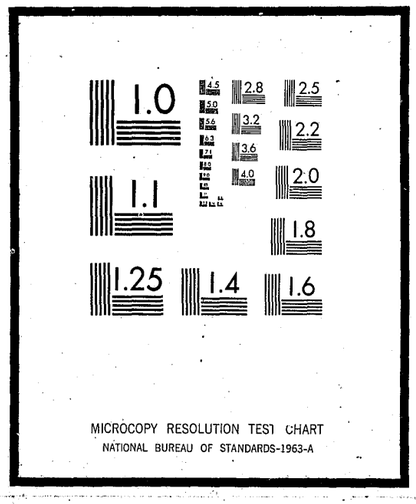

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A CANJUS PROJECT REPORT
#5

PREDICTION OF PENITENTIARY POPULATION

Volume I

by
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CANJUS PROJECT

The CANJUS project is a project being undertaken by the Statistics Division of the Ministry of the Solicitor General with the assistance of the Planning Branch of the Treasury Board Secretariat. The objective of the project is to develop a comprehensive simulation model of the Canadian Criminal Justice system to 1) develop a basic quantitative description of that system, 2) assist in the planning of policy and program changes by agencies involved in the administration of that system, and 3) serve as the foundation for future analyses and research on the system. The project team at the present time consists of (alphabetically) Neil Carroll, Gordon Cassidy, Elizabeth Cole, Carolyn Fuller, George Hopkinson, Brian Johnson, Lynda Peach, and John Townesend. Not all persons have been committed to the project full-time, but all have made a contribution, without which, some of the many CANJUS publications would not have been possible.

DISCLAIMER

The views expressed are those of the authors and do not necessarily represent those of the Ministry of the Solicitor General or the Secretariat of Treasury Board.

ACKNOWLEDGEMENT

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I. INTRODUCTION

This study was undertaken in order to prepare aggregate prediction figures of admittances to federal penitentiaries for the fiscal year 1974-75 for the Canadian Penitentiary Service. The rationale or use of these figures was to be a part of the program budgeting submission to the central agencies for that fiscal year. In undertaking this particular prediction, the Statistics Division felt that it would serve as a pilot project for using its CANJUS planning model (see reference (2) for description of model methodology and reference (6) for the present form of model) for predictive purposes within the Canadian criminal justice system (see reference (3) for the more general application of the model). The use of the model in such a preliminary form has had both its virtues and its drawbacks. The virtues include the ability of the model to relate admissions to many other factors in the Criminal Justice System, the drawbacks are mainly the linearity of the model and its preliminary form. (See references (4), (7) and (8) for further assumptions inherent in the present data used by the model.)

The present method of prediction for penitentiary admittances in the Canadian Penitentiary Service consists basically of a linear extrapolation of a 4% prediction with slight deviations from the linearity due to intuited impacts of other programs and policies on penitentiary admissions. It was felt that the major effort then of the CANJUS team in

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predicting the penitentiary admittances would be to document existing data and to evaluate their applicability for use in such a prediction study. This was undertaken and completed by Fuller and Hopkinson in reference (5). We feel that this reference document rather carefully describes the existing sources of data which could be used for prediction as well as their relative validity for such a prediction. The document also includes recommendations for changes in the data collection and aggregation of the various systems in order to further facilitate such prediction in the future.

In addition to data on actual inmate population over previous years and admittances to penitentiaries, the following data had already been aggregated within the CANJUS planning model context:

(i) flow figures for the Canadian criminal justice system in 1970. This included, by crime type, reported offences, arrests, convictions, commitments (to federal and provincial prisons), paroles, and releases. This was done by the calendar year.

(ii) Reported offences by crime type and arrests for all years up to and including the first quarter of 1973. Again this is by calendar year.

On closer examination of some of the figures which were available to us, both on actual inmate population and admissions, as well as on the more general Canadian criminal justice system

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over the last five to ten years, it became clear that there were some serious anomalies with any kind of linear or simple extrapolation procedure (this includes the exponential smoothing procedure presented by John Bailey (see reference (1)). For example, while the aggregate crime rate change over the last three years was 4%, the actual commitment to federal penitentiaries over that same period decreased by approximately two hundred persons per year (those were admitted by "warrant of commitment upon conviction"). Perhaps even more startling, the number of persons admitted under parole violation (i.e., "warrant of commitment upon forfeiture" and "warrant of commitment upon revocation") increased by two hundred per year over the last three years, thus making the admittances to federal penitentiaries almost constant over that period. Thus, further investigation was needed, not just in terms of using the CANJUS model as a prediction tool, but also to invoke some prediction of number of persons paroled and parole violation rate as well as the mandatory supervision violation rate[1]. For example, it can be shown that there is a direct relation between the highly increasing number of persons in penitentiaries and the recent decrease in the parole rate.

