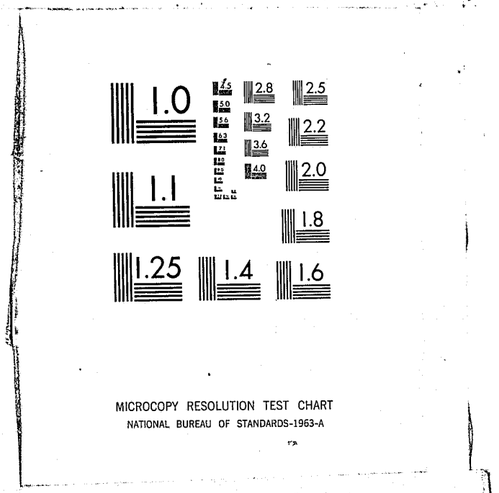

CR Sent 3-8-82

PROJECTION OF FUTURE POPULATION LEVELS OF ADULT MALE INSTITUTIONS

DEPARTMENT OF CORRECTIONAL SERVICES
STATE OF NEBRASKA

Research and Information Office
Research and Planning Section
Department of Correctional Services
State of Nebraska
July, 1981

Numerous studies have confirmed the strong relationship between unemployment and crime. Several studies by the Federal Bureau of Prison of many variables influencing the size of the federal prison population have been conducted. Analysis of results showed that of all the variables examined, unemployment was most strongly related to the federal prison population. It was noted that whenever the unemployment rate for men 20 or older moved - either up or down - the federal prison population was observed to increase or decrease, respectively. Such changes in prison population were not immediate, however; a lag of approximately 15 months was observed between arrest, conviction, and subsequent incarceration.

Similarly, other studies have found that long periods of joblessness contribute to higher rates of crimes known to the police, particularly crimes against property such as robbery, burglary, and theft. The rate of crimes known to the police has been found to vary not only with unemployment rates, but with labor force participation rate - the proportion of the civilian non-institutional population that is employed or actively seeking work and thus officially counted as part of the labor force - it means that the ranks of discouraged workers have increased. That is to say, people have given up their job search in frustration, and crime increases in response to a lack of economic opportunity.

It has long been known that work plays a crucial part in an individual's life. One's job determines not only one's way of life, but to a great extent how a person is seen and/or defined by the outside world and by the person themselves, and thus is a powerful force in the formation of individual identity. This fact

is of critical importance to younger persons, who are in the process of establishing who and what they are and what patterns- legitimate or otherwise - their lives will follow. Yet it is precisely this group - young men under 30 - who suffer the highest rates of unemployment and who commit a disproportionate number of criminal acts, particularly crimes against property.

Generally, speaking, public policy has been dependent upon the criminal justice system to change anti-social behavior that is essentially caused by economic deprivation. Put another way, society has generally opted to "cure" crime by punishing the results and ignoring their causes.

When inadequate economic opportunities deny people the chance to establish themselves in the social world, to grow and prosper, they can be expected to suffer and possibly to react to such stresses in abnormal and socially-disapproved ways such as crime, suicide, alcoholism, and drug abuse. And people who fall victim to these behaviors are often imprisoned or otherwise stigmatized and thus further estranged from "respectable" society and the labor market.

Thus, the linkage between unemployment and crime is of critical importance. Unemployment contributes to crime, crime contributes to unemployment, and so the vicious cycle is established and maintained.

As might be expected, a strong relationship has been observed for several years between the rate of unemployment within the Omaha Standard Metropolitan Statistical Area (SMSA) and population levels of institutions managed by the Department of Correctional Services. For the purposes of this study, population levels ex-

clude parolees and include only those persons confined inside the institutions. For FY80, Douglas County comprised 13.2% of the total state population, yet 47.3% of all adult male inmates were committed from Douglas County, an over-representation of 258%. For the first segment of population projections, this relationship will be examined in depth.

Obviously, changes in the unemployment rate may not immediately affect population levels. The criminal justice system does not always function so rapidly or so efficiently, and unemployment benefits, savings, or other influence may ease the effects of unemployment for some individuals at a marginal rate and for a relatively short period of time. As unemployment rises and as the period of that rise increases, unemployed persons as a group are likely to come into contact with the criminal justice system at a gradual but increasingly more pronounced rate. (Of course, marginal persons, existing on the fringes of society to begin with, should be among the first to be affected by economic decline). Of this group of unemployed persons, a percentage will be sentenced to prison for the commission of a felony. Other factors must also be considered. Some defendants may take longer journeys through the criminal justice system than others, who may be tried, sentenced, and incarcerated within a relatively short time. As noted earlier, the effects of rising unemployment tend to persist over a period of time, since the span of time between conviction of a felony and incarceration may range from a few weeks to many months, or even years.

