New Mexico
Sentencing Commission

New Mexico Sentencing Commission Staff June 2010

NEW MEXICO PRISON POPULATION FORECAST: *FY 2011—FY 2020*

Table of Contents

INTRODUCTION

This is the first prison population forecast prepared by the New Mexico Sentencing Commission (NMSC). This report is designed to assist the New Mexico Corrections Department (NMCD) in assessing the immediate and future resident population of the NMCD. Pursuant to its contract with the NMCD, New Mexico Sentencing Commission staff meets quarterly with NMCD staff to review population trends and will prepare a final report, due by June 30, 2010, covering ten-year inmate population projections (FY 2011-2020).

The NMSC is providing a population forecast using methods similar to those used by JFA Associates. This report does not incorporate data sources different from those used by JFA, but we have made efforts to improve the quality of the data used for the analysis.

Forecasting is not an attempt to predict the future prison population in New Mexico. Rather, forecasting provides the NMCD with data regarding future prison populations based on current policies and procedures. When those policies and procedures are changed, or when external factors change (i.e. numbers of arrests, amendments to sentencing laws, number of felony charges filed in district courts) projections of prison populations may also change. The ensuing report details the literature and evolution of prison population forecasting in the U.S., explains the method we used for this report, and provides a forecast.

The NMSC's Sentencing Reform Sub-committee may assist our forecasting efforts in the future by meeting with NMSC staff and providing routine communications regarding changes in policies and practices in the criminal justice system.

NEW MEXICO OUTLOOK

The US Department of Justice shows the national incarceration rate has increased steadily. Between 1980 and 2000, the national rate averaged 7% annual growth but since 2001 the national rate has averaged 2% annual growth.

During 2007, the prison population declined in 8 states, including New Mexico. In 2008, the U.S. prison population grew at the slowest rate (0.8%) since 2000, reaching 1,610,446 prisoners at yearend 2008 (Sabol, West, Cooper, 2010).

The total NM inmate population on June 30, 2006 reached a high of 6,803 and by May 2008 the population dipped to 6,361. This represented a 6.6% drop in the prison population over a two-year period. At the request of the New Mexico Legislative Finance Committee, NMSC prepared a paper to explain possible reasons for the downturn in the prison population between 2006 and 2008 (NMSC, 2008). JFA attributed the decline to two factors: more non-violent and drug offenders were being released than being admitted into prison, and violent offenders were being admitted and released at the same rate. NMSC looked at five additional factors which together may have affected the New Mexico prison population reduction: diversion for technical violators, parole in the community, the first 60 -days earned meritorious deduction (EMD) law, felony drug courts, and jail populations.

Explaining Incarceration Change

In 2009, the Pew Center on the States reported that for the first time, more than 1 in every 100 adults in the United States was confined behind bars. This year the Pew Center is reporting that the number of people on probation or parole has skyrocketed to more than 5 million. This means that 1 in 45 adults in the United States are being supervised in the community by the criminal justice system. Combined with those in prison and jail, 1 in every 31 adults, or 3.2 percent of the population, is under some form of correctional control. The Pew Center pronounced that the growth in prison populations and community supervision is the result of state policy choices that sent more people to prison and kept them there longer. Other researchers ascribe rising prisoner populations to more than a single cause.

According to William Spelman (2009) the prison boom of the last 30 years has a remarkably simple explanation: ". . .persistently increasing crime rates, sentencing policies that put more offenders behind bars and kept them there longer, and sufficient state revenues to pay for it all." Spelman acknowledges the Pew Center's finding and adds the impact of healthy state coffers on the change in prison populations.

Table 1 provides a list of factors that may affect prison population forecasts.

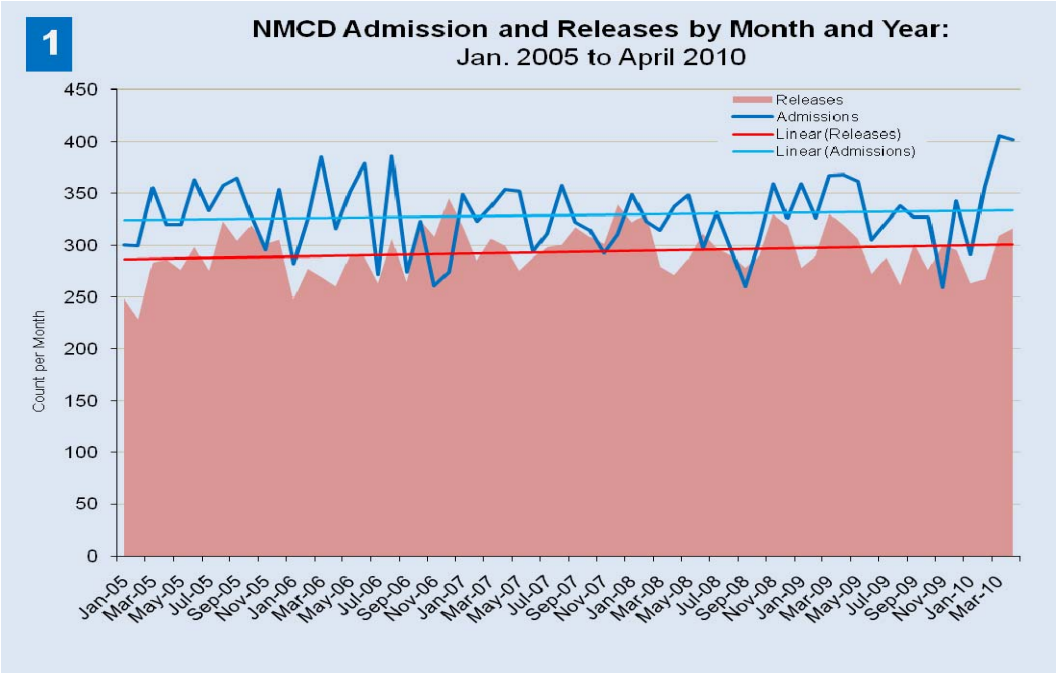
Table 1 Examples of Factors that May Affect the Forecast

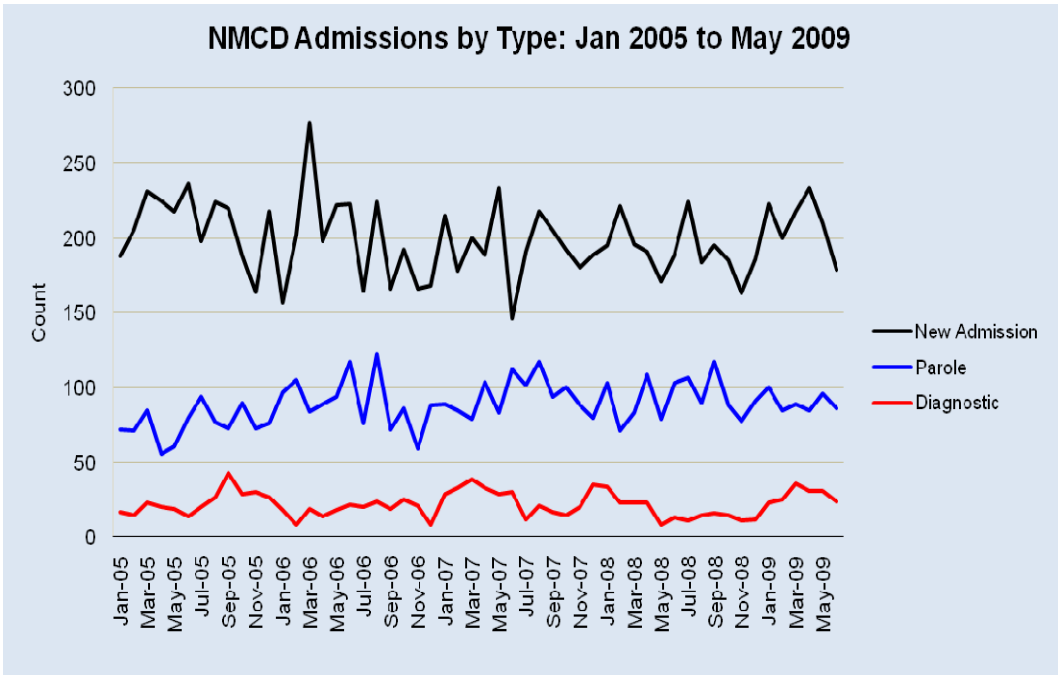
- Demographic trends ("crime-prone age group")
- Economic trends
- Crime trends
- Policing and Arrest Trends
- Court case filings and trends (i.e. case processing time)
- Probation and parole violators
- Sentencing practices
- Changes in lengths of stay in prison
- Legislative or other policy changes (i.e. increased parole terms for sex offenders)

ADMISSIONS AND RELEASES

Chart 1 shows the progression of Admissions and Releases from January 2005 to April 2010. The red area represents Releases, the dark blue line shows Admissions. Both Admissions and Releases are on a slight upward trend. Admissions spiked during 2006 and recently in 2010 they have increased beyond 400 per month. Releases for the same period (2005 to 2010) were at their lowest in February 2005. By August 2007 Releases had gradually trended to 300 per month.

The bottom chart shows the composition of Admissions. New Admissions contribute the most to the total number of Admissions and Parole continues to be the second highest Admission type.