First, some work was done on prediction, using the CANJUS model for predicting warrant of commitment admittances (upon conviction and forfeiture) to the penitentiary and some simple extrapolation procedures for prediction of parole and

[1]Data only exists for 1972 and part of 1973 for this program since it has only been operational for less than two years.

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mandatory supervision revocation admittances to the penitentiaries. It was then learned that, in fact, for the program budget forecast there would also be needed releases from the penitentiaries. Naturally this was required within a very protracted period of time and it was felt that such a prediction could only be done on the basis of certain simple further analyses. For this reason, then, releases are incorporated as only a peripheral item and any confidence in those figures should even be further discounted than those others included in this report. In the future it is hoped that workloads from the CANJUS model can be used directly to predict actual penitentiary population (a preliminary use of this methodology is included in the last section), rather than relying on admittances minus releases as a surrogate measure[1].

In the following section, then, we present the methodologies for predicting the penitentiary admittances and in the final section draw some conclusions from these figures, together with analyses determining how sensitive these predictions are to such factors as crime rates and conviction rates. In addition, preliminary predictions of releases are included.

[1]Naturally other assumptions are involved in using admittances minus releases; such as their distributions over the year being identical.

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II. METHODOLOGY

As stated earlier, the CANJUS model provides a quantitative description of the Canadian Criminal Justice System (C.C.J.S.). It is a linear model which gives a description of the costs, workloads, resources and the number of persons at the various stages in the C.C.J.S. (A diagram of this model is shown in figure 1.) However, for our present purposes of predicting the number of admissions into the correctional institutions (and more specifically into the penitentiary) basically we need to use only one of these variables. This variable is the number of persons or flows between the different stages. Before describing the methodology used here an outline of the present data base should be useful for those unfamiliar with the CANJUS model[1].

To furnish the descr-ption of the number of individuals in the system we used the data found in the Judicial Division, Statistics Canada publications and the reports from line agencies such as the Canadian Penitentiary Service and the National Parole Service (see reference (5) for detail). At present, the most recent and complete data on the system is only available for 1970[2]. Given this data on the number of individuals in the various stages of the system (broken down by 21 crime types - see Table 1) the branching ratios by crime type for the system were calculated. The branching ratio

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[1] See reference (6) for a complete description of the present model.

[2] It should be noted that the data on court proceedings for 1970 excludes Quebec and Alberta. The reason for this is

