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GENERAL ASSEMBLY

LEGISLATIVE AUDIT COUNCIL

A REVIEW OF SOUTH CAROLINA DEPARTMENT OF CORRECTIONS'

PRISON POPULATION PROJECTIONS

FEBRUARY 27, 1986

1. **WHAT ARE THE WEAKNESSES IN THE SOUTH CAROLINA
DEPARTMENT OF CORRECTIONS (SCDC) PRISON POPULATION
PROJECTION METHODS, AND HOW SHOULD THE PROJECTIONS BE
IMPROVED?**

Description of Current Methodology

Three major components are involved in prison population forecasting: (1) estimates of the length of stay for inmates within the existing population; (2) estimates of the number of prisoners to be admitted in the future; and (3) estimates of the length of stay of those future admissions. All three components are addressed by SCDC's forecasting model.

SCDC's formula for projecting length of stay for the existing and future inmate populations accounts for the earning of reduction in sentence for good behavior ("good time"), work credits, sentence length, and the probability that the prisoner will be granted parole. The Department assumes that the number of inmates admitted by sentence group (length of sentences) will be the same as in the previous year. SCDC also assumes that the percentage of prisoners who are paroled versus those who serve out their sentences will also follow historical trends. Lastly, it is assumed that admissions and releases are distributed evenly across the 12 months of the year.

The formula allows modifications to any of the components, as laws, policy and judicial trends change. The

formula's flexibility also allows the Department to adjust to changes made in sentencing practices.

Projecting future admissions is the most difficult component of forecasting. Most forecasts of future admissions are based on past admissions patterns. SCDC assumes that future admissions will be the same as the number admitted in the previous year.

Evaluating the Current Methodology

In 1984, the United States General Accounting Office (GAO) issued a report on federal and state future prison populations and the methodologies used to calculate them.

The GAO summarized:

Forecasting future prison or correctional institution populations is an art, not yet a science. Although each year new developments in the state-of-the-art produce advances over previous methods, increasing the validity and reliability of prison population projections made beyond one or two years remains an elusive goal...

There does not seem to be any one method of population projection that will yield accurate, valid, and reliable forecasts of future populations that can be adapted to fit different criminal justice settings. [Emphasis Added]

The number and type of people admitted to prisons are a function of a number of factors both within and without the criminal justice system. For example, arrest rates, convictions, and policies on parole and "good time" all have an effect on prison admissions and time served. However, demographic factors such as the proportion of 18- to