It should be noted that in studies of this type, not all relevant variables may be identified, much less controlled. Certain

of these variables are beyond control of either the statistician or the Department. For example, the effects of unforeseen changes in practice or policy by police, judges, and legislators cannot be predicted. Similarly, major shifts in public opinion may well influence discretionary judgments within the criminal justice system, and changes in internal Departmental policy (e.g., parole practices) may affect population levels in unforeseeable ways. Therefore, all projections of future population should be cautiously interpreted as the best possible "educated guess", but subject to many potential disturbing influences whose effects cannot be charted or predicted.

The dataset utilized in this report appears here in Table I. The annual monthly average population of incarcerated adult males for fiscal years 1969-70 through 1979-80 is the dependent variable. Since the influences of changing unemployment rates may not immediately impact institutional population levels and are known to persist over time, independent (predictor) variables must be lagged across time. In Table I, unemployment rates in the Omaha SMSA are presented as R0, R1, and R2, representing contemporary fiscal-year levels and one - and two-year lagged levels respectively. For example, the FY81 population level would be predicted from unemployment rates for 1981 (R0), 1980 (R1), and 1979 (R2). The appropriate prediction equation from the general linear model is

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

where Y = adult male population level for (fiscal year)

X_1= unemployment rate for (fiscal year), or R0

X_2= unemployment rate for (fiscal year -1), or R1

X_3= unemployment rate for (fiscal year -2), or R2

The SPSS Multiple Regression subroutine was applied to the dataset,

and the following prediction equation was obtained:

$Y = 641.4863 + 32.38506\ (R0) + 60.52363\ (R1) + 33.30456\ (R2)$

$R^2 = .94885$, $F_{(3,5)} = 30.91617$ (significant at .01 level)

This model explains about 95 percent of the variation in population levels, as shown by the large R^2. In layman's terms, the odds against a relationship of this strength occurring by change alone is less than one chance in one hundred. Thus, the model is believed to provide considerable accuracy in description and prediction.

Certain facts should be taken into consideration here, namely that

1) The nation faces an unsettled economic situation over the near term, with continued inflationary pressures and a strong probability of a continuing or deepening recession of indeterminate severity.

2) The "baby boom" is likely to keep unemployment high among the population at risk for some time. The population of males aged 20-30 probably will not peak until about 1985, and will then decline for about a decade before it begins to rise again.

3) The major problem of the American economy is inflation. It exacerbates stresses on the unemployed and readily escalates petty theft into grand larceny. Worse, there is little reason to believe that inflation will be controlled over the near term.

Since unemployment does affect population levels over a span of time, the duration and severity of the present economic downturn assumes extremely critical proportions. The model presented above

indicates that a 1% rise in the unemployment rate can be expected to bring about some 32 new admissions that same year, some 61 admissions the following year, and some 33 admissions two years later. Put another way, every one percent rise in unemployment can be expected to cause some 126 new admissions over the following three years. Given these facts, it would be misleading and a disservice to policymakers to cite a single set of estimates of future populations. Consequently, three different scenarios are presented, each with different assumptions regarding economic events to come. A graphic presentation of known and projected curves for each scenario is presented here as Figure I.

The first scenario, presented here as Table II, suggests the likely effects of an extremely mild recession, postulating an almost immediate recovery and declining unemployment levels which reach the "full-employment" level of 4.20% by 1990. The consensus opinion of most analysts is that the probability of such a swift recovery is quite slim, but not impossible. Under this model, populations would reach a maximum level of 1,240 during FY82 with a relatively slow decline through the remainder of the decade to a level of 1,179 in FY90, equivalent to the FY80 population.

The second scenario, presented here as Table III, suggests the likely effects of a recession of somewhat greater severity and duration than the recession of 1975, which produced unemployment levels approaching 6% within the Omaha SMSA. This sequence of events postulates a slump of some four years with increasing unemployment, followed by a perfectly proportionate recovery. This scenario is believed to be most likely, although perhaps a bit pessimistic. Under this model, populations would rise to a

maximum level of 1,417 during FY86 (an increase of nearly 20% over FY80 levels) before beginning to decline.