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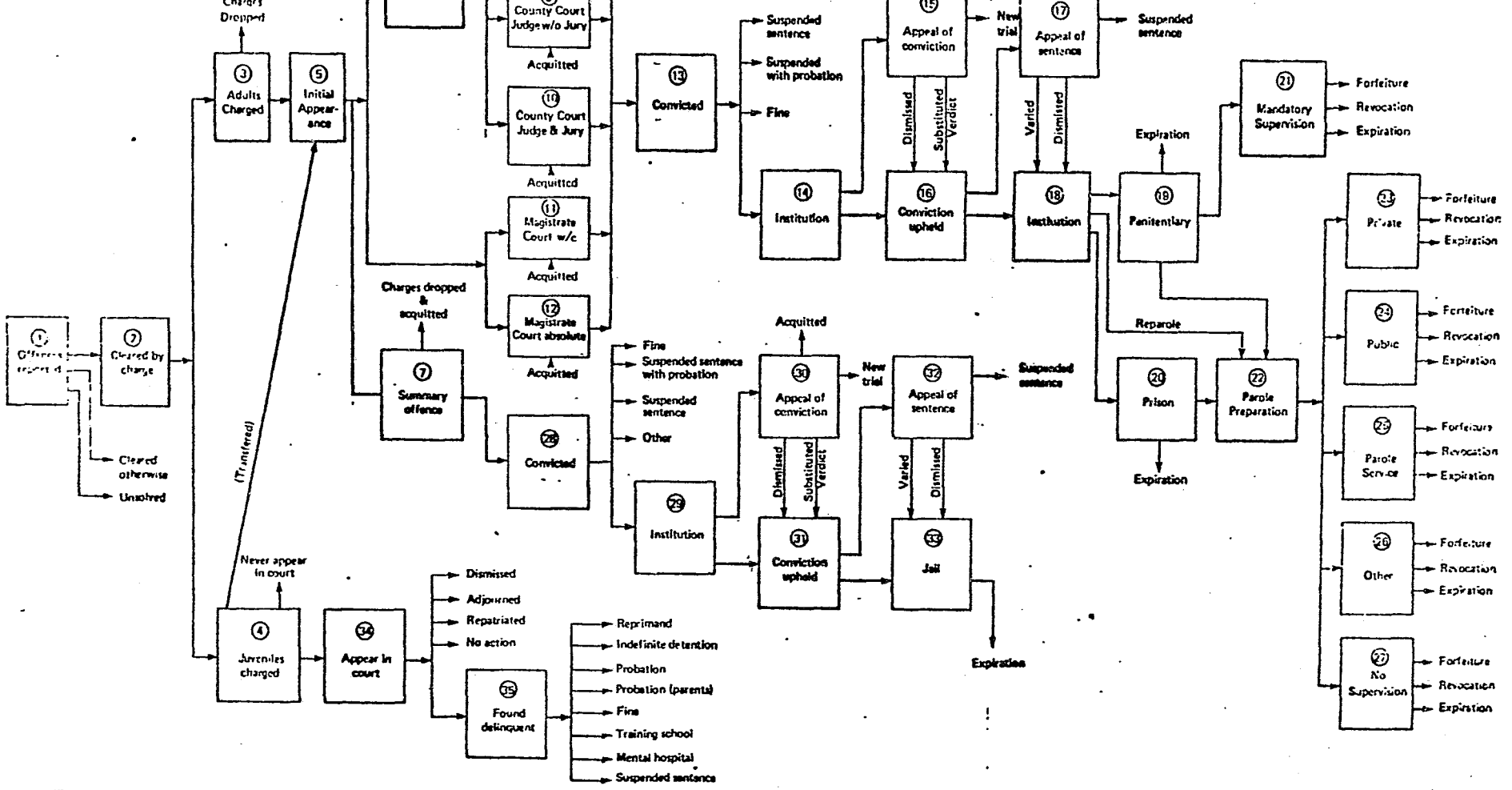

Flow diagram: **Canadian Criminal Justice System**

is defined as a percentage of persons who flow from one stage to the next ones following it in the system. (For example, the branching ratio of the number of adult persons convicted of an indictable offence who then enter a correctional institution is approximately 35%.) Then, using the "Crime Statistics" publication of Statistics Canada for 1970 we found the number of persons (again by crime type) who entered stage one of the criminal justice system in 1970. Stage one depicts the number of offences (converted to number of persons[3]) that are reported and known to the police.

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2 (cont'd)

that Quebec and Alberta have different reporting methods and that Statistics Canada is in the process of changing to this reporting system for all the provinces. Therefore, to incorporate these provinces in this prediction we have assumed that the branching ratios for Quebec and Alberta are the same as the total for the other eight provinces.

[3]For more detail on this conversion see Section III, 1.2 in reference (6).

TABLE 1

CRIME TYPES - CANADIAN CRIMINAL JUSTICE SYSTEM

1. Murder
2. Attempted Murder
3. Manslaughter
4. Rape
5. Other Sexual Offences
6. Wounding
7. Assaults
8. Robbery
9. Break & Enter
10. Theft of a Motor Vehicle
11. Theft
12. Have Stolen Goods
13. Fraud
14. Prostitution
15. Gaming & Betting
16. Offensive Weapons
17. Other Criminal Code
18. Narcotics Control Act
19. Federal Statutes
20. Provincial Statutes
21. Municipal By-Laws

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With these calculated branching ratios for all 35 stages in the system and the absolute number of persons who enter the system, the model calculates the number of individuals within each crime type category who flow into each stage in the system. For example, we can see the number of individuals who flow into the various correctional institutional stages. Stage 19 represents the penitentiaries and for 1970 the model calculates that 3,934 individuals entered this stage in the system[4]. Stage 20 represents the number of individuals who have been convicted on an indictable offence and were sentenced to provincial prisons. For 1970, there were 19,983 persons who entered this stage. Stage 33 depicts the number of individuals who have been convicted on a summary offence and subsequently sentenced to imprisonment. During 1970, 25,834 persons were imprisoned on a summary conviction and thus the model simulates that this number of persons entered stage 33. The total number of individuals who have been convicted and have been sentenced to a correctional institution would be the sum of these three stages.

