POPULATION PROJECTIONS: PAST AND PRESENT

1975 – 1978

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December, 1978

INTRODUCTION

A major function of the Office of Research is the projection of inmate commitments and incarcerated populations. These projections have become an integral part of the Department's budgetary and facilities planning process.

Accuracy in inmate population projections is not a simple task. As this office has experienced, it is very difficult to project commitments and incarcerants in a non-static environment. Changes in parole board policies, legislation, and the economy have been major factors affecting accuracy of inmate population projections.

In order to better understand the techniques used to project inmate populations, and the factors contributing to error in them, this report will give an overview of the Department's population projection techniques from 1975 to the present.

Our first attempt at inmate population projections began in July, 1975. As prior research had frequently found that unemployment rates and the number of prison commitments were highly correlated, we examined that relationship in Colorado. Using quarterly data, we found a very high correlation between Colorado's unemployment rate and the number of new court commitments.

Using the Colorado unemployment rate as the driving variable along with the state's population and the seasonal variation of commitments, we utilized a multiple linear regression model to predict new court commitments. Since commitments affect our total incarcerated population, commitments were combined with parole revocation rates and the percent of determinate sentences received to predict the incarcerated population. Those projections, published in a paper presented to the 1976 ACA convention (Research Document 76-10), were as follows:

February, 1976 Projections and Actual Experience

Year	Projected Commitments	Actual Commitments	Projected Incarcerated Population	Actual Incarcerated Population
1974	–	1187	–	1994
1975	–	1439	–	2114
1976	1401	1311	2117	2260
1977	1330	1276	2105	2445
1978	1328	–	2105	–
1979	1340	–	2107	–
1980	1354	–	2110	–

These projections were based on the following assumptions:

1.) The unemployment rate would stabilize at an annual average of 4.2 by third quarter, 1977.

2.) No diversion would occur.

3.) Average length of stay would be captured by the rate of determinate sentences received.

4.) No changes in legislation would occur.

5.) The level of parole revocations would stabilize at approximately 144 per year.

Actual date compiled for 1976 and 1977 indicated that commitment projections for those two years were in error by 6.9 percent and 4.2 percent, respectively. In each year, our statistical model over-projected the number of commitments. (See figure 1).

The accuracy in the commitment projections was not achieved by the predictive power of the model itself, but by two factors counter balancing the actual commitments. First, we had underestimated the unemployment rate (which means that we should have under-projected the number of commitments) and, secondly, we assumed that no diversion would occur (which means we should have over-projected the number of commitments).

To test the accuracy of the model for 1976 and 1977 projections, actual unemployment rates were substituted for the original estimates. The results indicated an error rate of 15 percent in 1976 and 18.9 percent in 1977. This inordinate error rate lead us to further examination of the unemployment rate variable used in the model.

In the original model, the relationship between the unemployment rate (set at a three month lag) and commitments was relatively high (r = .7410). When actual unemployment rate data were inserted into the model, the relationship was found to be insignificant (r = .1054). With the loss of this relationship, it became apparent that the error associated with this model would not allow us to quantify the degree to which the unemployment rate or diversion rate affected the actual number of commitments.

The error rate associated for the incarcerated population was 6.3 percent in 1976 and 14 percent in 1977. Each year the model under-projected the incarcerated pop-

ulation. (See figure 2). First, the model had not included any effects of
new legislation. As discussed later, H.B. 1111 did, in fact, have an increas-
ing effect on our incarcerated population. A second factor contributing to the
low projections was the inappropriate use of the determinate sentences re-
ceived variable. As the number of determinate sentences received increased
(which would indicate a longer average length of stay), the effect in the model
was to reduce the incarcerated population projection.

Finally, the level of revocations did not stabilize at 144 but increased to
nearly the level experienced prior to the Morissey vs. Brewer decision. (A su-
preme court decision that stimulated legislation mandating due process be fol-
lowed for all parole revocations).

A Second Attempt.

In late 1976, the Office of Research published 5-year population projections in
the 1977 Corrections Master Plan.

These projections were based on the following assumptions:

1.) Unemployment will peak at 6% by calendar year 1977.

2.) Average length of stay had stabilized at 20 months.

3.) H.B. 1111 impact will not occur all at once but will be phased over
     time, up to a maximum of 492 ADA per year by 1981.

4.) Diversion will occur over time up to 10% by 1982.

These new projections were as follows:

December, 1976 Population Projections and Actual Experience

Calendar Year	Projected Commitments	Actual Commitments	Projected Incarcerated Population	Actual Incarcerated Population
1977	1376	1276	2351	2445
1978	1379	–	2469	–
1979	1387	–	2586	–
1980	1395	–	2650	–
1981	1401	–	2648	–

Actual 1977 data indicated that the Department received 1,276 new court commit-
ments and had an average incarcerated population of 2,445. Therefore, our new
court commitment projection was in error by 7.8 percent (over-projected), and
the incarcerated population projection was in error by 3.8 percent (under-pro-
jected). (See figure 3 and 4).

In retrospect, this error can be attributed to several factors associated with
the commitment and incarcerated population projection methodology.

