporated within the model. Those assumptions about future prison population growth which presume only a continuation of current socioeconomic patterns and existing influential factors are called status quo assumptions.

Table 1.
Alaska Prison Population Forecasts: 1985 through 2000*

| Year | Total | Unsentenced | Sentenced |
|---|---|---|---|
| 1985 | 2084 | 521 | 1563 |
| 1990 | 4080 | 863 | 3217 |
| 1995 | 6421 | 1158 | 5263 |
| 2000 | 8914 | 1429 | 7485 |

* Based on status quo assumptions. Forecasts are mean yearly population estimates. Includes FBOP population.

[1]Appendix A, "Inmate Population Forecasting: Statistical Model," contains a description and discussion of the model used; Appendix B is a discussion of the JUSSIM forecasting model which could not be implemented because of inadequate data; Appendix C presents the bibliography of the literature on prison population forecasting.

## Status Quo Forecasts

The forecast of the most probable yearly prison population of Alaska which is presented in Table 1 is derived from a model based on status quo assumptions (i.e., assumptions that no structural or substantially disruptive change such as a code revision, an unanticipated population shift, or a major policy change in the criminal justice system will occur). In other words, these forecasts are based on the assumption that, aside from normal evolution and growth, the situation in Alaska will be more or less the same through the year 2000. Without changes from the status quo, Alaska's total long-range prison population, both sentenced and unsentenced, will total nearly 9,000 inmates by the year 2000. The larger portion of the ADOC population, those actually sentenced to a prison term, will increase almost five-fold from 1985 levels.

Status quo assumptions were also used in forecasting the expected characteristics of the prison population by type of offense (felony or misdemeanor), sex of prisoners, and region of incarceration in the state. Overall, the largest increases will occur in the male sentenced felon category within the Southcentral region. Throughout the state, the number of sentenced female felons will also continue to increase, to over 400 females by the year 2000.

The status quo model used includes three factors which have been identified as affecting the ADOC prison population growth. Foremost among these factors has been the criminal code revisions of the early 1980s. These revisions, which affected the length of sentences (by an average increase of 1.35 years), parole eligibility and prosecutorial prioritization of crimes, have accelerated ADOC's population growth in almost all areas. Perhaps the most dramatic example of this growth has been the increase in sentenced sexual abuse offenders from approximately 50 to nearly 500 since 1982.

The other two factors found to have a statistically significant effect on Alaska prison population levels are the state unemployment and armed robbery rates. Increases in these rates result in an almost immediate increase in the prison population; however, decreases in these rates are followed by only a gradual reduction in prison population. This generally accelerated growth in inmate population is reflected in the upward sloping line between the years 1985 and 1990.

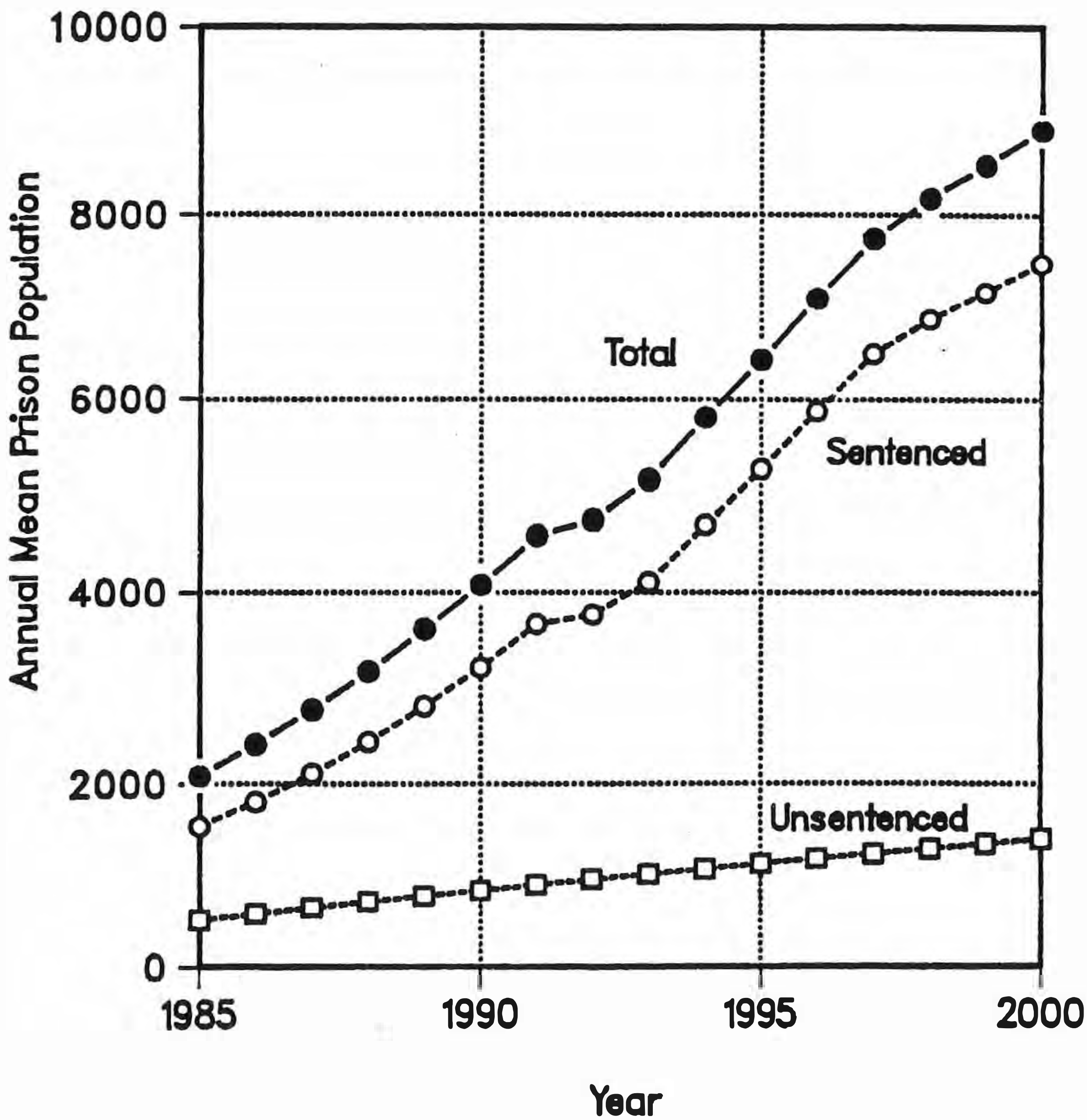
Alternative Scenarios Impact

The study also explored the effects of certain hypothetical scenarios upon the future Alaska Department of Corrections population. These scenarios involve certain demographic, economic and crime-related factors.

Investigation of two extreme alternative scenarios illustrates the consequences of changes in the Alaska sentencing code, the unemployment rate, and the armed robbery rate and demonstrates the range of the possible future ADOC population. One scenario, which would involve complete repeal of the 1980 code revisions and substantial reductions in both the unemployment and armed robbery rates, would result in the ADOC population being

GRAPH 1

# TOTAL POPULATION FORECASTS
## Status Quo



over 3000 inmates by the end of the century. The likelihood of such substantial changes in the Alaska situation is very low. At the other extreme, the opposing scenario indicates that if the code is not repealed or significantly altered or its effects on the ADOC population mitigated in some substantial fashion, and if the unemployment and armed robbery rates increase significantly, the ADOC could have over 20,000 prisoners and an extremely serious facilities deficit by the year 2000. Obviously the probability of this scenario being realized is low simply because the state probably could not afford to maintain such an enormous correctional population and policy and administrative officials would be forced by economic realities to develop methods for deinstitutionalizing many potential prisoners.

## CONCLUSIONS

The status quo forecast, which we use to generate the most likely future prison population situation in Alaska, lies between the best and worst case scenarios which we calculated. We are confident of the accuracy of this "most likely" forecast as long as there are no major changes in the assumed patterns of the state's overall population, the state's economic situation, or Alaska crime rates. However, it is very likely that some changes will occur and in planning for future bedspace needs ADOC may want to consider other possible futures from the range of scenarios presented in this report. The present tenor of the political arena would cause one to expect changes to result in higher rather than lower levels of incarceration.

Our analysis leads us to the conclusion that the only variable related to prison population increases which both has been a factor driving the ADOC population and can be readily controlled is the early 1980s code revisions. Of course, methods for the early release of inmates can be devised, but such a strategy is merely a subversion of mandatory and presumptive sentencing.

The forecast derived from this study provides evidence of the need for additional institutional capacity in Southcentral Alaska by 1990. Planning should proceed for a capacity of 1,000 beds to be available for use by 1990.

## SECTION I

## INTRODUCTION

The growth in the Alaska prison inmate population over the past fifteen years has been quite substantial. (See Table 2) According to available statistics there were 482 institutionalized adult prisoners under the control of the Alaska Division of Corrections in January of 1971; by January of 1985 this population had increased to 2073 inmates.

TABLE 2

Alaska Adult Prison Populations: 1971 - 85

| Year | Daily Average* | | |
|---|---|---|---|
| | Total Adult Prisoners Statewide | Subcategories | |
| | | Federal Institutions | Community Corrections |
| 1971 | 482 | | |
| 1972 | 413 | | |
| 1973 | 413 | | |
| 1974 | 488 | | |
| 1975 | 495 | | |
| 1976 | 529 | | |
| 1977 | 600 | | |
| 1978 | 732 | 120 | |
| 1979 | 738 | 165 | |
| 1980 | 770 | 163 | |
| 1981 | 876 | 200 | |
| 1982 | 1069 | 187 | |
| 1983 | 1388 | 191 | |
| 1984 | 1732 | 198 | 103 |
| 1985 | 2073 | 182 | 97 |

* Daily average for January of each year. Includes FBOP and CRC in Statewide total. Federal Bureau of Prisons totals not available for period prior to 1978. CRC totals not available for period prior to 1984.

When seen in relation to the high annual rate of Alaska population growth, the growth in the corrections population during the 1970s can be viewed as gradual. Since 1980, however, despite an approximately 7% rate of annual state population growth, Alaska prison population has grown at a rate of approximately 20% annually - nearly tripling overall.

Past estimates of prison growth have all substantially underestimated the populations which ultimately materialized. For example, an April, 1976[1] study predicted that if a mandatory sentencing scheme were to be implemented on January 1, 1977, Alaska could expect to have a total of 505 prisoners in the system in 1985. The 1979 Alaska Corrections Master Plan predicted that, if a "New Criminal Code" which established mandatory sentences and prohibited individuals from being released on their own recognizance (ROR) and other forms of prerelease was enacted, the Alaska prison population would reach approximately 1569 inmates in the year 2000. An Alaska Judicial Council report released in June, 1982 concluded that "we believe the increases experienced by the Division of Corrections (in 1980, 81, and 82) were the result of unusually high sentences rendered during the 1977-78 period. " leaving the implication that the prison population growth could be expected to level off in the immediate future. The rate of growth has obviously increased, rather than diminished, and has produced a total of 2073 prisoners under the control of ADOC in January, 1985.

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[1] Peter S. Ring, "Potential Impact of Mandatory Sentencing on Existing Division of Corrections Adult Offender Inmate Capacity." Anchorage: Criminal Justice Center, April, 1976.

This report is the result of a study of Alaska's future prison needs which was commissioned by the Alaska Department of Corrections in early 1985. It was prepared by the School of Justice as the result of one phase of the larger investigation undertaken by the University of Alaska, Anchorage on the feasibility of using a portion of Fire Island near Anchorage to satisfy Alaska's future correctional space needs.

The prison population forecasts contained in this report were derived from the use of a forecasting model discussed in detail in Appendix A. The details of this model have been developed by Dr. Richard McCleary in conjunction with School of Justice staff and Alaska Department of Corrections administrators and planners. The model is designed to use advanced statistics to overcome deficiencies in Alaska criminal justice data and to produce reliable prison population forecasts up to the year 2000. It can be applied to both long-range and short-range forecasting. The long-range forecasts should be useful in strategic planning - in this case deciding whether to build a new prison. Short-range forecasts, i.e., one year into the future, are less useful for strategic planning but they can be used for routine planning in such areas as organizing and scheduling personnel. The next section will be devoted to the results of long range forecasts; it is followed by sections presenting the short-range and regional forecasts.

# SECTION II

## LONG-RANGE FORECASTS

The most useful statistic, for strategic planning purposes, is the average (mean) yearly prison population. The yearly population mean incorporates month-to-month population fluctuations and provides the basic information needed for initiating facility plannng. For this reason all of our long-range forecasts are stated in terms of mean yearly populations.

The major planning categories which have been forecast are those of sentenced and unsentenced prisoners. Both the unsentenced and sentenced subpopulations have been further divided according to the categories of sex (male or female) and type of charge (felony or misdemeanor). Sentenced prisoners are typically in ADOC custody for longer periods of time, and thus eventually require greater overall levels of service and security than unsentenced prisoners. However, unsentenced prisoners are not, from a planning perspective, an insignificant proportion of the prison population. Their special security and transportation arrangements may require a disproportionate amount of staff attention.

### Status Quo Assumptions

The following initial long-range forecasts are based on an assumption that the "status quo" surrounding corrections will continue for the fifteen year period covered by the forecast. If the "status quo" continues as assumed, all socioeconomic patterns will continue through a normal evolution and growth process; no structural or substantially disruptive change such as a criminal code revision, or unanticipated population shift, or major criminal justice policy change will occur.

Three major assumptions have been critical in formulating the status quo forecasts of this report. They can be described as follows:

(1) ADOC total populations, both unsentenced and sentenced, have historically grown by more than five percent per year since 1970. At this historic growth rate, ADOC populations would be expected to at least double every fifteen years. The forecasts in Tables 3 and 4 assume that this historic base rate of growth is associated with normal population changes which will continue to increase at a five percent annual rate for the next fifteen years.

(2) In the early 1980s, the Alaska criminal code was substantially revised. Many criminal code revisions occurred in 1980, but substantial sections, i.e., those dealing with sex crimes sentences, were not fully revised until 1982. Good time was established at one day for every four served. Presumptive sentences were mandated for certain offenders and crimes. Priorities of prosecution were initiated. The forecasts in Tables 3 and 4 are based on assumptions that the early 1980s revisions will remain in effect until the end of the century.

(3) We have found that ADOC's prison population changes are also associated with unemployment and crime rates. The forecasts in Tables 3 and 4 are based on the assumption that both indicators will remain unchanged (on average) for fifteen years.

The first of the above three assumptions may or may not be warranted, but in purely statistical terms, we have strong confidence in a five percent historic, statistically based annual growth rate. The second and third assumptions, in contrast, are probably more subject to change. It is very likely, for example, that the impact of the 1980 criminal code revision will be mitigated by administrative, legislative or executive action before ADOC's population growth reaches a crisis stage. Similarly, both unemployment and crime rates are likely to change substantially - for better or worse - before the end of the century. To account for these changes, we have prepared conditional forecasts of ADOC's total unsentenced and sentenced population. These varied conditional forecasts are the products of statistical models specifically created to test our assumptions or to describe the impacts of changes in the policy underlying those assumptions.

## Unsentenced Forecasts

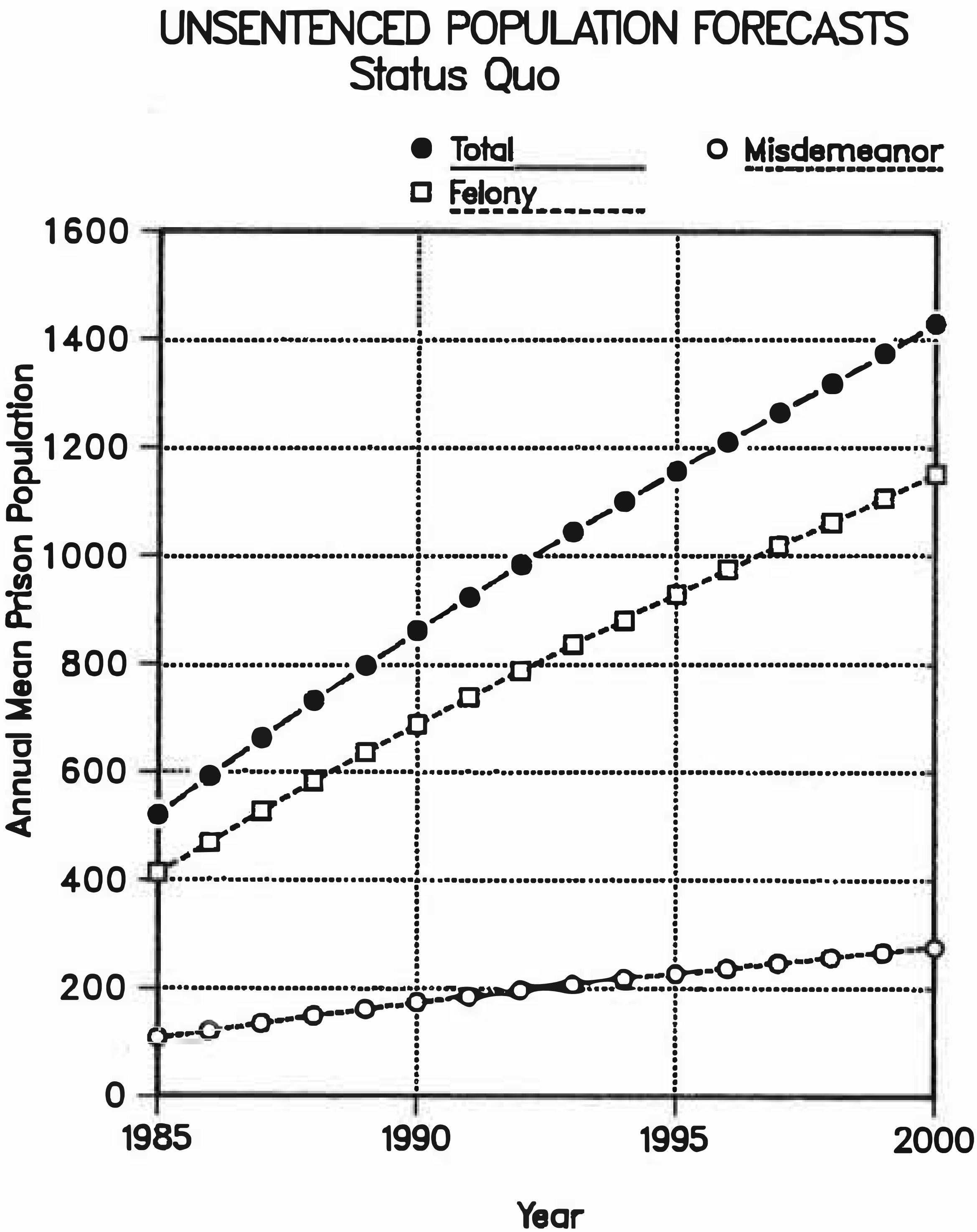
Table 3 and Graph 2 give forecasts of ADOC's annual mean unsentenced populations from 1985 to 2000. All other things being equal, ADOC's total unsentenced population will nearly triple (1985:521; 2000:1429) in the next fifteen years. This growth is based on an assumption of no change in the underlying population dynamics, however, and this assumption is probably not warranted. We will address this issue at length in the next section.

TABLE 3 - Unsentenced Population Status Quo Forecasts by Type of Crime and Sex

| | | Misdemeanor | | Felony | |
|---|---|---|---|---|---|
| Year | Total | (F) | (M) | (F) | (M) |
| 1985 | 521 | 10 | 98 | 21 | 392 |
| 1986 | 592 | 11 | 110 | 24 | 446 |
| 1987 | 663 | 12 | 123 | 27 | 501 |
| 1988 | 732 | 13 | 136 | 31 | 552 |
| 1989 | 798 | 14 | 147 | 34 | 603 |
| 1990 | 863 | 15 | 159 | 37 | 652 |
| 1991 | 925 | 16 | 169 | 40 | 700 |
| 1992 | 986 | 17 | 180 | 43 | 746 |
| 1993 | 1045 | 18 | 190 | 45 | 792 |
| 1994 | 1102 | 19 | 200 | 48 | 835 |
| 1995 | 1158 | 19 | 209 | 50 | 880 |
| 1996 | 1213 | 20 | 218 | 53 | 922 |
| 1997 | 1267 | 21 | 227 | 55 | 964 |
| 1998 | 1321 | 22 | 236 | 58 | 1005 |
| 1999 | 1375 | 23 | 245 | 60 | 1047 |
| 2000 | 1429 | 23 | 254 | 62 | 1091 |

The male/female ratio of ADOC's unsentenced population is not expected to change substantially by the year 2000. Nonetheless, despite the fact that the proportion of female prisoners - approximately six percent - is not expected to change during this period, the absolute number of female inmates in Alaska corrections will grow to the point where they may present a housing problem. The ratio of felons to misdemeanants, approximately four to one, is also expected to remain constant through the end of the century. (The forecasts of unsentenced population according to ADOC regions will be presented in a later section.)