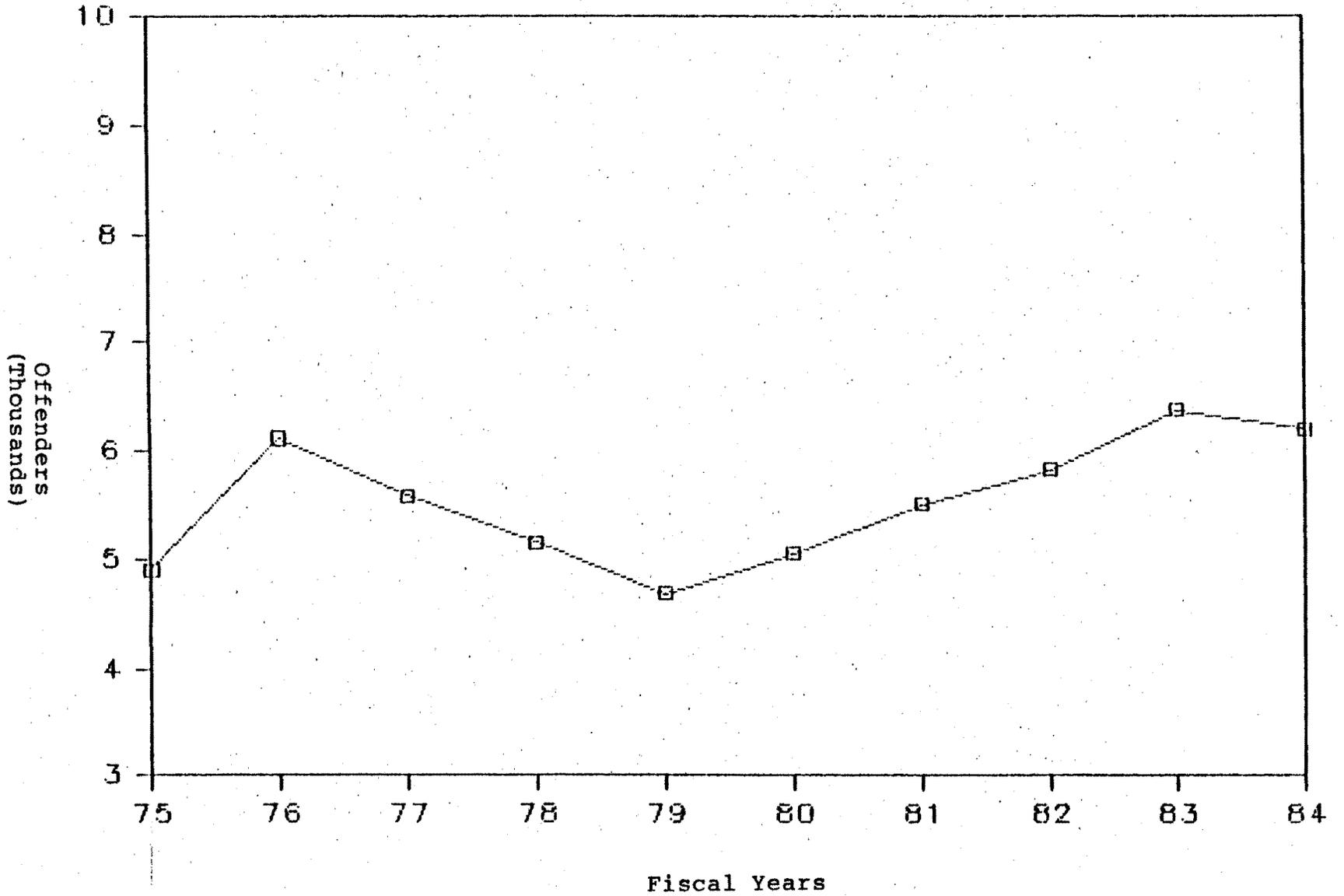
35-year-old males in the general population, and economic considerations, have also been shown to affect admissions. The relationship between these factors, admissions and time served varies from state to state. As a result, forecasting models do not tend to be readily transferable from state to state.

Recent reviews of SCDC's projection methodology have indicated that SCDC's methods of projecting the length of stay for current inmates is adequate. These reviews were conducted by Dr. Kai Yu, a University of South Carolina Professor, staff of the South Carolina Budget and Control Board's Division of Research and Statistics and Dr. Charles Friel, Professor at Sam Houston State University in Texas. Dr. Friel concluded that projections of inmates' length of stay were accurate for up to eight years into the future.

The greatest potential for improvement lies in the admissions component of SCDC's methodology. SCDC assumes that admissions will be constant. Historical data indicate that there has been no distinct trend in admissions over the past ten years (see Graph 1).

GRAPH 1

SCDC ADMISSIONS FY 75-76 TO FY 84-85



Secondly, SCDC's short-term (1-2 years) projections have been reliable, within 2%. However, projections in the the third year have erred by as much as 13.5%. Although SCDC has been able to correct gross long-term error by updating previous forecasts, more accurate long-term forecasts are desirable for capital planning purposes.

Major Schools of Thought on Forecasting Admissions

There are two basic ways to predict future admissions:

- (1) let prior admissions predict future admissions by using a constant, or by extrapolating trends in admissions; or
- (2) identify one or more "lead indicators," such as arrest rate, unemployment or admissions per 100,000 young males in the State's population. By using a model which predicts future admissions based on prior admissions, SCDC assumes that admissions will remain constant or will change at a constant rate. Models which use lead indicators can be more sensitive to fluctuations either within the criminal justice system or outside of it. It is not unusual to use prior admissions as one of the lead indicators in such a model.