A.) New court commitments - The key variable in the commitment model was the
future trend of the state's unemployment rate. In order to project new court
commitments, we had to estimate the future trend of Colorado's unemployment rate.

From information gathered from state and private organizations, we estimated the
state's unemployment rate to peak at 6.0 percent during 1977. Actual unemploy-
ment rate data revealed an average rate of 5.6 percent in 1977 - an error in our
estimation by .4 percent.

To test the error associated by the unemployment rate estimates used in our model,
we substituted actual unemployment rate data for the original estimates. The
model then projected 1,353 commitments. With actual data, the overall error rate
was reduced to 6.0 percent. Therefore, our unemployment rate estimates contri-
buted 1.8 percent of the overall error in the projections.

Reasons for the overall error rate of 6.0 percent in this projection methodology
(an over-estimation of commitments by 77 offenders), are difficult to pinpoint.
In a pure statistical sense, we could attribute all error to the model itself.
However, we feel that the presence of a state diversion program accounted for
part of this total error. Unfortunately, we are not certain to what degree di-
version has affected the rate of commitments and therefore are unable to quantify

the true effect of diversion.

B.) Incarcerated Population – As stated before, the incarcerated population projections for 1977 were in error by 3.8 percent. Again, we feel this error rate was not due entirely to the model itself but due to several unforseen factors affecting the system.

First, the 1976 projections were based on an estimated aggregate length of stay of 20 months. In fact, it was closer to 24 months. The additional 4 month length of stay, coupled with the actual lower rate of commitments, acted as counter effects on the actual population.

Second, the commitment projection error associated with the rate of diversion was apparently counter-balanced by an increased number of shock probation releases. Overall, probation releases increased from 74 in 1976 to 114 in 1977.

Finally, it is felt that the effects of H.B. 1111 occurred faster than originally estimated in the 1977 corrections plan.

First Update

In February, 1978, a population projection update was published in Corrections Five Year Plan. The projections were based on the following assumptions:

1.) H.B. 1589 was vetoed.

2.) Colorado's unemployment rate would drop to 5.4 percent by 1978-79.

3.) The average length of stay had stabilized at 24 months.

4.) No new legislation would be passed which would significantly effect sentencing or length of stay.

5.) No change in the diversion rate would occur over the next five years.

February, 1978 Population Projections

Calendar Year	Commitments	Incarcerated Population
1978	1320	2536
1979	1323	2585
1980	1331	2648
1981	1345	2667
1982	1359	2694

Inspection of the actual data compiled during the first nine months of 1978 would indicate the commitment and population projections for 1978 will be relatively accurate. (See figure 5 and 6). However, the accuracy of the long range population projection is suspect due to some recent research findings.

A study funded by NIC (National Institute of Corrections) and coordinated through the Office of Reserrch this summer documented aggregate lengths of stay for offenders received over a five year period, 1973-1977. This study revealed a projected 26.2 month aggregate length of stay for offenders received in the third quarter of 1977. This figure is 2.2 months higher than the 24 month estimate used to project incarcerated population in the five year plan.

In addition, a recent publication by the Department of Labor and Employment (Colorado Marpower Review, April-1978) estimated that between Octover, 1978, and September, 1979, Colorado's unemployment rate will average 6.0 percent.

Second Update

In light of these new findings, an update to our population projections seems necessary. These new population projections are based on the following assumptions:

1.) H.B. 1589 has been vetoed.

2.) Colorado's unemployment rate will rise to 6.0% by 1979-80.

3.) The average length of stay has stabilized at 26.2 months.

4.) No new legislation will be passed which would significantly effect sentencing or length of stay.

5.) No change in the diversion rate will occur over the next five years.

September, 1978 Population Projections

Year	Commitments	Population
1978	1265	2491
1979	1318	2679
1980	1350	2867
1981	1350	2936
1982	1354	2950

These projections are used in the FY 1979-80 budget request and are the most recent projections available, based on the above mentioned assumptions. (See figure 7 and 8).

CONCLUSION

The Office of Research continually monitors the assumptions underlying its most recent projections. As we have shown, a significant change in any assumption can produce errors that make both short-term and long-term projection accuracy difficult to achieve.

In future months, we will attempt to quantify the rate of diversion that is effecting the new commitment projections. With this variable quantified, along with a reliable unemployment rate estimate, we feel that commitment projections can achieve greater accuracy than in the past.

Incarcerated population projections are more difficult to monitor. This part of the projection model is most affected by unforseen factors, such as parole policy, legislation, and offender length of sentence.

The main factor that will certainly affect future incarcerated population projections is the outcome of Colorado's new sentencing legislation. As that bill becomes law, we will analyze its effects upon the incarcerated population and update projections appropriately.