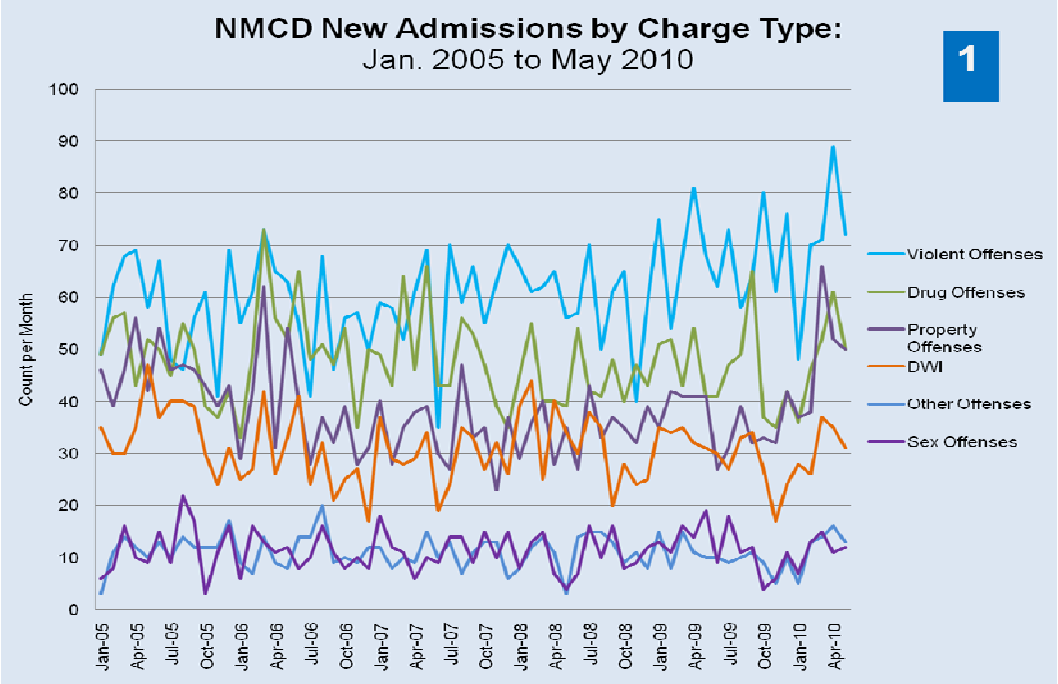


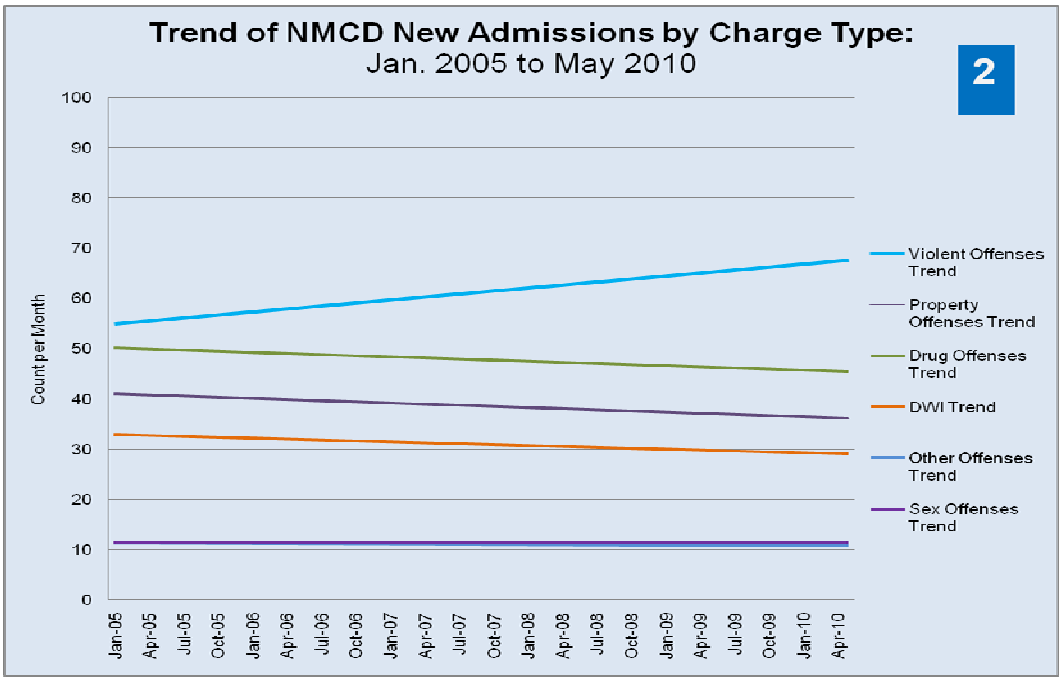


A FOCUS ON NEW ADMISSIONS

A detailed view of New Admissions shows a possible reason for the recent population increase. Chart 1 shows New Admissions from January 2005 to May 2010 by charge type. Violent Offenses account for the largest number of admissions per month. Chart 2 shows the impact Violent Offenses have on New Admissions. Not only are Violent Offenses contributing the most admissions each month to the population, Violent Offenses are the only charge type trending upwards.

On page 5 we examine these trends with Serious Violent Offenses (SVO) separated out from all the charge types.

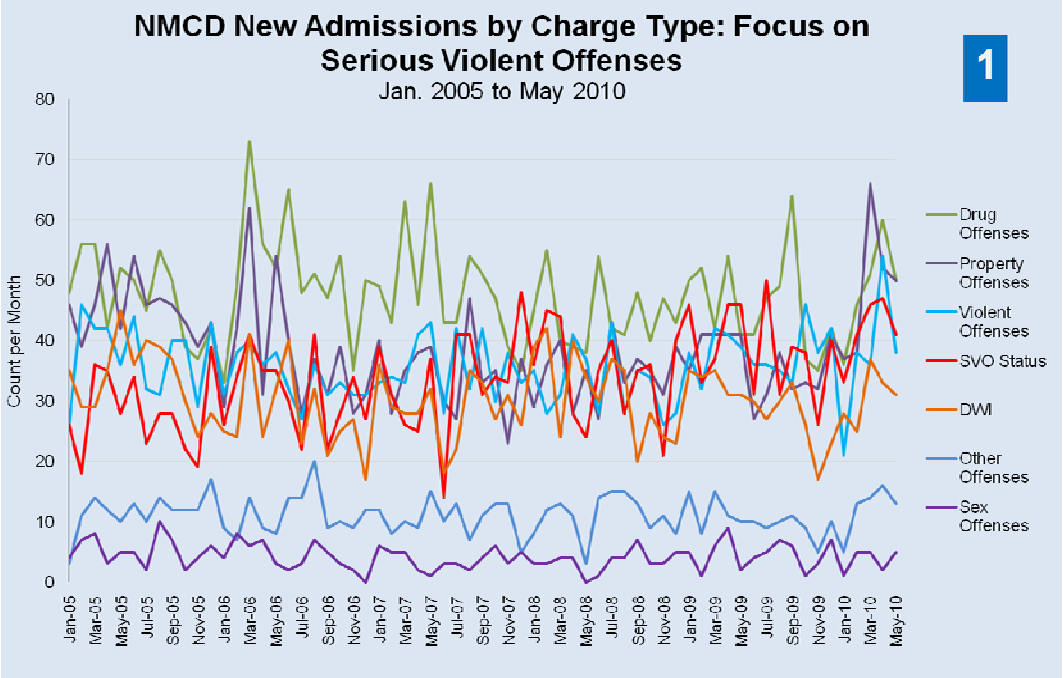


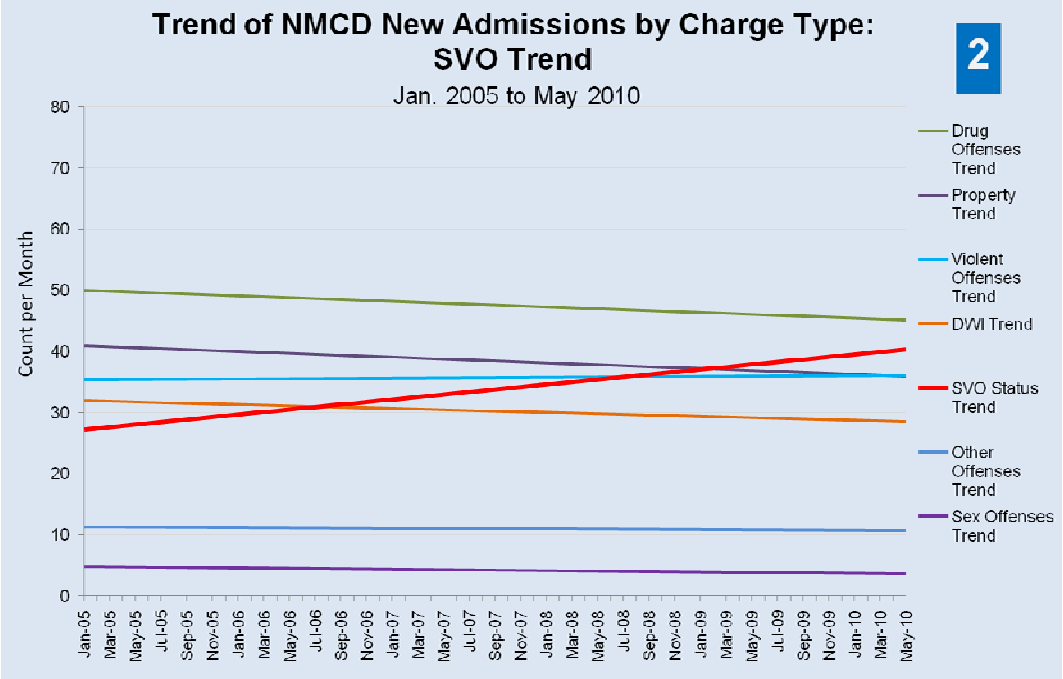


SERIOUS VIOLENT ADMISSIONS

Chart 1 shows New Admissions by Charge Type with SVO separated out from all charge types. In Chart 2 we have erased the monthly counts and left the trend lines for each of the Charge Types. This shows that SVO's are a factor in the increase of Violent Offense admissions.