To provide an estimate of the number of individuals who enter the correctional institutions in 1974 the 1970 data clearly

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[4]This number of individuals who enter the penitentiary stage only includes "warrant of commitment upon conviction" and "warrant of commitment upon parole forfeiture". Therefore, other admissions such as transfers of inmates from provincial prisons to federal penitentiaries and "warrants of commitment upon parole revocation" are excluded from this figure and need to be kept separate in making this prediction when using the CANJUS methodology.

needs to be updated. The following is the method that was used and the assumptions that are necessary to update the 1970 figures and subsequently make a prediction for 1974.

Basically, the method used to predict admissions into the correctional institutions included the following steps:

i) estimate the number of offences committed in 1974 (i.e., number of individuals by crime type who enter stage one of the system);

ii) assume the branching ratios remain constant for the system between 1970 and 1974;

iii) given the estimated input to the system (step i) and the assumed branching ratios (step ii) the model calculates the number of individuals who enter the correctional institutions.

The first step was to calculate the inputs into the system at stage 1 for 1971, 1972 and 1973. The figures for 1971 and 1972 were simply taken from the "Crime Statistics" publication of Statistics Canada. For 1973 only the first quarter crime rate was available (again using a "Crime Statistics" report) and by using the seasonal fluctuations in crime rates for 1972 an estimate of the total number of crimes committed in Canada for 1973 was calculated. Then, with these estimates of the inputs into the system for 1970 to 1973 the average percentage change

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between these years was calculated. Using this average percentage changes an estimated number of crimes committed within each crime type (i.e., total input at stage 1) was calculated for 1974. The results of this estimation can be seen in Table 2.

TABLE 2

CRIME IN CANADA 1970 TO 1974

CRIME TYPE	TOTAL 1970	TOTAL 1971	% CHANGE 70 - 71	TOTAL 1972	% CHANGE 71 - 72	ESTIMATE 1973 *	% CHANGE 72 - 73	AVERAGE CHANGE 70 - 73	ESTIMATE 1974
Murder	489	504	3.07	541	7.34	561	3.69	4.82	588
Attempted Murder	287	365	27.17	415	13.69	372	-10.36	12.73	419
Manslaughter	38	49	28.95	46	-6.12	121	97.00	32.75	191
Rape	1,495	1,586	6.08	1,722	8.57	1,877	9.00	7.74	2,022
Other Sexual Offences	9,837	9,413	-4.31	9,197	-2.29	10,012	8.86	-.26	9,986
Wounding	1,689	1,920	13.67	1,797	-6.40	1,710	-4.84	1.51	1,735
Assaults	78,247	84,800	8.37	91,162	7.50	106,632	16.96	10.19	117,497
Robbery	16,546	16,307	-1.44	16,732	2.60	18,760	14.66	4.1	19,529
Breaking & Entering	209,714	222,330	6.01	225,706	1.51	228,318	1.15	3.11	235,418
Theft of a Mot. Veh.	75,389	79,888	5.96	85,637	7.19	86,458	-1.07	4.66	90,486
Theft	460,817	505,247	9.64	510,020	.94	657,654	28.98	11.21	731,377
Have Stolen Goods	10,169	11,116	9.31	11,415	2.69	13,114	14.62	8.15	14,182
Fraud	36,364	35,839	-1.44	37,371	4.27	41,845	11.97	4.41	43,490
Prostitution	2,016	2,184	8.33	2,236	2.38	3,977	77.86	23.48	4,910
Gaming & Betting	3,445	3,683	6.91	4,270	15.93	5,351	25.29	14.88	6,147
Offensive Weapons	6,312	6,414	1.61	6,947	8.31	8,371	20.49	8.84	9,110
Other Criminal Code	401,897	418,501	4.13	455,163	8.76	504,703	-10.88	7.55	542,808
Narcotics Control Act	16,315	20,960	28.47	26,208	25.03	52,764	101.0	45.31	76,671
Federal Statutes	41,916	43,577	3.96	39,953	-8.31	52,947	32.52	6.5	56,388
Provincial Statutes	2,223,841	2,232,939	.41	2,407,828	7.83	2,165,040	-10.08	.57	2,177,380
Municipal By-Laws	484,419	572,375	18.15	504,920	-11.78	376,951	-25.34	-3.95	362,062
TOTAL	4,074,071	4,269,997	4.81	4,439,286	3.96	4,338,105	-2.27	2.72	4,456,101

SOURCE: Statistics Canada, Judicial Division, "Crime Statistics" and "Traffic Enforcement Statistics", Police Publications 1970 to 1973.