Commitment Projections and Actual Experience

February, 1976

_____ Actual
_ _ _ _ Projected

Figure 1

Projected Incarcerated Population and Actual Experience

February, 1976

——————— Actual
— — — — Projected

Figure 2

Commitment Projections and Actual Experience

December, 1976

Figure 3

Projected Incarcerated Population and Actual Experience

December, 1976

_____ Actual
_ _ _ _ Projected

Figure 4

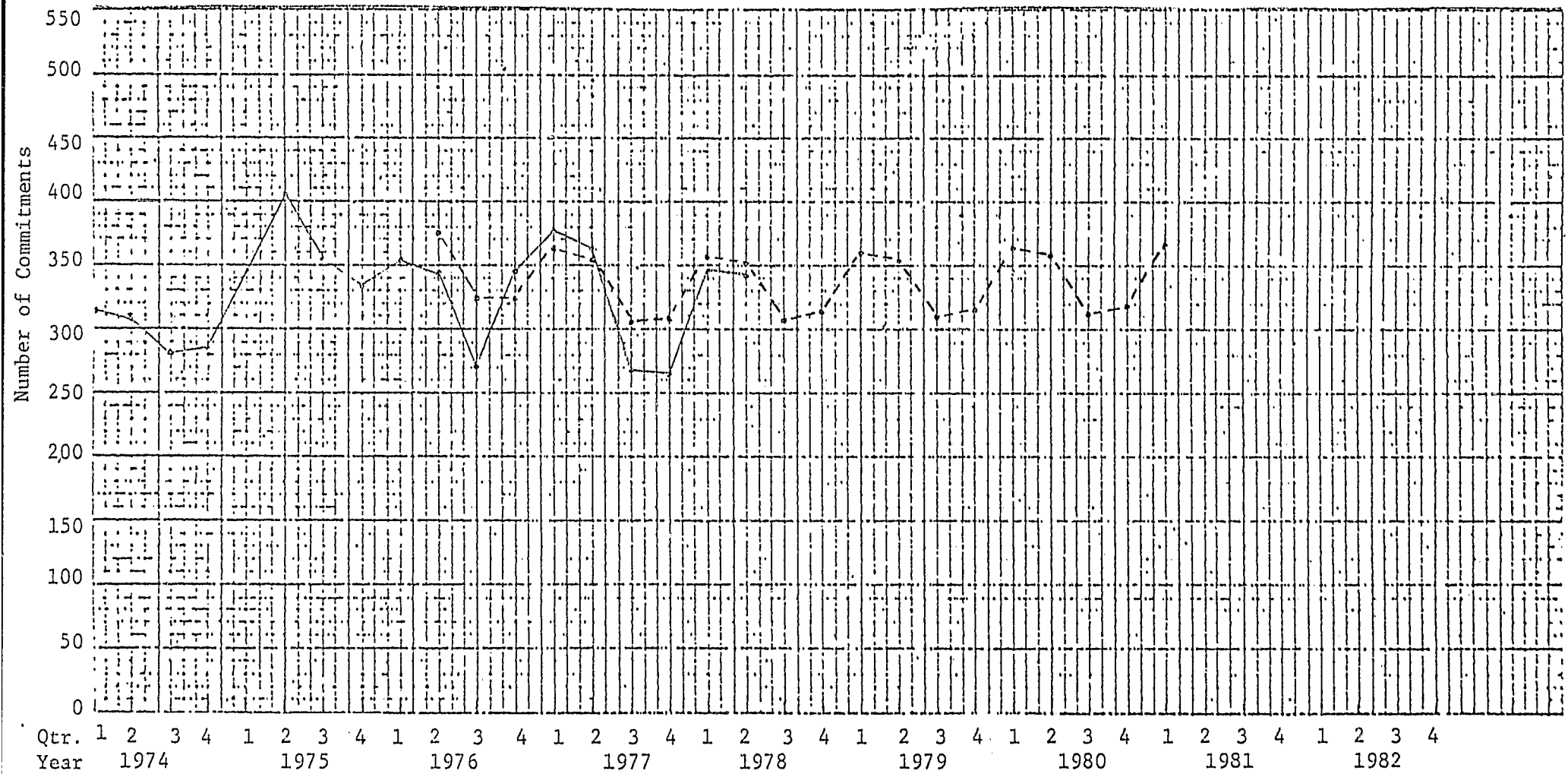# Commitment Projections and Actual Experience