In addition to the upward trend in SVO cases, Serious Violent Offenders must serve 85% of their sentence. SVO's are increasing at a faster rate than other new admission charge types and staying longer in prison. These factors may explain the recent increase in the prison population.





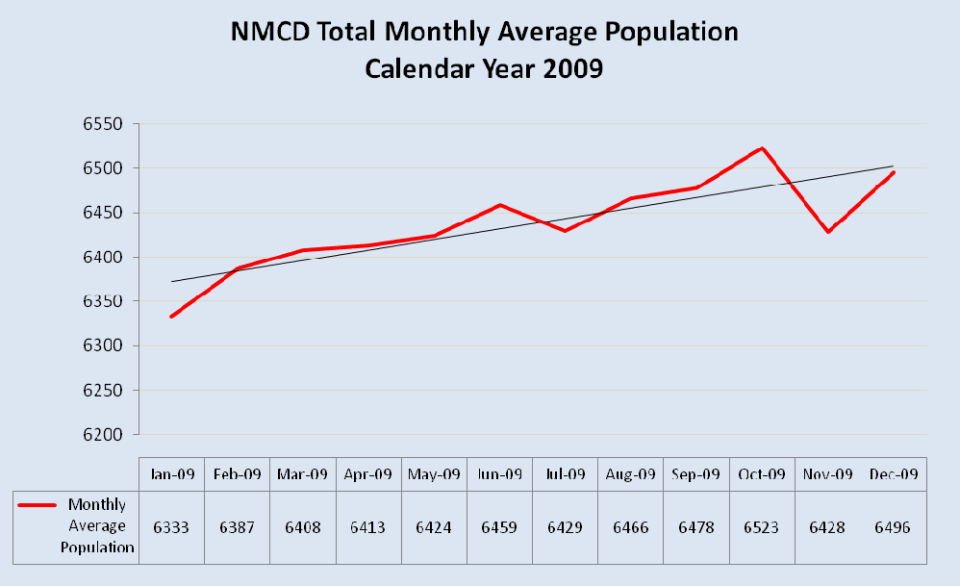
FY 2009 Admission Group	N	%
Males	**3,441**	**87.6%**
Murder	3	0.1%
Assault and Battery	158	4.0%
Sex	51	1.3%
Robbery	86	2.2%
Other Violent Crimes	111	2.8%
Drug Distribution	269	6.9%
Drug Possession	192	4.9%
Burglary	185	4.7%
Theft/Fraud	181	4.6%
Other Non-violent	123	3.1%
DWI	345	8.8%
Parole Violator (Total - SVO)	790	20.1%
Violent	216	5.5%
Drug	214	5.5%
Property	189	4.8%
DWI	119	3.0%
Other Non-violent	52	1.3%
Diagnostic	179	4.6%
Parole Violator - Serious Violent	141	3.6%
Serious Violent - Murder	62	1.6%
Serious Violent – Assault and Battery	159	4.0%
Serious Violent - Sex	98	2.5%
Serious Violent - Robbery	54	1.4%
Serious Violent - Other	57	1.5%
Other (Other, Probation, Sanctioned Parole)	136	3.5%
Female	**485**	**12.4%**
Parole Violator (Total - SVO)	172	4.4%
Violent	27	0.7%
Drug	67	1.7%
Property	59	1.5%
DWI	10	0.3%
Other Non-violent	9	0.2%
Diagnostic	47	1.2%
Violent	48	1.2%
Drug	80	2.0%
DWI	18	0.5%
Non-violent (Property)	95	2.4%
Serious Violent	9	0.2%
Parole Violator - Serious Violent	10	0.3%
Other (Other, Probation, Sanctioned Parole)	9	0.2%
Total	**3,926**	**100.00%**

AVERAGE MONTHLY POPULATION TOTAL AND BY GENDER

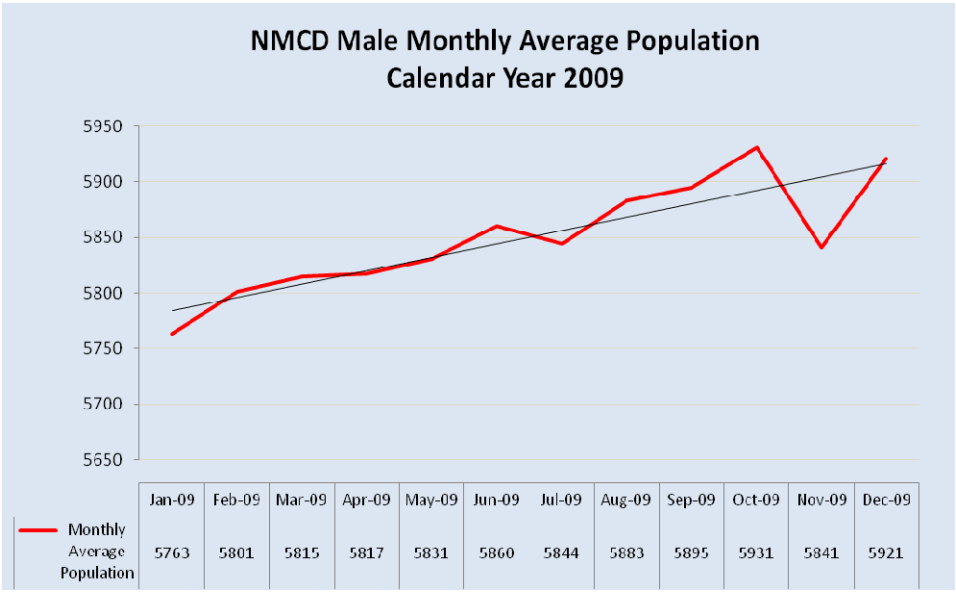
The total monthly average population for Calendar Year 2009 increased from 6,333 in January 2009 to 6,496 in December. The highest monthly population occurred in October (6,523). The highest month was followed by the sharpest decrease for the year in November (1.5%).

The average monthly male population rose from 5,763 in January to 5,921 in December. The October-November change in the total population is reflected in the male monthly average.

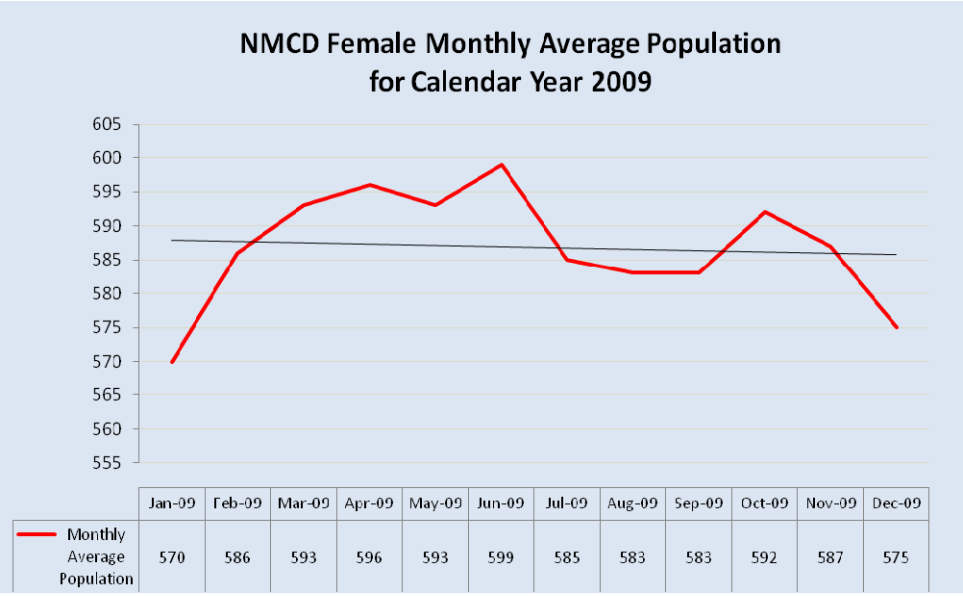
The female monthly average population for 2009 began at a low of 570 in January. The average climbed to a high for the year in June (599) but was down to 575 by December.