GRAPH 2


UNSENTENCED POPULATION FORECASTS
Status Quo
Total
Misdemeanor
Felony
1600
1400
1200
1000
800
600
400
200
0
Annual Mean Prison Population
1985
1990
1995
2000
Year

Sentenced Forecasts

Table 4 and Graph 3 present the forecasts for ADOC's sentenced populations. All other things being equal, ADOC's total sentenced population will quadruple to exceed 7000 prisoners by the year 2000. The proportion of sentenced females, approximately five percent, will not change nor will the approximately four-to-one ratio of felonies to misdemeanors. As was the case with unsentenced prisoners, the proportion of sentenced female prisoners is expected to remain constant even though their absolute numbers will grow to the point where ADOC may need an additional special facility for women.

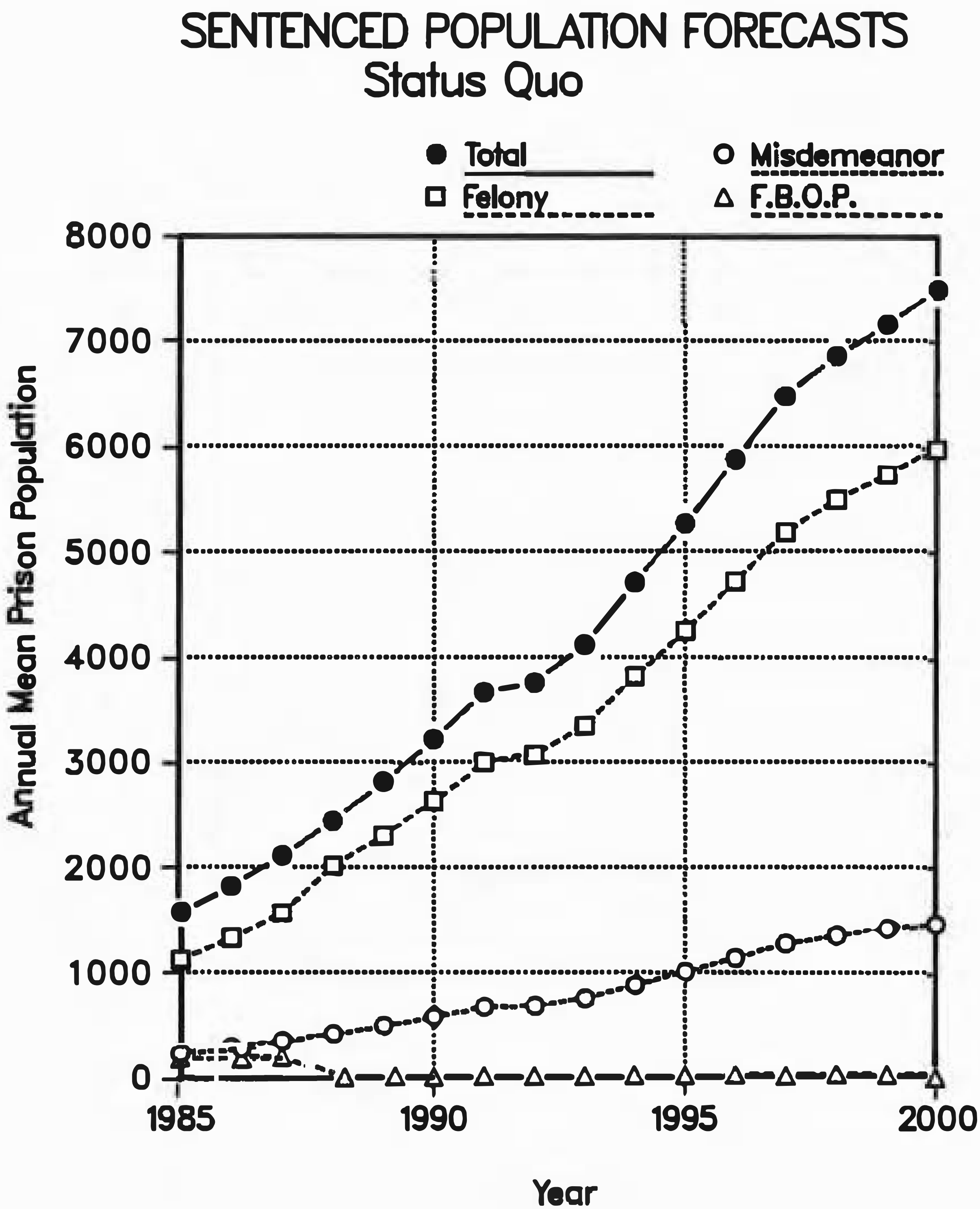
Table 4 - Sentenced Population Status Quo Forecasts by Type of Crime and Sex

| | | Misdemeanor | | Felony | | |
|---|---|---|---|---|---|---|
| Year | Total | (F) | (M) | (F) | (M) | FBOP[1] |
| 1985 | 1563 | 23 | 216 | 45 | 1079 | 200 |
| 1986 | 1822 | 28 | 261 | 53 | 1280 | 200 |
| 1987 | 2112 | 34 | 313 | 61 | 1504 | 200 |
| 1988 | 2442 | 40 | 373 | 71 | 1946 | 012 |
| 1989 | 2814 | 48 | 442 | 82 | 2229 | 013 |
| 1990 | 3217 | 56 | 519 | 94 | 2535 | 013 |
| 1991 | 3669 | 65 | 606 | 108 | 2876 | 014 |
| 1992 | 3767 | 66 | 614 | 110 | 2962 | 015 |
| 1993 | 4113 | 73 | 678 | 121 | 3226 | 015 |
| 1994 | 4706 | 86 | 796 | 139 | 3669 | 016 |
| 1995 | 5263 | 98 | 906 | 156 | 4087 | 016 |
| 1996 | 5872 | 111 | 1027 | 175 | 4542 | 017 |
| 1997 | 6485 | 124 | 1150 | 194 | 4999 | 018 |
| 1998 | 6860 | 132 | 1219 | 205 | 5286 | 018 |
| 1999 | 7160 | 138 | 1273 | 214 | 5516 | 019 |
| 2000 | 7485 | 144 | 1332 | 224 | 5765 | 020 |

[1]Federal Bureau of Prisons has a cap of 200 until 1988 when most will be returned.

At the present time the Federal Bureau of Prisons houses many

GRAPH 3


SENTENCED POPULATION FORECASTS
Status Quo
Total
Misdemeanor
Felony
F.B.O.P.
Annual Mean Prison Population
8000
7000
6000
5000
4000
3000
2000
1000
0
1985
1990
1995
2000
Year

Alaska prisoners. The Bureau has limited this population to 200; in January, 1988 almost all of these prisoners are scheduled for return to Alaska. Table 4 reflects this population cap. Those who remain with the Federal Bureau of Prisons after that will be those who for medical, psychological, security or other reasons cannot be housed in Alaska. Since the number of prisoners to remain with the Federal Bureau of Prisons will be determined by management, the numbers are based on an estimate provided by Alaska Department of Corrections personnel. (The forecast of sentenced population by ADOC region will be presented in a later section.)

Criminal Code Revision Impact: Unsentenced Population

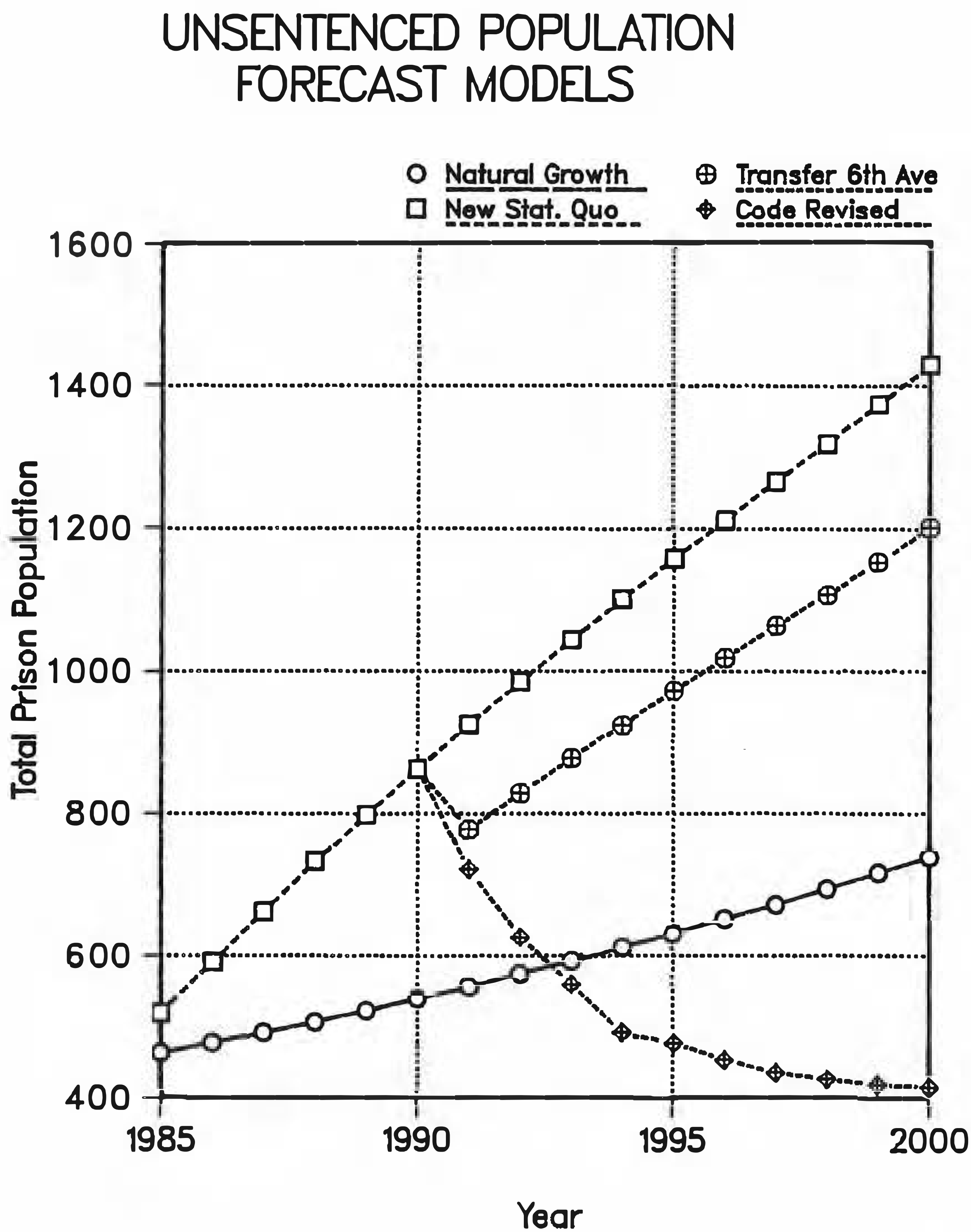
Since the number of unsentenced inmates will eventually be a factor contributing to the sentenced population, the model used for analysis includes considerations of the total unsentenced population. Table 5 presents a summary of the results of the four unsentenced population forecast models discussed in this section: (1) a natural growth model which is based on an assumption that nothing has occurred since 1970 which has had an impact on prison population growth; (2) a status quo model which more accurately reflects the growth that actually occurred; (3) a Sixth Avenue model which demonstrates the effects of transferring the total responsibility of the Sixth Avenue facility and its inmates to another jurisdiction; and (4) a 1990 code revision model which describes the impact of revising the criminal code to provide sentences equivalent to those in existence prior to the 1980 code revision.

Table 5 - Unsentenced Population Forecast Models

| Year | Natural Growth (1) | New Status Quo (2) | Sixth Ave Transferred (3) | Code Revised 1990 (4) |
|---|---|---|---|---|
| 1985 | 463 | 521 | - | - |
| 1986 | 477 | 592 | - | - |
| 1987 | 493 | 663 | - | - |
| 1988 | 508 | 732 | - | - |
| 1989 | 524 | 798 | - | - |
| 1990 | 541 | 863 | - | - |
| 1991 | 558 | 925 | 777 | 722 |
| 1992 | 576 | 986 | 829 | 627 |
| 1993 | 594 | 1045 | 878 | 561 |
| 1994 | 613 | 1102 | 926 | 493 |
| 1995 | 632 | 1158 | 973 | 478 |
| 1996 | 653 | 1213 | 1019 | 455 |
| 1997 | 673 | 1267 | 1065 | 437 |
| 1998 | 695 | 1321 | 1110 | 428 |
| 1999 | 717 | 1375 | 1155 | 420 |
| 2000 | 739 | 1429 | 1201 | 416 |

Forecasts of unsentenced prisoners using the natural growth model are presented in column 1 of Table 5. After statistically controlling all other possible factors, a base growth rate of 10% emerged from the 1970-1984 unsentenced data. This first model incorporates this statistically derived natural growth rate and disregards all other changes, such as the changes in the criminal code which may have caused changes the prison population. The base growth rate is not the actual rate at which the prison population grew between 1970 and 1984 but rather is the growth rate stripped of all other influences. We consider this model "naive" because of its assumption that nothing has influenced the prison population. This first model also assumes that the total unsentenced population will continue its historical pattern of growth

GRAPH 4


UNSENTENCED POPULATION
FORECAST MODELS
Natural Growth
New Stat. Quo
Transfer 6th Ave
Code Revised
Total Prison Population
1600
1400
1200
1000
800
600
400
1985
1990
1995
2000
Year

to the end of this century.

The first model is substantively naive in its assumptions. The mean unsentenced population did not grow gradually and relentlessly from 1970 to 1984. An analysis of the actual time series data indicated that there were at least two profound interruptions in the series which changed ADOC prisoner population. We determined these to be, first, the November, 1973 ADOC takeover of the Sixth Avenue Anchorage facility and, second, the Alaska Criminal Code Revision in the early 1980s. To calculate the impact of these known interruptions, we incorporated independent variables into the first model in an attempt statistically to account for the fact that the prison population increases did not occur in the manner explained by this slow and steady natural growth model.

From the perspective of the natural growth model, the population explosion beginning in 1980 is nothing more than a random disturbance which will go away and, in the long run, will have little permanent impact on the series. The second model, the results of which are shown in the second column of Table 5, attributes the post-1980 explosion to an independent variable - the early 1980s criminal code revisions. This second model reveals the impact of the 1980 code revision as a permanent change in the status quo of the unsentenced population.

Column 3 of Table 5 shows what theoretically would happen if the Sixth Avenue facility and its population were removed from ADOC jurisdiction in 1990 by returning them to the control of the

Municipality of Anchorage; the mean unsentenced population under the control of ADOC would drop by approximately nine percent in the next year and this one-time reduction would show up in each successive forecast.

The impact of the 1980s code revisions on the unsentenced population is not as easily interpreted. The long-term effect of this interruption is an approximately 46 percent increase in inmates distributed over the years following 1980, with the full impact of the code revisions not fully realized until after 1992. We prepared a forecast of the unsentenced population which would result if the provision for presumptive sentencing was dropped from the criminal code in 1990. These forecasts, shown in column 4, amount to a sharp reduction in 1991, followed by successively smaller reductions in each year to 2000. Comparing 2 and 4 illuminates the profound, complex impact of the 1980s code revisions on the total unsentenced population.

While one might think that the effects of the revisions would show up in one, two, or three years, this is not the case. The 1980s code revision has had, and, unless changed, will continue to have, a cumulative effect on the unsentenced population. On the other hand, the impact of a major abatement of the presumptive sentencing provision in the existing criminal code may not be realized for a decade or more.

The 1974 plea bargaining prohibition and the late 70s drunk driving crackdown may have had an impact on the ADOC population; however, such variables did not prove to be statistically significant or even helpful in attempts to understand the possible range of interruptions and prison population changes.

Criminal Code Revision Impact: Sentenced Population

We replicated the preceding forecasting exercise for the mean sentenced population. Graph 5 summarizes the results of the four models used in forecasting sentenced populations. The natural growth forecasts of the sentenced population, Column 1 of Table 6, are not as "naive" as our forecasts of the unsentenced population. For one thing, we determined that the unsentenced population feeds the sentenced population and included this assumption in the model. It is, for example, assumed that a proportion of this year's unsentenced population will show up in next year's sentenced population. The first model illustrates that the mean sentenced population is a function of gradual, relentless growth *per se* in addition to growth in the unsentenced population. Compared to the effects of the unsentenced population, however, the gradual, relentless growth in this series is exceedingly small.

Forecasts of the first model are shown in column 1 of Table 6. The natural growth forecast of the sentenced population for the year 2000 is slightly over 4500 sentenced prisoners, or more than three times the present size. Remember that the projections of the natural growth model are not based on the true fluctuations in prison population over the 1970-84 period but rather on the underlying long-term growth rate which resulted from naively stripping away all other factors which affect prison population growth except the annual increases. We now turn to looking for factors which may help us explain why this naive natural growth model for the sentenced population is inaccurate.

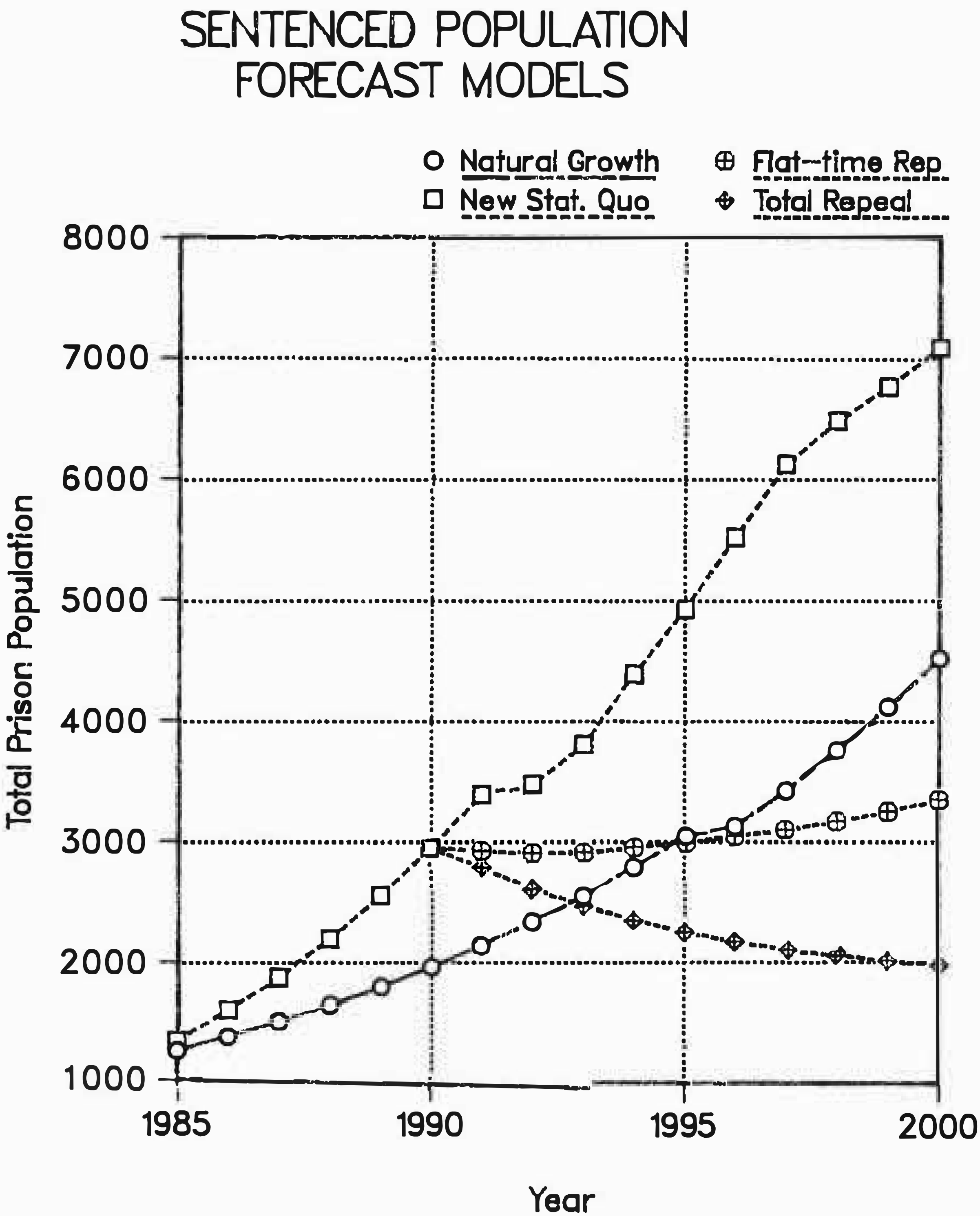
Table 6 - Sentenced Population Forecast Models

| Year | Natural Growth 70-84 | New Status Quo | Flat-time Repealed 1990 | Total Repeal |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| 1985 | 1271 | 1352 | - | - |
| 1986 | 1387 | 1602 | - | - |
| 1987 | 1514 | 1884 | - | - |
| 1988 | 1652 | 2201 | - | - |
| 1989 | 1803 | 2557 | - | - |
| 1990 | 1968 | 2952 | - | - |
| 1991 | 2149 | 3391 | 2925 | 2787 |
| 1992 | 2345 | 3475 | 2913 | 2616 |
| 1993 | 2560 | 3809 | 2915 | 2474 |
| 1994 | 2794 | 4393 | 2956 | 2356 |
| 1995 | 3050 | 4934 | 2995 | 2258 |
| 1996 | 3128 | 5531 | 3046 | 2178 |
| 1997 | 3433 | 6131 | 3107 | 2113 |
| 1998 | 3765 | 6491 | 3180 | 2061 |
| 1999 | 4128 | 6780 | 3263 | 2020 |
| 2000 | 4524 | 7092 | 3358 | 1989 |

The 1980s criminal code revision has both direct and indirect effects on the size of the sentenced population. The revision led to an increase in the unsentenced population and this in turn leads to an indirect increase in the size of the sentenced population. The direct effect is that not only have more prisoners been sent to ADOC institutions since 1980, but prisoners are also serving longer average sentences. The effects of the 1980s code revisions on sentenced populations are seen in column 2. When the direct effects of the 1980s criminal code revisions are factored into the forecasts, ADOC will have more than 7,000 sentenced prisoners in the year 2000.