However, an increase in the complexity and technical sophistication of a model will not necessarily result in a more accurate forecast.

A number of criteria must be considered when determining lead indicators. First, reliable, consistent data must be available on the indicator. Second, the indicator must be predictable. For example, if arrest rates

are determined to be the best indicator, predicting the arrest rate with some degree of accuracy is necessary. Third, if too many indicators are used, errors can be magnified; the number of predictions made increases as the number of indicators increases.

In his review of SCDC's projections, Friel recommended developing a more sophisticated model for estimating future admissions. He suggested the use of monthly admissions data to more accurately reflect seasonal variations in admissions. SCDC currently uses quarterly data for projections.

The second major recommendation made by Friel was that the Department of Corrections develop and test other models to determine if lead indicators could be identified and incorporated into the forecasting methodology. SCDC has tested its projections using two other methods, but has not yet researched a wide range of potential indicators.

In 1980, Dr. Alfred Blumstein, Professor at Carnegie-Mellon University in Pittsburgh, published a paper entitled Demographically Disaggregated Projections of Prison Populations. A disaggregated model not only attempts to predict the total prison population, but also predicts subgroups within the population. Blumstein projected prison populations for Pennsylvania by accounting for demographic changes in the state's population. By correlating historical demographic changes, arrest histories and prison commitments, he showed that prison populations were related

to age and race factors within the general population in Pennsylvania. In short, because imprisonment probabilities varied widely across demographic groups, Blumstein predicted that changes to the prison population would vary with changes in the demographic composition of the general population. His third-year forecast, using this model, was within 2.7% of the actual prison population.

In January 1986, James Austin of the National Council on Crime and Delinquency reviewed SCDC's projection methodology and recommended a similar approach. Austin suggested that census data be reviewed, and a demographic profile of the "at risk" population be developed.

A large part of the SCDC prison population (57%) is made up of young, non-white males. This is the population group considered to be "at risk" for incarceration. South Carolina census data project a 7% increase in the "at risk" population from 1985 to 2005 for the State. If the relationships found in Pennsylvania hold true for South Carolina, a corresponding increase in the prison population could be expected. **A research proposal to incorporate a demographics component in SCDC's projection model is being developed.**

As previously mentioned, two of the most important considerations in determining the usefulness of lead indicators are availability and reliability of data. For example, Blumstein's model uses census data, arrest rates and court commitments. While census information is readily

available from the Budget and Control Board's Division of Research and Statistics, other information is more difficult to gather.

A 1982 SCDC study found that criminal justice data in South Carolina are collected and maintained by five different agencies; therefore, tracking offenders through the system is difficult. SLED maintains arrest records. The Attorney General's Office and the South Carolina Office of Court Administration jointly maintain criminal dockets. SCDC maintains criminal history records and the Department of Parole and Community Corrections maintains parole records. Since the data systems involved are large, matching offenders by name, sex, age and race would be an extensive undertaking. This is one reason why SCDC assumes constant admissions.

Friel's third recommendation to SCDC was to incorporate a recidivism component in the projection model. This "recidivism loop" would link prison releases to admissions. Recidivism can be defined as reincarceration or return of released offenders to the custody of State correctional authorities. Reports released by the Bureau of Justice Statistics from 1983 to 1985 stated that recidivism rates of releasees are similar from state to state. The return rate to prison within three years averaged 31%, based on a study of 14 states. **By not considering the impact of recidivistic offenders on prison admissions, SCDC's model may overstate**

future admissions, if average sentence lengths are increased.