February, 1978

——— Actual
– – – – Projected

Figure 5

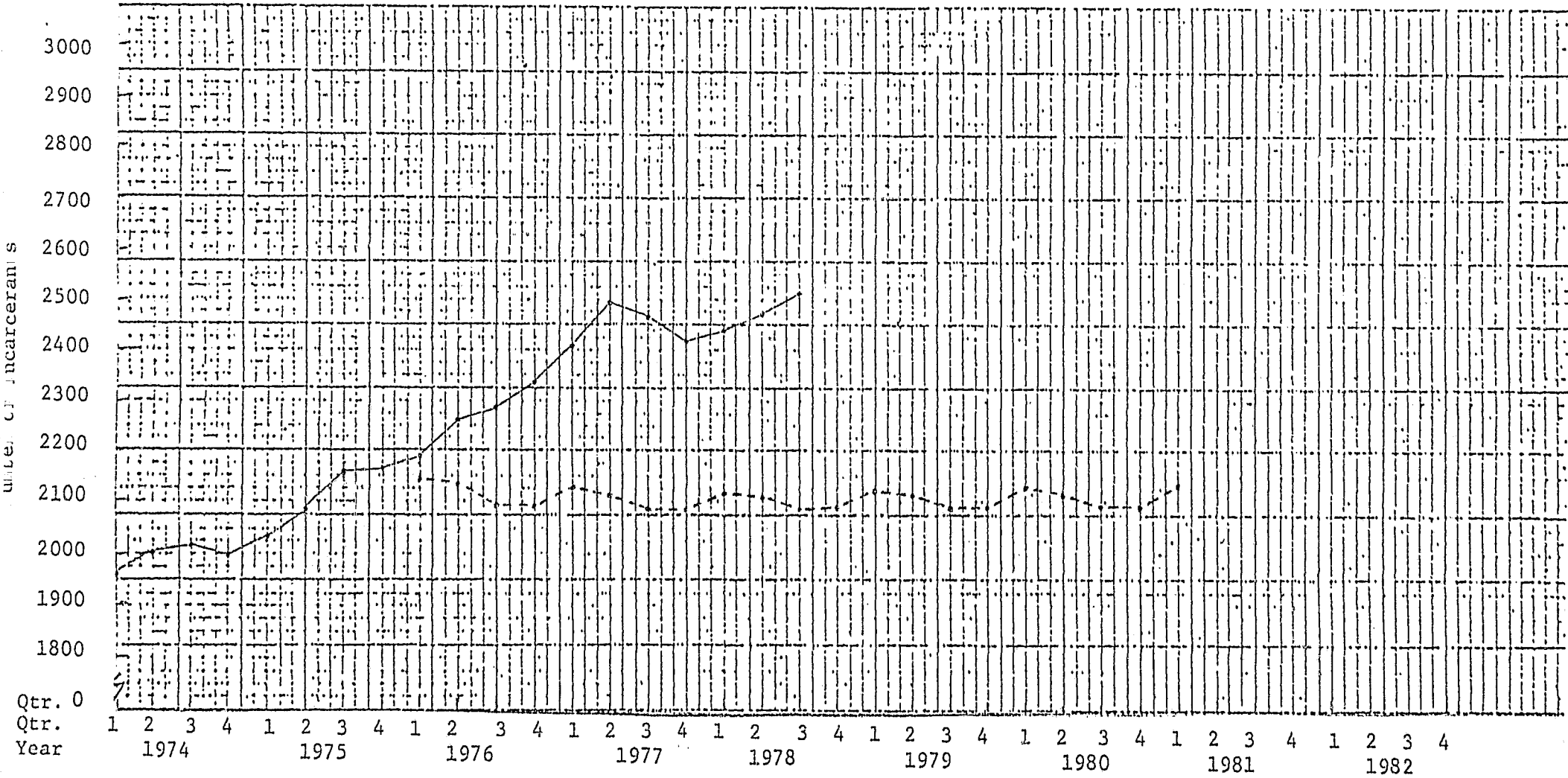