Before we play "what if" with these figures, it must be noted

GRAPH 5


SENTENCED POPULATION
FORECAST MODELS
Natural Growth
New Stat. Quo
Flat-time Rep
Total Repeal
Total Prison Population
8000
7000
6000
5000
4000
3000
2000
1000
1985
1990
1995
2000
Year

that the second model probably provides the most probable unconditional forecasts of the total ADOC sentenced population. This model assumes no changes in the criminal code as it existed in 1984; this may result in ADOC's mean sentenced population increasing substantially by the end of this century. This forecast illustrates the profound impact of the 1980s criminal code revisions on ADOC populations.

An important implication of the results of the second model for planning purposes at least, is that there are no simple remedies to the problem. Column 3 shows what would happen if the direct effects of the 1980s criminal code revisions were mitigated in the year 1990. For example, if the code's provision for presumptive sentences were replaced with a more flexible mechanism such as indeterminate sentencing with parole, the change would slow the population growth rate within one year but it would not appreciably reduce the size of the population because ADOC would still be receiving a large number of new prisoners. As a result, the sentenced population would steadily increase for nearly a decade.

Column 4 shows what would happen if both the direct and the indirect effects of the 1980s criminal code revisions were removed, that is, if presumptive sentences were repealed and if ADOC received fewer prisoners from the courts. Under this scenario, the population would begin to shrink within one year and would continue to shrink at a decreasing rate until the end of the century.

The year 2000 forecasts of the fourth model in Table 6 are more or less what would be expected if the early 1980s criminal code revisions had never occurred. Even without the impact of the revisions, ADOC's sentenced population would grow by more than five percent annually for the remainder of the century. This prompts an obvious question: what factors might be responsible for this gradual, relentless growth? The next subsection discusses the results of attempts to identify some of these factors.

Demographics, Economics, and Crime: Sentenced and Unsentenced

The criminal code revision of the early 1980s preceded the substantial growth in ADOC prisoner population. Analyses of time series data show that this was no coincidence and that the impact of the revisions on ADOC's population is far from complete. The early 1980s code revisions will continue to be a main causal factor in prison population growth through the rest of this century.

It is conceivable that ADOC populations would have grown in 1980 even without the code revisions because the revisions were not the only crucial event of the year which may have influenced the prison population. Tables 7 and 8 show the results of the evaluation of three additional alternative areas of influences: demographic, economic, and crime. If Alaska's population rises dramatically, for example, one might expect a concurrent rise in ADOC's population. Similarly, if Alaska's economy goes into recession, one might expect crime rates and, in turn, incarceration rates to rise. And finally, if Alaska's crime rate rises, one would of course expect a rise in prison population.

Table 7 - Sources of Growth - Demographic

| Year | Total Alaska Population (in thousands) A | Population Under 18 years B | Population 18 to 45 years C |
|---|---|---|---|
| 1970 | 305 | 120 | 132 |
| 1971 | 315 | 125 | 137 |
| 1972 | 325 | 130 | 141 |
| 1973 | 333 | 130 | 146 |
| 1974 | 344 | 129 | 151 |
| 1975 | 370 | 133 | 160 |
| 1976 | 382 | 142 | 177 |
| 1977 | 396 | 148 | 191 |
| 1978 | 401 | 145 | 191 |
| 1979 | 402 | 146 | 192 |
| 1980 | 403 | 130 | 204 |
| 1981 | 416 | 133 | 210 |
| 1982 | 444 | 140 | 225 |
| 1983 | 479 | 154 | 246 |

Table 8 - Sources of Growth - Economic and Crime

| Year | Unemployment Rate in % A | Homicide Rate B | Rape Rate C | Armed Robbery Rate D | Aggravated Assault Rate E |
|---|---|---|---|---|---|
| 1970 | 10.3% | 12.2 | 26.1 | 71.8 | 168 |
| 1971 | 11.9 | 13.4 | 43.5 | 67.1 | 231 |
| 1972 | 10.5 | 9.5 | 47.8 | 66.5 | 253 |
| 1973 | 10.8 | 10.0 | 44.5 | 67.0 | 263 |
| 1974 | 10.0 | 13.6 | 49.3 | 88.4 | 302 |
| 1975 | 8.6 | 12.2 | 44.6 | 129.5 | 353 |
| 1976 | 8.0 | 11.3 | 46.9 | 124.9 | 357 |
| 1977 | 9.4 | 10.8 | 51.6 | 96.8 | 284 |
| 1978 | 11.2 | 12.9 | 55.6 | 91.3 | 282 |
| 1979 | 9.2 | 13.3 | 71.9 | 109.6 | 296 |
| 1980 | 9.7 | 9.7 | 62.5 | 90.0 | 317 |
| 1981 | 9.3 | 14.6 | 102.2 | 114.6 | 384 |
| 1982 | 10.0 | 18.5 | 85.4 | 134.0 | 386 |
| 1983 | 10.3 | 13.8 | 101.5 | 97.0 | 402 |

Since demographics, economics, and crime all shifted suddenly in 1980 one could argue that these social and economic shifts rather than the revised criminal code caused ADOC's inmate population growth. We examined this hypothesis, incorporated several growth indicators into the forecasting models and forecast ADOC populations under several growth scenarios.

Columns A, B, and C of Table 7 show Alaska's total population, population under 18 years of age, and population between 18 and 45 years of age. Focusing on total population, we see that the population did not grow substantially from 1977 to 1980; the rate of growth during this period was substantially lower than in previous years. But in 1981 and 1982 the rate of growth of the total population increased noticeably. Is ADOC's prisoner population explosion due only to this sudden growth in Alaska's population?

Alaska's population has grown dramatically since the end of World War II and this <u>external</u> growth has forced ADOC's population upward to some extent. ADOC's inmate population did not, however, increase at the same rate as population growth. This lack of correlation is probably associated with the fact that not all people, new residents or otherwise, have the same rate of imprisonment. If the bulk of Alaska's population growth consisted of women, men over 35 years of age, and young children - i.e., families - there would probably be little or no growth in ADOC populations regardless of growth in the general population because such individuals are not associated with traditional criminal behavior nor subsequent arrest and incarceration.

Conversely, if the bulk of Alaska's population growth consisted of young men, there would probably be large increases in ADOC populations from relatively small increases in the general population.

The population at risk - conventionally defined - is the number of young men in the general population who are eighteen to twenty-four. This demographic statistic has proved time and time again to be the single best indicator of prison admissions. It has been confirmed in studies in Washington, Oregon, Arizona and New Mexico.

Since numbers for this precise age grouping was not available as a time series for Alaska, the next best indicator of the at risk population was used: the eighteen to forty-five year-old population, presented in column C. U.S. Census statistics report little change in the male/female ratio in Alaska from 1970 to 1980. Therefore, it is reasonable to assume that the same ratio of males to females continues to exist in the eighteen to forty-five year-old population. The population under eighteen, column B, is the population least at risk and, in this sense, serves as a quasi-experimental control for the at risk population.

Column A of Table 8 shows Alaska's annual mean unemployment rates as determined by the U.S. Bureau of Labor Statistics Census of the Workforce. This is not the only unemployment statistic available and it is certainly not an ideal statistic; however, this is probably the best of the available employment-related statistics from which an inference concerning unemployment can be drawn. Remember, even if the rate of unemployment remains the same, increases in the general population will result in a higher number of people who are actually unemployed. The population of Alaska has obviously grown considerably since 1970; in addition, unemployment followed the national trend. Could this increase in the numbers of unemployed underlie ADOC's population growth?

The argument that unemployment produced the increase in prison population is not as strong as the argument that the increase in population was caused by demographic changes. ADOC populations also rose dramatically in 1981, for example, a year when unemployment was actually falling. Nevertheless, conventional wisdom holds that prison populations are linked with the economy, and we will examine this link more closely below.

Columns B through E contain Alaska's homicide, rape, armed robbery, and aggravated assault rates. It might be argued that these statistics caused the 1980s criminal code revisions and the trends in Table 8 support this argument. All four statistics rose in 1979, for example, and since three of the four dropped in 1980, one might conclude that the code revision had a salutary impact by reducing crime in Alaska. On the other hand, beginning in 1981, serious crime rates began to trend upwards again, raising the possibility that ADOC's prison population explosion is nothing more than the inevitable result of a crime wave. We can assume without fear of contradiction that crime rate trends are responsible for at least some of the increase in ADOC populations during this period. The real question is, "How much?"

A mathematical basis for exploring this "how much" question has been formed by a procedure developed in McCleary and Hay (1980).[2] If any of the variables in Table 8 causes ADOC population growth, we can expect a correlation with ADOC population after controlling for all other within-series factors. Table 9 summarizes the results of these analyses. Only the correlations between either the unemployment or robbery variables with sentenced ADOC populations are statistically significant. The evidence for a causal relationship between these two series and the sentenced population is strong. Otherwise, none of these lag series explains the growth in ADOC's unsentenced populations.

Surprisingly, demographics have no statistically causal relationship with any ADOC population series. This null relationship may indicate that these identified demographics play no explicit role in ADOC's population dynamics. Alaska's population growth since the end of World War II is, after all, a unique phenomenon both quantitatively and qualitatively. But the null relationship may only indicate that we have not yet found an appropriate demographic indicator. Given the possible value of demographic indicators in forecasting, ADOC might find a sophisticated study of this issue to be a worthwhile investment.

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[2] McCleary, R.L. and Hay, K.C. Applied Time Series Analysis for the Social Sciences. Beverly Hills, CA: Sage, 1980.

Table 9 - Haugh-Box Absolute Correlation Matrix**

| Variable: | Unsentenced Lag # (0) | (1) | (2) | (3) | Sentenced Lag # (0) | (1) | (2) | (3) |
|---|---|---|---|---|---|---|---|---|
| Under 18 | .05 | .07 | .04 | .12 | .12 | .19 | .07 | .26 |
| 18-45 | .11 | .25 | .12 | .07 | .11 | .06 | .09 | .25 |
| Unemployment | .07 | .24 | .34 | .03 | .44* | .54* | .01 | .08 |
| Homicide | .15 | .21 | .05 | .29 | .21 | .29 | .07 | .10 |
| Rape | .09 | .16 | .10 | .01 | .01 | .14 | .10 | .08 |
| Robbery | .22 | .16 | .32 | .14 | .51* | .26 | .05 | .16 |
| Assault | .26 | .30 | .11 | .07 | .21 | .40 | .10 | .23 |

* Statistically significant at P < .05
** Haugh, L.D. (1976) Checking the Independence of Two Covariance Stationary Time Series. Journal of the American Statistical Association. Vol. 71, pp. 378-385.

The null finding for three of the four crime indicators may also be a statistical artifact: there is too little variation over time in the historical series of homicide, rape, and assault rates. Armed robbery, in contrast, is highly variable over the 1970-1983 period. Also, armed robbery and armed robbers are likely to be dealt with harshly by Alaska's criminal justice system and, as a result, drive ADOC's sentenced populations. This relationship is weaker than the relationship between unemployment and ADOC's sentenced populations, however. If we accept any of the conventional psychological or sociological explanations, we would also expect an analogous relationship between unemployment and ADOC's <u>unsentenced</u> populations. Finding none, we suspect a more pragmatic mechanism: when unemployment is high, for example, convictees are obviously less likely to be employed and, perhaps, ineligible for probation or other alternatives to incarceration. But for whatever reason, the analyses summarized in Table 9 show that unemployment and armed robbery lead ADOC's sentenced population and this means that conditional forecasts can be generated from these indicators.

Alternative Scenarios

The long-range forecasts of ADOC's unsentenced and sentenced populations in Tables 3 and 4 are status quo forecasts. If nothing changes, ADOC's total population, including both unsentenced and sentenced prisoners, will be nearly 8900 by the year 2000. It is difficult to imagine a future where nothing changes, however, and for this reason, the status quo forecasts are best viewed as a benchmark for assessing alternative scenarios.

Our time series analyses to this point have shown that ADOC populations are associated with four forces: (1) the early 1980s criminal code revision; (2) Alaska unemployment; (3) armed robbery; and (4) natural growth. Natural growth is a misnomer, as explained previously. There is nothing at all natural about the growth of a prison population. What we mean, explicitly, is that after the factors of code revision, unemployment, and armed robbery are controlled, ADOC's total populations still grow at about a five percent annual rate. This rate is so consistent across time that it is necessarily a component of any scenario. Unemployment and armed robbery rates need not be consistent and can vary greatly across both time and region. Change in these indicators and the major policy variable form the basis of the scenarios outlined in Tables 10 and 11.

Table 10- Alternative Scenarios: "Best Case"

| Year | 1980 Code Repealed in 1985 | | 1980 Code Repealed in 1985 and . . . | | |
|---|---|---|---|---|---|
| | | | Unemployment goes down | Armed Robbery goes down | Unemployment and Armed Robbery go down |
| | (1) Unsentenced | (2) Sentenced | (3) Sentenced | (4) Sentenced | (5) Sentenced |
| 1985 | 521 | 1563 | 1562 | 1563 | 1562 |
| 1990 | 664 | 2073 | 2035 | 2056 | 2018 |
| 1995 | 455 | 2627 | 2589 | 2542 | 2521 |
| 2000 | 412 | 3343 | 3284 | 3267 | 3225 |

Table 11- Alternative Scenarios: "Worst Case"

| Year | 1980 Code IS Repealed | | 1980 Code IS Repealed and . . . | | 1980 Code NOT Repealed and . . . |
|---|---|---|---|---|---|
| | | | Unemployment goes up | Armed Robbery goes up | Unemployment and Armed Robbery go up |
| | (1)Unsentenced | (2)Sentenced | (3)Sentenced | (4)Sentenced | (5)Sentenced |
| 1985 | 521 | 1563 | 1798 | 1563 | 1799 |
| 1990 | 664 | 2073 | 2386 | 2166 | 4736 |
| 1995 | 455 | 2627 | 3280 | 2542 | 14065 |
| 2000 | 412 | 3343 | 4538 | 3379 | 24333 |

We begin with the best case scenarios in Table 10. The five columns of Table 10 all assume a mitigation of the 1980 code. Of the four exogenous forces driving ADOC populations, the most potent is the 1980 code revision. Under a "best case" scenario, the impact of this policy intervention would be mitigated beginning in 1985. Theoretically, the process could be started by legislative or executive action but, in either case, the pressure on ADOC populations would only slowly be relieved over a five year period ending in 1990. The following can be concluded by reviewing Table 10:

(1) By 1990, the unsentenced population will be 664, in contrast to the <u>status quo</u> forecast of 863 from Table 3.

(2) The effect on ADOC's sentenced population, Column 2, will be equally dramatic but will be distributed over a longer period of time. By 1990, the sentenced population will be 2073, in contrast to <u>status quo</u> forecast of 3217 from Table 4 and 3343 versus 7485 in the year 2000.

Although the scenarios of Columns 1 and 2 reflect changes in the early 1980s code revision, they assume no change in the unemployment or robbery rates which, from 1970 to 1983, averaged 9.9 percent and 96.3 per hundred thousand respectively. Compared to those of other states, these rates are high but, considering Alaska's unique social and economic systems, we cannot conclude they are high in any absolute sense, nor can we predict whether these rates will stay at these levels for the rest of the century. Nevertheless, continuing with the code revision scenario, let us additionally assume that both rates decline by ten percent (on average) over the next fifteen years.

(3) If only the average unemployment rate dropped to 9.0 percent, ADOC's sentenced population would be decreased by nearly 60 prisoners in the year 2000. Due to the nonlinear logarithmic structure of unemployment, the effect builds up in absolute terms over the years, but due to natural growth, it grows smaller in percentage terms. Nonlinearity precludes a precisely uniform representation of the unemployment effect. In the year 2000, however, each percentage point decrease in unemployment can be translated into 60 fewer sentenced prisoners. Thus, if an economic boom of an unprecedented level drove unemployment down to an average of five percent, ADOC would have 300 fewer sentenced prisoners. Of course, viewed from a purely statistical viewpoint, neither unemployment nor armed robbery has any measurable impact on ADOC's unsentenced populations.

(4) Next, if only the armed robbery rate dropped to 86.7 crimes per hundred thousand (on average), the effect on sentenced populations would be weaker than the effect of a drop in unemployment <u>before</u> 1990 but stronger <u>after</u> 1990. This anomaly is presumably explained by the relatively long sentences served by armed robbers.

(5) Finally, if there were an immediate mitigation of the 1980s code revision and if both the unemployment and armed robbery rates dropped (on average) by ten percent, the absolute best case scenario would be 3225 sentenced prisoners in the year

2000.

Even the best case scenario, however, is not good because ADOC's total population, unsentenced and sentenced, will exceed 3600 by the year 2000. ADOC's planning must, at a bare minimum, include correctional services large enough to handle this expanded population.

Approaching the absolute "worst case," let us again assume, as we did for the scenarios discussed above, that the major policy intervention has been mitigated beginning in 1985. Then, from Table 11 we can see that columns 1 and 2 are identical to the forecasts in the previous Table 10. In column 3, if the unemployment rate rose to 11.0 percent (on average), ADOC's sentenced population would be 4538 by the year 2000. Note here that <u>increases</u> and <u>decreases</u> in the unemployment rate do not have "mirror image" opposite effects on the sentenced population. Instead, at the benchmark 9.9 percent rate, due to the nonlinear structure of the relationship between unemployment and the prison population, each percentage point increase in the unemployment rate has an exaggerated effect. The models reveal that decreases in unemployment are associated with small decreases in the prison population but even small increases in unemployment lead to very large prison population increases.

As indicated in column 4, if the armed robbery rate rose by ten percent (on average) to 105.9 crimes per hundred thousand, there would be only a slight effect on the sentenced population. Increases beyond the historic 96.3 rate have a weaker impact on the sentenced population than decreases.

Finally, column 5 presents the worst case. If the economy stagnated, generating an average 11.0% unemployment rate, and if the armed robbery rate averaged 105.9 crimes per hundred thousand, and if the 1980s code revision went unmitigated for the rest of this century, ADOC's sentenced population would explode beyond all credible limits, exceeding 24,000 prisoners by the year 2000.

The worst case is exaggerated somewhat by compounded rounding error. Nevertheless, anyone with a rudimentary knowledge of correctional economics would realize that the state of Alaska would have reached the limits of its ability to provide the necessary resources well before the year 2000 and emergency provisions would be enacted to reduce ADOC's total population drastically. The worst case scenario, an institutional population comparable to that of Texas by the century's end, emphasizes the need for immediate long-range planning by the entire criminal justice system. Rational correctional planning is naturally directed toward avoiding such a crisis. Considering the range from best to worst, there seem to be at least three options worth considering:

Policy Mitigation The 1980s criminal code revision has had, and will continue to have, both direct and indirect impacts on ADOC's sentenced population. The direct impact could be mitigated by returning to a discretionary release (parole) model, by accelerating "good time" provisions, or by otherwise acting to differentially decrease mean time served. The indirect effect is not as well understood. The 1980s code revision somehow impacted the unsentenced population. Since unsentenced prisoners feed the sentenced population, any decrease in the unsentenced population has an automatic effect on the size of the sentenced population. Note that the earlier the policy mitigation process begins, the sooner its ameliorating effect will be realized and the larger the effect will be.