The potential effect of not considering recidivism, and the incapacitation effect of keeping offenders in prison for longer periods of time, was studied in 1985 by Arnold Barnett of the Massachusetts Institute of Technology. Like Blumstein, Barnett's study projected prison populations in eight states by correlating population demographics and imprisonment policies. He used four different sentencing policies in establishing projections. Two alternative policies focused on across-the-board increases in time served of 25% and 50%. The other two policies focused on increasing time served by repeat offenders. He concluded:

Viewed collectively, the curves indicate that the greater the growth in the average sentence length, the greater the rise in the prison population. **Of more interest than this unsurprising outcome is the 'three-fifths rule' that succinctly summarizes the various findings: if x is the percentage increase in the mean time served, the percentage rise in the inmate population is approximately 3/5x. Thus, a 50-percent rise in the mean sentence would cause about a 30-percent growth in the total number incarcerated.**
[Emphasis Added]

Summary

Recent studies by respected criminal justice experts indicate potential benefits of using demographics and other lead indicators to project prison populations. Blumstein contends that the use of constant admissions to project

future admissions is inadequate in the long term. SCDC's current prison population projections have been adequate for short-term prediction, but have been shown to have significant long-term errors of both over- and under-estimation. A projection model using elements which are more sensitive to fluctuations in populations demographics, changes in criminal justice policy and economic factors is necessary. However, the relationship of demographics, and of recidivism, to future admissions needs to be tested to determine if more accurate projections can be made. Study could show that the effect of the two relationships will "cancel each other," such that there would be no net change in projections.

It is recommended that the South Carolina Department of Corrections review and test possible lead indicators, such as demographic trends and economic and criminal justice factors. The projection model should be modified to consider the effects of recidivism, seasonal changes in prison admissions and other factors found to be statistically significant.

2. HOW WELL ARE THE IMPACTS OF INCREASING SENTENCES FOR VIOLENT AND/OR REPEAT OFFENDERS UNDERSTOOD, AND HOW WELL CAN THEY BE ESTIMATED?

Background

Accuracy in forecasting the impact of increased sentences will depend on the strengths and weaknesses of the projection methodology discussed in question one. The flaws in the methodology will be reflected in any policy simulation used by SCDC to predict the impact on future admissions.

The types of initiatives affecting sentences will determine the degree to which prison population will increase. Policy changes adjusting the use of earned work credits, "good time," and parole eligibility will affect the future prison population as a whole. Proposals limited to increasing sentences for repeat offenders, or for perpetrators of certain violent crimes will result in sentencing changes for those selected groups. The creation of a new crime, or the addition of an element to a crime not currently part of the offense, will also increase the future prison population. **Accurate identification of the group(s) subject to the initiatives is necessary before the potential impact on the prison population can be estimated.**

Potential Weaknesses

SCDC analyzes proposed changes in the State's penalty statutes whenever a bill or initiative is introduced which could impact future prison populations. These analyses estimate the number of inmates affected, additional operating costs, any capital construction costs which would result, and the fiscal year where a leveling off of the expected population increase would occur. However, impact assessment of proposals changing sentencing patterns is not an easy task. Rich and Barnett (1985) stated:

An across-the-board doubling of prison sentences, for example, would not double the prison population. For one thing, the stiffer policy might discourage some people from joining the criminal class. For another, a longer term deprives an offender of some opportunities (to) commit further crime that would in turn require imprisonment. [Emphasis Added]

Potential weaknesses in impact analyses follow.

1. The Department's assumption of constant admissions has already been addressed; this assumption may also affect the Department's analyses of new sentencing proposals.
2. Accurate forecasting also depends on the size of the group; the fewer the offenders affected by the proposal, the greater the margin for error. Friel states:

Since historical data is used to develop the model, its statistical power can't be greater than the size of the historical sample used in its construction. The smaller the data base, the less the statistical power.