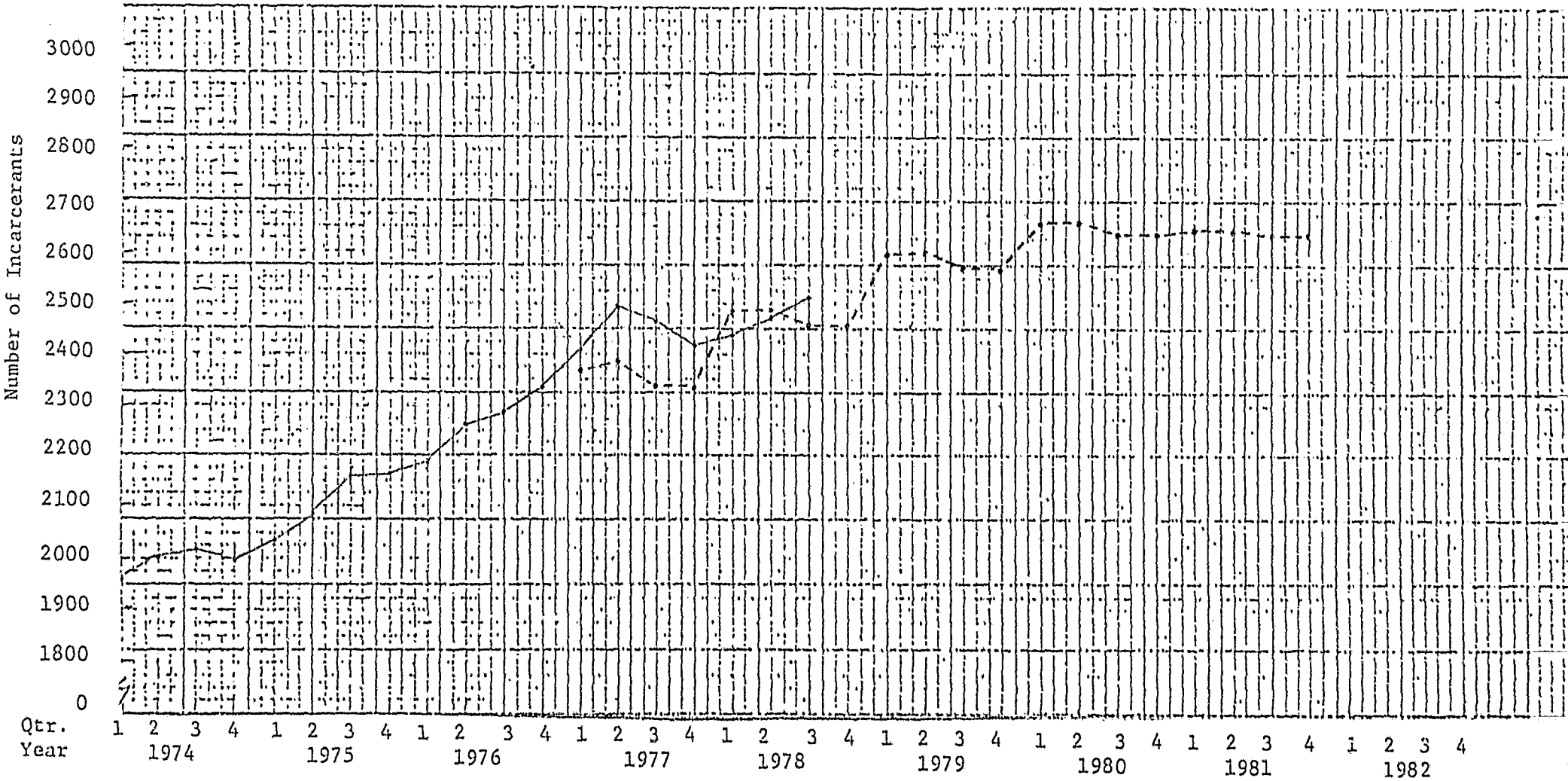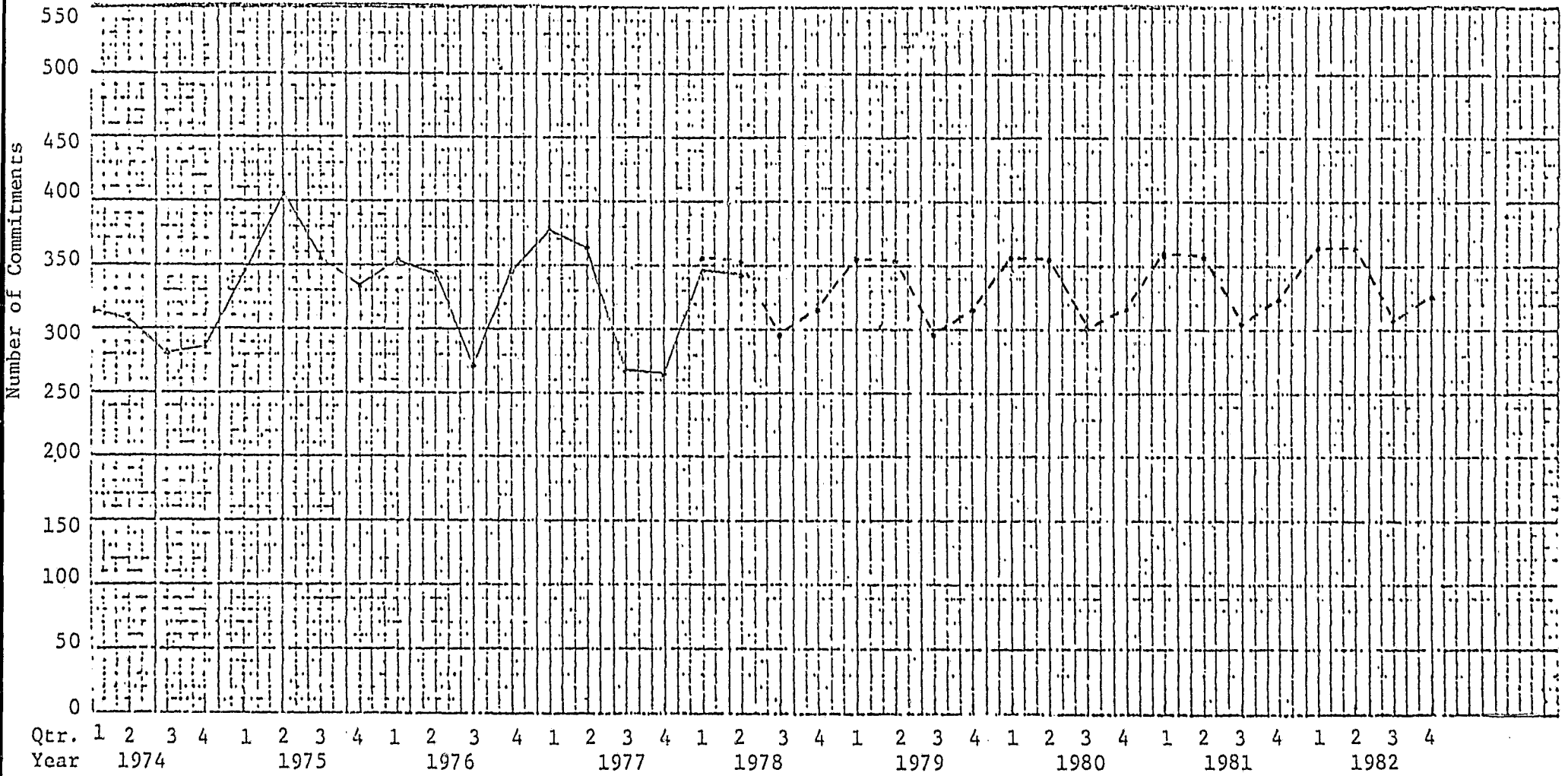