	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Monthly Average Population	6333	6387	6408	6413	6424	6459	6429	6466	6478	6523	6428	6496



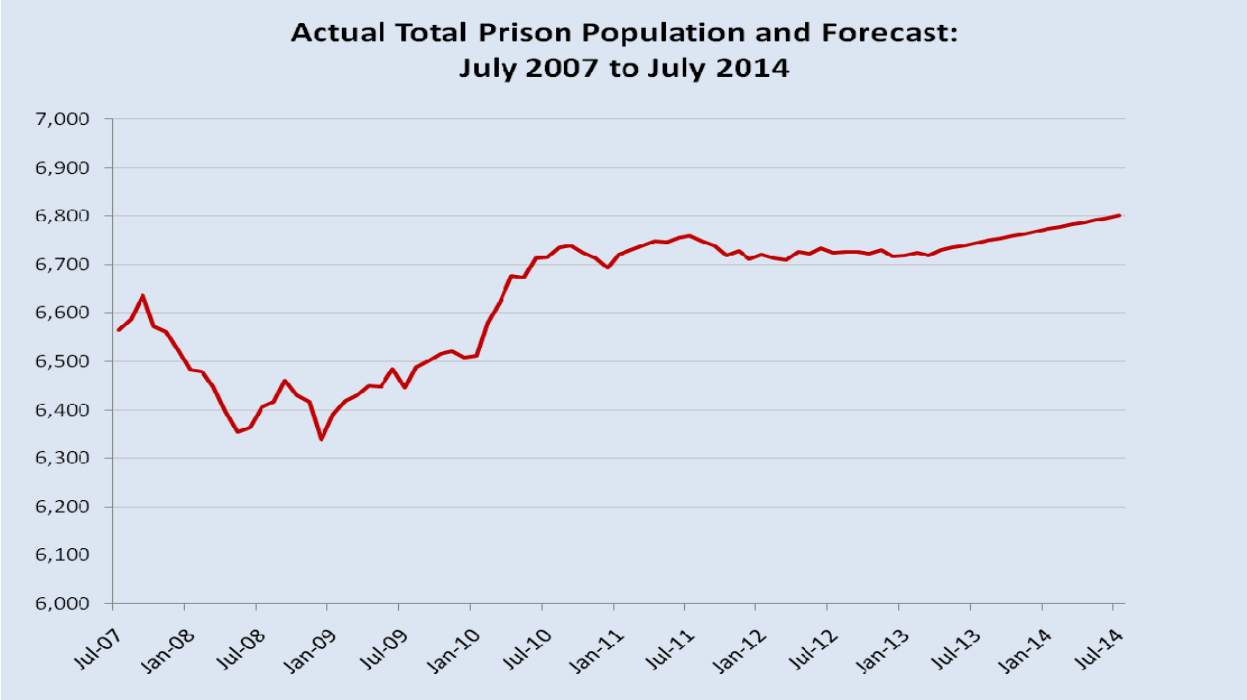
	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Monthly Average Population	5763	5801	5815	5817	5831	5860	5844	5883	5895	5931	5841	5921


NMCD Female Monthly Average Population
for Calendar Year 2009
605
600
595
590
585
580
575
570
565
560
555
Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09
Monthly Average Population
570 586 593 596 593 599 585 583 583 592 587 575

FINDINGS

The primary finding from this analysis is that the prison population forecast remains on average, relatively constant. There are fluctuations and periods of increase and decrease, both for the total population and male and female sub-populations. This can give rise to the idea that populations have risen or fallen over certain time periods. The more pertinent figure here is the average value over time. As can be seen in the chart below the average value is relatively constant.

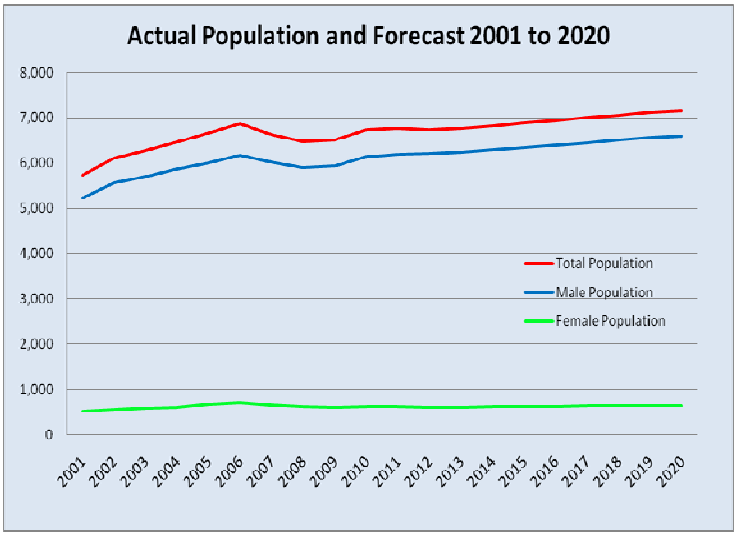
Female populations are particularly hard to forecast, because of the fluctuation in population relative to the absolute size of the population. While the male population changes as much as the female population, it's absolute size means that the percent fluctuations are much smaller. This makes predictions in the female model less accurate.



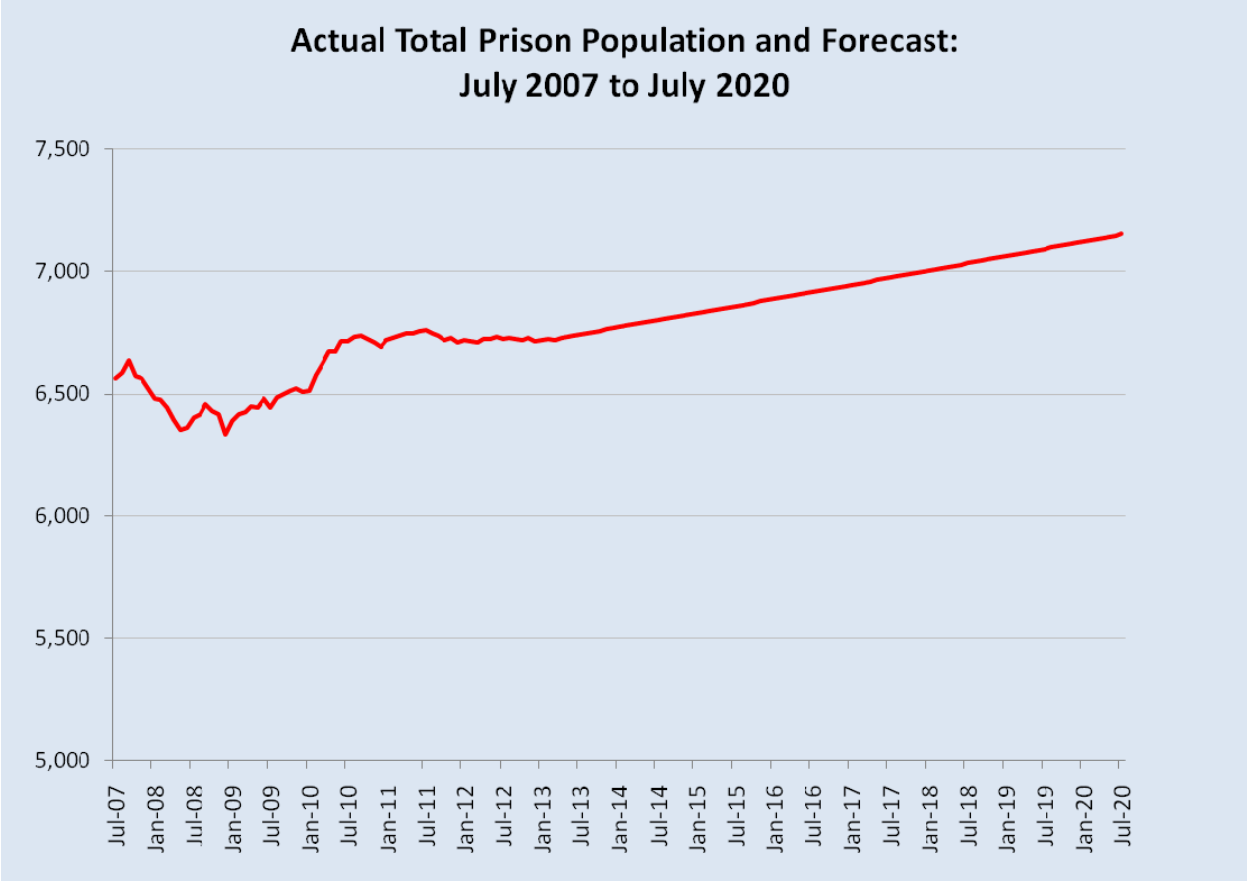
FORECAST FINDINGS

It should be noted that while the total prison population does vary over time, there is little fluctuation in the average population, trending to slight gains over long periods of time. This is most clearly illustrated in the chart, "*Actual Population and Forecast 2001 to 2020"*, with yearly totals present in the overall population.