3. The absence of a "recidivist loop" in the methodology may lead to inaccuracies not only in prison projections, but also in impact statements. Recidivists are not accounted for in the SCDC model as cited above. In a 1985 study of the impact of increasing sentences for repeat offenders (recidivists), Rich and Barnett state:

...although longer prison terms might reduce the level of crime, they seem unlikely to have the additional benefit of reducing the level of imprisonment.
[Emphasis Added]

However, Rich and Barnett also note that a 50% rise in the mean sentence would not cause a 50% growth in the number incarcerated. Instead, they suggest that a 30% rise would be experienced. **Therefore, any impact analysis of a proposal which increases sentences for a group of offenders but does not account for recidivism may be overstated.**

4. Another aspect of the Department's policy simulation capabilities was discussed by Dr. Charles Friel in his 1985 assessment of Corrections' prison population methodology. In this study, he states:

A distinct advantage of the Department's approach to forecasting is that it can be easily modified to simulate the possible effects of changes in law or policy. Of course **not all statutory or policy changes can be simulated, only those associated with the parameters used in the calculation of releases from the current population and future admissions.** [Emphasis Added]

Therefore, assessments of the impact of increasing sentences will be accurate only where the proposal involves elements which are part of SCDC's methodology. If a sentencing proposal includes elements which are not part of the formula, or involves data elements not collected by Corrections, the proposal's potential impact becomes speculative. For example, the use of a weapon during the commission of the crime for which the inmate has been incarcerated may not be noted in the inmate's record. Determining the impact of a proposal increasing sentences for weapons use based on the characteristics of the present population may then not be possible. Thus, in certain cases SCDC may not have the necessary historical data base to provide accurate estimates, and may not be able to estimate for planning purposes.

5. SCDC analyses sometimes establish that the greatest impact of a proposal will not be felt in the system for several (or many) years. The problems with long-range forecasting, as discussed in question one, also apply to policy simulation. **The further population is projected into the future, the less accurate the projection is likely to be.** This is the case with many types of long-term projections, such as economic forecasting.

3. WHAT PROPORTION OF AN OFFENDER'S SENTENCE WILL ACTUALLY BE SERVED, BY TYPE OF OFFENDER AND LENGTH OF SENTENCE?

According to Friel (1985), the typical inmate in SCDC will be eligible for parole after serving 29% of his or her sentence. Friel notes that the probability of being granted parole has varied, and is decreasing, as follows:

1979	60%
1980-82	50%
1985	37%

Three tables and a graph are provided which report time served by length of sentence. Table 1 provides estimated and actual time served by the 1983 release cohort. Table 2 provides similar information for those released in 1985. In Table 3 and in Graph 2, the Audit Council summarizes average time served by sentence length for the FY 84-85 release cohort.

The proportion of time served by type of offender requires information not routinely generated by SCDC. Table 4 reports information for four types of offenders: those convicted of murder, armed robbery, housebreaking, and receiving stolen property.

The Audit Council did not request a special study of additional offender types due to SCDC's present workload in the Statistics and Research Section.

TABLE 1
ESTIMATED AND ACTUAL TIME SERVED
BY 1983 RELEASE COHORT
(IN MONTHS)

Sentence Length	Formula Generated Estimated Average Time Served (E)	Actual Average Time Served (A)	Difference between Estimate and Actual (E-A)
3	2	2	0
6	3	4	-1
9	5	4	+1
12	7	6	+1
18	9	9	0
24	11	9	+2
36	15	16	-1
48	20	20	0
60	25	24	+1
72	27	29	-2
84	31	34	-3
96	34	35	-1
108	49	41	+8
120	52	51	+1
180	72	68	+4
240	89	81	+8
300	106	90	+16
360	134	135	-1

Source: Charles M. Friel, Ph.D. "An Assessment of the Forecasting and Policy Simulation Model of the South Carolina Department of Corrections" November 1985.