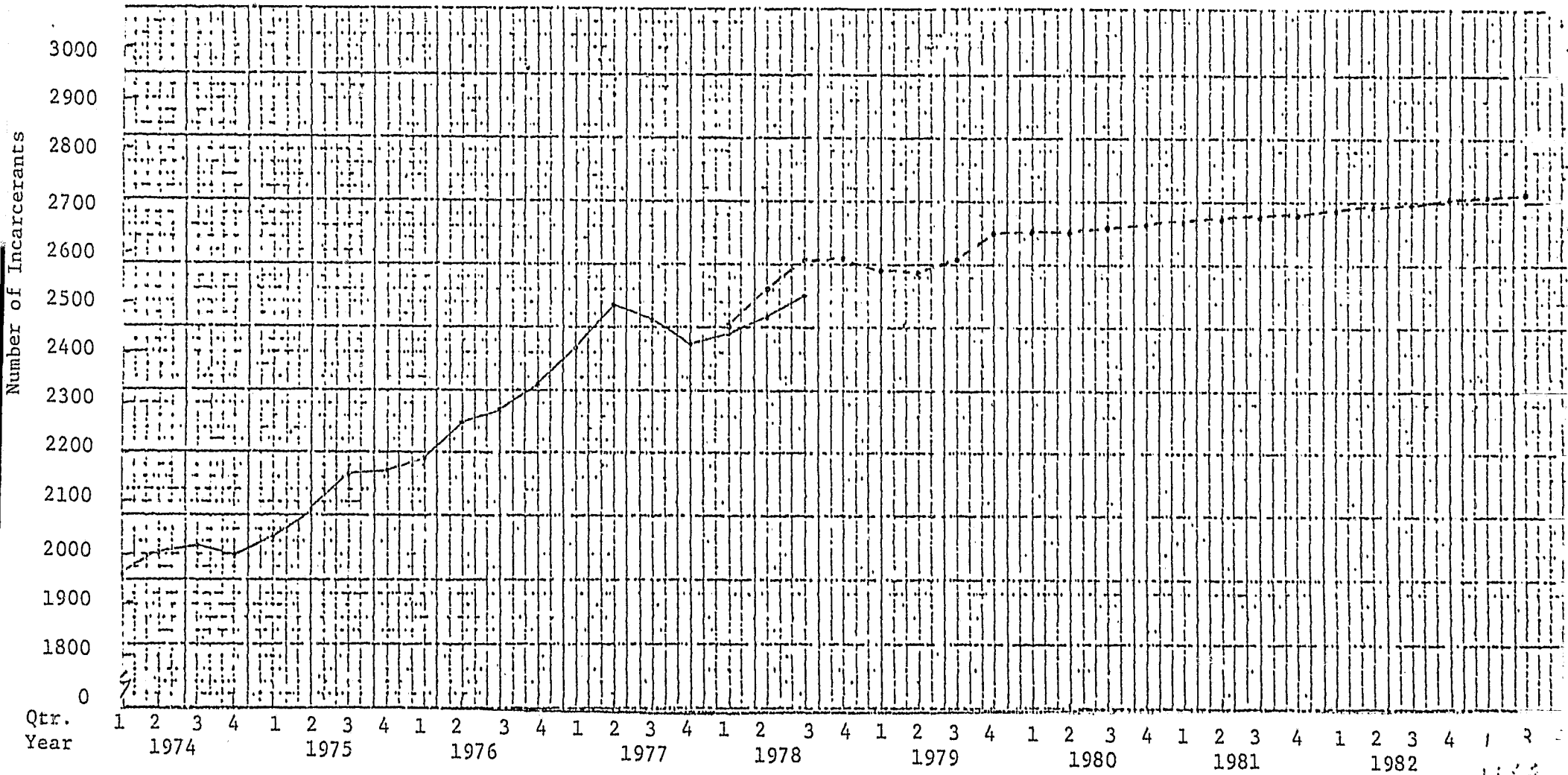# Projected Incarcerated Population and Actual Experience