The third scenario, presented here as Table IV, suggests the likely effects of a severe recession, very nearly the equal of the Great Depression of the 1930's. This sequence of events postulates a rapidly increasing rate of unemployment over the next four years to a Depression-level of 8.3% with a relatively slow recovery - in short, an extremely serious disruption of affairs. Under this model, populations would rise quite abruptly to a maximum level of 1,639 during FY86 (an increase of nearly 39% over FY80 levels) before beginning to decline. Although the probability of such a sequence of events is not great, it is included here as a "worst-case" example to illustrate the maximum foreseeable level of demand upon Departmental facilities.

The second scenario, presented here as Table III (Moderate Recession with Proportional Recovery) is believed to be the most realistic, and estimates derived from it are thought to be the most reliable. By inspection of Table III, we see that the effects of rising unemployment are felt immediately (within the same fiscal year) and the effect upon population levels persists over time. This model suggests that average population will increase over the next five years to a maximum level of slightly over 1,400 and then decline slowly for the next four years. For planning purposes, these estimates are probably the most useful, since the cumulative effects of governmental intervention and systematic policy changes will probably render these estimates somewhat higher than will actually be the case. It should be emphasized that even the most powerful and sophisticated mathematical

techniques of this type assume that all relevant variables have been included in the analysis, that the interrelationships among variables remain stable, and no external influences are introduced. To the extent that these assumptions are violated, the results of the analysis are adversely affected.

Another method was utilized to obtain intermediate - to long range projections of adult male population levels, using the logistic curve (S-curve) as a representation of growth patterns. This heuristic technique requires the construction of several S-curves; based upon analysis of past populations; the best-fitting curves are then selected and projections obtained. Though not a statistical technique, this method allows consideration of population levels in terms of a common historical perspective, the size of the population at risk, and historical policy levels. For a variety of technical reasons, the precision and reliability of estimates obtained through this technique cannot be determined.

Please note that as the term is used in this discussion, policy refers to gross policy levels as measured by the incarceration rate. It is a macro-level variable which reflects the total functional behavior of the criminal justice system, but does not necessarily affect or represent any micro-level variable such as sentencing or parole practices. It is obvious that any and all policy changes that many influence population levels cannot be controlled using this methodology.

This series of projections cover the period 1950-2000, utilizing actual DCS population levels from 1950-1980. The independent variable is the rate of incarceration per 1,000 population at risk (males aged 20-29) for various based years. Data

were gathered to assess risk population and incarcerated population trends for the period, and are presented here as Table V. The risk population for 1950, 1960, and 1970 were obtained from US Census reports, while projections of risk populations for 1980, 1990, and 2000 were obtained from the University of Nebraska - Lincoln Bureau of Business Research Nebraska Population Projections (rev. ed., July 1976).

Projected DCS populations were obtained by this method:

1) Determination of base-year incarceration rates.
   Compute incarceration rates for past years from actual census population data and Nebraska Population Projections by dividing actual DCS population by risk population in thousands.

   1950: 1138 ÷ 98.710 = 11.53
   1960: 1197 ÷ 81.625 = 14.66
   1970: 924 ÷ 99.469 = 9.36
   1980: 1182 ÷ 148.189 = 7.98

2) To determine projected DCS populations levels, multiply base-year incarceration rates by the projected risk population in thousands. For example, using the 1970 base-year incarceration rate, the projected DCS population in 1980 will be

   9.36 x 133.768 = 1252

3) Repeat the procedure for all future years using all base-year incarceration rates.

The S-curves derived from base-years 1950, 1960, 1970, and 1980 are shown here in Figure II. All four of the predictor curves indicate a general decline over the next twenty years. By inspection, base-year 1950 and base-year 1970 are the best-fitting curves, and these two were chosen as high-end and low-end estimators

respectively. The results of this application are presented here as Table VI.

SUMMARY

Both methods predict that the adult male institutional population will increase through the first half of this decade and decline thereafter. The logistic-curve method suggests a rise through FY85 followed by a somewhat steeper decline, while the multiple-regression method predicts that the increase will peak out in FY86 and also decline more sharply thereafter. The projections derived from the regression analysis should be regarded as considerably the stronger of the two. The best assessment possible at this time is that the maximum population level should be achieved in mid-to-late 1985; approximately 1,417 men should be in custody at that point in time, roughly 20% more than the FY80 average population. The 99% confidence interval lies between 1,306 and 1,528. In other words, the changes of the maximum population level in the next ten years being less than 1,305 or greater than 1,528 are less than one in one hundred, with our best estimate being 1,417.