* Based on offences committed in the first quarter of 1973.

** Based on average percentage change in offences committed 1970 to 1973.

While it was hoped that by using the 1974 crime rate estimates we could make a fairly good prediction on the number of individuals who enter the correctional institutions in 1974 on warrant of commitment, the prediction seemed inaccurate. This was due to the assumption that the branching ratios remained relatively constant between 1970 and 1974. Upon closer examination of the available statistics for the penitentiary admittances this certainly was not the case. It was found that the proportion of individuals who entered the penitentiary stage by "warrant of commitment upon conviction" and "warrant of commitment upon parole forfeiture" decreased between the years 1970 and 1972 (see Table 3). Therefore, when the increased crime rate for 1974 is used as an input for the model with the 1970 branching ratios, the flows into the penitentiary stage also increased. This, however, is contradictory to the statistics in the "Correctional Institution Statistics" publications which show a decrease of the "warrants of commitment upon conviction" and the "warrants of commitment upon parole forfeiture".

In order to make a prediction on the number of individuals who enter the correctional institution stages consistent with actual data a further assumption on the proportion of individuals who enter the penitentiary stage needs to be made. That is, the branching ratios for the stages had to be changed to correspond to the actual number of persons who entered the penitentiary in 1972. The branching ratios for the admittances

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into stage 19 (penitentiary) and into stage 20 (prison) by crime type are shown in Table 4.

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TABLE 3

ADMISSIONS TO PENITENTIARIES (INCLUDING W/C AND FORFEITURE)

CRIME TYPE	1970	1971	70 - 71 % CHANGE	ESTIMATED* 1972
Murder	74	61	-17.57	50
Attempted Murder	19	15	-21.05	12
Manslaughter	104	104	0.0	104
Rape	85	82	-3.53	79
Other Sexual Offences	162	125	-22.84	96
Wounding	71	74	4.22	77
Assaults	77	103	33.77	138
Robbery	834	837	.36	840
Breaking & Entering	1,158	1,031	-10.97	918
Theft of M/V	-	-	-	-
Theft	456	429	-5.92	404
Have Stolen Goods	194	186	-4.12	178
Fraud	433	388	-10.39	348
Prostitution	7	8	14.28	9
Gaming & Betting	-	-	-	-
Offensive Weapons	52	59	13.46	67
Others	286	321	12.24	360
Narcotics Control Act	230	242	5.22	255
Federal Statutes	7	8	14.28	9
Provincial Statutes	-	-	-	-
Municipal By-Laws	-	-	-	-

TOTAL	4,249	4,073	3,944
REVOCATIONS	224	310	

SOURCE: Statistics Canada, Judicial Division, "Correctional Institutional Statistics", Publications 1970 and 1971.

* Estimate based on % change 1970-1971.

TABLE 4

PERCENTAGE OF PERSONS ADMITTED TO PENITENTIARY AND PRISONS
(INDICTABLE OFFENCES BASED ON 1972 FIGURES)

CRIME TYPE	TO PENITENTIARY	TO PRISON
Murder	100%	0%
Attempted Murder	100	0
Manslaughter	100	0
Rape	88.2	11.8
Other Sexual Offences	20.6	79.4
Wounding	45.6	54.4
Assaults	7.0	93.0
Robbery	57.8	42.2
Breaking & Entering	15.8	84.2
Theft	5.7	94.3
Have Stolen Goods	10.0	90.0
Fraud	13.1	86.9
Prostitution	10.6	89.4
Gaming & Betting	0	100
Offensive Weapons	13.9	86.1
Others	14.4	85.6
Narcotics Control Act	18.4	81.6
Federal Statutes	2.1	97.9

The prediction of the admittances of persons into federal penitentiaries and provincial prisons on "warrants of commitment upon conviction" and "warrants of commitment upon parole forfeiture" can be seen in Table 5. This prediction was made using the 1972 branching ratios and the estimated 1974 crime rate (see Table 2).