February, 1978

Figure 6

Commitment Projections and Actual Experience

September, 1978
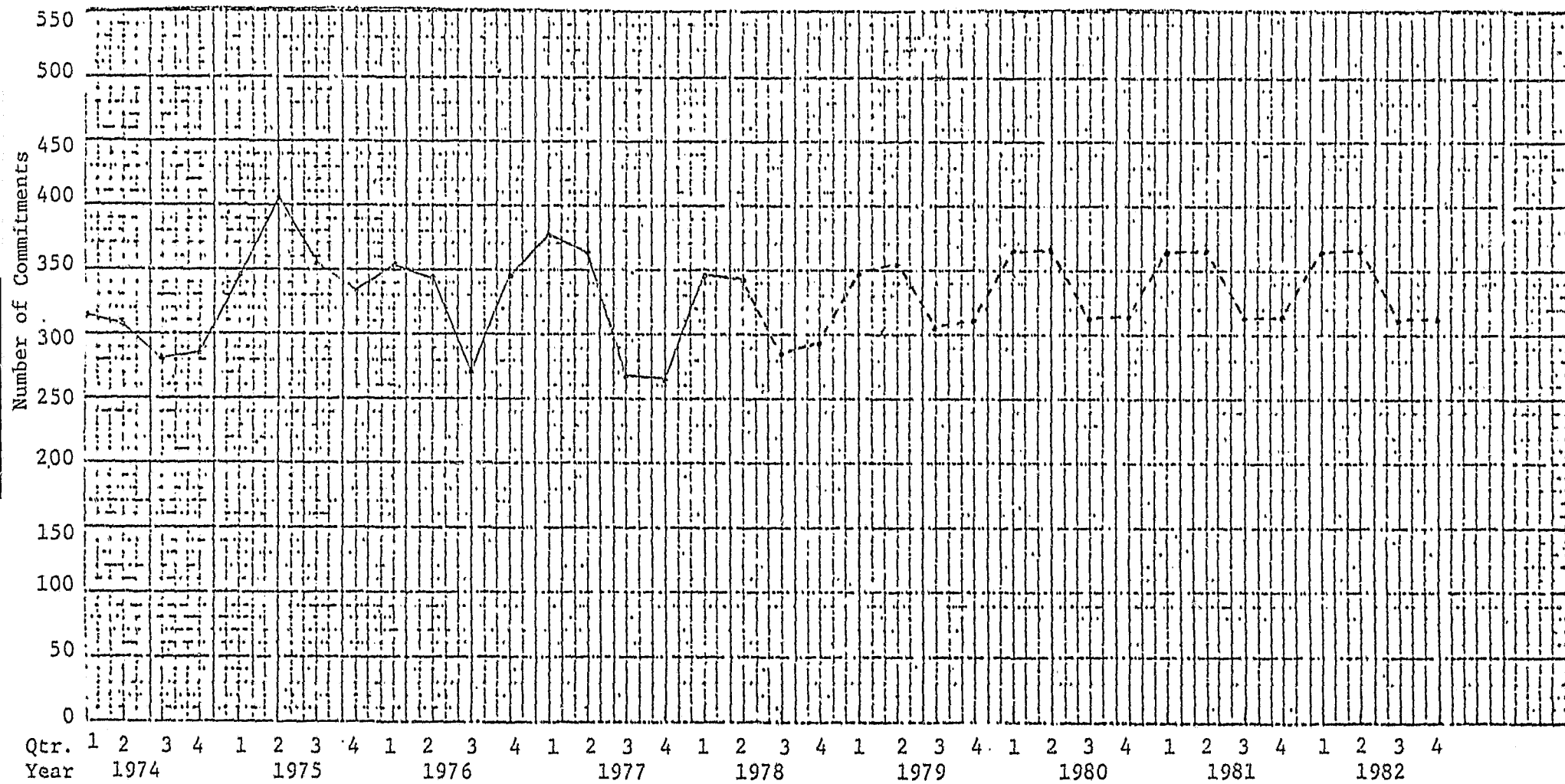

Figure 7

Projected Incarcerated Population and Actual Experience

September, 1978
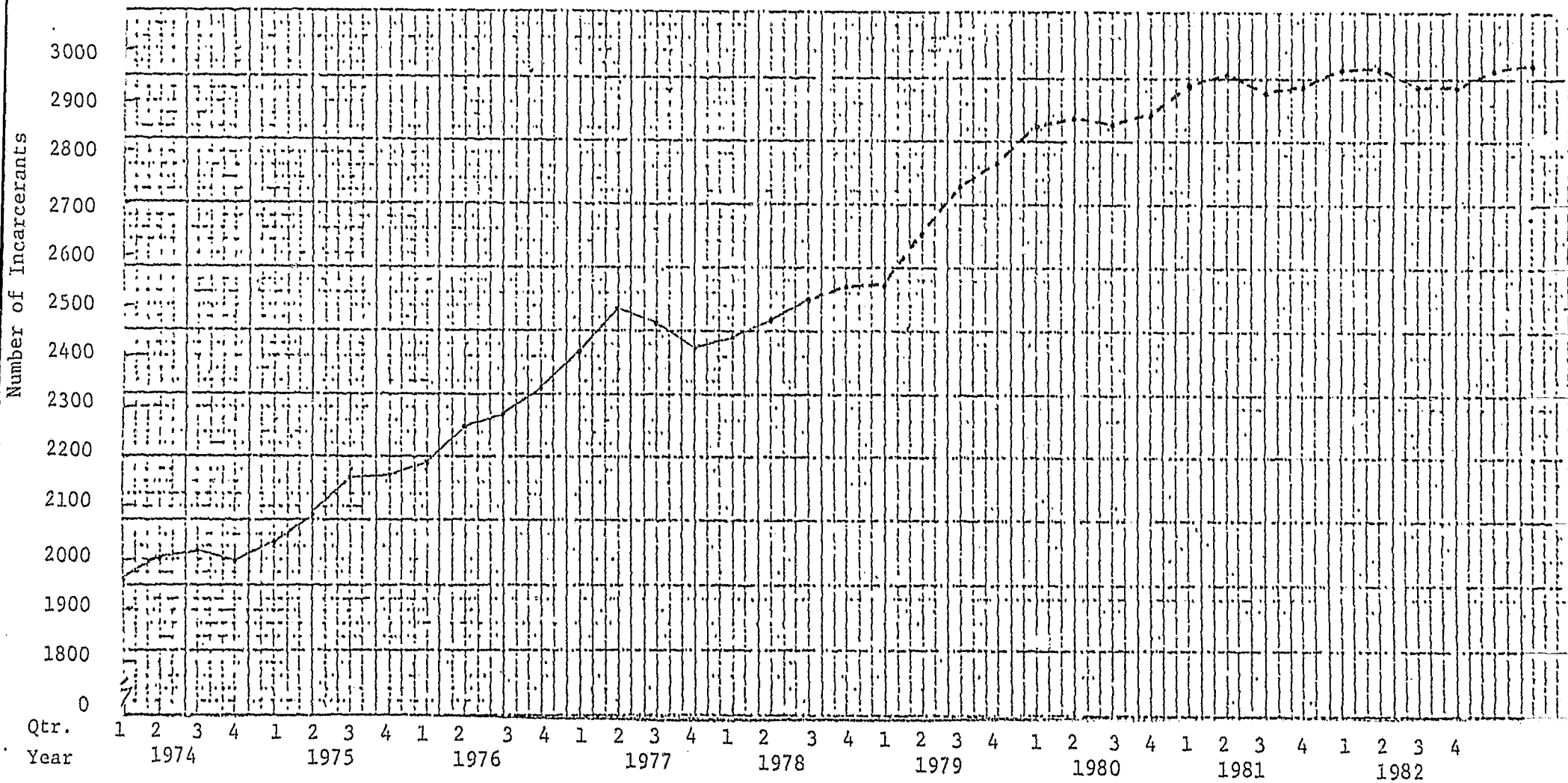
Figure 8

Population Projections Data

Year	Qtr.	2/76 Projections	12/76 Projections	2/78 Projections	9/78 Projections	Actual
1974	1					1961
	2					2000
	3					2017
	4					1999
1975	1					2033
	2					2109
	3					2153
	4					2160
1976	1	2140	–	–	–	2184
	2	2134	–	–	–	2267
	3	2097	–	–	–	2280
	4	2098	–	–	–	2308
1977	1	2126	2346	–	–	2404
	2	2119	2382	–	–	2495
	3	2087	2338	–	–	2464
	4	2089	2336	–	–	2419
1978	1	2122	2485	2453	–	2438
	2	2118	2483	2525	–	2474
	3	2087	2454	2580	2511	2512
	4	2091	2453	2584	2541	
1979	1	2125	2601	2560	2549	
	2	2120	2600	2553	2649	
	3	2089	2572	2584	2738	
	4	2093	2571	2641	2778	
1980	1	2127	2665	2643	2854	
	2	2122	2664	2646	2873	
	3	2092	2636	2650	2858	
	4	2096	2635	2654	2881	