Alternatives to Incarceration Even the best case scenario presents a pessimistic view of the future. Using the best available demographic models, it is estimated Alaska's population will not exceed 600,000 by the end of the century. Can this future population support even the minimal "best case" scenario of 3600 occupied institutional beds? It seems ADOC will be faced with no option but to continue to develop alternatives to incarceration.

Alaska Unemployment While we cannot explain why Alaska unemployment is related to ADOC's sentenced population, it is. ADOC cannot control the unemployment rate, of course, but the relationship, which may be due to probation eligibility, might be ameliorated by continued ADOC emphasis on pre-conviction employment programs. In any event, ADOC may wish to direct resources to explaining the link between unemployment and the size of the sentenced population.

And finally, we must note that the natural growth rates used in these scenarios are poor proxies for the explicit variables which underlie growth. Although we have found no demographic indicator which can explain a statistically significant proportion of ADOC's historical population growth, past experience in Washington, Oregon, Arizona and New Mexico convinces us that such indicators could produce more powerful and meaningful long-range forecasts. ADOC may wish to identify and collect such data to improve future forecasts.

Requested Scenarios

Forecasts for several additional alternative scenarios were requested by ADOC personnel during the preparation of the this report. Table 12 illustrates the effects on the sentenced population of changes in "good time" and of the transfer of the contract jail beds now under the auspices of the Department of Public Safety to ADOC control. An increase in the amount of good time awarded from the current one day for every four served to one day for every three would have an immediate and substantial impact. This effect increases as the years progress, resulting in dramatic decreases in the sentenced population from the status quo forecast.

Adding the approximately 208 contract beds and prisoners to the control of the ADOC in 1985 has the effect of increasing the sentenced population by that amount in every year to 2000. No cumulative effects were noted for this interruption in the status quo forecast.

Table 13 illustrates the effect on ADOC's mean sentenced population of the transfer of Anchorage's 3rd Avenue facility and its inmates to the control of the city. There is a small decrease in this male subpopulation in 1985 but this reduction quickly fades and after five years one sees no effects at all.

Table 12 - Alternative Scenarios as Requested by ADOC
Annual Mean, Total Sentenced Population Forecasts

| Year | Status Quo | Increase Good Time | Add Contract Beds |
|---|---|---|---|
| 1985 | 1563 | 1285 | 1771 |
| 1986 | 1822 | 1441 | 2030 |
| 1987 | 2112 | 1496 | 2320 |
| 1988 | 2442 | 1673 | 2650 |
| 1989 | 2814 | 1952 | 3022 |
| 1990 | 3217 | 2066 | 3425 |
| 1991 | 3669 | 2311 | 3877 |
| 1992 | 3767 | 2376 | 3975 |
| 1993 | 4113 | 2588 | 4321 |
| 1994 | 4706 | 2977 | 4914 |
| 1995 | 5263 | 3365 | 5471 |
| 1996 | 5872 | 3769 | 6080 |
| 1997 | 6485 | 4175 | 6693 |
| 1998 | 6860 | 4431 | 7068 |
| 1999 | 7160 | 4601 | 7368 |
| 2000 | 7485 | 4812 | 7693 |

Table 13 - Alternative Scenarios as Requested by ADOC
Annual Mean, Male Sentenced Felony Forecasts

| Year | Status Quo | 3rd Avenue Transferred |
|---|---|---|
| 1985 | 1079 | 1034 |
| 1986 | 1280 | 1244 |
| 1987 | 1504 | 1477 |
| 1988 | 1946 | 1928 |
| 1989 | 2229 | 2218 |
| 1990 | 2535 | 2528 |
| 1991 | 2876 | 2876 |
| 1992 | 2962 | 2962 |
| 1993 | 3226 | 3226 |
| 1994 | 3669 | 3669 |
| 1995 | 4087 | 4087 |
| 1996 | 4542 | 4542 |
| 1997 | 4999 | 4999 |
| 1998 | 5286 | 5286 |
| 1999 | 5516 | 5516 |
| 2000 | 5765 | 5765 |

SECTION III

SHORT-RANGE FORECASTS

Short-range forecasts, i.e,, one year into the future, are a by-product of the long-range forecasting models presented in the preceding sections. For strategic planning purposes, short-range forecasts are of little interest. But for more routine purposes, especially scheduling and purchasing, short-range forecasts are often invaluable. They identify population highs and lows and otherwise provide insight into micro-level population dynamics. The short-range forecasts for 1985 presented below allow us to monitor the accuracy of our projections as the actual population totals were not available when the study began.

Sentenced and Unsentenced Forecasts

Table 14 presents the total mean sentenced and unsentenced short-range forecasts for each month of 1985. The total population, including that of the Federal Bureau of Prisons, was expected to rise from 1922 to 2057 in December, 1985. The FBOP population was set at 200 for each month to reflect the cap placed on that portion of ADOC growth. The projections are further broken down by sex in Tables 15 and 16 without this FBOP addition.

Table 14 - Short-range Sentenced and Unsentenced Forecasts

| | Total* | Misdemeanor Unsent. | Misdemeanor Sent. | Felony Unsent. | Felony Sent. |
|---|---|---|---|---|---|
| January | 1922.1 | 106.8 | 201.8 | 375.0 | 1238.5 |
| February | 1950.7 | 107.9 | 217.4 | 378.2 | 1247.2 |
| March | 1955.6 | 107.0 | 210.4 | 384.8 | 1253.4 |
| April | 1961.1 | 107.7 | 200.7 | 390.1 | 1262.6 |
| May | 1972.3 | 107.9 | 197.2 | 395.5 | 1271.7 |
| June | 1973.6 | 109.2 | 186.4 | 397.9 | 1280.1 |
| July | 1985.8 | 111.0 | 180.3 | 406.0 | 1288.5 |
| August | 1997.0 | 111.8 | 177.7 | 410.6 | 1296.9 |
| September | 1995.6 | 112.9 | 179.7 | 397.6 | 1305.4 |
| October | 2019.7 | 112.8 | 194.3 | 398.8 | 1313.8 |
| November | 2043.4 | 113.1 | 206.7 | 401.3 | 1322.3 |
| December | 2057.6 | 113.6 | 204.5 | 408.8 | 1330.7 |

* includes the Federal Bureau of Prison population which was set at 200 for each month.

## Female Population Forecasts

Table 15 gives monthly forecasts of ADOC's female populations - sentenced and unsentenced, misdemeanor and felony - for 1985. One of the most interesting aspects of these forecasts is the distribution of means throughout 1985. In every category, the low occurs in the early months, usually January, and the high occurs in the later months. Some of the variance in this table is due to seasonality, of course, but some is due only to natural growth. Seasonality notwithstanding, we would expect the last six months of 1985 to be higher than the first six months because, throughout 1985, these populations are growing larger.

Table 15 - Female Population Forecasts, 1985

| | Mean Unsentenced Misd. | Mean Unsentenced Fel. | Mean Sentenced Misd. | Mean Sentenced Fel. |
|---|---|---|---|---|
| January | 6.7 | 18.6 | 17.3 | 35.6 |
| February | 7.0 | 19.1 | 17.5 | 36.1 |
| March | 7.3 | 19.3 | 17.6 | 34.1 |
| April | 7.3 | 19.4 | 17.7 | 35.2 |
| May | 6.7 | 19.1 | 17.9 | 36.1 |
| June | 7.3 | 19.9 | 18.0 | 36.3 |
| July | 8.3 | 20.6 | 18.1 | 36.5 |
| August | 8.4 | 19.7 | 18.3 | 36.8 |
| September | 8.8 | 20.0 | 18.4 | 37.1 |
| October | 7.9 | 20.5 | 18.5 | 37.3 |
| November | 7.5 | 20.7 | 18.7 | 37.6 |
| December | 7.2 | 20.0 | 18.8 | 37.9 |

Table 16 - Male Population Forecasts, 1985

| | Mean Unsentenced Misd. | Mean Unsentenced Fel. | Mean Sentenced Misd. | Mean Sentenced Fel. |
|---|---|---|---|---|
| January | 100.1 | 356.4 | 184.5 | 1002.9 |
| February | 100.9 | 359.1 | 199.9 | 1011.1 |
| March | 99.7 | 365.5 | 192.8 | 1019.3 |
| April | 100.4 | 370.7 | 183.0 | 1027.4 |
| May | 101.2 | 376.4 | 179.3 | 1035.6 |
| June | 101.9 | 378.0 | 168.4 | 1043.8 |
| July | 102.7 | 385.4 | 162.2 | 1052.0 |
| August | 103.4 | 390.9 | 159.4 | 1060.1 |
| September | 104.1 | 377.6 | 161.3 | 1068.3 |
| October | 104.9 | 378.3 | 175.8 | 1076.5 |
| November | 105.6 | 380.6 | 188.0 | 1084.7 |
| December | 106.4 | 388.8 | 185.7 | 1092.8 |

## Male Population Forecasts

Table 16 gives the analogous forecasts for the male subpopulations. Through 1985, the male subpopulations are more seasonally variant and grow at a slightly higher rate. Nevertheless, these forecasts are interpreted in the same way. In January, 1985 we expect the male sentenced felon population mean to be 1002.9, and this figure will continue to rise to 1092.8 by December.

Conclusion

The forecasts in Tables 15 and 16 will not be very useful in practice because these subpopulation categories are artificial. In a typical use, short-range forecasting models would be constructed for each real population - for example, for each institution. These local forecasting models could then be used for scheduling vacations, hiring temporary personnel, purchasing supplies, and so forth.

## SECTION IV

## REGIONAL FORECASTS

The breakdowns of the status quo ADOC population forecasts by region are presented in Tables 17 and 18 respectively. The population estimates from which the regional analyses were constructed are given in Table 19. The latter figures require additional explanations.

The ADOC areas were defined by ADOC as: (1) Northern, including those facilities in Fairbanks, Bethel, and Nome; (2) Southeastern, including Juneau and Ketchikan; and (3) Southcentral, including Anchorage, Eagle River, Palmer, Wasilla, Kenai, and Seward. (See the following tables.) The ADOC areas corresponded with the census areas so that the Northern area included census areas such as North Slope Borough, Kobuk, Nome, Yukon-Koyukuk, Fairbanks North Star Borough, Southeast Fairbanks, Wade Hampton, and Bethel. The Southcentral area was defined as census areas Valdez-Cordova, Matanuska-Susitna Borough, Municipality of Anchorage, Kenai Peninsula Borough, Dillingham, Bristol Bay Borough, Kodiak Island Borough, and Aleutian Islands. The Southeastern area was defined as census areas Skagway-Yakutat-Angoon, Haines Borough, City and Borough of Juneau, City and Borough of Sitka, Wrangell-Petersburg, Prince of Wales-Outer Ketchikan, and Ketchikan Gateway Borough.

The figures for the year 1970 were taken from the U.S. Department of Commerce's preliminary estimates (see Table 19, note b), rather than the Alaska Department of Labor's Alaska Population Overview (see Table 19, note a), because an error in addition was found in the state's computations. Rather than arbitrarily manipulating the area totals, the federal figures were used. (Note: The state and federal figures agreed on the statewide total, but not on the census area totals.)

These regional breakdowns indicate that the largest increase, in absolute number of inmates, will occur in the Southcentral region. This is true for both unsentenced and sentenced sub-populations. However, all areas will experience substantial growth.

Table 17 - Breakdown of Unsentenced Population Forecasts Status Quo by ADOC Regions

| Year | Total | Southcentral | Northern | Southeastern |
|---|---|---|---|---|
| 1985 | 521 | 286 | 188 | 47 |
| 1986 | 592 | 326 | 213 | 53 |
| 1987 | 663 | 364 | 239 | 60 |
| 1988 | 732 | 403 | 263 | 66 |
| 1989 | 798 | 439 | 287 | 72 |
| 1990 | 863 | 474 | 311 | 78 |
| 1991 | 925 | 509 | 333 | 83 |
| 1992 | 986 | 542 | 355 | 89 |
| 1993 | 1045 | 575 | 376 | 94 |
| 1994 | 1102 | 606 | 397 | 99 |
| 1995 | 1158 | 637 | 417 | 104 |
| 1996 | 1213 | 667 | 437 | 109 |
| 1997 | 1267 | 697 | 456 | 114 |
| 1998 | 1321 | 726 | 476 | 119 |
| 1999 | 1375 | 756 | 495 | 124 |
| 2000 | 1429 | 786 | 514 | 129 |

Table 18 - Breakdown of Sentenced Population Forecasts Status Quo by D.O.C. Regions

| Year | Total | Southcentral | Northern | Southeastern |
|---|---|---|---|---|
| 1985 | 1563 | 1110 | 266 | 187 |
| 1986 | 1822 | 1294 | 310 | 218 |
| 1987 | 2112 | 1500 | 359 | 253 |
| 1988 | 2442 | 1734 | 415 | 293 |
| 1989 | 2814 | 1998 | 478 | 338 |
| 1990 | 3217 | 2284 | 547 | 386 |
| 1991 | 3669 | 2605 | 624 | 440 |
| 1992 | 3767 | 2675 | 640 | 452 |
| 1993 | 4113 | 2920 | 699 | 494 |
| 1994 | 4706 | 3341 | 800 | 565 |
| 1995 | 5263 | 3737 | 895 | 631 |
| 1996 | 5872 | 4169 | 998 | 705 |
| 1997 | 6485 | 4605 | 1102 | 778 |
| 1998 | 6860 | 4871 | 1166 | 823 |
| 1999 | 7160 | 5084 | 1217 | 859 |
| 2000 | 7485 | 5315 | 1272 | 898 |

Table 19

ALASKA POPULATION BY ADOC REGIONS

| Area | 1960[a] | 1970[b] | 1975[b] | 1980[a] |
|---|---|---|---|---|
| Northern | 71,878 | 83,321 | 95,700 | 98,763 |
| South Central | 118,886 | 176,697 | 223,600 | 249,294 |
| South Eastern | 35,403 | 42,565 | 51,900 | 53,794 |
| Total | 226,167 | 302,583 | 371,200 | 401,851 |

| Area | 1981[c] | 1982[d] | 1983[e] | 1984[e] |
|---|---|---|---|---|
| Northern | 106,905 | 106,773 | 112,720 | 114,550 |
| South Central | 259,297 | 294,863 | 322,404 | 347,621 |
| South Eastern | 55,985 | 59,201 | 60,166 | 60,877 |
| Total | 422,187 | 460,837 | 495,290 | 523,048 |

[a]The Alaska Department of Labor, Research and Analysis "Population of Boroughs and Census Areas, Alaska 1960, 1970, and 1980," Alaska Population Overview, 1983, p. 24.

[b]U.S. Department of Commerce, Bureau of the Census "Preliminary Estimates of the Intercensal Population in Alaska." Undated news release from the Bureau of the Census.

[c]The Alaska Department of Labor, Research and Analysis "Official Alaska Population, 1980 and 1981, by Census Area," Alaska Population Overview, 1981, p. 2.

[d]The Alaska Department of Labor, Research and Analysis "Population of Boroughs and Census Areas, Alaska 1980 and 1982." Alaska Population Overview, 1982, p. 6.

[e]The Alaska Department of Labor, Research and Analysis Demographic Unit, 1985; July 8, 1985 news release, "Population Estimates for Alaska Boroughs and Census Areas, Revised July 1, 1983 and Provisional July 1, 1984."

## SECTION V

## CONCLUSIONS

The time series analyses we performed have demonstrated that, since 1980, ADOC populations have increased dramatically as a result of, in large measure, the early 1980s criminal code revisions and, to a much lesser extent, natural growth, unemployment and crime rates. What may be less obvious is that the impact of the 1980s criminal code revisions will continue to drive prisoner populations upward until well into the next decade. From there on, natural growth will drive prisoner populations to all-time high levels. But whether ADOC's total population in the year 2000 is as low as 3600 or as high as 24,000, the total prisoner population will have substantially increased, and, therefore, a new long-term prison facility in the Southcentral region is certainly warranted.

A major assumption underlying our large growth forecasts was that the impact of the early 1980s code revisions will not be mitigated. However, judging from the experience of other states, where "get tough" codes and "flat-time" sentencing models were enacted, this assumption is unwarranted. In the last five years, several states have enacted emergency "safety valve" legislation to mitigate the impacts of simplistic criminal codes, and in the interests of stability, Alaska's legislative and executive branches may wish to follow a similar course. The Alaska prison population can still be expected to increase significantly even in the face of the policy mitigation.

Our time series analyses also reveal several fruitful areas for research. First, we have found no demographic indicator that explains any of the historic natural growth in ADOC populations. This situation is an anomaly. We suspect that the problem is a straightforward lack of data, although recent improvements in ADOC data collection procedures hold promise for the future. Some effort to collect additional demographic data on a regular basis may prove highly valuable. In addition, our analyses show that unemployment is an important factor for ADOC populations, and this, too, is an anomaly. ADOC planners may wish to explore this relationship to discover the causal nexus.

The overcrowding in Alaska correctional institutions was not caused by the Alaska Department of Corrections. It is the result of policies and actions by legislative, administrative and judicial officials. The ultimate solutions are beyond the control of correctional personnel acting alone. A broad-based cooperative approach involving legislative, executive and judicial officials is critically needed to address the fundamental, yet substantive, impending problems.

# APPENDIX A

# INMATE POPULATION FORECASTING:

# STATISTICAL MODEL

STATISTICAL MODEL

This appendix contains material from the preliminary technical memorandum prepared to delineate the statistical basis of the study.

Introduction: Statistical Model

This section outlines the statistical model of forecasting the Alaska Department of Corrections (ADOC) prison population. Based on preliminary analyses of ADOC time series, we believe that reliable, accurate forecasting models can be constructed for most major subpopulations. (Due to statistical constraints, some minor subpopulations, e.g., unsentenced females, are unable to be forecast. These minor subpopulations are small, however, and of little value for planning.) We propose to concentrate our efforts and resources on forecasting the major subpopulations of greatest policy relevance.

Table 1: Major Subpopulations

| | |
|---|---|
| Unsentenced Populations | Total<br>Anchorage |
| Sentenced Populations | Total<br>Male/Female<br>Felony/Misdemeanor<br>Maximum Security |

Table 1 lists the subpopulations that we propose to forecast. The major breakdown is unsentenced *versus* sentenced. Historically, unsentenced prisoners constitute 25 to 35 percent of the total ADOC population. Since 1978, it has been possible to break down the total unsentenced subpopulation according to male/female, felony/misdemeanor, and institution. In some cases, however, these breakdowns result in small integer time series which are nonforecastable. Preliminary analyses suggest that we will be able to forecast the unsentenced subpopulation according to the criteria of total and male with reasonable accuracy.

The sentenced subpopulation is more important than the unsentenced from a policy perspective. Sentenced populations are typically in ADOC custody for longer periods of time, for example, and typically require greater levels of service and security. Preliminary analyses suggest that we will be able to forecast the sentenced subpopulation by the criteria of total, male/female, and felony/misdemeanor. These breakdowns appear to have the greatest relevance for ADOC planning.

For each of the major subpopulations listed in Table 1, we propose to build both short- and long-range forecasting models. Short-range models will forecast monthly mean subpopulation counts one or two years into the future. Long-range models will forecast the analogous annual statistics from 1985 to 2000.

ADOC populations peak in October and fall away to a January trough with a secondary peak in December. This is a peculiar cycle with no obvious explanation. Mortality series often covary with the natural seasons (June and December), for example, while other series covary with business or government calendars, peaking with the start or end of a school or fiscal year. Though inexplicable, the October peak is fact and, since peak statistics are the most important for planning, the October statistic will be the basic unit of our long-range forecasts.

Extrapolating a time series several months into the future requires few assumptions and, consequently, short-range forecasts are always more accurate and reliable than long-range forecasts. The problem with long-range forecasts is that many factors can change drastically over a ten or fifteen year time span. We cannot foresee revisions in the criminal code, for example, or shifts in the demographic structure. Structural changes of this sort can wreak havoc on long-range forecasts. We begin with status quo assumptions; that is, we assume that Alaska will be more or less the same in the year 2000. However, Alaska will certainly undergo many changes between 1985 and 2000. While we cannot predict exactly what these changes might be, we can accommodate a range of likely changes in our long-range forecasts by relaxing our status quo assumptions. We cannot predict with certainty future revisions in the criminal code, or changes in the demographic structure, but we can prepare conditional forecasts that show what effects these structural changes would have on ADOC populations. In the next section, we outline our status quo assumptions in great detail and develop a strategy for generating conditional forecasts.