However, as stated earlier, this prediction omits persons who enter the institutions on "warrants of commitment upon parole revocation" and those who entered on "warrants of commitment upon revocation of mandatory supervision". At present, the most reliable data that is available on parole revocation are the admittances into penitentiaries during 1970 and 1971. An estimate of the number of these revocation admittances can be made based on the increase in this year. The increase from 1970 to 1971 was 32.14%[5]. If this increase is maintained until 1974 there would be 683 persons entering the penitentiary on "warrants of commitment upon parole revocation". Although linear extrapolation for estimation of parole revocation is admittedly a very general and aggregate method of estimation, it is probably the best approximation feasible at the present time. Similarly the revocations on mandatory supervision were 33 in 1972 (of 245 released) and 103 in 1973. Assuming the same absolute increase (a linear extrapolation would be very poor because of the

[5]This figure is based on "Correctional Institution Statistics" publication.

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non-normalcy of the 1972 year - the year the program began) again we have 1973 such revocations for 1974. Therefore, the total warrants of commitment would be 5,935. The next section of this paper provides some sensitivity tests on these estimates, including a changed conviction rate, as well as a calculation of the releases of these persons admitted. In addition, we present an alternate method (other than admittances minus releases) for predicting the actual penitentiary population in 1974. The section then draws together some conclusions on the results of the predictions using these estimates.

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TABLE 5

PREDICTION OF PERSONS ADMITTED TO PENITENTIARIES AND PRISONS ON "WARRANTS OF COMMITMENT UPON CONVICTION" AND "WARRANTS OF COMMITMENT UPON PAROLE FORFEITURE" IN 1974

CRIME TYPE	PENITENTIARY	PRISON*
Murder	86	0
Attempted Murder	9	0
Manslaughter	98	0
Rape	93	13
Other Sexual Offences	104	402
Wounding	74	89
Assaults	177	2,355
Robbery	980	715
Breaking & Entering	957	5,100
Taking Motor Vehicle without consent	0	0
Theft	579	9,527
Have Stolen Goods	221	1,979
Fraud	405	2,676
Prostitution	20	166
Gaming & Betting	0	22
Offensive Weapons	88	542
Others	429	2,546
Narcotics Control Act	746	3,304
Federal Statutes	13	585
Provincial Statutes	0	0
Municipal By-Laws	0	0
TOTAL	5,079	30,019

* This includes persons admitted to prisons on indictable offences only.

III. SENSITIVITY ANALYSES AND CONCLUSIONS

While the prediction of the admittances into penitentiaries and prisons as seen in the previous section does provide some quantitative estimate of the correctional institutions' inmate populations, the estimates by themselves do not provide the line agencies enough information for their program budget forecast. As such, this section presents more information on the actual number of inmate years expected in the institutions. This additional information is presented in the form of the year of the releases of these 1974 admittances and in the form of sensitivity analyses of the assumptions thus far. First of all, we will estimate the releases from the penitentiaries.

One of the most important pieces of information that can be supplied for the program budget forecast is the amount of time that is required by the penitentiary to supervise the persons who are admitted to a correctional institution. The inherent assumption, if one is to make this estimate by subtracting releases from admittances (and adding this to present population), is that the distribution of admittances and releases are exactly the same over the year in question. As such, to calculate the years of the releases of the persons who enter the penitentiary in 1974 we found the average time served per inmate by each crime type. For example, it was found that murderers served a term of 10.51 years. Therefore, with all other variables remaining constant, it is estimated that all of the murderers who enter the penitentiary in 1974 would

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be released in 1984. The method of finding the average time served per inmate by crime type is shown below.

First of all, it should be mentioned that two different mean times served per inmate by crime type have been calculated. These different averages are dependent on the type of release of the inmate. The averages were calculated for the number released after expiration of sentence and for the number released under parole supervision. These means were computed for both 1970 and 1971. The average term served per inmate by each crime type for both types of releases can be seen in Table 6.

By applying these mean times served to the predicted admittances for 1974 we can find the "expected"[1] year of release. To apply these releases we first of all found the proportion of the number of expiration releases to the number of parole releases in 1970 and 1971. For example, in the assault crime type this proportion was 71 to 67. The proportions for all the crime types are shown in Table 7. Given this proportion, we then applied both types of mean times served per crime type to the predicted number of admittances in 1974 within this crime type. The results for expected year of release are shown in Table 8.

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1 Notice we are assuming all served the average or mean time not an unreasonable assumption if we want only long term expected values.