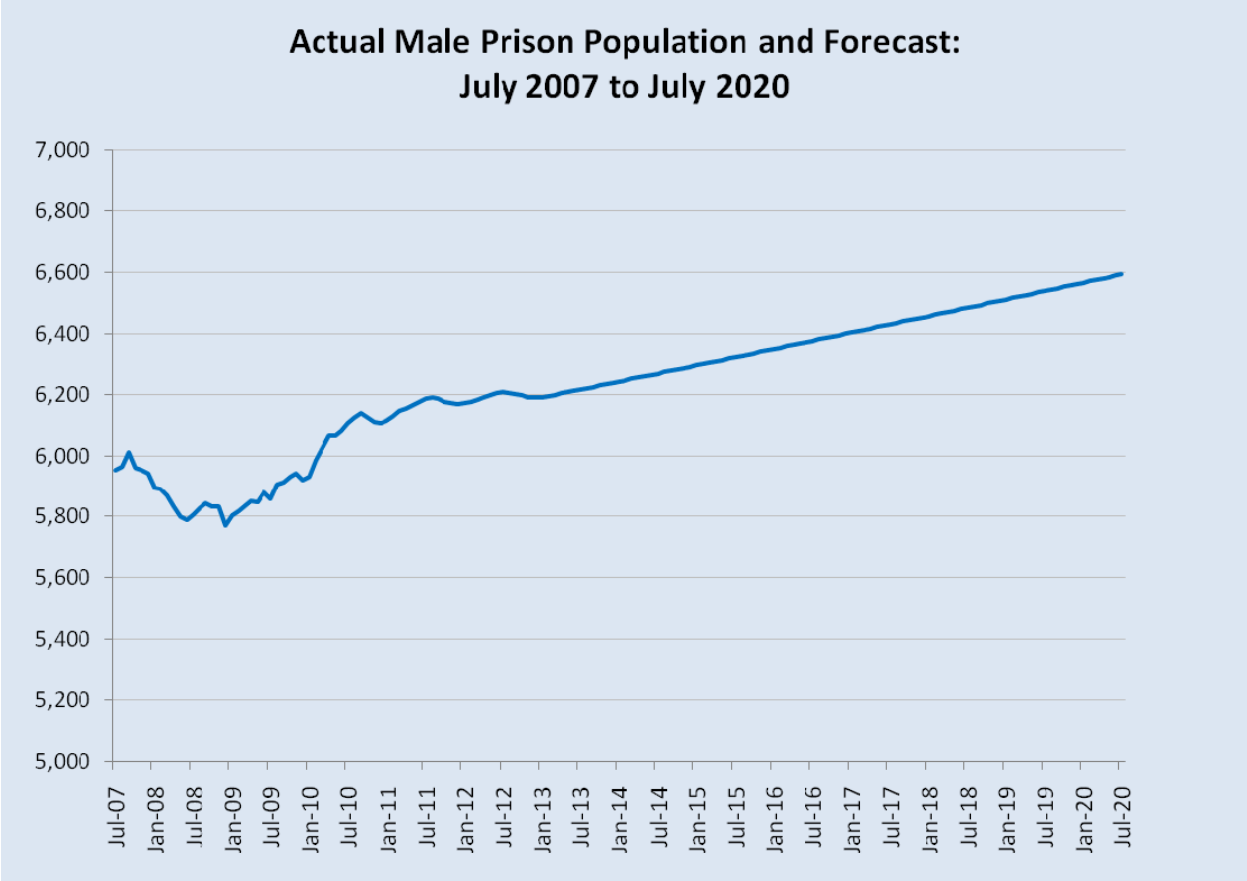
Our forecast begins to show little change in the far future. This is primarily because while the population increased in the past it has slowed recently and our model is biased towards more recent data, indicating that the best estimate is neither a decline or an incline but to remain relatively constant.



Actual Yearly Populations and Forecast to 2020						
Year	Total Population	Male Population	Female Population	Change in Total Population	Change in Male Population	Change in Female Population
2001	5,729	5,219	517			
2002	6,107	5,570	554	6.60%	6.73%	7.16%
2003	6,273	5,699	586	2.72%	2.32%	5.78%
2004	6,462	5,875	600	3.01%	3.09%	2.39%
2005	6,667	6,010	674	3.17%	2.30%	12.33%
2006	6,873	6,174	713	3.09%	2.73%	5.79%
2007	6,636	6,012	656	-3.45%	-2.62%	-7.99%
2008	6,482	5,895	619	-2.32%	-1.95%	-5.64%
2009	6,521	5,941	606	0.60%	0.78%	-2.10%
2010	6,740	6,141	614	3.36%	3.37%	1.32%
2011	6,760	6,192	615	0.30%	0.83%	0.16%
2012	6,733	6,209	611	-0.40%	0.27%	-0.65%
2013	6,768	6,239	609	0.52%	0.48%	-0.33%
2014	6,825	6,292	614	0.84%	0.85%	0.82%
2015	6,883	6,345	620	0.85%	0.84%	0.98%
2016	6,941	6,399	625	0.84%	0.85%	0.81%
2017	6,999	6,453	630	0.84%	0.84%	0.80%
2018	7,058	6,507	635	0.84%	0.84%	0.79%
2019	7,118	6,562	641	0.85%	0.85%	0.94%
2020	7,153	6,594	644	0.48%	0.49%	0.47%

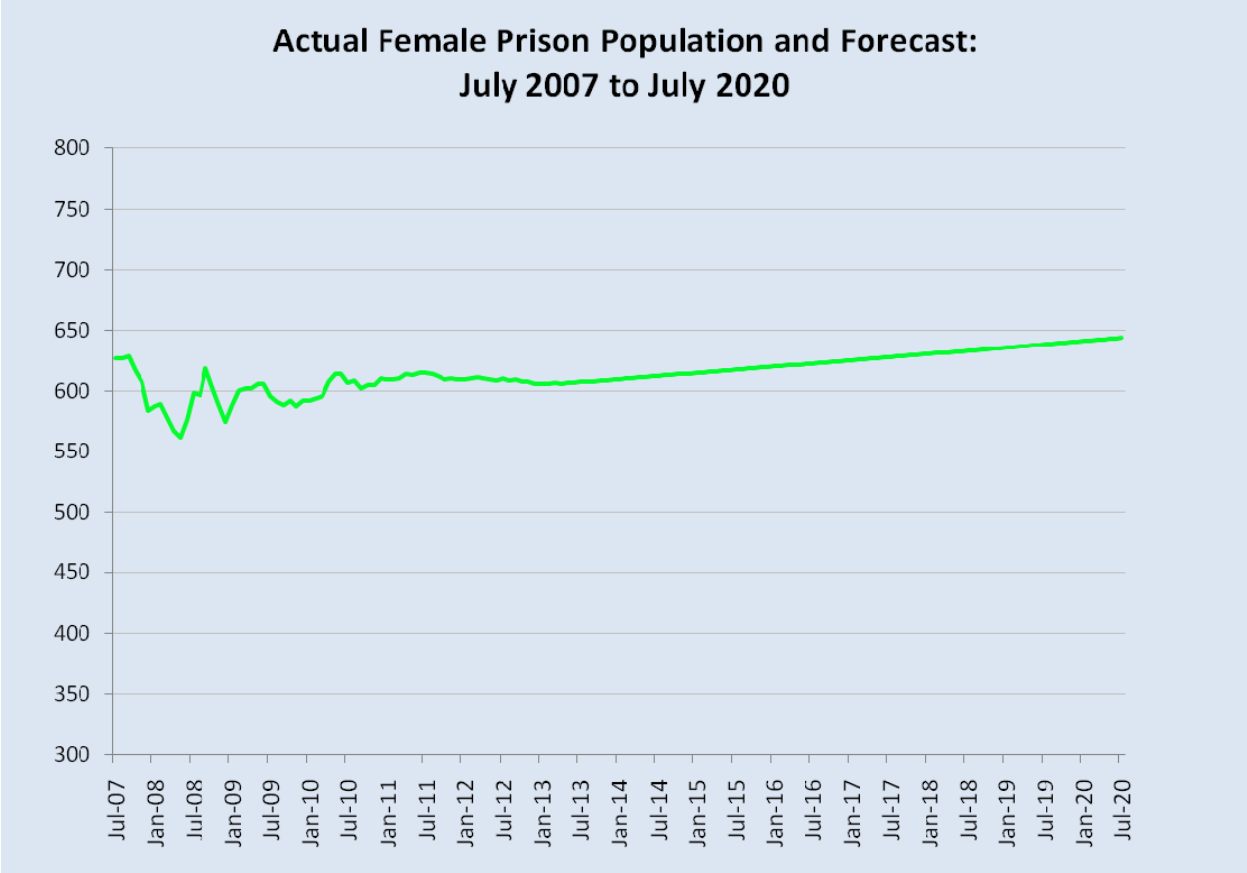


TOTAL POPULATION FORECAST: July 2010 to June 2020											
Month	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
January		6,721	6,721	6,720	6,773	6,830	6,888	6,946	7,004	7,063	7,123
February		6,729	6,714	6,724	6,778	6,835	6,892	6,951	7,009	7,068	7,128
March		6,739	6,710	6,720	6,782	6,840	6,897	6,955	7,014	7,073	7,133
April		6,748	6,725	6,730	6,787	6,844	6,902	6,960	7,019	7,078	7,138
May		6,746	6,723	6,735	6,792	6,849	6,907	6,965	7,024	7,083	7,143
June		6,756	6,733	6,740	6,797	6,854	6,912	6,970	7,029	7,088	7,148
July	6,715	6,760	6,725	6,745	6,801	6,859	6,917	6,975	7,034	7,093	
August	6,735	6,749	6,727	6,749	6,806	6,864	6,921	6,980	7,039	7,098	
September	6,740	6,739	6,726	6,754	6,811	6,868	6,926	6,985	7,044	7,103	
October	6,725	6,719	6,722	6,759	6,816	6,873	6,931	6,990	7,049	7,108	
November	6,713	6,729	6,730	6,763	6,821	6,878	6,936	6,995	7,054	7,113	
December	6,694	6,712	6,717	6,768	6,825	6,883	6,941	6,999	7,058	7,118	