Status Quo Assumptions: Policy Interventions

In June, 1983, the Arizona legislature enacted a felony DWI law, providing mandatory one-year prison sentences for third convictions. The legislature assumed that few people, if any, would be imprisoned under the new law. But within 12 months, 800 felony DWI prisoners were admitted to the Arizona DOC; 2400 more cases are pending. This example illustrates the dramatic impact a policy intervention can have on a prison population. In our present context, an apparently simple intervention can throw even the best forecasting model off by several thousand percent in a short period of time. No legislature or court would knowingly enact a policy that might double or triple a prison population, of course, but legislatures and courts often enact new policies without understanding or even suspecting what the potential impact might be. The behavior of legislatures and courts is more or less unpredictable and long-range forecasts are consequently fragile. The forecaster accommodates this problem by anticipating likely policy interventions and generating conditional prison population forecasts for each intervention.

To illustrate the conditional forecasting strategy, consider the statistics in Table 2. Column (A) shows the October mean total unsentenced population from 1970 to 1984. For all practical purposes, the series seems to grow at a small, steady rate for ten years. Then, beginning in 1980, it appears to grow at a faster and faster rate. The 1980 Alaska criminal code revision might seem to explain these statistics but the overall pattern

Table 2 - Total Unsentenced Subpopulation

| Year | Oct. mean (A) |
|---|---|
| 1970 | 125 |
| 1971 | 107 |
| 1972 | 150 |
| 1973 | 115 |
| 1974 | 140 |
| 1975 | 159 |
| 1976 | 197 |
| 1977 | 202 |
| 1978 | 193 |
| 1979 | 162 |
| 1980 | 213 |
| 1981 | 281 |
| 1982 | 360 |
| 1983 | 400 |
| 1984 | 477 |

| Year | (B) | (C) | (D) |
|---|---|---|---|
| 1985 | 506 | 506 | 506 |
| 1986 | 544 | 544 | 544 |
| 1987 | 584 | 584 | 584 |
| 1988 | 624 | 624 | 624 |
| 1989 | 667 | 667 | 667 |
| 1990 | 711 | 711 | 711 |
| 1991 | 756 | 800* | 756 |
| 1992 | 802 | 853* | 802 |
| 1993 | 850 | 904* | 850 |
| 1994 | 900 | 957* | 900 |
| 1995 | 950 | 1010* | 950 |
| 1996 | 1002 | 1066* | 802** |
| 1997 | 1056 | 1123* | 845** |
| 1998 | 1111 | 1182* | 889** |
| 1999 | 1167 | 1241* | 934** |
| 2000 | 1224 | 1302* | 979** |

* Criminal Code Revised in 1990
** Sixth Avenue Anchorage Closed in 1995

requires a more comprehensive explanation. First, the total unsentenced population was growing prior to 1980 and at an accelerating rate. Second, from what we know of the 1980 criminal code revision, we would expect only a one-time increase on the unsentenced population, not the explosive growth shown in column (A).

Column (B) gives "naive" status quo forecasts of the total unsentenced population to the year 2000; column (C) gives the analogous forecasts under the assumption that the criminal code will be revised (to its pre-1980 state) in 1990. These are conditional forecasts which amount to simple percentage decreases from the status quo in each year after 1990.

But if the 1980 criminal code revision had a negative impact on the total unsentenced subpopulation, as we claim, what accounts for the dramatic growth in this series between 1980 and 1984? Some of this growth is due to "natural" causes, especially growth in the general population of Alaska, but the bulk of this growth is due to a policy impact. Within limits, the size the total unsentenced subpopulation is expected to increase whenever ADOC opens a new facility. Our analyses show an increase in the level of this series, beginning in November, 1973, coinciding almost exactly with the opening of the Sixth Avenue Anchorage facility. We conclude without fear of contradiction that ADOC's total unsentenced subpopulation increased substantially due to this policy change. We reason, furthermore, that the total unsentenced subpopulation will decrease just as substantially if the Sixth Avenue facility is closed. Column (D) gives forecasts of this statistic incorporating the assumption that the Sixth Avenue facility will be closed in 1995. Closing the facility, for whatever reason, will result in the percentage reductions shown.

This finding may seem trivial or obvious. However, we also searched for impacts associated with the openings of the Hiland Mountain, Ridgeview, Meadow Creek, Cook Inlet, Ketchikan, Palmer, Wildwood, and Yukon-Kuskokwim facilities, but found nothing. We might conclude from this null finding that regional expansion, if implemented slowly, will have no adverse impact on the size of ADOC's unsentenced population. This finding is not at all trivial or obvious.

The forecasts in Table 2 are preliminary forecasts, intended not as the final word on the future of this subpopulation, but rather as an illustration of the conditional forecast strategy to be employed. Policy interventions can have major impacts on ADOC subpopulations. While we cannot predict future policy interventions, we can forecast conditionally the impacts of some possible interventions.

## Status Quo Assumptions: Structural Change

In practice, policy interventions are well-defined in time and, hence, easily analyzed. A policy impact may surprise us but we can almost measure it precisely and interpret it. This is not the case with "natural" causes of growth, however. As a general rule, for example, we expect ADOC populations to grow as the state grows. This sort of "natural" growth is incremental, however, and difficult to predict.

Table 3 - Lead Indicators of ADOC Population Growth

| Variable | Indicator |
|---|---|
| At-Risk Population | 18 Year-Old Men<br>Unsentenced Population |
| Recidivism | Age at First Sentence |
| Crime | Total Property Crime<br>Total Violent Crime |
| Economics | Unemployment<br>Workforce Participation |

Table 3 lists several "lead indicators" of ADOC population growth, that is, independent variables that cause the ADOC population to grow. The most important of these lead indicators are what we call at-risk populations. As the number of 18-year-old men in the general population grows, for example, we expect the most important ADOC subpopulations to increase. It should not be surprising that the unsentenced subpopulation is a leading (sensitive) indicator of the sentenced subpopulation. Preliminary analyses show a strong correlation at three, four, and five months. The October sentenced subpopulation, in other words, can be predicted from the size of the May unsentenced subpopulation, and for our long-range forecasts, last year's unsentenced subpopulation is an excellent indicator of this year's sentenced subpopulation.

Recidivism is another sensitive indicator of the sentenced subpopulation. As the recidivism rate increases, so does the size of the sentenced subpopulation. In principle, ADOC could manipulate its recidivism rate through its treatment and correctional policies (e.g., through programming) and thereby increase or decrease the size of its sentenced subpopulation. Ideally, our model requires an annual measure of ADOC's recidivism rate; lacking this, we can assume a constant rate and prepare conditional forecasts for deviations from the status quo recidivism rate.

Finally, we include crime and economic indicators. While ADOC has no control over these variables in a policy sense, we assume that they are sources of growth in ADOC populations. We propose to estimate the causal effects of the indicators in Table 3 by means of a covariance analysis. If we find that a rise in unemployment led to an increase in ADOC populations in the past, for example, we will assume that the relationship holds in the future as well. We have little ability to forecast these indicators into the distant future. By incorporating these variables into our long-range forecasting models, however, we can prepare conditional forecasts, showing, for example, the impact of an economic slowdown on the size of ADOC subpopulations. Conditional forecasts of this sort will give ADOC planners lead time of several years to prepare for the impact.

With respect to ADOC's sentenced subpopulation, at least, the precise relationships between these variables and population growth will be determined by dynamic input-output equations. In the next three sections, we describe these equations in some detail. This material is necessarily technical. Following this, we discuss the impact of the 1980 criminal code revision on ADOC's sentenced population. Not surprisingly, the dynamics of our population model suggest a profound increase in ADOC's sentenced subpopulation.

## A Description of Input-Output Models

A "model," for our purposes, is an equation or set of equations purporting to describe some natural phenomenon, in this case the growth of a prison population. An "input-output" model is a set of equations describing how units enter and leave a system. If we define prisoners as our unit, an input-output model for ADOC's prisoner population can be diagrammed as

Commitment -> [ DOC ] -> Release

Put simply - a prisoner is committed to DOC and, at a later time, is released. For this simple input-output model, there are two parameters which determine the size of the DOC population at any time. First, the number of prisoners committed to DOC in each month and, second, the number of prisoners released from DOC - through parole, expiration of sentence, or death - each month. If these two parameters are known, or can be estimated, the size of the DOC population can be forecast with extreme accuracy.

Although the mathematics of an input-output model is difficult to explain to an audience of non-mathematicians, the general principles require only common sense and arithmetic. As an illustration, consider a city bus that stops at every block of its route to let passenters on (inputs) and off (outputs). If the number of people on the bus immediately after the $k^{th}$ stop is denoted as $P_k$, a rather simple input-output equation results. When the bus begins its route in the morning, it is empty, so

$$P_0 = 0$$

On its first stop, no passengers will get off (because the bus is empty) but some passengers may get on. Representing the number who get on at the first stop as $I_1$ - "Input 1" - and the number who get off as $0_1$ - "Output 1" - the number of passengers on the bus after the first stop is

$$P_1 = I_1 - 0_1 \text{ with } 0_1 = 0$$

On the second stop, some passengers may get on and some may get off. The number on the bus after the second stop is thus

$$P_2 = I_2 - 0_2 + I_1 - 0_1$$

This is the sum of all the passengers who got on the bus at the first and second stops minus the sum of all the passengers who got off the bus at the first and second stops. To make this point clear, we rearrange terms and rewrite $P_2$ as

$$P_2 = I_1 + I_2 - 0_1 - 0_2$$

$$\Sigma I_k - \Sigma 0_k \quad k = 1, 2, 3\ldots \text{ etc.}$$

We may also write $P_2$ as

$$P_2 = P_1 + I_2 - 0_2$$

This identity for $P_2$, which we call the <u>difference equation</u> form of the input-output system, is derived by substitution. Since $P_1 = I_1 - 0_1$, we simply substitute $P_1$ for $(I_1 - 0_1)$. We will have much to say about the difference equation form later. On the third stop,

$$P_3 = I_3 - 0_3 + I_2 - 0_2 + I_1 - 0_1$$

$$= \Sigma I_k - \Sigma 0_k \quad k = 1, 2, 3$$

$$= P_2 + I_3 - 0_3$$

Continuing this argument to its logical conclusion, the number of passengers on the bus after the $n^{th}$ stop is equal to the sum of all the passengers who got on the bus on each of the stops minus the sum of all the passengers who got off the bus on each of the stops. That is,

$$P_n = I_n - O_n + I_{n-1} - O_{n-1} + \dots - I_1 - O_1$$
$$= \Sigma I_k - \Sigma O_k \quad k = 1, 2, \dots, n$$
$$= P_{n-1} + I_n - O_n$$

And what these equations say, simply, is that the number of passengers on the bus at any time is equal to the total who got on at all previous stops minus the total who got off at all previous stops. This is obviously true and, on the face of it, trivial. But by using this simple input-output model and assuming that certain properties and parameters of the model are known - or can be estimated - we can forecast the number of passengers on the bus at some future time.

The similarities between the number of passengers on a bus and the number of inmates in a prison may not at first be obvious. Before outlining these similarities, however, let us examine a few crucial properties of the model. The most important property of the model is its equilibrium state, the point where the number of passengers on the bus is constant or stable. Suppose, for example, that two passengers get on the bus at each stop and that each rides five blocks before getting off the bus. Then

$$P_0 = 0$$
$$P_1 = P_0 + I_1 - O_1$$
$$= 0 + 2 - 0 = 2$$
$$P_2 = P_1 + I_2 - O_2$$
$$= 2 + 2 - 0 = 4$$
$$P_3 = P_2 + I_3 - O_3$$
$$= 4 + 2 - 0 = 6$$

$$P_4 = P_3 + I_4 - 0_4$$
$$= 6 + 2 - 0 = 8$$

$$P_5 = P_4 + I_5 - 0_5$$
$$= 8 + 2 - 0 = 10$$

Because each passenger rides for exactly five blocks, none has yet left the bus. But now the two passengers who got on at the first stop have traveled five blocks. These two will get off the bus at the next stop, so

$$P_6 = P_5 + I_6 - 0_6$$
$$= 10 + 2 - 2 = 10$$

Similarly, the two passengers who got on at the second stop have at the $7^{th}$ stop now traveled five blocks, so

$$P_7 = P_6 + I_7 - O_7$$
$$= 10 + 2 - 2 = 10$$

The equilibrium state, ten passengers, is realized after the fifth stop. For the $n^{th}$ stop, then, we confidently predict that

$$P_n = P_n = P_{n-1} + I_n - 0_n$$
$$= 10 + 2 - 2 = 10$$

This equilibrium state depends on three assumptions. First, everyone who gets on the bus will sooner or later get off the bus; second, exactly two passengers get on the bus at each stop; and third, everyone rides exactly five blocks. The first assumption is not at all problematic, but the second and third assumptions are obviously not empirically warranted. We may relax the second and third assumptions, however, without changing the essential properties of the input-output model. Instead of assuming that exactly two passengrs get on the bus at each stop and that each passenger rides exactly five blocks, we may assume that the average or mean number of passengers getting on the bus at all stops is two and that the mean ride is five blocks. Our equilibrium state is now an average state and our forecasts are subject to error. We are no longer absolutely confident that the number of passengers on the bus after the $n^{th}$ stop is ten, in other words; rather, depending on the variance of inputs and riding times about their means, we are 96 percent confident that $P_n$ lies between, say, nine and eleven passengers. We will comment further on forecast confidence intervals at a later point.

We are generally interested in forecasting the system when it leaves its equilibrium state. To illustrate this concept, consider what happens to our bus during rush hour. Throughout the day, the number of passengers getting on the bus at each stop is relatively constant. During rush hour, the number of inputs increases and the system goes out of equilibrium. Suppose that the rush hour occurs at the $50^{th}$ stop and that inputs increase by 50 percent at rush hour. Three people get on the bus at the $50^{th}$ and each subsequent stop, so

$$P_{50} = P_{49} + I_{50} - 0_{50}$$
$$= 10 + 3 - 2 = 11$$

$$P_{51} = P_{50} + I_{51} - 0_{51}$$
$$= 11 + 3 - 2 = 12$$

$$P_{52} = P_{51} + I_{52} - 0_{52}$$
$$= 12 + 3 - 2 = 13$$

$$P_{53} = P_{52} + I_{53} - 0_{53}$$
$$= 13 + 3 - 2 = 14$$

$$P_{54} = P_{53} + I_{54} - 0_{54}$$

$$= 14 + 3 - 2 = 15$$

At the next stop, the three passengers who got on the bus at the first rush hour stop will have traveled five blocks. Thus,

$$P_{55} = P_{54} + I_{55} - O_{55}$$
$$= 15 + 3 - 3 = 15$$

The rush hour equilibrium state is fifteen passengers, and because the average ride is still five blocks - rush hour does not change this parameter - the rush hour equilibrium is realized in five stops. Suppose now that the end of rush hour occurs at the $60^{th}$ stop. Inputs are reduced by 50 percent while outputs remain constant for five stops. Thus,

$$P_{60} = P_{59} + I_{60} - O_{60}$$
$$= 15 + 2 - 3 = 14$$

$$P_{61} = P_{60} + I_{61} - O_{61}$$
$$= 14 + 2 - 3 = 13$$

$$P_{62} = P_{61} + I_{62} - O_{62}$$
$$= 13 + 2 - 3 = 12$$

$$P_{63} = P_{62} + I_{63} - O_{63}$$
$$= 12 + 2 - 3 = 11$$

$$P_{64} = P_{63} + I_{64} - O_{64}$$
$$= 11 + 2 - 3 = 10$$

At the next stop, the two passengers who got on at the $60^{th}$ stop leave the bus; inputs again equal outputs and the system returns to its pre-rush hour equilibrium.

Rush hour sends the system out of equilibrium by changing the level of inputs. A change in the mean ride also sends the system out of equilibrium, however. Suppose, for example, that street repairs force the bus to detour from its regular route. Passengers adjust to the change in route by riding a few more stops. Now if the detour occurs at the 70th stop and if each passenger adjusts by remaining on the bus for one more block, inputs and outputs are equal for the next five stops. But at the 74th stop, the first two detour passengers stay on the bus and,

$$P_{74} = P_{73} + I_{74} - 0_{74}$$
$$= 10 + 2 - 0 = 12$$

The equilibrium state increases to twelve passengers. The first two detour passengers get off at the next stop, however, and

$$P_{75} = P_{74} + I_{75} - 0_{75}$$
$$= 12 + 2 - 2 = 12$$

The system is in a new equilibrium state.

An input-output system is thrown out of equilibrium whenever inputs and outputs are not equal. When inputs exceed outputs, the level of the system - the number of passengers on the bus in this case - increases to a new equilibrium state, and when outputs exceed inputs, the opposite is true. In either case, the system may be thrown out of equilibrium by either a change in the level of inputs or a change in the level of outputs. Since the model assumes that every input eventually becomes an output, changes in outputs are generally due to changes in the system's "holding time," the length of time each input remains in the system. The gross relationship here is

Equilibrium = Input x Holding Time

and a change in either independent variable has a predictable change in the dependent variable. Adequate forecasts require a forecast of the new equilibrium state and the rate at which the system reaches its new equilibrium. As our bus example demonstrates, forecasting the equilibrium state is typically an easier task than determining rates of change. To accomplish this task, we must know <u>why</u> the system has gone out of equilibrium, and we must be able to measure the independent variables underlying the change.

The Dynamics of a Prison Population

With one important exception, the input-output dynamics of a prison population are the same as the input-output dynamics of a city bus. Inputs to the prison population are the number of men committed to the prison by the courts in each year and the system's holding time is the average length of sentence. Each man committed to the system by the courts is eventually released, and the system population is determined generally by the number of admissions and the mean length of sentence. Denoting the prison population in the $t^{th}$ year by $P_t$ and denoting the number of admissions and releases in that year by $A_t$ and $R_t$ respectively, the population is determined by the equation,

$$P_t = P_{t-1} + A_t - R_t$$

And, of course, we may write this equation identically as

$$P_t = \Sigma A_{t-k} - \Sigma R_{t-k} \quad k = 0, 1, \ldots$$

We will ordinarily prefer the difference equation form, however.

The only real difference between prison populations and the city bus is that, unlike the city bus, a prison population is not necessarily well represented as a closed system. What this means is that the number of admissions to a prison system can conceivably increase without practical bound. If prison admissions increase by five percent per year, for example, the "doubling time" is slightly less than fifteen years. A system with 100 admissions in 1950, in other words, will have more than 200 admissions in 1965, more than 400 in 1980, and so forth. Now every person admitted to the system is eventually released, so releases will also grow by five percent per year. Releases will necessarily lag behind admissions, however, and the system will "explode." To illustrate this simple point, let us open a new prison in 1950 with 100 new admissions; let admissions grow by five percent per year, moreover, and let the average sentence length be five years. Then

$$P_{1950} = A_{1950} = 100$$

$$P_{1951} = P_{1950} + A_{1951}$$
$$= 100 + 105 = 205$$

$$P_{1952} = P_{1951} + A_{1952}$$
$$= 205 + 110 = 315$$

$$P_{1953} = P_{1952} + A_{1953}$$
$$= 315 + 116 = 431$$

$$P_{1954} = P_{1953} + A_{1954}$$
$$= 431 + 122 = 553$$

At this point, no prisoners have yet been released because none has completed the five year sentence. In the next year, however, the 100 prisoners admitted to the system in 1950 are released. Hence,

$$P_{1955} = P_{1954} + A_{1955} - R_{1955}$$
$$= 553 + 128 - 100 = 581$$

Population growth in 1955 is the smallest one-year increase in the system's history. This is an anomaly, however, due to the fact that the system has released no prisoners in its first five years. In subsequent years, as sentences expire, prisoners are released from the system. Population growth continues, driven only by growth in admissions. The rate of growth increases each year, however. In 1960,

$$P_{1960} = P_{1959} + A_{1960} - R_{1960}$$
$$= 706 + 163 - 128 = 741$$

And in 1965,

$$P_{1965} = P_{1964} + A_{1965} - R_{1965}$$
$$= 901 + 208 - 163 = 946$$

What we see here is a system permanently out of equilibrium. Although releases grow each year, they never equal admissions. The system's population continues to grow, approaching infinity.

A prison population, obviously, cannot grow infinitely large. But in a small, growing state like Alaska, prison populations can grow exponentially for decades, posing a practical dilemma. In a period of 50 years, for example, given continued growth and increasing crime, Alaska's prison population could grow beyond all practical bounds. Technically speaking, a purely nonstationary or <u>open</u> system cannot be forecast. With a reasonable set of assumptions about the nature of the system, however, and especially about the causal sources of growth, a powerful and accurate forecasting model can be built. The validity of the model depends entirely on the validity of our assumptions, suggesting caution in making those assumptions. The model proposed here has proved itself in three state correctional systems and we may assume that, in its general form, it will provide equally powerful and accurate forecasts of ADOC's prison population.