Since the logistic-curve method is not a statistical procedure, we cannot assess the probability of error in those estimates. The two curves should be conceptualized as the limits of an envelope, with the expected value of the population falling somewhere between them, within the envelope. Inspection

of Table VI and comparison with Table III assures us that the maximum population predicted by the regression equation does in fact fall within the limits of the boundary curves. Therefore, we can state with considerable confidence that the adult male population will grow by some 235 men over and above the FY80 average over the next five years, and subsequently decline very nearly to the FY80 level by the end of FY90, assuming no major systematic policy changes or unforeseeable societal dislocations during that period. With considerably less confidence, we can expect further declines during the decade of the 1990's to a level in the vicinity of 1,100 to 1,200 men by the year 2000.

FIGURE I

ACTUAL AND PROJECTED
ADULT MALE POPULATION LEVELS
FY 70 - FY 90

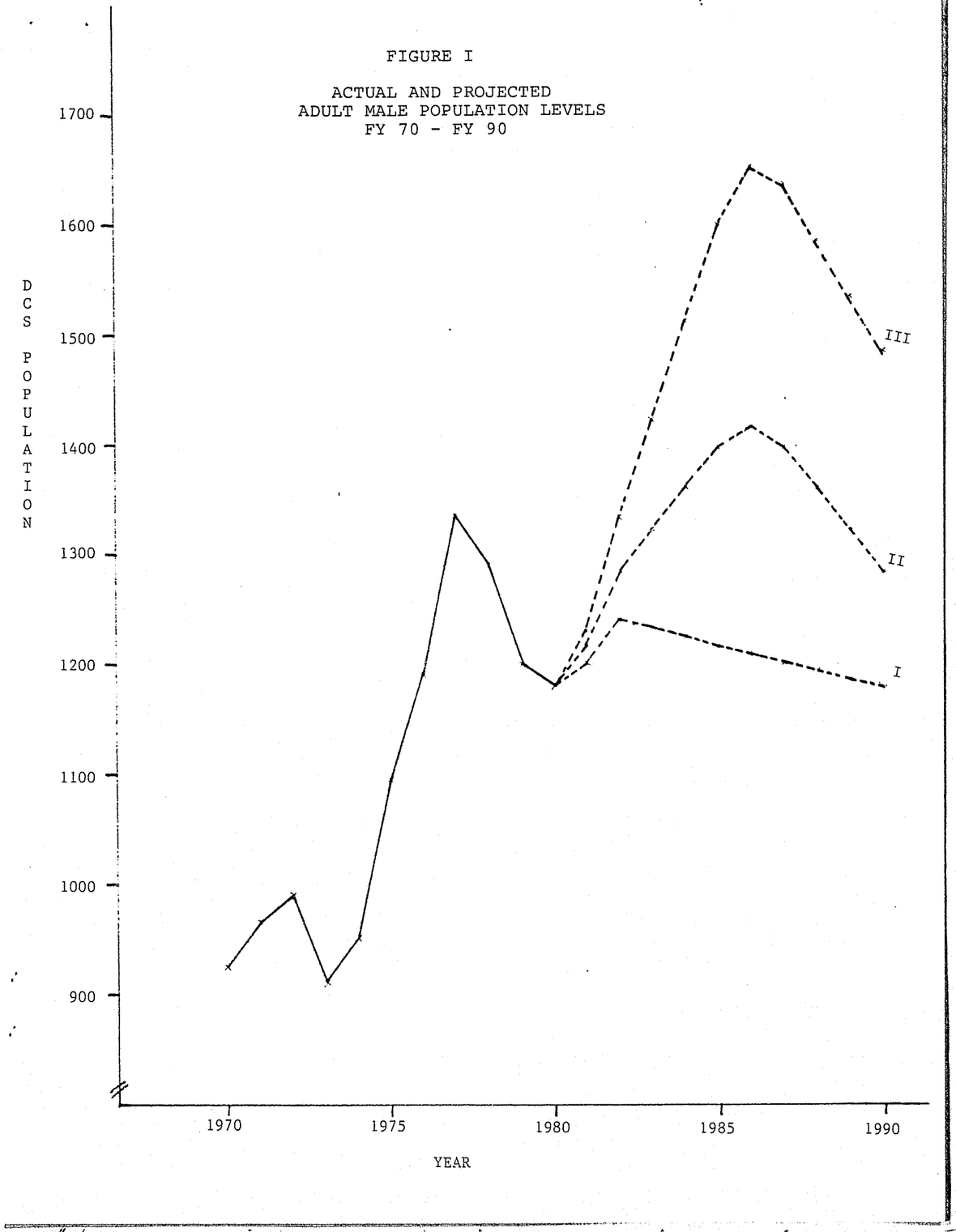

FIGURE 2

S-CURVES OF PROJECTED
ADULT MALE POPULATIONS
FY 70 - FY90

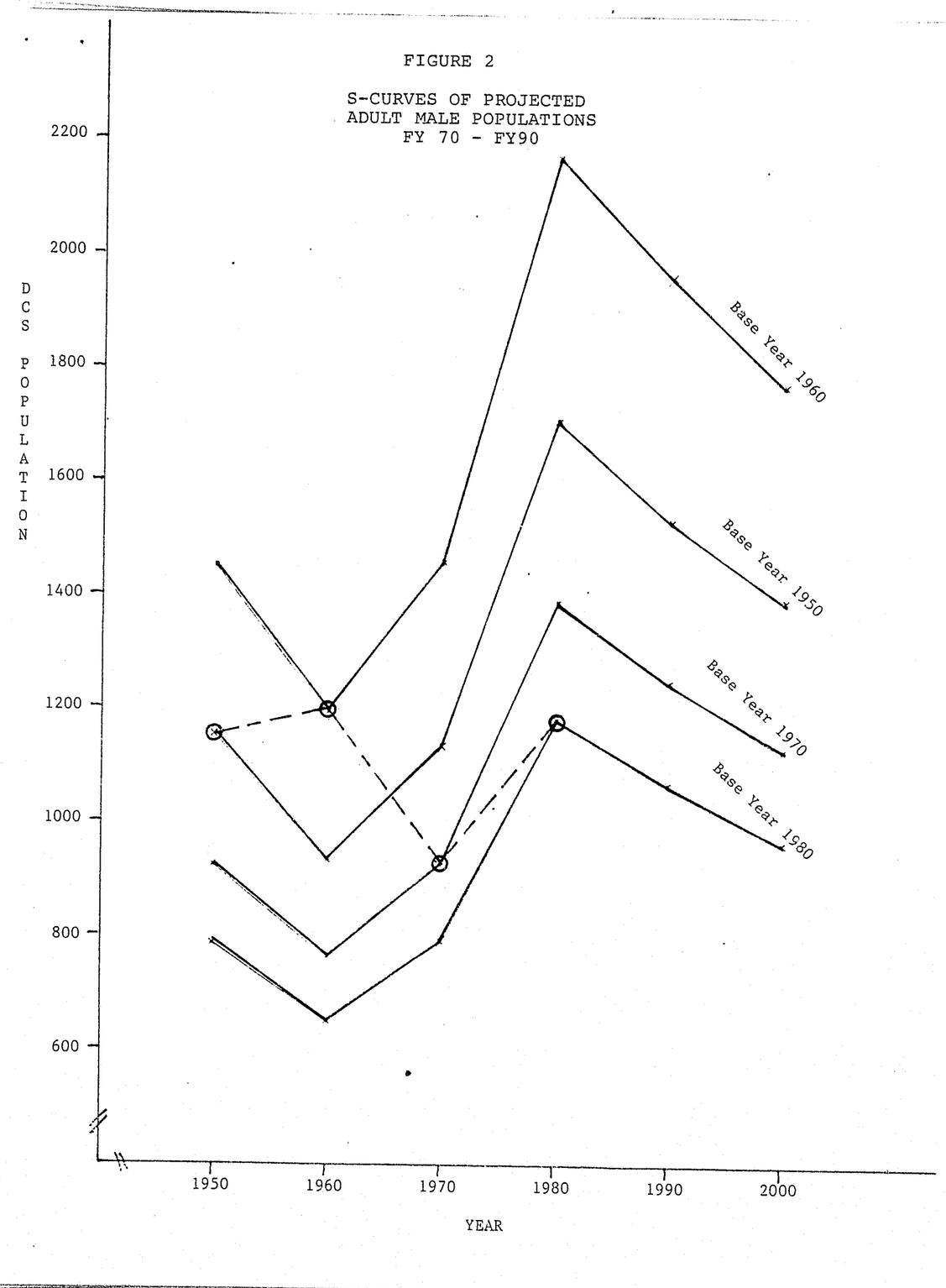