MALE POPULATION FORECAST: July 2010 to June 2020

Month	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
January		6,114	6,172	6,192	6,244	6,296	6,350	6,403	6,457	6,512	6,566
February		6,129	6,178	6,195	6,248	6,301	6,354	6,408	6,462	6,516	6,571
March		6,147	6,184	6,199	6,253	6,305	6,358	6,412	6,466	6,521	6,576
April		6,154	6,191	6,205	6,257	6,310	6,363	6,417	6,471	6,525	6,580
May		6,166	6,200	6,209	6,261	6,314	6,367	6,421	6,475	6,530	6,585
June		6,179	6,206	6,213	6,266	6,319	6,372	6,426	6,480	6,534	6,589
July	6,109	6,188	6,209	6,218	6,270	6,323	6,376	6,430	6,484	6,539	
August	6,124	6,192	6,208	6,222	6,274	6,327	6,381	6,435	6,489	6,544	
September	6,141	6,188	6,203	6,226	6,279	6,332	6,385	6,439	6,493	6,548	
October	6,127	6,178	6,198	6,231	6,283	6,336	6,390	6,444	6,498	6,553	
November	6,111	6,172	6,193	6,235	6,288	6,341	6,394	6,448	6,502	6,557	
December	6,106	6,169	6,191	6,239	6,292	6,345	6,399	6,453	6,507	6,562	



FEMALE POPULATION FORECAST: July 2010 to June 2020

Month	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
January		609	610	606	610	615	620	625	631	636	641
February		609	610	606	610	615	620	626	631	636	642
March		610	611	607	611	616	621	626	631	637	642
April		614	610	606	611	616	621	627	632	637	643
May		614	609	606	611	617	622	627	632	638	643
June		615	609	607	612	617	622	627	633	638	643
July	607	615	610	607	612	617	623	628	633	639	
August	609	614	608	608	613	618	623	628	634	639	
September	602	612	609	608	613	618	624	629	634	639	
October	605	610	607	608	614	619	624	629	635	640	
November	605	610	607	609	614	619	624	630	635	640	
December	610	610	606	609	614	620	625	630	635	641	

APPENDIX A: PREDICTING PRISON POPULATIONS LITERATURE REVIEW

Introduction

Prison population forecasts are essential for prison administrators and policy makers to make management and budget decisions. Prison population forecasts are also significant for legislators to make informed decisions when passing laws that potentially affect prison populations.

The growth of prison populations in the past 30 years has made prison population forecasts necessary. Between 1980 and 1990 the U.S. prison population grew by approximately 134% (U.S. Department of Justice 1995). The prison population increase slowed between 1990 and 2000, but still grew by 69% (U.S. Department of Justice 2001). Martinez (2009) made the argument that prison population forecasts are crucial due to the length of time it takes to build a new prison. After legislators have approved funding for construction of a new prison, it can take two years for a prison to be built and staffed. Without prison population forecasts and with a continuing trend of increasing prison populations, prisons would become overcrowded for years before relief from a new prison comes to fruition.

Legislative and policy decisions have a direct impact on prison populations. According to a report produced by the Federal Bureau of Investigation in 2004, U.S. crime rates decreased in the previous10 years, but the prison population for that time period increased. The cause of the prison population increase has been attributed in part to changes in sentencing laws, including: longer prison sentences for some crimes; three strikes legislation; stricter habitual offender laws; an increase in mandatory minimum stays; tougher policies imposed on criminals in prison, on parole or probation; and the war on drugs (Martinez, 2009).

Prison Population Forecast Models: Then and Now

Since the 1960s, trying to project future prison populations has proven difficult. In 1984, the Federal Bureau of Prisons (BOP) announced:

> ". . . The 'state of the art' for predicting prison populations is still in its infancy and accurate and reliable methodologies simply do not exist. Our review of numerous prison population projection studies conducted by national experts reveals, with the wisdom of hindsight, that their projections have continually been in error."

In 1984, the General Accounting Office (GAO) surveyed the BOP, the District of Columbia, and the 50 states to find what methods were used to forecast prison populations. The GAO found that states used more than one method to forecast. Fifty-two percent analyzed admissions and releases to forecast prison populations. Nineteen states (38%) used trend analysis based on past prison populations, 17 (34%) performed a simulation of policies and practices then assessed how changes would impact the prison population. Thirteen states (26%) performed linear regressions using factors such as unemployment rates, which seemed to correlate to prison populations when the rates are lagged six months to a year. Twelve states (24%) used multiple linear regression, 20% projected future populations based on design or rated capacity of their facilities. Two states based projections on a "consensus statement" or group opinion (GAO, 1984).

In 2008, the American Correctional Associations in its journal, *Corrections Compendium*, published results of a survey of US and Canadian correctional systems (see Appendix F). The agencies were asked to project their populations for the years 2008, 2010 and 2012. The survey found 28 U.S. correctional systems perform internal projections. The systems used a variety of methods including stochastic models, a flow model method pioneered in Texas, autoregression integrated moving average (ARIMA), and a micro-simulation model. Agencies also reported analyzing their own historical population data and conducting a general simulation of admissions, lengths of stay, and departures. If not developed and performed within their systems, the departments identified outside sources such as JFA Associates, the Connecticut Office of Policy and Management, a local university, the Criminal Justice Estimating Conference, and specific state agencies and boards. Twenty-seven agencies reported their figures were considered to be accurate or reasonably so, higher by 5 of the agencies and lower by 7 of the agencies (Corrections Compendium, 2008).

The 2008 Corrections Compendium survey revealed the methodologies used to produce prison population projections have not changed significantly since the GAO's 1984 report. Martinez (2008) stated, ". . .The methodologies used to produce prison population projections have not changed significantly in the past 10 to 15 years, despite the fact that advancing computer technologies could make the task much easier."

In the past it was thought that the total number of citizens in the population primarily affected the prison population. Based on this assumption, prison populations were expected to reach their pinnacle in the 1990s and start their decline with baby boomers passing out of the crime age population (18-36) (Barnett, 1987). As we now know, the rate of growth of prison populations has slowed, proving the inadequacy of predicting prison population growth on the total population of citizens in the community.

Prison population forecast models based on historical population data, admissions, lengths of stay, and departures are limited to the scope of population growth trends and

legislation that are current at the time the forecast is run (Barnett, 1987). More advanced models such as the flow, stochastic, autoregression integrated moving average (ARIMA), and micro-simulation models are considered to be more accurate than models based on primarily historical data and can be adjusted to include changes in policies and practices (Martinez, 2008).

Conclusion

Experts agree that predicting prison population is not an exact science. Predicting prison populations is a combination of facts and probabilities (Martinez, 2009). The state of the art prison population forecast model does not currently exist. The rapid advancement of computer technology should be utilized to produce the state of the art prison population forecast model. Experts believe the state of the art prison population forecasting model should be:

- A computer simulated model (BOP 1984, Martinez 2008)
- Intuitive so those who do not regularly deal in statistical mathematical concepts could understand the prediction output and could input their own queries (Martinez 2008)
- Able to answer 'what if' scenarios to help legislatures make informed decisions when passing laws that affect prison populations (Martinez 2008)
- Capable of taking into account the vast number of variables to produce an accurate forecasting model (BOP 1984, Martinez 2008).

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APPENDIX B: METHODOLOGY

The corrections population forecast projects 10 years into the future for state prison inmates. The forecast relies on data extracted from the NMCD Corrections Management Information System (CMIS). Annually, NMCD Information Technology staff provide data files on offenders admitted to a state prison (admissions file), offenders released from prison (release file), and offenders confined to prison on a given day (confined file). For each offender released from a state prison we also receive the amount of time in days offenders earned off their sentence during the time they were in prison, and any lump sum awards in days offenders earned while in prison.

In order to generate information regarding admissions and releases, the NMSC used data provided by NMCD for January 1, 2005 through May 1, 2010. A description of the data files is found in Appendix E. The most important data elements from the three data files are listed below:

- Type of admission
- Type of release
- Institutional start date
- Sentence length
- Release date
- Classification type
- Date of Birth
- Amount of earned time

In the future we hope to use more complete crime data compiled and maintained by the New Mexico Department of Public Safety (DPS) and court case filing and disposition data collected and maintained by the New Mexico Administrative Office of the Courts (AOC). We may also use various external data sources, including, limited crime data gathered from the federal Uniform Crime Reporting (UCR) program, federal Census Bureau and New Mexico Bureau of Business and Economic Research (BBER) population data.

NMSC Forecasting Model

As indicated in the state survey by the American Correctional Association (see Appendix F), time series analysis and forecasting is an important concern of corrections departments in the U.S. and Canada. The accuracy of time series forecasting methods and improved forecasting models is a primary concern for corrections departments. The ARIMA model (Autoregressive Integrated Moving Averaging) is a popular method of statistical forecasting. We used the ARIMA because it is a powerful short-term prediction tool.

In order to generate a forecast, we used data provided by the NMCD for January 1, 2001 through April 27, 2010. We used the highest count from each months daily, actual count to forecast total population, the male population, and the female population.

The ARIMA model works by predicting the next point in a time series based on a fixed number of previous points, the difference between previous points, as well as an exponential smoothing factor. Individual analysis was given to each subpopulation to determine the best-fit model.

The forecasts themselves can be seen in the tables and figures in the Findings and Forecast Findings sections of this report.

APPENDIX C: ARIMA MODEL BUILDING PROCESS

Mathematical Definition

The ARIMA model used for the forecast was built using the following methodology. Here we report the details of the process for the construction of the forecast of the total population model for purposes of illustration. The same process was followed to construct the model for the Male and Female sub-populations.