## The Model

Our forecasting model is based on the difference equation,

$$P_t = P_{t-1} + A_t - R_t \quad (1)$$

Equation (1) gives an exact value $P_t$. It is a purely deterministic model, that is, having no parameters to estimate. If Alaska's prison system were in equilibrium, we could forecast future populations directly from equation (1). But the system is clearly not in equilibrium. It is growing and, to account for this growth, our model requires a second equation for admissions. We write this second equation in its general form as

$$A_t = \alpha + \beta_2 X_{2t} + \gamma_2 I_{2t} + \eta_{2t} \quad (2)$$

Admissions are caused by two sets of exogenous or independent variables, $X_{2t}$ and $I_{2t}$, with weights $\beta_2$ and $\gamma_2$. When $X_{2t}$ and $I_{2t}$ are zero - that is, when the system is in equilibrium - admissions are at an equilibrium level, $\alpha$. $X_{2t}$ and $I_{2t}$ give the expected number of admissions in the $t^{th}$ year. The error term of equation (2), $\eta_{2t}$, gives the variability of the actual number of admission about the expected value and, of course, sets the confidence limits of our forecasts. The smaller the value of $\eta_{2t}$ is, the more accurate the forecast.

In practice, we estimate the parameters of equation (2), extrapolate admissions into the future, and substitute the extrapolated admissions into equation (1). To complete the input-output dynamic, however, our model requires a third equation for releases which we write generally as

$$R_t = \alpha + \beta_3 X_{3t} + \gamma_3 I_{3t} + \eta_{3t} \quad (3)$$

Releases are caused by two sets of exogenous or independent variables, not necessarily the same variables as in equation (2), and by an error term, $\gamma_{2t}$. Equation (3) is also stochastic and, in practice, is used in the same way as equation (2). That is, parameters are estimated, releases are extrapolated into the future and are substituted into equation (1). This is an over-simplification of the forecasting procedure, but it describes the essence of our model.

We will now develop the logic of equations (2) and (3), describing how and why Alaska's prison admissions and releases change over time. As noted, this task requires a set of reasonable assumptions about the causal sources of population growth and the validity of our forecasts depends largely on the validity of our assumptions. As it turns out, releases are much easier to forecast than admissions; fewer assumptions are required. The assumptions required for equation (2) are most problematic. To forecast future admissions to Alaska's prison system, we must make assumptions about migration, demographic change, economic expansion, legislative and policy interventions, and other dimensions of growth. These variables, for the most part, cannot be forecast. We accommodate our uncertainty in these areas by executing forecasts under a range of assumptions. Thus, while we cannot predict whether or not the legislature will revise the criminal code, we can develop accurate forecasts of Alaska's prison population for both assumptions.

Admissions and Releases

Our general forecasting model is driven by admissions and releases. In this sense, it is a simple input-output model. In its "normal" equilibrium state, moreover, admissions and releases are equal. The problem, in simple terms, is that the system has been pushed out of its "normal" equilibrium state and our model must include the exogenous forces underlying this change. Growth in the prison population is ordinarily a function of growth in admissions. The exogenous forces underlying growth in prison admissions include demographic, economic, social, and political changes which are not well understood or predictable. Releases from prison play a smaller role in population growth. Changes in prison releases over time are well understood and predictable, however, so we begin our explication with this component of the general model.

In its general form, our equation for prison releases is written as

$$R_t = \alpha_3 + \beta_3 X_{3t} + \gamma_3 I_{3t} + \eta_{3t} \qquad (3)$$

Here, $X_{2t}$ is a vector of exogenous forces which cause men to be released from prison. We cannot easily include each of many variables in our equation. The most important variable, however, is sentence length and this variable has a straightforward representation. In the preceding section, we developed a hypothetical input-output model which, for the sake of exposition, assumed that each prisoner had exactly five years to serve. This assumption is unrealistic for any real prison system, of course. While the mean sentence for an incoming cohort may be five years, the actual sentence lengths will be distributed non-uniformly about this mean. Using the same hypothetical input-output model, let us now assume that ten percent of the incoming cohort will serve one year, 30 percent will serve two years, 30 percent will serve three years, 20 percent will serve four years, and ten percent will serve five years. In the second year then, ten percent of the number admitted in the first year are released. That is,

$$R_2 = .1\ A_1$$

In the third year, ten percent of the second-year cohort will be released along with 30 percent of the first-year cohort:

$$R_3 = .1\ A_2 + .3\ A_1$$

And following this logic, in the fourth and subsequent years,

$$R_4 = .1\ A_3 + .3\ A_2 + .3\ A_1$$

$$R_5 = .1\ A_4 + .3\ A_3 + .3\ A_2 + .2\ A_1$$

$$R_6 = .1\ A_5 + .3\ A_4 + .3\ A_3 + .2\ A_2 + .3\ A_1$$

In the general case then, for the $t^{th}$ year, releases are a distributed lag of past admissions:

$$R_t = \theta_1 A_{t-1} + \dots + \theta_n A_{t-n} = \Sigma\ \theta_k A_{t-k} \quad k = 1, 2, \dots, n$$

The number of lagged admissions required for this expression is determined by the relative frequency of extraordinarily long sentences. For most states, seven lagged admissions account for 95 of all releases; 95 percent of all prisoners serve seven years or less in other words. The $\theta$-weights applied to each lagged admission are estimated empirically and, of course, will vary from state to state. Finally, since the distribution of sentences varies from year to year, we include an error term. We now rewrite (3) as

$$R_t = \Sigma\ \theta_k A_{t-k} + \gamma_3 I_{3t} + \eta_{3t} \qquad (3)$$

In this explicated form, the equilibrium constant, $\alpha$, is implicitly represented in the lagged $A_{t-k}$ terms. The $I_{3t}$ variables of (3) represent policy interventions. If the legislature changes the presumptive sentence structure of the criminal code, for example, we expect releases to change in some way. We will discuss these interventions and their effects on releases and admissions in the next section.

Equation (3) is easily specified because, ultimately, the system is closed in part with respect to releases. No prisoner can be released without first being admitted, that is, and all prisoners admitted to the system will eventually leave. The admissions component of our model is not so easily specified because the system is open with respect to admissions. There are limits to this dictim, of course. The number of admissions to ADOC cannot exceed the state's population, for example. But given the relatively small base of these numbers, admissions could conceivably grow by five percent (implying a fifteen year "doubling time") for decades before approaching equilibrium. The obvious limits to growth, hence, do not help us.

In its general form, our equation for admissions is written as

$$A_t = \alpha_2 + \beta_2 X_{2t} + \gamma_2 I_{2t} + \eta_{2t} \qquad (2)$$

The $I_{2t}$ variables are policy interventions that might have impact on admissions; as noted, we will discuss these variables in the next section. The $X_{2t}$ variables represent exogenous sources of growth in admissions, the most obvious being in-migration to the state.

Alaska's population has grown dramatically since the end of World War II and this _external_ growth has, to some extent, forced prison admissions upward. We do not expect prison populations to increase one-to-one with growth in the general population, of course. Such a rate of growth would assume that each new resident has a fixed, homogeneous probability of ending up in the prison - an untenable assumption. Not all people, new residents or otherwise, have the same risk of imprisonment. If the bulk of Alaska's new residents comprised women, men over 35 years old, and children - i.e., families - we would expect little or no growth in prison admissions regardless of growth in the general population. On the other hand, if the bulk of Alaska's new residents comprised young men, we would expect large increases in prison admissions from relatively small increases in the general population.

The population _at risk_ - conventionally defined as the number of young men in the general population - has proved time and time again to be the single best indicator of prison admissions. If $M18_t$ denotes the number of 18 year old men in the general population in the $t^{th}$ year, $M19_t$ denotes the number of 19 year old men, and so forth, then the causal relationship between the size of the at-risk population and prison admissions is

$$A_t = \phi_{18}M18_t + \phi_{19}M19_t + \ldots = \Sigma\ \phi_K MK_t \quad K = 18, 19, \ldots, N$$

We do not require that the $\phi$-weights sum to unity; they are not literally proportions, that is, but proportions weighted for risk. The actual value of each $\phi_K$ is estimated from ADOC admissions data; the $MK_t$ are ordinarily collected from noncorrections sources such as lists of licensed drivers, secondary school enrollments and so forth.

There is another important at-risk population, not reflected in the $MK_t$, which often contributes substantially to admissions. This population consists of the releasees who are returned to prison to complete the remainders of their sentences. Since "recidivism" occurs within a year of release in almost all cases, this component of admissions can be represented by the lagged number of releases, $R_{t-1}$, and a "recidivism rate," $\rho$. Incorporating this population into the expression, we write admissions as

$$A_t = \Sigma \quad \phi_K MK_t + \rho R_{t-1}$$

When the at-risk population grows due to in-migration or aging of the resident population - due to external pressure - the prison system behaves as if it were open. Admissions may grow steadily over time, thus seeming to "explode." On the other hand, when the at-risk population grows due to internal pressure, from releases and recidivism, the system can react to alleviate the pressure.

Other causal sources of admissions include changes in the economy and changes in the criminal justice system. The causal effects of these other variables on admissions pose an empirical question, so we represent them in the model as the vector $X_t$. Table 2 lists several potential variables to be included in the admissions equation. Each will be empirically assessed as a lead indicator of admissions. Finally, policy interventions, represented in the model as the vector $I_t$, may have impact on admissions. Including these unexplicated variables, we now write our equation (2) as

$$A_t = \alpha + \beta_2 X_{2t} + \gamma_2 I_{2t} + \Sigma\ \phi_K MK_t + \rho R_{t-1} + \eta_{2t} \quad (2)$$

There are several problems, some technical, some conceptual, yet to be addressed. In the next section, we will discuss the effects of policy interventions on admissions and releases. As it turns out, these are the most important and difficult variables of our model.

## Policy Intervention Models

Earlier, we presented preliminary findings on the impact of Alaska's 1980 criminal code revision on the total unsentenced subpopulation. Our analyses show that, contrary to conventional wisdom, the 1980 revision reduced the peak population statistic. The impact of the 1980 revision (or any future code revision, for that matter) can impact either admissions or waiting time or, more likely, both. In this section, we describe the model dynamics of the 1980 code revision, demonstrating in a hypothetical case exactly how these impacts affect the size of a sentenced population.

Conditional forecasting amounts to generating a range of forecasts corresponding to a range of scenarios. The "normal" scenario assumes no major policy interventions; from this base, the assumption of no interventions is relaxed to consider the consequences of specific interventions. Conditional forecasting requires some knowledge of likely policy interventions and achieving this might seem an impossible feat. In practice, however, interventions can only impact admissions or sentence length, or both, thus simplifying the task of forecasting considerably.

Judging from past history, the most likely policy intervention is a criminal code revision. Alaska revised its criminal code in 1980, and further revisions before the turn of the century are not unlikely. We note first that a criminal code revision need have no impact on the prison population. If the revision does have an impact, however, it will be realized either through admissions and/or releases. To illustrate the first scenario, we suppose that the code is revised to provide mandatory imprisonment of convicted burglars; that is, convicted burglars are made ineligible for probation or community supervision. The immediate consequence of this policy change is an abrupt increase in admissions. Assuming that the code revision has no impact on exogenous pressures (at-risk populations, unemployment, etc.), equation (2) may be abridged to emphasize the immediate impact.

$$A_t = \alpha + \gamma_2 I_{2t} + \rho R_{t-1} + \eta_{2t} \qquad (2')$$

Defining $I_{2t}$ as a conventional step function or dummy variable such that

$$I_{2t} = 0 \text{ prior to the revision}$$
$$= 1 \text{ thereafter}$$

The equilibrium state of equation (2') changes from $\alpha$ to $(\alpha + \gamma)$ with the revision. The precise value of $\gamma$ is unknown, of course, but it can be estimated from past revisions and extrapolated to a representative range of future revisions.

The immediate impact on admissions forces the population to a higher equilibrium state. If the minimum sentence for burglary under the revised code is, say, two years, the new population equilibrium will be realized in two years. In addition to this most immediate impact, however, the revision will change the distribution of sentence lengths, forcing releases out of equilibrium. This is a relatively straightforward impact, involving the sentence length function of equation (3), and eventually feeding back to equation (2'). We might expect a change in the <u>statue quo</u> 'recidivism rate," $\rho$, for example.

A criminal code revision might instead impact sentence length. To illustrate this second scenario, we suppose that the code is revised to make convicted burglars ineligible for parole; that is, burglars must now serve their full sentences. Given this intervention, the impact will be felt in releases. Abridging our equation (3) and defining $I_{3t}$ as a conventional step function, releases prior to the revision are given by

$$R_t = \Sigma \theta_k A_{t-k} + \eta_{3t} \qquad (3')$$

and thereafter by

$$R_t = \Sigma \gamma_k \theta_k A_{t-k} + \eta_{3t} \qquad (3')$$

A multiplicative form is implied. In any event, the impact on populations will be lagged. If the full sentence for burglary under the revised code is, say, two years, the population stays in equilibrium for three years after the revision. The new equilibrium state is calculated as the product of $\gamma$ and the pre-revision population level.

Let us now apply these general principles to the specific case. Table 4a shows a breakdown of ADOC's prison population by crime for 1979 and 1984. In 1980, the criminal code was substantially revised and, one assumes, the dramatic growth in ADOC populations from 1979 to 1984 is due in large part to this policy intervention. With one exception (Sex Assault, the category of exception, increased by 513 percent, accounting for 28 percent of the total 1979-84 growth) the 1980 code revision seems to have had a uniform impact on ADOC populations. Assault and robbery accounted for 19 percent of the ADOC population in 1979, for

Table 4a - Population by Crime, 1979 and 1984*

| | 1979 | | 1984 | | Change | | |
|---|---|---|---|---|---|---|---|
| All Homicide | 89 | 16% | 188 | 14% | 99 | 111% | 12% |
| Sex Assault** | 45 | 8% | 276 | 20% | 231 | 513% | 28% |
| Assault | 47 | 8% | 132 | 10% | 85 | 181% | 10% |
| Robbery | 60 | 11% | 119 | 9% | 59 | 98% | 7% |
| Burglary | 58 | 10% | 117 | 8% | 59 | 102% | 7% |
| Theft | 34 | 6% | 51 | 4% | 17 | 50% | 2% |
| Drugs | 24 | 4% | 67 | 5% | 43 | 179% | 5% |
| Misdemeanor | 72 | 13% | 195 | 14% | 123 | 171% | 15% |
| Probation | 62 | 11% | 105 | 7% | 43 | 69% | 5% |
| All Other | 64 | 12% | 126 | 9% | 59 | 82% | 7% |
| Total | 555 | 100% | 1376 | 100% | 821 | 148% | 100% |

* Source: ADOC Annual Report 1984, p. 70
** Sex Assault covered under 1982 revision as well

Table 4b - Old and New Sentence Structures*

| | | Old Mean | New Mean | Change |
|---|---|---|---|---|
| Unclassified | 3% | 6.83 | 9.50 | 139% |
| Class A Felony | 55% | 5.66 | 7.29 | 129% |
| Class B Felony | 23% | 3.16 | 4.07 | 129% |
| Class C Felony | 19% | 3.19 | 4.03 | 126% |
| | 100% | 4.66 | 6.01 | 129% |

* Source: ADOC Annual Report 1984, p. 71

example, and 19 percent in 1984. It is impossible to determine from this simple breakdown, however, whether the growth is due to a rise in admissions, to an increase in mean sentence length, or to some combination of factors.

This dilemma can be solved somewhat by isolating the presumptive sentence provision of the 1980 code. Let us first assume that the Alaska DOC population is at equilibrium in 1979. Standardizing the 1979 population at 1000 inmates then,

$$P_{79} = 100$$

By implication, admissions and releases are equal. Table 4b shows a distribution of mean sentence length for a sample of prisoners before and after the 1980 code revision. From this distribution, the abridged release function prior to 1980 is

$$R_t = .03A_{t-3} + .55A_{t-6} + .42A_{t-3} + n_t \quad (3')$$

After 1980, the mean prison sentence increases from 4.66 to 6.01 as shown in Table 4b. This policy change has no impact on our simple model, however, because prisoners released in 1980 were sentenced under the old code. This continues until 1982. In that year, prisoners serving sentences for Class B and C felonies, who would ordinarily be released, must now serve an extra year. Reflecting this change in the system, the release function changes to

$$R_t = .03A_{t-7} + .55A_{t-6} + .42A_{t-4} + n_t$$

And the population leaves its pre-1980 equilibrium. Specifically,

$$P_{83} = P_{82} + .42A_{80}$$

In the next year, admissions and releases are again equal and the system is again in equilibrium - temporarily. In 1986, prisoners serving sentences for class A felonies, who would ordinarily be released, must serve an extra year and the release function changes again:

$$R_t = .03A_{t-7} + .55A_{t-7} + .42A_{t-4} + n_t$$

And the population again leaves equilibrium:

$$P_{86} = P_{85} + .55A_{80}$$

This difference equation can be simplified to emphasize a most important point. From 1984 to 1986, the system was in equilibrium, neither growing nor decaying. Thus, by backward substitution,

$$P_{86} = P_{84} + .55A_{80}$$

And in 1983, the system jumped out of equilibrium, so

$$P_{86} = P_{82} + .42A_{80} + .55A_{80}$$

Combining terms and continuing the backward substitution,

$$P_{86} = P_{80} + .97A_{80}$$

And from this result, we see that the 1986 population is equal to the 1980 population plus 97 percent of the "class of 1980." The system does not realize a new equilibrium state in 1987. That year, prisoners serving sentences for Unclassified Felonies, who would ordinarily be released, must serve an extra three years. As a result, in 1987, 1988, and 1989,

$$P_{87} = P_{80} + .97A_{80} + .03A_{80}$$

$$P_{88} = P_{80} + A_{80} + .03A_{81}$$

$$P_{89} = P_{80} + A_{80} + .03A_{81} + .03A_{82}$$

Prisoners sentenced for Unclassified Felonies in 1980 will be released in the next year and the system returns to equilibrium. The equilibrium release function,

$$R_t = .03A_{t-10} + .55A_{t-7} + .42A_{t-4} + n_t$$

is identical, within rounding, to the post-1980 distribution shown in Table 4b.

Based on this simplest model, ADOC's population will not return to equilibrium until 1990. This is a "best case" scenario, of course. It assumes that the only impact of the 1980 criminal code revision is the provision for presumptive sentencing and that DOC admissions will remain constant. Under this assumption,

$$_t = A_{t+k} = a$$

where a is the equilibrium admission state. The 1990 ADOC population may thus be expressed simply as

$$P_{90} = P_{80} + 1.06A_{80}$$

If admissions remained constant, in other words, and if the 1980 code revision had only the simplest impact - an increase in the mean sentence served - ADOC's population would still experience substantial growth until 1990; the asymptotic growth would be 106 percent of the number of prisoners admitted in 1980.

This example demonstrates the input-output algebra of a policy intervention, that of the 1980 criminal code revision. In practice, of course, the algebra is more complicated than this oversimplified example suggests. Nevertheless, even this simplest model points to the obvious conclusions: the rapid growth in ADOC's population during the last decade has not run its course.

Conclusion

This section of this appendix has described the statistical model's assumptions and variables. Our analyses of ADOC time series to date suggest that the major subpopulations listed in Table 1 can be forecast in short-range models two or more years into the future and in long-range models, to the year 2000. Long-range forecasts are problematic in the sense that they require the status quo assumption that ADOC subpopulations will continue to grow in the future as in the past and that the causes of growth will remain constant. With respect to two sources of growth - policy interventions and structural change - the status quo assumption is implausible. We propose to accommodate this problem with conditional forecasts, demonstrating the effects of any change in the status quo assumptions on key ADOC subpopulations.

Policy interventions are relatively simple to accommodate. Assuming that we can foresee the range of likely interventions - criminal code revisions, court decisions, etc. - and assuming that we can rely on historical impacts, accurate and reliable conditional forecasts are possible. While ADOC cannot control the legislative or judicial processes, the conditional forecasts will allow ADOC several years lead time to prepare for the impact of any policy intervention.

Structural change is more difficult to handle. In the long run, ADOC populations are driven by Alaska's general population. As the number of eighteen-year-old men in the general population rises, so will ADOC's population; when Alaska's economoy dips, ADOC's population might rise and so forth. Our model assumes that the at-risk population, crime, and economics will continue in the future more or less as in the past. If this *status quo* assumption proves warranted in the future, our long-range forecasts will be acceptable. Otherwise, we propose to generate conditional forecasts demonstrating the effects of reasonable changes in our assumptions.