MAXED-OUT AND PAROLED IN FY 1985*

Sentence Length	Paroled		Max-Out		Total	
	Number of Inmates	Average Time Served (in months)	Number of Inmates	Average Time Served (in months)	Number of Inmates	Average Time Served (in months)
3 mos. or less	0	--	153	1	153	1
3.1 mos.-11 mos.	1	3	634	3	635	3
1 yr.	3	4	211	7	214	7
1.1-2 yrs.	48	6	205	11	253	10
2.1-3 yrs.	86	10	128	19	214	15
3.1-4 yrs.	40	12	49	25	89	19
4.1-5 yrs.	125	16	76	32	201	22
5.1-6 yrs.	59	20	36	39	95	27
6.1-7 yrs.	42	23	18	44	60	29
7.1-8 yrs.	47	28	5	53	52	30
8.1-9 yrs.	33	29	10	58	43	36
9.1-10 yrs.	87	33	22	67	109	40
10.1-11 yrs.	3	39	3	67	6	53
11.1-12 yrs.	25	43	10	80	35	54
12.1-13 yrs.	2	58	--	--	2	58
13.1-14 yrs.	4	44	1	82	5	52
14.1-15 yrs.	63	50	7	92	70	54
15.1-16 yrs.	3	53	2	112	5	77
16.1-17 yrs.	6	71	--	--	6	71
17.1-18 yrs.	19	69	--	--	19	69
18.1-19 yrs.	--	--	--	--	--	--
19.1-20 yrs.	25	66	3	106	28	70
20.1-25 yrs.	65	82	1	166	66	83
25.1-30 yrs.	29	93	--	--	29	93
30.1-40 yrs.	5	111	--	--	5	111
Over 40 yrs.	3	127	--	--	3	127
Life	29	132	--	--	29	132
Total	852	38 mos.	1,574	12 mos.	2,426**	21 mos.
Average Sentence (Excludes Lifers)		120 mos.		22 mos.		56 mos.

* Excluding Youthful Offenders and releases with a history of parole/probation revocation and escapes. By this exclusion, time served calculated herein reflects time served under SCDC custody/supervision.

** This figure does not represent the total number of releases in FY 1985.

Source: South Carolina Department of Corrections, February 1986.

TABLE 3

AVERAGE TIME SERVED BY SENTENCE LENGTH

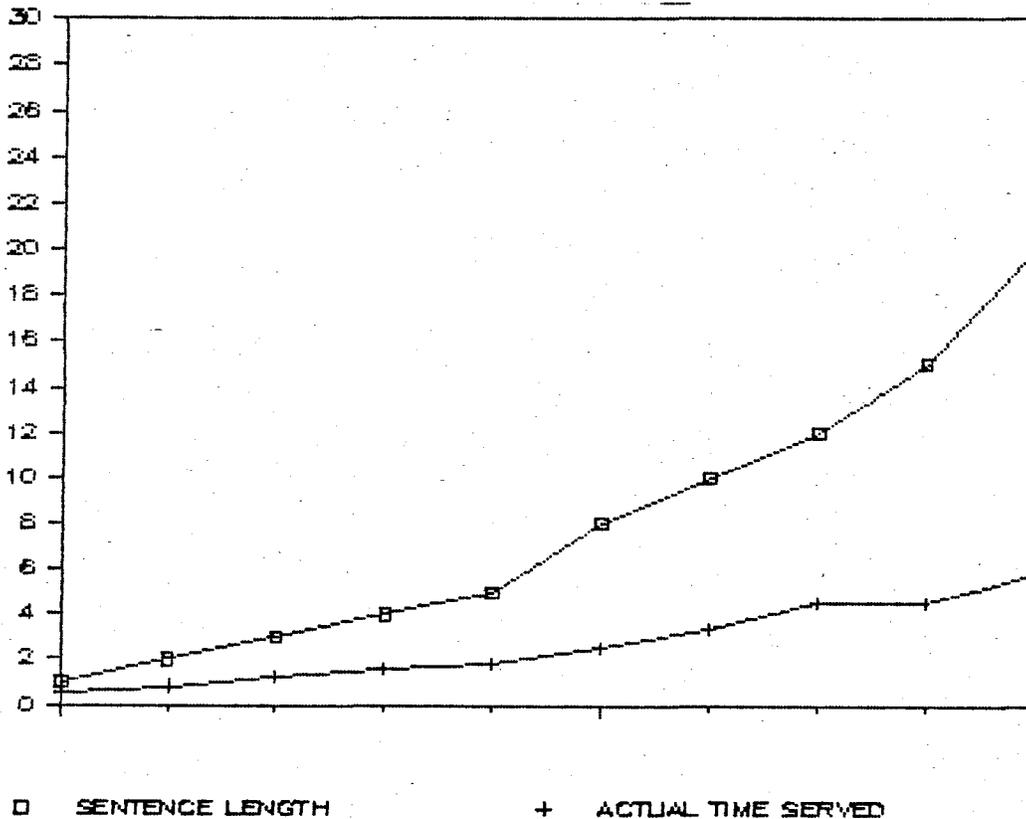
SCDC FY 84-85 RELEASE COHORT (YEARS)