The Autoregressive Integrated Moving Average (ARIMA) model, is a generalized model for predicting time series based on prior observations. It is a general model in the sense that it is a linear combination of three simpler models: the auto regressive model (AR), the moving average model (MA) and the differencing model. If we have some time series of observations, our model can be written as

$$(1-\sum_{i=1}^{p}\phi_i L^i)(1-L)^d X_t = (1+\sum_{i=1}^{q}\theta_i L_i)\epsilon_t$$

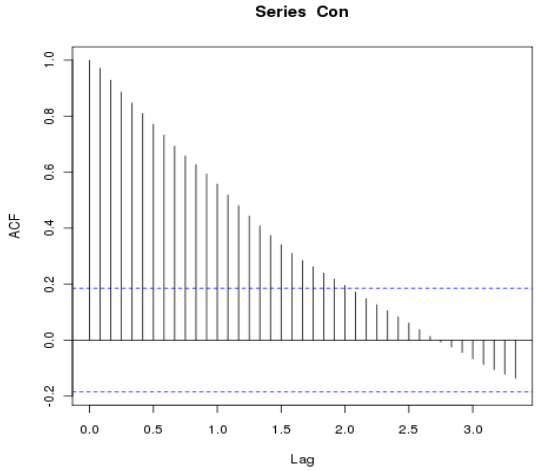
Where L is the lag operator ϕ is the coefficient of the autoregressive portion of the model, and θ is the parameter for the moving average portion of the model, with ε representing the error at time t. Thus the model allows to express future values as a function of prior values with decreasing importance. Note here also that the model can be specified with only three values p, q, and d, representing the number of autoregressive terms, moving average terms, and differencing terms respectively, and thus we will express a given model as *ARIMA(p,d,q)*. It is assumed that the error terms are independent, identically distributed values with mean zero, an assumption we will check as we build our model.

Construction of the Model

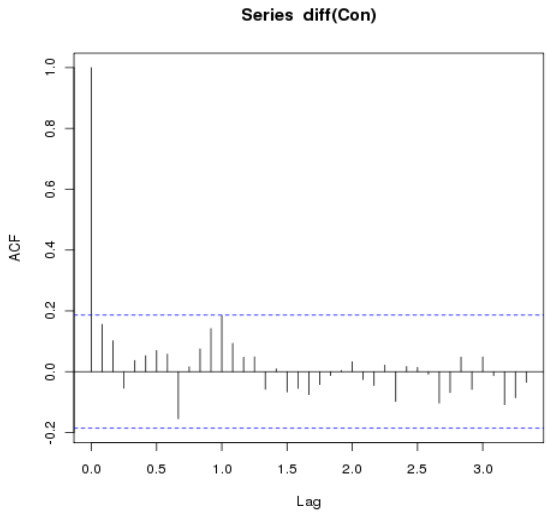
Throughout the construction we use the R statistical package. R is an open source statistical computing package that is widely used in econometrics and statistics.

First for each series of daily population counts a maximum population for a given month was found. This series of months was then translated into a comma seperated value file(csv) which can then be easily read by R.

Next the series autoregressive correlation is examined. This is the simply the series correlated with a lagged version of itself, for various lagged values. A plot of the correlations can be seen in the figure below.



There is a significant linear trend in the correlations indicating that this is not necessarily a stationary process. That is each value is highly correlated with its previous value. While this indicates that predictions will likely be accurate, by differencing the data (i.e., using an ARIMA model with *d=1)* we will be able to make more accurate future predictions. The Autocorrelative effect of the differenced series is then checked.



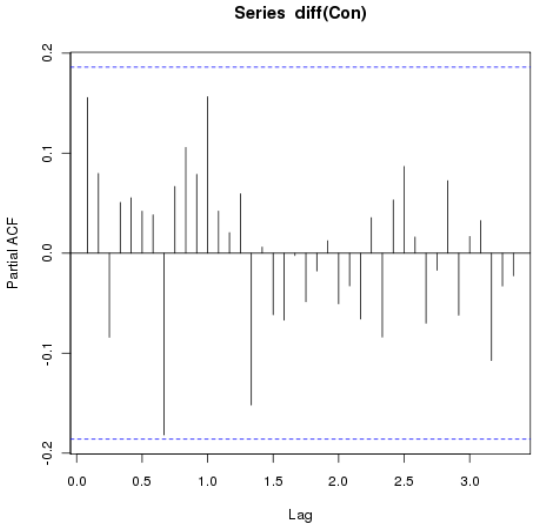
Here we see correlations randomly distributed around 0 indicating a stationary process and that a *d=1* is sufficient to make the model stationary. Note here also high correlation values for 1 and 8 lags, with possible

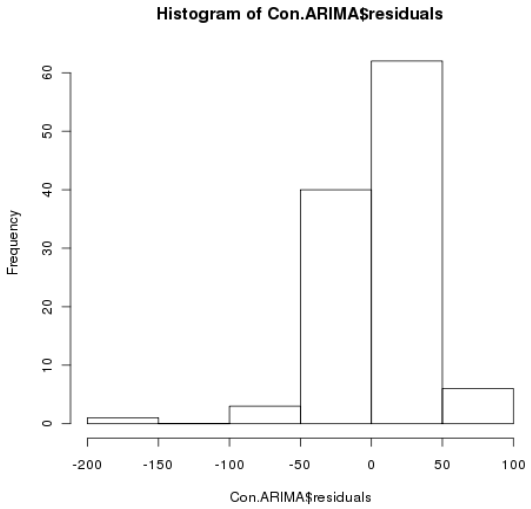
high lag values as high as 12. These will be considered as moving average terms in our model, keeping them in mind to explore the other possible parameter

Next we examine the partial autocorrelative effect to determine any possible remaining autoregressive terms. Here we see high correlations at 1, 8, 12 and 16, providing possible *q* values for our model.

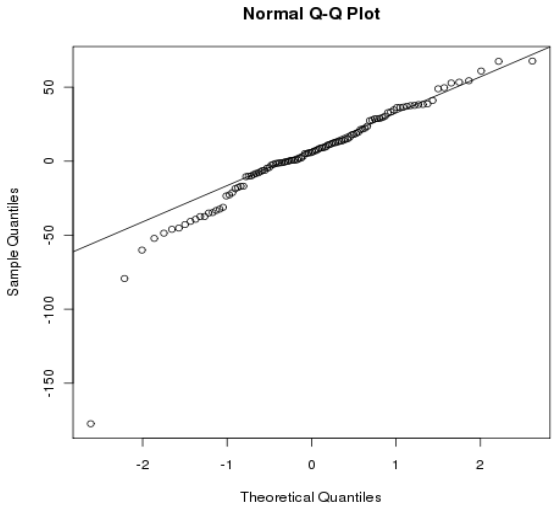
With a range of possible values determined for our model, we can simply test each set of parameters and determine which set provides us with the statistically significant log likelihood value. Because of its

statistical properties, we can use a χ^2 test on the -2*log(likelihood) of any given model to determine if it is significantly better than others. Comparing each of the 12 possible values of parameters we find that the best statistically significant model is *ARIMA (16,1,12).*





Next we check our assumption of normality of the error terms. A histogram of the residuals reveals, a primarily normal distribution with some possible divergence in the tails of the distribution.



A qq polot verifies this. These results indicate that there may be some missing external regressors in our model which may help to provide more accurate future predictions.

With our model defined, R can use it to predict into the future a number of years. We can then plot this forecast along with a 98% percent confidence interval to determine the fit of our model.

Statistical Software Used In This Model

We used a statistical package known as "R." R is a language and environment for statistical computing and graphics. R provides a wide variety of statistical (linear and nonlinear modeling, classical statistical tests, time-series analysis, classification, and clustering) and graphical techniques, and is highly extensible. R is available as Free Software under the terms of the Free Software Foundation's GNU General Public License in source code form. It compiles and runs on a wide variety of UNIX platforms and similar systems (including FreeBSD and Linux), Windows and MacOS.

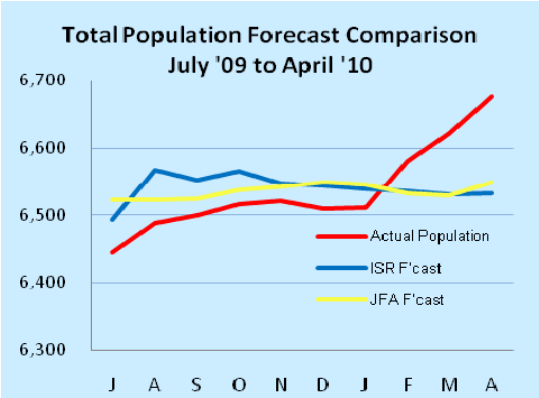
One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formula where needed.

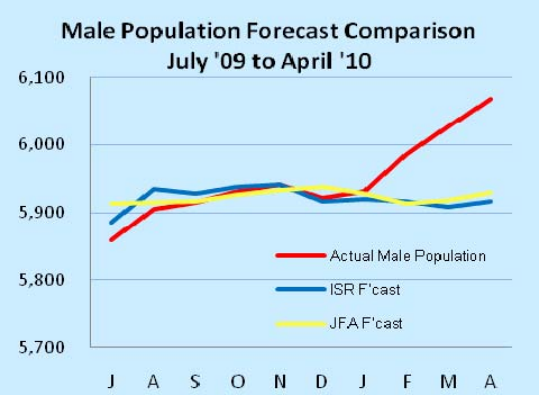
APPENDIX D: JFA COMPARISON

In an effort to validate our results vs. JFA's predictions we forecast for 10 months of the 2010 fiscal year using the same data JFA would have had available during the time period, and compared our results to JFA's forecast as well as the actual population counts during the 2010 fiscal year. While it is unknown the precise method JFA used to create their predictions, we feel our method is comparable. The table enumerates our predictions and JFA's predictions from July 2009, through April 2010.