# APPENDIX B

# JUSSIM FORECASTING MODEL

# APPENDIX B

## JUSSIM FORECASTING MODEL

A second, systems, model could be used to project the prison population dynamics in Alaska: the Justice System Interactive Model (JUSSIM). This model is an interactive analytical computer model that allows one to examine the flow of criminal cases through the entire criminal justice system. It allows one to assess the consequences of fluctuations in the justice system and to use that information to make relevant policy changes. The JUSSIM model was developed at Carnegie-Mellon University under the direction of Dr. Alfred Blumstein.

### Operation of the Model

To operate the JUSSIM model one must begin with a base case that reflects the current operation of the system. One then creates a test case by making changes in the base case parameters. The differences between the test and base cases are reflected in changes in the flow of cases, costs, workloads and resource requirements. Operating the JUSSIM model to assess the consequences of a system change requires the analyst to make certain assumptions about that change. One of the advantages of the JUSSIM model is that several policy analysts can explore the same system changes, each using his or her own assumptions. Such a dynamic, interactive model would be of great value to Department of Corrections planning.

While the JUSSIM model is an appropriate selection for determining the effects of the entire criminal justice system upon the Alaska Department of Corrections and could be used to project increases in the types of offenders ADOC may have received, the Alaska data base (the test case) is not yet sufficient.

Among the data which must be available are:

(1) list of the crime types to be considered;

(2) number of reported crimes by crime type;

(3) outline of justice system stages;

(4) list of system resources - cost, capacity and availability; and

(5) workload units.

This model could be extremely useful in projecting prison population dynamics in future studies.

# APPENDIX C

# BIBLIOGRAPHY

# BIBLIOGRAPHY OF

# INMATE POPULATION FORECASTING

# FIRE ISLAND PRISON FEASIBILITY STUDY

Note: A number of the entries in this bibliography are based on abstracts from National Institute of Justice - National Criminal Justice Reference Service and are indicated by the notation "NIJ-NCJRS" in parentheses at the end of the entry.

## SECTION I

## JOURNAL ARTICLES

BECK, ALLEN RAY
1980 "The Art and Methods of Criminal-Justice Forecasting." Law Enforcement News (5/12)6:9.

BLUMSTEIN, A.; COHEN, J.; and GOODING, W.
1983 "Influence of Capacity on Prison Population - A Critical Review of Some Recent Evidence." Crime and Delinquency 29(1):1-51.

This critique does not demonstrate that there is no causal relationship between prison capacity and prison population. Some judges, no doubt, feel inhibited about sending convicted persons to crowded prisons, and providing more capacity could well diminish that inhibition. Isolating the unique influence of prison capacity on prison population, however, requires much more reliable data and careful formulations than have yet been displayed. (NIJ-NCJRS)

BLUMSTEIN, A.; COHEN, J.; and MILLER, H.D.
1980 "Demographically Disaggregated Projections of Prison Populations." Journal of Criminal Justice, 8:1-26.

This paper develops a model for projecting general population demographics, demographic- and offense-specific arrest rates, imprisonment probabilities and time served, and the size and composition of prison populations. The model is used to estimate such factors for the State of Pennsylvania and shown to be particularly sensitive to age and race. In Pennsylvania, arrests are expected to peak in 1980, prison commitments in 1985, and prison population is projected to peak in 1990.

BLUMSTEIN, A.; COHEN, J.; and NAGIN, D.
1976 "The Dynamics of a Homeostatic Punishment Process." Journal of Criminal Law and Criminology 67(3):317-34).

This article proposes that a homeostatic process operates within a society to maintain a stable level of punishment. Adaptive responses to criminal behavior, such as changes in sentencing policies and redefining what constitutes a 'criminal act' over time, enable a society to maintain a roughly constant proportion of the population as 'criminal.' National imprisonment rates for three countries (including the U.S.) are presented and shown to be trendless time series, each generated by a second-order autoregressive process. Two models were created in an effort to identify the process responsible for this stability and these models require further development incorporating such factors as deterrence and population shifts.

BLUMSTEIN, A. and MOITRA, S.
1980 "Growing or Stable Incarceration Rates: A Comment on Cahalan's 'Trends in Incarceration in the United States Since 1880's.'" _Crime and Delinquency_ 26(Jan):91-94.

1979 "An Analysis of the Time Series of the Imprisonment Rate in the States of the United States: A Further Test of the Stability of Punishment Hypothesis." _Journal of Criminal Law and Criminology_ 70(3):376-90.

This paper examines the trends in the per capita imprisonment rates in forty-seven states and finds that almost half of them are stationary. Trends in the remainder are small, less than 2% of the mean per year in all cases. These findings are consistent with previous work which identified a homeostatic punishment process at work in societies which keeps the imprisoned or criminal percentage of a population stable over time. The study suggests that short-term projections of a state's imprisonment rate is much more likely to be reliable when done using time-series analysis rather than by extrapolation of a time trend. Demographic and migration patterns are also important to such projections.

CAHALAN, MARGARET
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COHEN, J.
1983 "Incapacitation as a Strategy for Crime Control - Possibilities and Pitfalls." _Crime and Justice - An Annual Review of Research_ 5:1-84.

In view of the limited crime reduction and enormous increases in prison population associated with collective incapacitation policies, recent research has explored the potential benefits of selective or targeted incapacitation. (NIJ-NCJRS)

CONRAD, J. P.
1982 "Research and Development in Corrections." _Federal Probation_ 46(1):81-84.

Findings from a 1980 prison study examine the adequacy of the nation's prisons to meet expanding inmate populations, predictions about the size of the prison population in the near future, and the impact of determinate sentencing on the use of imprisonment. (NIJ-NCJRS)

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MINOR-HARPER, S.
1983 "Prisoners in 1982." Bureau of Justice Statistics Bulletin (April 1983). U.S. Department of Justice, Bureau of Justice Statistics, Washington, D.C.

The male population aged 20-29 years is generally considered to be the most prison-prone population group. This group's size could continue to drive up the prison population through at least 1990. Other data look at state and federal prison population growth, laws and practices affecting the prison population, prisoner housing and relief measures for overcrowding, female prisoners, short-term and unsentenced prisoners, and state prison population patterns. Five tables and two graphs are supplied. (NIJ-NCJRS)

MITTRA, SITANSU
1976 "Population Forecasting Model." American Journal of Correction 38(4)(July, August):19,42.

This article presents a detailed description of a prison population forecasting model used in the state of Pennsylvania. The model selected was the Difference Equation for Steady State, used by the Georgia Department of Offender Rehabilitation. Factors included are monthly population figures (admissions and releases), socioeconomic conditions (unemployment) and legal conditions (parole policies).

PETERSILIA, J. and GREENWOOD, P.W.
1978 "Mandatory Prison Sentences: Their Projected Effects on Crime and Prison Populations." Journal of Criminal Law and Criminology 69(4):604-15.

This article attempts to determine how much crime is prevented by imposing sentences of varying length on specific classes of offenders and what impact these mandatory penalties will have on the prison population. Mandatory minimum sentence policies are found to reduce crime, but only with substantial increases in prison populations. The analysis indicates that for

a one percent reduction in crime, prison population must increase by 3-10%. The most efficient model appears to be that in which all defendants, regardless of prior record, are given mandatory sentences.

STOLLMACK, STEVEN
1973 "Predicting Inmate Populations from Arrest, Court Dispositions and Recidivism Rates." Journal of Research in Crime and Delinquency 10(2):141-62.

SECTION II

## CONSULTING AGENCY REPORTS

ALASKA JUDICIAL COUNCIL
1982 Alaska Prison Population Impact Analysis. Office of the Executive Director, June 15.

This report offers three sets of projection models covering five years of future sentenced felon prison populations. These include adjustments for various levels of conviction rate growth, the impact of attending presumptive sentencing to all felony offenders, and the impact of Alaska's new drug law to the above models. (These models provide a wide range of possible outcomes and scenarios; it concludes that the sudden inmate increase during 1980-81 was due to 1977-78 sentencing patterns rather than anything unique in the offenses and/or sentences in 1980-81.

CARLSON, K., ET AL
1979 "Prison Populaton and Policy Choices, Volume 1 - Preliminary Report to Congress." ABT Associates, Inc., Cambridge, MA.

CLARK, J.J.
1979 Correctional Consultant Report, Report to the Alaska Division of Corrections, August 13.

CORY, B.; and S. GETTINGER
1984 Time To Build? The Realities of Prison Construction. New York: Edna McConnell Clark Foundation.

The theme of this booklet is that part of the long-term solution to the overcrowding crisis will involve building new prisons and jails, but, in many cases, this costly and problematic step can be avoided. The true costs of prison construction are identified, including hidden construction costs, cost overruns, financing costs, hidden operating costs, long-term costs, and the monies lost to other public services because of prison construction. In examining the management of the corrections and court systems to reduce prison and jail populations, attention is given to planning structures, inmate population projections, setting limits on inmate populations, sentencing guidelines, community corrections, and regional corrections systems. A review of strategies for reducing jail populations categorizes them according to reductions in bookings and ways to secure earlier releases. A resource guide lists organizations and publications. (NIJ-NCJRS)

CCC/HOK (CRITTENDEN, CASSETTA, CANNON, HELLMUTH, OBATA & KASSABAUM - ARCHITECTS & PLANNERS)
1977 Detention Requirements for the Anchorage Area, Study for the State of Alaska Division of Corrections, March 21.

This report is an analysis and recommendations for providing a sound systsem for the detention of persons arrested and awaiting trial in the Anchorage area. Topics covered include a description of available sites and facilities for housing the detention population, the probable remodeling for expanding of these sites, alternatives in new construction, and costs associated with construction, remodeling, and annual operation of detention facilities. The report includes projections of future Anchorage detention population to the year 2000, where the forecast is 468 persons arrested. The forecasts project average population plus an additional 15% for seasonal peaking periods. The projections are based on past ratios of detainees to the general Anchorage population and forecast over projected increases in the city's population.

EVERSON, T. G.
1982 Populations in the Dane County Jail - Past and Future Trends - A Special Report to the Dane County Sheriff. Madison, WI: Wisconsin Council on Criminal Justice Statistical Analysis Center.

Various factors may contribute to the increased population at the Dane County Jail. These include legislative actions, migratory patterns, public attitudes, etc. However, except for rising arrest figures, all such factors at best only indirectly affect jail populations. Thus, jail population forecasts, illustrated in the text by tables and graphs, only represent "educated guesses." (NIJ-NCJRS)

HUTTO, T. DON
1982 Consultant's Report on Population Capacity of the Alaska Division of Corrections. American Correctional Association, December.

This 1982 report presents an analysis of capacity within the State Corrections Division with an indepth description and recommendation for each institution. Recommendations included: establishing "Normal Operating Capacity" of 1220 inmates plus 51 special purpose beds; establishing "Maximum Capacity" of 1286 inmates; establishing a "population trigger" mechanism which would allow the Governor to reduce sentences until normal operating capacity could be reached again; and the immediate closure of Ridgeview.

JOHNSON, K.: MCCLEARY, R.; ANGELL, J; and EIDSON, J.
1983 Crime and Arrest Rate Predictions for the States of Alaska and Oregon. Justice Center, School of Justice, University of Alaska, Anchorage.

This four volume report presents the results of a statistical analysis which resulted in forecasts of both crime rates and arrest rates for the States of Alaska and Oregon, and regions within those states. Topics covered include the history of crime forecasting, with annotated bibliography, and conceptual and date requirements needed for performing forecasts. The report presents the results of Box-Jenkins, Panel and Regression Analysis employed in the forecasts. The results indicate that, for Alaska, violent crime is expected to remain stable through 1987 with the exception of Anchorage, where it is expected to rise modestly. Property crime in Anchorage is also expected to rise, at a faster rate than for violent crime, but property crime for the rest of the state is predicted to remain constant or even decline. In Oregon, most of the state should see violent crime remain constant or even decline; in the city of Portland, violent crime has appeared to "peak" in the late 1970s. Property crime is expected to rise and gradually taper off over the 1980 decade.

MILLER, DAN
1981 Prison Population Projection Methods. Springfield, IL: Illinois Department of Corrections.

POCHODA, D.
1982 Prison Population Explosion in New York State - A Study of Its Causes and Consequences With Recommendations for Change. New York: Correctional Association of New York, NY.

Study findings and recommendations concern the causes of the explosive growth in New York State's prison population, its impact on the criminal justice system, and strategies for containing this growth. The dramatic expansion is attributable mainly to the implementation of public policies and practices, such as new laws requiring more frequent mandatory prison sentences and longer terms of imprisonment; a decline in granted paroles; and a reduction in the use of probation caused by funding cutbacks. The increased use of imprisonment has failed to stop the growth of crime rates and has resulted in overcrowded, unsafe institutions. State correctional system costs have increased by more than 400 percent during the decade. Approximately 12 percent of the total prison population could have been placed under probation conditions without endangering the public. The corrections commission should establish capacity limits and space requirements for each institution, including a prohibition on double celling. (NIJ-NCJRS)

POLICY ANALYSTS, LTD: APPLIED RESEARCH ASSOCIATES, INC.
ND <u>Benefit/Cost Analysis of Alternative Site Selections of the State of Alaska Maximum Security Prison</u>, Prepared for the Matanuska-Susitna Borough.

This report recommends that, in light of operating efficiency, impact on the local community, and impact on prisoner population, the state of Alaska build its maximum security prison at Palmer, as opposed to Valdez or Seward. Within the report are projections which forecast the number of felons in the state to rise to 1176 by 1986, necessitating at least 300 additional bed spaces in correctional facilities.

RING, PETER S.
1976 "Potential Impact of Mandatory Minimum Sentencing on Existing Division of Corrections Adult Offender Inmate Capacity." Prepared for the Alaska Criminal Code Revision Commission, Criminal Justice Center, University of Alaska, Anchorage, April.

This report provides an assessment of the potential impact on the Division of Corrections (now the Department of Corrections, State of Alaska) adult offender inmate capacity likely to result from the enactment of mandatory minimum sentencing provisions in Alaska. The study projected that the Division would need at least 200 more secure units by 1981 if the mandatory minimum sentencing scheme was applied to second or subsequent felony offenders for a limited number of violent felony crimes. Application of mandatory minimums for second or subsequent felony offenders to <u>all</u> felony crimes indicated that the entire capacity of the Division would be used within three years after enactment of the minimum sentencing guidelines.

SMITH, L.
1982 <u>Relationship of Jail Capacity to Jail Overcrowding.</u> Rockville, MD: National Institute of Justice.

A 1980 study by the National Institute of Justice revealed that capacity was the only statistically significant indicator of current or future prison population levels. In addition, capacity had a consistent relationship to the incarceration level. The NIJ researchers concluded that the decision to incarcerate or release an offender results from a series of discretionary actions by individual criminal justice officials in the absence of a clear overall correctional policy. The overall effect of these individual decisions is for the incarceration rate to increase until a facility is crowded and then to remain at the overcrowded level. Overcrowding seems to result from the uncertain definition of a facility's capacity. Constructing new space is extremely expensive and produces new overcrowding problems. The American Prisons and Jails study recommends that a community should determine the capacity of its correctional institutions and should adopt procedures for accelerated release when a facil-

ity nears capacity. Diversion programs and careful management of other alternative programs are also recommended. (NIJ-NCJRS)

TOUCHE, ROSS & CO.
1982 Management Plan. Alaska Division of Corrections, September.

YOUNG, ARTHUR and CO.
1982 "Analysis of Prison Population," Report to the Alaska Division of Corrections, March.

## SECTION III

## FEDERAL/STATE REPORTS

ALASKA, OFFICE OF ATTORNEY GENERAL

1982 "Analysis of Corrections Population Projections," Memorandum to the File, Wilson L. Condon, Attorney General, Nov. 23, 1982.

ALASKA, DIVISION OF CORRECTIONS

1982 Adult Corrections in Alaska: A Five Year Summary.

This report presents an overview of the dynamic changes that took place in adult corrections from 1978 to 1982. Topics covered include development of a Master Plan, establishment of a community Corrections Program, Corrections staffing and budget, history of the capital program for the department, legislative history including sentencing guidelines, litigation and program development. Also included is an inmate population forecast with projections of 190 new inmates per year and by January, 1990, a total of 2870 inmates.

ALASKA, STATE OF, HOUSE RESEARCH AGENCY, LEGISLATURE

1983 Adult Corrections in Alaska: Current Issues in Administration and Management (House Research Agency Report 82-E), January.

This report presents 1980 and 1982 data on corrections trends within the state of Alaska. Referencing straight line projections done by the Attorney General in 1982, the report projects state prisoner population to exceed 2,000 by 1987. Prisoner profiles, descriptions of state responsibility for corrections, recent prisoner litigation and issues in current corrections management are also discussed. Recommendations for legislative alternatives to the problems in corrections include increasing bed space, modifying state law and reorganization in criminal justice agencies.

AMERICAL CORRECTIONAL ASSOCIATION

ND The Classification Process Policy, Working Draft. Alaska Division of Corrections.

ND Institutional Security Classification Policy, Working Paper. Alaska Division of Corrections.

AULT, A.L.
1982 Staff Analysis; Alaska Jails and Prisons. National Institute of Corrections, October 18.

COHEN, J.
1983 Incapacitating Criminals - Recent Research Findings. Washington, D.C.: U.S. Department of Justice National Institute of Justice.

Incarceration decisions focusing on criminal careers rather than on a policy of collective incapacitation offer the most promising opportunity for significantly reducing crime while avoiding major increases in prison populations. (NIJ-NCJRS)

COLORADO DEPARTMENT OF CORRECTIONS
1980 Inmate Population Projections, 1980-1985. Colorado Springs.

1982 Inmate Population Projections, 1982-1987. Colorado Springs.

CONNECTICUT GOVERNOR'S OFFICE JUSTICE PLANNING DIVISION
1982 Final Report of the Task Force on the Prison and Jail Overcrowding Report. Office of Policy and Management, Budget Division, March.

DELAWARE STATISTICAL ANALYSIS CENTER
1982 Corrections Populations, Time Series Analysis, Prison, Probation and Parole. Delaware: Governor's Commission on Criminal Justice, November.

DISTRICT OF COLUMBIA
1981 1981 Update: Crime in the District of Columbia. Memorandum TO: Office of Criminal Justice Plans and Analysis, FROM: Marlene Carpenter, Government of the District of Columbia, August.

1982 Crime and Arrest Profile: The Nation's Capital, 1981. Monograph, Office of Criminal Justice Plans and Analysis, Government of the District of Columbia, November.

DISTRICT OF COLUMBIA OFFICE OF PLANNING AND PROGRAM ANALYSIS
1982 Population Projections for the Department of Corrections 1982-1985. Washington, D.C.: Department of Corrections, November.

FISCHER, F.R.
1979 "Crime and Criminal Justice in Iowa." Vo. 2, Crime and Arrest Patterns. Des Moines, IA: Iowa Office for Planning and Programming Statistical Analysis Center.

This volume presents and analyzes statistical data on reported crimes and arrests in Iowa between 1960 and 1978. The relationships between crime patterns and the general population's age distribution is discussed and future crime trends in Iowa are predicted. Trends indicate that crime will shift from youth-oriented property crime to adult-oriented violent and Part Two crime.

FLORIDA DEPARTMENT OF OFFENDER REHABILITATION
1977a Inmate Population Projections. Tallahassee, FL: Bureau of Planning, Research and Statistics, Department of Corrections, July 27.

1977b A Survey of Population Projection Methodologies in the States and the District of Columbia, Document #77-R-065, Sept. 23.

1978 Inmate Population Projections: SLAM-Phase II. Tallahassee, FL: Bureau of Planning, Research and Statistics, Department of Corrections, November 16.

This report presents a revised methodology for developing inmate population levels using the computer-based, input/output model known as Simulated Losses/Amissions Model (SLAM). The report first analyzes SLAM-Phase I forecasts, describes SLAM-Phase II, and discusses the application of SLAM-Phase II. The major contribution of SLAM-Phase II is a more accurate set of forecasts from incorporating "probability functions" to determine the most likely dates of release of offenders. Four Appendices are included which contain a technical description of the computer program, a copy of the actual Fortran program and data tables related to variables considered in the SLAM-Phase II methodology.

1980 Analysis of SLAM-Phase II: Inmate Population Projections, July 31, 1973 through November 30, 1980. Tallahassee, FL: Bureau of Planning, Research and Statistics, Department of Corrections. January 13.

This very brief paper presents an analysis of the accuracy of the computer-based, input/output model known as Simulated Losses/Admissions Model (SLAM) as applied to the Florida state prison population from July 1973 to November 1980. The model was found to be 97.28 percent accurate when compared to actual head-counts taken the last day of each month. The primary reason for inaccuracy was a new policy and procedure by the Florida state parole board which led to sudden and significant increases in the number of parole releases.