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TABLE 6

MEAN TIME SERVED IN YEARS, 1970 & 1971 COMBINED

CRIME TYPE	EXPIRATION	PAROLE
Murder	-	10.51
Attempted Murder	5.07	4.97
Manslaughter	4.39	2.50
Rape	3.69	1.79
Other Sexual Offences	2.53	1.44
Wounding	2.42	1.98
Assaults	2.07	1.03
Robbery	3.02	1.93
Breaking & Entering	2.13	1.21
Theft	1.77	1.06
Have Stolen Goods	1.88	1.27
Frauds	1.92	1.07
Prostitution & Procuring	1.99	1.83
Offensive Weapons	2.23	1.08
Other Criminal Code	2.13	1.77
Narcotic Control Act	2.33	1.42
Other Federal Statutes	1.83	1.50

TABLE 7

EXPIRATION AND PAROLE AS PERCENTAGE OF
TOTAL RELEASES PER CRIME TYPE (1970 and 1971 COMBINED)

Offence	1970 and 1971 Expiration No.	%	1970 and 1971 Parole No.	%
Murder	-	--	52	100.0
Attempted Murder	7	26.92	19	73.09
Manslaughter	37	25.34	109	74.66
Rape	36	24.32	112	75.68
Other Sexual Offences	113	40.50	166	59.50
Wounding	51	41.46	72	58.54
Assaults (not ind.)	71	51.45	67	48.55
Robbery	431	30.10	1,001	69.90
Breaking & Entering	842	37.83	1,384	62.17
Theft	377	42.65	507	57.35
Have Stolen Goods	167	41.96	231	58.04
Frauds	312	40.89	451	59.11
Prostitution and Procuring	12	50.00	12	50.00
Offensive Weapons	37	49.33	38	50.67
Other Criminal Code	265	40.90	383	59.10
Narcotics Control Act	102	25.82	293	74.18
Other Federal Statutes	6	31.58	13	68.42
TOTAL:	2,866		4,910	

TABLE 7

OFFENCE TYPE	EXPECTED ADMISSIONS 1974	EXPECTED YEAR OF RELEASE													
		1974		1975		1976		1977		1978		1979		1984	
		Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.
Murder	86.1														86.1
Attempted Murder	9.4										6.87	2.53			
Manslaughter	98.1						73.24			24.86					
Rape	92.8				70.23				22.57						
Other Sexual Offences	104.2				62.00	42.20									
Wounding	74.3				43.50	30.80									
Assaults (not ind.)	176.5				85.69	90.81									
Robbery	980.4				685.30				295.10						
Breaking & Entering	957.7				595.40	362.30									
Theft (incl. M.V.)	579.1			246.99	332.11										
Have Stolen Goods	221.2			92.82	128.38										
Frauds	404.8			165.52	239.28										
Prostitution & Procuring	19.8			9.90	9.90										
Offensive Weapons	87.8				44.49	43.31									
Other Criminal Code	428.6				253.30	175.30									
Narcotic Control Act	746.0				553.38	192.62									

OFFENCE TYPE	EXPECTED ADMISSIONS 1974	EXPECTED YEAR OF RELEASE													
		1974		1975		1976		1977		1978		1979		1984	
		Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.	Exp.	Par.
ther Federal Statutes	12.7				8.69	4.01									
TOTAL	5,079.50			515.23	3111.65	941.35	73.24	317.67		24.86	6.87	2.53			86.1

here are no estimated releases between the years 1980 and 1983.

Given that we now have total admittances of 5,935 in 1974 and total releases of 0 in 1974 we can estimate the prison population for 1974 by taking

i) present population;

ii) estimated releases of present population in 1974;

iii) net estimated addition in 1974 (5,935).

The total estimated population is then: i) -ii) + iii).

The expected releases of the 1974 admittances as shown in Table 8 are only one way of expressing the time that is required by the penitentiary to supervise these persons. Another way of expressing the time that is required to supervise these persons (or, in other words, the resource requirements) is by multiplying the average time served (the unit workloads) by the number of admittances[1]. This calculation gives us a product which is the number of man years that are required for supervision of the inmate population. OR, this is the total expected number of inmates in 1974 in the institutions. The CANJUS model is precisely programmed to make these calculations of (workload) times (flow).

In putting the two estimated variables (persons entering the penitentiary[2] and the two types of unit workloads) into the data file the computer calculates the penitentiary

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[1] It should be noted that the resulting estimate is a "steady state" estimate of total population in the institution. Thus the i) - ii) plus iii) calculation is no longer necessary.