TABLE I

DATASET USED FOR

MR PREDICTION EQUATION

FISCAL YEAR	ANNUAL MONTHLY AVERAGE POPULATION	R0	R1	R2
1970	924.25	1.80	---	---
1971	966.67	2.40	1.80	---
1972	989.75	2.50	2.40	1.80
1973	910.92	2.50	2.50	2.40
1974	950.92	3.20	2.50	2.50
1975	1095.00	4.90	3.20	2.50
1976	1191.50	5.60	4.90	3.20
1977	1335.50	5.00	5.60	4.90
1978	1290.42	4.80	5.00	5.60
1979	1199.92	3.60	4.80	5.00
1980	1181.58	4.80	3.60	4.80

TABLE II

SCENARIO I

MILD RECESSION, QUICK RECOVERY

	R0	R1	R2	PROJECTED POPULATION
1981	4.74	4.80	3.60	1205
1982	4.68	4.74	4.80	1240
1983	4.62	4.68	4.74	1232
1984	4.56	4.62	4.68	1225
1985	4.50	4.56	4.62	1217
1986	4.44	4.50	4.56	1210
1987	4.38	4.44	4.50	1202
1988	4.32	4.38	4.44	1194
1989	4.26	4.32	4.38	1187
1990	4.20	4.26	4.32	1179

TABLE III
SCENARIO II
MODERATE RECESSION, PROPORTIONAL RECOVERY

	R0	R1	R2	PROJECTED POPULATION
1981	5.10	4.80	3.60	1217
1982	5.40	5.10	4.80	1285
1983	5.70	5.40	5.10	1323
1984	6.00	5.70	5.40	1361
1985	6.30	6.00	5.70	1398
1986	6.00	6.30	6.00	1417
1987	5.70	6.00	6.30	1399
1988	5.40	5.70	6.00	1361
1989	5.10	5.40	5.70	1323
1990	4.80	5.10	5.40	1285

TABLE IV

SCENARIO III

SEVERE RECESSION, SLOW RECOVERY

	R0	R1	R2	PROJECTED POPULATION
1981	5.50	4.80	3.60	1230