GOFF, C. and S. T. WOODWELL
1982 Forecasts of Prison and Field Populations for the Oregon Corrections Division. Salem, OR: Oregon Law Enforcement Council.

Produced primarily by means of multiple regression and time series analysis, this document forecasts population estimates for various subgroups of the Oregon Corrections Division. The subgroups analyzed include new commitments to institutions, felony probation receptions, felony and misdemeanant probation receptions, and parole subgroups, as well as institutions releases. The procedures reported here are based on monthly data, obtained from regional and county units of corrections that contribute the state's data base of crime and arrest information, court filings, population estimates and characteristics, and employment statistics. It is emphasized that this cooperative, systematized data reporting continue so that Oregon's forecasting procedures can be refined in the future. (NIJ-NCJRS)

HROMAS, C.S. and CRAGO, T.G.
1976 Colorado Unemployment and Commitment Rates, Research Note No. 6. Denver, CO: Colorado Division of Corrections Services, Office of Research and Planning (June).

ILLINOIS LEGISLATIVE INVESTIGATING COMMISSION
1982 Illinois Correction - An Interim Report to the Illinois General Assembly. Chicago, IL: Illinois Legislative Investigating Commission.

Increases in crime rates, conviction rates, and greater use of determinate sentencing have caused severe overcrowding in Illinois prisons. The problem is compounded by the poor physical condition of most state prisons. Renovation projects, the addition of community-based correctional facilities, and the construction of two new prisons have not kept pace with the increasing number of incarcerations. Although alternative-approach facilities are more acceptable to the federal courts and the federal government, the design and construction of such facilities will not ensure security, prevent escapes, or rehabilitate offenders without a well-trained staff. These prisons require special programs and cell clustering, both of which necessitate more staff for surveillance. Thus, total costs for facility operation must be carefully assessed. Altered sentencing statutes, enhanced judicial discretion, and sentencing options should be investigated. (NIJ-NCJRS)

IOWA STATISTICAL ANALYSIS CENTER
1979 Statistical Overview, Vol. I of Crime and Criminal Justice in Iowa. Office for Planning and Programming, State of Iowa.

JANKOVIC, IVAN
1977 "Labor Market and Imprisonment." Crime and Social Justice 8:17-31.

KENTUCKY, COMMONWEALTH OF, DEPARTMENT OF JUSTICE
1980 "Survey of Projection Techniques." November 3.

KOLODNEY, S.E. and RYAN, V.
1972 "A Computer Model for Corrections Population Projections." Proceedings of the 102nd Congress of The American Corrections Association: 34-41.

MARYLAND GOVERNOR'S COMMISSION ON LAW ENFORCEMENT AND THE ADMINISTRATION OF JUSTICE
1978 Geographical-based Projections of Maryland Adult and Juvenile Arrests Through the Year 1990.

Projects of adult and juvenile arrests for each jurisdiction in the state of Maryland are made through the year 1990, and an arrest projection model is described. The model operates under the assumption that arrests have been and will continue to be numerically related to demographic factors in the population, such as age, race, sex, and population density. Arrest rate relationships provided a basis for estimating future volumes of arrests based on changes over time in the demographic mix of a jurisdiction's population. Arrest projections were made for 1980, 1985, and 1990 using arrest data for 1975, 1976, and 1977. The results of the projections show an anticipated increase in total adult arrests over the period 1977-1990 of approximately 20 percent statewide and an anticipated decrease in juvenile arrests of approximately 20 percent statewide for the same period.

MONTANA CRIMINAL JUSTICE DATA CENTER
1977 Crime in Montana - Annual Report. Helena, MT.

A statistical analysis of the number and types of crime, a projection of how much crime may be expected in the future, and a summary of arrests, criminal court proceedings, and prison admissions are presented.

MONTANA DEPARTMENT OF INSTITUTIONS
1979 Corrections Master Plan for Fiscal Years 1980-1985. Helena, MT: Department of Institutions, April.

NEBRASKA DEPARTMENT OF CORRECTIONAL SERVICES
1983 Projected Adult Male Population Levels - Fiscal Year 1984 to Fiscal Year 2000. Lincoln, NB: Nebraska Department of Correctional Services.

In Nebraska, adult male populations in correctional institutions are expected to vary directly with Omaha-area unemployment. Total custody population will probably peak in 1984-86 and decline slowly for the rest of the decade, with institutional population behaving in a similar fashion. (NIJ-NCJRS)

NEW JERSEY OFFICE OF THE GOVERNOR
1982 Prison Overcrowding - A Plan of Action. Trenton, NJ: New Jersey Office of the Governor.

To deal with the current and projected overcrowding of its prisons, New Jersey should construct new correctional facilities and make several legislative and administrative changes to provide the correctional system with greater flexibility. (NIJ-NCJRS)

OKLAHOMA DEPARTMENT OF CORRECTIONS
1982 Prison Bed-Space Requirements, 1982-1986 - An Assessment in Response to HR 1016. Oklahoma City, OK: Oklahoma Department of Corrections Board of Corrections.

After projecting the prison bed-space needs over the next five years for Oklahoma and examining various options to deal with the anticipated prison overcrowding, this report presents recommendations to the legislature that focus on new prison construction and alternatives to imprisonment, including county corrections expansion, felony-limit modification for property crimes, mandatory community supervision, parole process efficiency, and alternatives to incarceration for drinking drivers. (NIJ-NCJRS)

OKLAHOMA DEPARTMENT OF CORRECTIONS
1982 Revised Prison Population Pressure Projections. Oklahoma City, OK: Planning and Research, Department of Corrections, Apr. 21.

This brief paper presents a revision of earlier forecasts based on an enhanced Stollmach Model of prison population forecasting. It presents upper and lower projection boundaries using data on average time to serve and commitment rates which appear to be more suited to Oklahoma than projections involving multivariate relationships.

OREGON LAW ENFORCEMENT COUNCIL
1980 Forecasts of Inmate Population for the Corrections Division, Department of Human Resources. State of Oregon, Department of Human Resources, Contingency Task Force, June.

PANNELL, W.C.
1977 "Population Projection Methodology with Emphasis on Simulation Techniques." California Department of Corrections. Presented at Offender Based State Corrections Information System III Seminar, Denver, CO, Sept 15.

PENNSYLVANIA COMMISSION ON CRIME AND DELINQUENCY
1981 Final Report, LEAA Grant No. 81-BJ-CX-K023. State of Pennsylvania Executive Office.

RYAN, V.
1976 "Prison and Parole Population Projection Techniques of the California Department of Corrections." Sacramento, CA. Presented at 106th Congress of Corrections, Denver, CO, Aug 23.

U.S. DEPARTMENT OF JUSTICE BUREAU OF JUSTICE STATISTICS
1982 Prisoners in State and Federal Institutions on December 31, 1980. Washington, D.C.: U.S. Department of Justice Bureau of Justice Statistics.

This report examines the sharp increase in prison population growth during 1980 and discusses developments in the correctional field that could lead to even greater growth. It is the most recent in an annual series reporting the number and movement of prisoners held by state and federal correctional authorities. As in previous reports, information is examined on changes in the distribution of prisoners at the state and regional levels; on the composition of the inmate population by race, sex, and Hispanic origin; and on the proportions of various types of admissions and releases. (NIJ-NCJRS)

WASHINGTON COUNCIL OF CRIME AND DELINQUENCY
1983 Rethinking Imprisonment in Washington State - Critical Public Policy Choices. Seattle, WA: Washington Council of Crime and Delinquency.

This report assesses the status of corrections in Washington state, examines prison population projection data and proposed construction projects, and challenges the 'incarcerative presumption' by considering various public policy alternatives, notably sentencing reform. This report argues that the incarcerative presumption, which is implicit if not explicit in the state's

correctional policy, must be challenged on the bases of effectiveness, efficiency, economy, and humaneness. The Sentencing Guidelines Commission's recommendation that violent offenders be incarcerated for longer sentences while less serious offenders receive sanctions that deemphasize total confinement is advocated. The report further advises that national research has demonstrated that prison overcrowding cannot be successfully addressed through additional prison construction. (NIJ-NCJRS)

WASHINGTON STATE LEGISLATURE
1982 Special Study of New Prison Construction Issues. Olympia, WA: Washington State Legislature Legislative Budget Committee.

The primary purpose of this report is to provide legislators, policymakers, and planners at the state and local levels with information that could be useful in formulating and implementing pragmatic approaches to addressing the current and future incarceration requirements in Washington state's prison system. After reviewing general policies and procedures throughout the country for addressing the problem of prison overcrowding, a needs assessment of the Washington prison system covers the classification of inmates, inmate rehabilitation and education needs, relevant court decisions, prison population forecasting in Washington state, the impact of the sentencing reform law of 1981, and community corrections programs. A discussion of new prison construction plans and costs considers the architect selection process, definitions and types of cost, cost estimates of architect and estimator, cost estimates to other states, and design cost considerations. The appendixes include options for reducing prison overcrowding, inmate education problems, prison conditions, a summary of recommendations, and internal procedures for selection of architects. (NIJ-NCJRS)

WASHINGTON STATE OFFICE OF FINANCIAL MANAGEMENT
1984 Analysis of Inmate Releases Expected Versus Actual - State of Washington, Fiscal Year 1982. Olympia, WA Washington State Office of Financial Management.

To facilitate a more accurate forecasting of Washington state inmate populations, this report presents a comparison of the difference between the estimated and actual release dates for inmates released during fiscal 1982. (NIJ-NCJRS)

WASHINGTON STATE OFFICE OF FINANCIAL MANAGEMENT DIVISION OF FORECASTING AND ESTIMATION

1984 <u>Prison and Inmate Population Forecast, Fiscal Year 1984-1997.</u> Olympia, WA: Washington State Office of Financial Management Division of Policy Analysis and Forecasting.

This Washington state prison and inmate population forecast for fiscal years 1984-97 addresses annual prison and inmate population forecasts, prison and inmate capacity forecasts, inmate admission and release forecasts, and monthly prison and inmate population forecast. The forecast factors considered are crime, arrest, and felony filing rates; conviction rates; judicial decision to imprison; length of stay/releases; and recidivism rates. Appendixes contain the rationale for the projected conviction rates and judicial-decision-to-imprison percentages as well as historical and projected conviction rates and judicial-decision-to-imprison percentages. (NIJ-NCJRS)

1983 <u>Prison Population Forecast for Washington State, Fiscal Years 1983-1996 - Assumptions and Findings.</u> Olympia, WA: Washington State Office of Financial Management Division of Forecasting and Estimation.

The major finding of this forecast is that the Washington state prison population, after growing at an all-time high rate in fiscal 1982, is expected to continue to grow at a rapid rate during fiscal 1983, with the rate of growth expected to decline during the remainder of the forecast. This forecast does not presume to predict the future, but rather states what the future prison population will be if the crime, demographic, and criminal justice system factors follow their projected paths. The forecast does not take into account proposed determinate sentencing nor the early release program planned by the Board of Prison Terms and Paroles. The basic formula by which the forecast operates is that future prison population equals present prison population plus new prison admission and admissions from parole failures minus prison releases. (NIJ-NCJRS)

1982 <u>Prison Population Forecast for Washington State, Fiscal Year 1982-1995 - Methods, Procedures and Findings.</u> Washington, D.C.: U.S. Department of Justice Bureau Statistics.

This report focuses on the projected prison population for the State of Washington for 1982 through 1995; forecasting components, methodology, and findings are emphasized. The forecast methodology involved application of the following formula: the future prison population equals the present prison population plus new prison admissions plus parole failures minus prison releases. The six components of the resultant prison population forecast include crime categories, sex and age structure of the at-risk population, conviction rates, judicial decision to imprison, length of stay, and the rate of return of parolees to prison. The major finding of this forecast is that the prison population may nearly double by 1995 because admissions will exceed releases throughout the forecast period. The at-risk population is expected to continue to grow and to age during the forecast period. The conviction rate is expected to increase gradually for violent offenders through fiscal year 1988; after 1988, it is expected that the violent crime conviction rates will stabilize. (NIJ-NCJRS)

1982 Prison Population Forecast for Washington State, Fiscal Years 1982-1995 - Summary of Major Assumptions and Findings. Olympia, WA: Washington State Office of Financial Management Division of Forecasting and Estimation.

Forecasts indicate that Washington's prison population may double by 1995, and that admissions will exceed releases throughout the forecast period. (NIJ-NCJRS)

1982 Prison Population Forecast for Washington State - Technical Programming Documentation. Olympia, WA: Washington State Office of Financial Management Division of Forecasting and Estimation.

This computer model allows for a 15 year forecast with the option of reporting the monthly or annual prison population for males, females, or both in Washington state. It is a multiphase process involving six programs, eight data input files, four sub-population forecast files, and two reports. (NIJ-NCJRS)

## SECTION IV

## MISCELLANEOUS REPORTS

BECK, ALLEN RAY

1978 The Art and Methods of Criminal Justice Forecasting. Doctoral Dissertaion Sam Houston State University. Vol. 39104-A, p. 2564.

BLUMSTEIN, A.

1983 "Impact of Changes in Sentencing Policy on Prison Populations." From Research on Sentencing - The Search for Reform, Blumstein (ed.) Washington, D.C.: National Academy Press, pp 460-89.

This paper argues that estimates of the impact on prison populations of proposed changes in sentencing policy are necessary to ensure that the debate over sentencing reform is balanced and the political attractiveness of a tougher stance is weighed against that policy's costs. This issue will be particularly important in the coming decade when prisons, already largely filled to capacity, can expect significant growth in sentenced populations. Projections of anticipated growth over at least 20 years are also needed to estimate if long-range prison population growth warrants additional prison capacity. The paper discusses methods of projecting prison populations, organized by increasing complexity of the projection model. The paper describes four steps for developing an impact estimate: characterizing the subset of court cases to which the policy applies, translating policies into corresponding values of policy variables, formulating the behavioral model characterizing the court's response to the sentencing policy, and calculating the projected change in prison population resulting from repsonses to the changed policy. (NIJ-NCJRS)

1983 "Prisons - Population, Capacity, and Alternatives." From Crime and Public Policy, James Q. Wilson (ed), San Francisco, CA: ICS Press, pp. 229-50.

To deal with their problems of prison overcrowding, states should develop demographic projections, develop solutions to short-term congestion problems, and establish linkages between their sentencing policies and prison capacities. Crime rates are likely to decline in the future as the age distribution of the population shifts. Thus, the prison population should decline by about 1990. The current large prison populations have resulted from demographic factors and from an increase in punitiveness in our society. The five possible strategies for dealing with the current overcrowding are doing nothing, constructing additional capacity, using selective incapacitation, diverting offenders into alternative treatment or shortening the time served, and basing sentencing and release policies on current populations. A reasonable strategy would be to use a mixed approach. (NIJ-NCJRS)

BLUMENSTEIN, A.; J. COHEN and H.D. MILLER
1978 Demographically Disaggregated Projections of Prison Populations. Pittsburgh, PA: Urban Systems Institute Carnegie-Mellon University School of Urban and Public Affairs.

In this paper, a model is develpoed for projecting general population demographics. The model accounts for differences in crime rates and imprisonment probabilities across different demographic groups. It begins with a demographically disaggregated projection of the population in a jurisdiction and produces projections of arrests, court cases, commitments to prisons, and prison populations. The application of the model is illustrated by estimating demographic projections and model parameters for the state of Pennsylvania.

CARLSON, K.
1980 "Population Trends and Projections," Vol. II in American Prisons and Jails. Washington, D.C.: United States Department of Justice, October.

CRAGO, T.G.
1982 "Prison Population Projection Techniques - Colorado's 'Commitment Cohort Model.'" From National Workshop on Prison Population Forecasting, Charles M. Friel (ed.) Sacramento, CA: Search Group, Inc., pp. 107-133.

Colorado's method of predicting prison populations, the commitment cohort model, uses historical data to predict future commitments by quarter. The primary input is a forecast of the number of people who are likely to be admitted to prison over the next few years, based on two factors - the likely number of Colorado males between 18 and 24 and the unemployment rate. With a back substitution method, the model uses quarterly commitments and the quarterly prison population in a population propagation matrix to calculate the aggregate length of stay of each commitment cohort coming into prison. The Colorado model has been criticized as insensitive to policy shifts, and its effectiveness could probably be improved by disaggregating the cohort into felony classes. Because of its reliance on economic trends, it is best utilized over a 2-year period. (NIJ-NCJRS)

CRAGO, T.G. and HROMAS, C.S.
1976 "Beyond a Straight Line Fit - Probation Projection Techniques Which Use Readily Available Data." Proceedings of the 106th Annual Congress of Correction of the American Correctional Association, Denver, CO, pp. 203-13.

ELIAS, G. L.
1982 "Policy-Oriented Approach to Forecasting Jail Populations." From National Workshop on Prison Population Forecasting, Charles M. Friel (ed.) Sacramento, CA: Search Group, Inc., pp. 61-106.

Three step-by-step methods for jail population forecasting can be completed without a computer. The first two can be used on any calculator, while the third requires a statistical or programmable calculator. Method I bases future jail size on three trends: ratio of state to national population, the ratio of county to state population, and the ratio of jail population to county population. It includes a peaking factor to estimate jail population during the greatest periods of use and requires five years of data. Method II was developed to deal with variations in jail population from day to day and month to month, allowing planners to identify the influence of discretionary decisions within the criminal justice system. Using five years of data from jail records, these projections are based on estimated admissions and releases by month. The first two methods have been used successfully to project bed space needs. Method III - population projections controlled for seasonal variations - can be used to estimate several different statistics, such as total bookings, pretrial versus sentenced residents, and resident days. It needs as much data on bookings as possible, preferably five years worth grouped by month. (NIJ-NCJRS)

FLANAGAN, J.
1976 "Projection of Prison Populations." Proceedings of the 106th Congress of the American Correctional Association, Denver, CO: 55-64.

FOUTY, L.
1982 "Inmate Population Forecasting." From National Workshop on Prison Population Forecasting, Charles M. Friel (ed.) Sacramento, CA: Search Group, Inc., pp. 135-68.

Forty-four states responded to Florida's survey on forecasting methods for corrections agencies, expressing concern over the reliability of linear and multiple regression approaches and discussing several simulation modeling techniques. Florida describes its Simulated Losses/Admissions Model (SLAM). (NIJ-NCJRS)

FRIEL, C. M.
1982 "Administrative and Policy Issues in Prison Population Forecasting." From National Workshop on Prison Population Forecasting, Charles M. Friel (ed.) Sacramento, CA: Search Group, Inc., pp. 1-21.

An intelligent solution to prison overcrowding must be based on reasonably accurate forecasts of future correctional populations. Forecasts are used to prepare yearly operating budgets, plan future construction, and estimate the effects of proposed policy changes on prison populations. A few states have demonstrated that operationally successful forecasts can be made, but a model must be developed in times of equilibrium rather than crisis. Disaggregated forecasts are likely to be inaccurate because of the lack of historical data on special groups of inmates. Administrators should develop an internal forecasting capability during periods of equilibrium. A forecaster may accept considerable gross error as long as the net error is small, depending on how the model is used. Ethical problems can arise when administrators try to modify forecasts to promote their policy objectives. (NIJ-NCJRS)

1982 "Forecasting Prison Populations - Where to Begin?" From National Workshop on Prison Population Forecasting, Charles M. Friel (Ed.) Sacramento, CA: Search Group, Inc., pp. 23-43.

Guidelines for correctional forecasting divide the process into five major steps: getting things organized, predicting admissions, predicting time served, sensitivity analysis, and ongoing forecasting. (NIJ-NCJRS)

1982 National Workshop on Prison Population Forecasting - Proceedings, Charles M. Friel (ed.) Sacramento, CA: Search Group, Inc.

Six papers on state prison population forecasting discuss policy and administrative issues, the use of automated information systems, and mathematical and simulation forecasting techniques with and without computers. (NIJ-NCJRS)

1982 "Proceedings of the National Workshop on Prison Population Forecasting, Denver, CO, January, 1982." Huntsville, TX: Criminal Justice Center, Sam Houston State University.

HAVELOCK, J.E.
1978 "The Future For Criminal Justice." Alaska Justice Forum 2(5):1, 6-7, June.

The author presents a subjective analysis of future crime in the state of Alaska. Based on population shifts, increases in property ownership and increased reporting, he predicts crime to rise in rural areas, and a decrease in urban crime for upcoming years.

KOLODNEY, S.E. and RYAN, V.
1972 "A Computer Model for Corrections Population Projections." Proceedings of the 102nd Congress of The American Corrections Association: 34-41.