1981	1	2130	2662	2659	2939	
	2	–	2661	2664	2953	
	3	–	2634	2670	2923	
	4	–	2633	2676	2927	
1982	1	–	–	2683	2968	
	2	–	–	2690	2969	
	3	–	–	2697	2931	
	4	–	–	2704	2932	
1983	1	–	–	2711	2973	
	2	–	–	2718	2975	
	3	–	–	–	–	
	4	–	–	–	–	

Commitment Projection Data

Year	Qtr.	2/76 Projections	12/76 Projections	2/78 Projections	9/78 Projections	Actual
1974	1					311
	2					309
	3					281
	4					286
1975	1					346
	2					404
	3					355
	4					334
1976	1	—				353
	2	374	—	—	—	343
	3	322	—	—	—	270
	4	322	—	—	—	345
1977	1	362	368	—	—	379
	2	353	367	—	—	361
	3	306	321	—	—	269
	4	309	320	—	—	267
1978	1	357	368	357	--	347
	2	351	367	352	—	341
	3	307	322	296	286	
	4	313	322	315	291	
1979	1	360	370	355	349	
	2	354	369	353	354	
	3	310	324	298	305	
	4	316	324	317	310	
1980	1	364	372	357	364	
	2	357	372	355	364	
	3	313	326	300	311	
	4	320	326	319	311	
1981	1	368	375	360	364	
	2		374	358	364	
	3		329	304	311	
	4		329	323	311	
1982	1			364	365	
	2			362	365	
	3			307	312	
	4			326	312	