1982	6.20	5.50	4.80	1335
1983	6.90	6.20	5.50	1423
1984	7.60	6.90	6.20	1512
1985	8.30	7.60	6.90	1600
1986	7.90	8.30	7.60	1653
1987	7.50	7.90	8.30	1639
1988	7.10	7.50	7.90	1588
1989	6.70	7.10	7.50	1538
1990	6.30	6.70	7.10	1487

TABLE V

POPULATION AT RISK,
ADULT MALE POPULATIONS AND
INCARCERATION RATES FOR THE
PERIOD 1950 - 1980

	POPULATION AT RISK	ADULT MALE POPULATION	INCARCERATION RATE
1950	98,710	1138	11.53
1960	81,625	1197	14.66
1970	99,469	924	8.32
1980	148,189	1182	7.98

TABLE VI

PROJECTED ADULT MALE POPULATION LEVELS

FROM BASE-YEAR PROJECTIONS 1950 - 2000

	BASE-YEAR (11.53)	(14.66)	(9.36)	(7.98)
	1950	1960	1970	1980
1950	1138	1447	924	788
1960	941	1197	764	651
1970	1147	1458	931	794
1980	1709	2172	1387	1183
1981	1713	2178	1390	1185
1982	1717	2183	1394	1188
1983	1721	2189	1397	1191
1984	1725	2194	1401	1194
1985	1730	2199	1404	1197
1986	1692	2152	1374	1171
1987	1655	2104	1343	1145
1988	1617	2056	1313	1119
1989	1580	2009	1282	1093
1990	1542	1961	1252	1067
1991	1509	1919	1225	1045
1992	1476	1877	1199	1022
1993	1443	1835	1172	999
1994	1410	1793	1145	976
1995	1377	1751	1118	953
1996	1381	1755	1121	955
1997	1384	1759	1123	958
1998	1387	1763	1126	960
1999	1390	1767	1128	962
2000	1393	1771	1131	964

END