<u>Sentence Length</u>	<u>Time Served</u> ¹	<u>% Time Served</u>
1	0.58	0.58
2	0.83	0.42
3	1.25	0.42
4	1.58	0.40
5	1.83	0.37
8	2.50	0.31
10	3.33	0.33
12	4.50	0.38
15	4.50	0.30
20	5.83	0.29

GRAPH 2

AVERAGE TIME SERVED BY SENTENCE LENGTH

SCDC FY 84-85 RELEASE COHORT



¹ Average time served is based on those inmates who have been released by sentence category. Inmates in each sentence category, who remain in prison, by definition, are serving longer sentences and, therefore, if considered, would raise the average time served. Source: Audit Council, based on SCDC information.

TABLE 4

PROJECTED TIME TO SERVE BASED ON EARLIEST POSSIBLE RELEASE

Sentence/Offense Category	Parole Eligibility Category	First Parole Eligibility (Yrs.)		Years to Serve Before Max-out,		Earliest Possible SFII Eligibility (Yrs)	Earliest Possible SFII/EPA Eligibility (Yrs)	Earliest Possible EPA Eligibility (Yrs)
		(Level 2 Maximum EWC 7 Days Per Week)	No EWC	Maximum Good Time & EWC (Level 2, 7 Days Per Week)	Maximum Good Time & No EWC			
Life - Murder After '78; 20 Yr. Parole Eligibility	(1/3)	13.3	20	Cannot Max-out	Cannot Max-out	Not Eligible	Not Eligible	Not Eligible
30 Yrs. - 1st Degree Criminal Sexual Assault	(1/3)	6.7	10	13.8	18	Not Eligible	Not Eligible	Not Eligible
25 Yrs. - Armed Robbery 7 Yr. Minimum Mandatory	(1/3)	5.6	8.3	11.5	15	Not Eligible	Not Eligible	Not Eligible
20 Yrs. - Housebreaking	(1/4)	3.3	5	9.2	12	8.7	8.5	9.0
10 Yrs. - Receiving Stolen Property	(1/4)	1.7	2.5	4.6	6	4.1	3.9	4.4

Source: South Carolina Department of Corrections, February 1986.

SOUTH CAROLINA DEPARTMENT OF CORRECTIONS' RESPONSE



South Carolina Department of Corrections

P.O. BOX 21787/4444 BROAD RIVER ROAD/COLUMBIA, SOUTH CAROLINA 29221-1787
TELEPHONE (803) 758-6444
WILLIAM D. LEEKE, Commissioner

February 26, 1986

Dr. Marilyn Edelhoach
Legislative Audit Council
620 Bankers Trust Tower
Columbia, South Carolina 29201

Dear Dr. Edelhoach:

We appreciate the opportunity to review the draft of your recent report. In the main, we have no problem with what it says. We are, however, concerned that by narrowly restricting your response to the questions asked, you may be leaving a great deal unsaid and, thus, lead those reading the report to wrong conclusions. For example, you quote a report by Dr. Charles Friel quite extensively to point out weaknesses in our methodology. Because I do not want your quotes to be taken out of context, I am attaching the transmittal letter Dr. Friel sent with his report. He was quite complimentary of our efforts and capabilities. He said,

The Department of Corrections' forecasting resource represents an advance state of the art. The technical approach is sound and highly transferable to other departments of Corrections in need of improved forecasting capability...While technical enhancements are always possible, the department should realize that its current capabilities stand at the forefront of correctional forecasting technology....