[2] This parameter in the model is called the level of system flows.

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resources (in terms of inmate man years) that are required for supervision of these persons. The results of the computations for the total 1974 admittances and by each crime type can be seen in Table 9.

Since we know that the results shown in Table 9 are directly related to the assumption made earlier that the workload information is based on 1970 and 1971 data, a sensitivity test can be made illustrating induced changes. For example, subsequent to the 1970 and 1971 penitentiary releases, parole policy has been altered to keep inmates in the penitentiary for a longer term before being released under parole. As a result, the penitentiary workloads for persons released under parole increases. For example, if we make the inductive change that persons released under parole for the crime types "Rape", "Other Sexual Offences", "Wounding", "Assaults", and "Robbery" serve penitentiary terms of 0.5 years longer, the inmate-man years of supervision required will also increase. The computer results of these inductive changes can be seen in Table 10.

As can be seen from the above example, sensitivity tests become very important in validating prediction. Therefore, one other such test should be made on the penitentiary admissions. As you will recall, in section II, the assumption was made that the branching ratios (or stage to stage percentage changes) based on 1970 data have been kept constant* to make the 1974

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* The only instance where the branching ratio was not kept constant was for the penitentiary admittances. These were based on the 1972 data.

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TABLE 9

Penitentiary Inmate-Man Years Required for Supervision in 1974

Crime Type	
Murder	465.3
Attempted Murder	47.0
Manslaughter	298.2
Rape	211.8
Other Sex Offences	204.4
Wounding	171.7
Assaults	215.1
Robbery	2,248.4
Break and Enter	1,500.8
Taking Motor Vehicle Without Consent	0.0
Theft	775.0
Have Stolen Goods	322.3
Fraud	580.3
Prostitution	36.6
Gaming and Betting	0.0
Offensive Weapons	155.1
Others	838.8
Narcotics Control Act	1,242.5
Federal Statutes	19.1
Provincial Statutes	0.0
Municipal By-Laws	0.0
TOTAL:	9,332.4

penitentiary admissions. Therefore, it becomes critical that a sensitivity test be made inserting an inductive change in some of the branching ratios. For example, it might be intuitively reasoned that the courts have employed harsher sentencing options since 1970. Then, the inductive change is made that 10 percent of the proportion of persons convicted who were previously penalized with a "fine" now are sentenced to an institution. If this change is made for all crime types it can be seen that the total penitentiaries admittances (excluding revocations for 1974) will increase from 5,079 to 6,531 which represents a 28.6 percent increase in absolute numbers.

SUMMATION:

It is fairly evident from the above section that the CANJUS planning model has many virtues in making predictions within the Canadian Criminal Justice System either as a support tool to predict admittances and releases or to make a study state estimate of total inmate years for 1974. It seems that the Model can make as good and if not, better predictions than the linear extrapolation method and at the same time, sensitivity tests can be made to simulate the policy changes of the agencies within the Canadian Criminal Justice System.

TABLE #10

Expected Inmate Man-Years for
Increased Penitentiary Term Before Parole Release

Crime Type	Base Case	Test Case	Change	Percentage Change
Murder	465.3	465.3	0.0	0.0
Attempted Murder	47.0	47.0	0.0	0.0
Manslaughter	298.2	298.2	0.0	0.0
Rape	211.8	246.1	34.4	16.2
Other Sex Offences	204.4	231.6	27.2	13.3
Wounding	171.7	180.8	9.1	5.3
Assaults	215.1	287.3	72.2	33.6
Robbery	2,248.4	2,575.2	326.8	14.5
Break and Enter	1,500.8	1,500.8	0.0	0.0
Taking Motor Vehicle Without Consent	0.0	0.0	0.0	0.0
Theft	775.0	775.0	0.0	0.0
Have Stolen Goods	322.3	322.3	0.0	0.0
Fraud	580.3	580.3	0.0	0.0
Prostitution	36.6	36.6	0.0	0.0
Gaming & Betting	0.0	0.0	0.0	0.0
Offensive Weapons	155.1	155.1	0.0	0.0
Others	838.8	838.8	0.0	0.0
Narcotics Control Act	1,242.5	1,242.5	0.0	0.0
Federal Statutes	19.1	19.1	0.0	0.0
Provincial Statutes	0.0	0.0	0.0	0.0
Municipal By-laws	0.0	0.0	0.0	0.0
TOTAL:	9,332.4	9,802.1		

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