We recognize that the Department of Corrections does not have the detailed historical data that we need for more sophisticated projections. But, as you know, we have been working, and continue to work towards improving both our data base and our methodology. While it is true that our long-term projections--like all other long-term projections--are subject to error (and the longer the projection, the greater the chance of error), it should be pointed out that the State of South Carolina has never built an unneeded prison as a result of our projections. In fact, as you point out, our short-term projections have been on target and our long-term projections have been as often understated as overstated. Recognizing the fact that changing conditions and policies can significantly impact long-term projections, we have diligently updated our projections at least every two years.

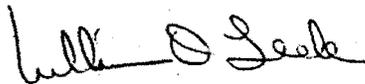
Dr. Marilyn Edelhoch
February 26, 1986
Page Two

Moreover, we are now making an all-out effort to incorporate all recommendations of Dr. Charles Friel and Dr. Kai Yu cited in your report. We particularly want to determine whether or not there is any objective evidence in South Carolina to support the theory that through deterrence, longer sentences reduce recidivism and, thus, future prison population. As Professors Rich and Barnett, whom you quote extensively, say:

Hence, although longer prison terms might reduce the level of crime, they seem unlikely to have the additional benefit of reducing the level of imprisonment. (*italics ours*)

In closing, we appreciate the efforts that you and your staff have made to understand the extremely complex issues involved in making prison population projections. Our staff have always been the first to acknowledge that projections are "art" rather than "science," and I am proud of the work that they have been able to accomplish to date, for which they have received national recognition.

Sincerely,



William D. Leeke

WDL:abb

Attachment

cc: Mr. George L. Schroeder

AN ASSESSMENT OF THE FORECASTING AND POLICY
SIMULATION MODEL OF THE SOUTH CAROLINA
DEPARTMENT OF CORRECTIONS

Charles M. Friel, Ph.D.
Criminal Justice Center
Sam Houston State University
Huntsville, Texas

November, 1985

216 Pine Valley
Huntsville, TX 77340
November 18, 1985

Lorraine T. Fowler, Ph.D.
Director
Division of Resource and
Information Management
South Carolina Department
of Corrections
4444 Broad River Road
Columbia, South Carolina 29210

Dear Dr. Fowler:

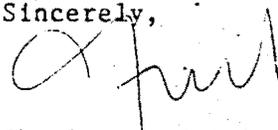
I am pleased to submit the enclosed assessment of the forecasting and simulation model of the South Carolina Department of Corrections. Based upon my experience with other states and familiarity with the field, it is my considered opinion that the Department's forecasting resource represents an advanced state of the art. The technical approach is sound and highly transferable to other departments of corrections in need of improved forecasting capability.

I also wish to commend the Department for the administrative configuration of its information and forecasting resources. In some other states, responsibility for information management and forecasting are in separate offices. Not infrequently, this tends to thwart rather than foster the development of good forecasts and policy simulations. I find that the Department's decision to integrate its information systems, forecasting, and policy simulation functions into a single office a wise one. It has resulted in a condition where advances in information systems management foster the work of those responsible for forecasting and policy simulation and vice versa.

While technical enhancements are always possible, the Department should realize that its current capabilities stand at the forefront of correctional forecasting technology. I would, therefore, encourage the Department to actively consider conducting experiments in technology transfer since I believe the capability it has developed would be of great assistance to other departments throughout the country.

Finally, I wish to commend to your attention Mrs. Meesim Lee who did an outstanding job in helping prepare this assessment. In my considered opinion, she is among the most talented and productive correctional forecasters in the nation today.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. Friel".

Charles M. Friel, Ph.D.

CMF/akb