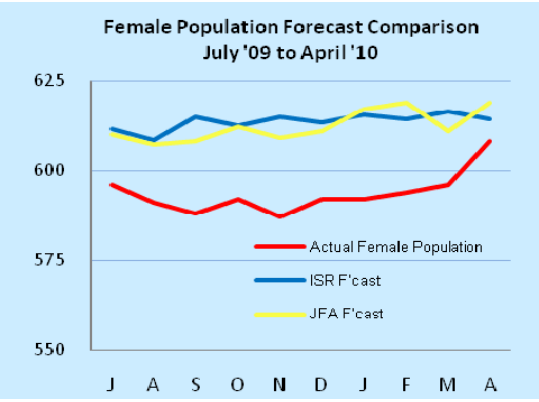
Table 3 ISR and JFA Forecast Compared: July 2009 to April 2010

Month-Yr	ISR Total Population Forecast	ISR Male Population Forecast	ISR Female Population Forecast	JFA Total Population Forecast	JFA Male Population Forecast	JFA Female Population Forecast
Jul-09	6,493	5,885	611	6,523	5,913	610
Aug-09	6,567	5,935	608	6,522	5,915	607
Sep-09	6,553	5,928	615	6,525	5,917	608
Oct-09	6,565	5,938	612	6,538	5,926	612
Nov-09	6,547	5,941	615	6,542	5,933	609
Dec-09	6,544	5,917	613	6,549	5,938	611
Jan-10	6,538	5,920	616	6,546	5,929	617
Feb-10	6,536	5,917	614	6,532	5,913	619
Mar-10	6,530	5,908	616	6,529	5,918	611
Apr-10	6,532	5,918	614	6,549	5,930	619





As can be seen in both the table and the charts, our forecast is roughly the same as JFA's. This is unsurprising, as we would expect similar results from comparable methods operating on the same data. It is difficult to predict large population changes as are present in the Female population at the beginning of the forecast, and the end of the forecast for Male and total populations.



APPENDIX E: DESCRIPTION OF DATA FILES

Admissions File	
Variable	***Definition***
State id number	Unique offender/incarceration identifier
Gender	Sex of offender
Race	Race of offender
Date of birth	Date of Birth of offender dd/mm/yyyy
County of residence n/a	This field is optional
Marital Status	This field is optional
Statute#	This field should represent the *most serious offense statute* the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized.
Offense Description# #	This field should describe the most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized and standardized offense name used.
Jail credits#	This field should represent the total number if pre-trial/ jail credits to be awarded to the offender.
Admission type#	i.e., parole violator technical, parole violator new charge, probation violator technical, probation violator new charge, new court commitment, escapee returned, etc.
Sentence length (Maxdays)# #	This field should represent the total net sentence the offender will serve under DOC custody. All consecutive and concurrent calculation should be applied. Lifers will also need to be determined from this field.
Parole eligibility date#	This field should represent the first date in which an offender is parole eligible.# dd/mm/yyyy
Goodtime earning class#	This field should represent the number of goodtime days per month the offender is eligible to receive.
Offense Class Code# #	This field should represent he most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized; standardized codes should be employed.
Mandatory release date (flatdate)#	This field should represent the absolute latest day the offender will be released.# dd/mm/yyyy
Initial classification level#	This field should represent the results of the initial classification, i.e. minimum, medium, maximum, close
Final custody level level#	This field should represent offender custody level placement after overrides
Projected release date#	This field should provide the projected release date assuming all future good-time will be awarded
Offense severity	Severity of current offense
Arrest date	Date of offenders arrest for current offense
Offense date	Date crime offender is currently held for was committed
Sentence date	Date offender was sentenced for most current/serious offense
Sentence Begin date	Sentence begin date
Institution start date	Institution admission date

Release File	
Variable	***Definition***
State id number	Unique offender/incarceration identifier
Gender	Sex of offender
Race	Race of offender
Date of birth	Date of Birth of offender dd/mm/yyyy
County of residence n/a	This field is optional
Marital Status	This field is optional
Statute#	This field should represent the *most serious offense statute* the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized.
Offense Description#	This field should describe the most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized and standardized offense name used.
Jail credits#	This field should represent the total number if pre-trial credits to be awarded to the offender
Admission type#	i.e., parole violator technical, parole violator new charge, probation violator technical, probation violator new charge, new court commitment, escapee returned, etc.
Sentence length#	This field should represent the total net sentence the offender will serve under DOC custody. All consecutive and concurrent calculations should be applied. Lifers will also need to be determined from this field.
Parole eligibility date#	This field should represent the first date in which an offender is parole eligible.# dd/mm/yyyy
Offense Class Code# #	This field should represent he most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized; standardized codes should be employed.
Mandatory release date#	This field should represent the absolute latest day the offender will be released.# dd/mm/yyyy.. but this is as of the date of release
Release date	This field should represent the actual date the offender was released from DOC custody.
Release type#	This field should represent the reason for an offender's release, i.e., parole, discharged, escape, transfer to another state, etc.
Total statutory monthly merit time earned#	This field should represent the total merit time credits an offender received during his/her stay at DOC.
Total goodtime credits lost#	This field should represent the total credits an offender lost due to disciplinary infractions during his/her stay at DOC.
Total goodtime credit forfeited#	This field should represent the total goodtime credit forfeited by an offender during his/her stay at DOC.
Total goodtime credit restored#	This field should represent the total goodtime credit restored to an offender during his/her stay at DOC.
Total other (lumpsum) credits#	This field should represent the total 'other' credits an offender received during his/her stay at DOC (including credits for education, work, etc.).
Finial classification level (1-6)# #	This field should represent the last classification level the offender was in before release, i.e. minimum, medium, maximum, close
Final custody level#	This field should represent offender custody level placement after overrides
Projected release date#	This field should provide the projected release date assuming all future good-time will be awarded
Offense severity	Severity of current offense
Arrest date	Date of offenders arrest for current offense
Offense date#	Date crime offender is currently held for was committed
Sentence date	Date offender was sentenced for most current/serious offense
Begin date	Sentence begin date
Institution start date	Institution admission date

Confined File	
Variable	***Definition***
State id number	Unique offender/incarceration identifier
Gender	Sex of offender
Race	Race of offender
Date of birth	Date of Birth of offender dd/mm/yyyy
County of residence n/a	This field is optional
Marital Status	This field is optional
Statute#	This field should represent the most serious offense statute the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized.
Offense Description#	This field should describe the most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized and standardized offense name used.
Jail credits#	This field should represent the total number if pre-trial credits to be awarded to the offender.
Admission type#	i.e., parole violator technical, parole violator new charge, probation violator technical, probation violator new charge, new court commitment, escapee returned, etc.
Sentence length (Maxdays)# #	This field should represent the total net sentence the offender will serve under DOC custody. All consecutive and concurrent calculations should be applied. Lifers will also need to be determined from this field.
Parole eligibility date#	This field should represent the first date in which an offender is parole eligible.# dd/mm/yyyy
Goodtime earning class#	This field should represent the number of goodtime days per month the offender is eligible to receive.
Offense Class Code# #	This field should represent he most serious offense the offender is currently serving, even if it is not his/her longest sentence. DOC established hierarchy of offenses should be utilized; standardized codes should be employed.
Mandatory release date (flatdate)#	This field should represent the absolute latest day the offender will be released.# dd/mm/yyyy
Current classification level (1-6)#	This field should represent the current classification level of the offender.
Final custody level#	This field should represent offender custody level placement after overrides
Projected release date#	This field should provide the projected release date assuming all future good-time will be awarded
Offense severity	Severity of current offense
Arrest date#	Date of offenders arrest for current offense
Offense date#	Date crime offender is currently held for was committed
Sentence date	Date offender was sentenced for most current/serious offense
Begin date	Sentence begin date
Institution start date	Institution admission date

Goodtime Release File	
Variable	***Definition***
State id number	Unique offender/incarceration identifier
Lump Sum Total#	Total amount of times in days an offender was awarded
Lump Sum Comments#	Comments relating to the lump sum award: comments are in a free text field and will indicate reason for award.

APPENDIX F: CORRECTIONS COMPENDIUM PRISON PROJECTIONS

PRISON POPULATIONS – TABLE 1: PROJECTIONS

SYSTEM	ADP 1-1-07; RATED CAPACITY	OPTIONAL HOUSING DUE TO CURRENT CROWDING	PROJECTION DEVELOPMENT			PROJECTION BY YEAR			PAST ACCURACY RATE OF PROJECTIONS
			By DOC	Method	By Other	2008 M;F	2010 M;F	2012 M;F	
ALABAMA	24,109; N/A	Gyms, day rooms, classrooms and converted dining areas	Yes	Excel forecasting software	N/A	29,041 Total	29,639 Total	30,739 Total	Higher
ALASKA	5,072; 3,098	Yes, but not specified	Yes	Exponential stochastic	N/A	4,795; 718	4,951; 967	5,106; 1,215	Accurate
ARIZONA	No response								
ARKANSAS	13,729; 12,561	None	Yes	Straight line based on last 15-year monthly average	JFA Associates	13,561; 1,100	14,315; 1,161	15,070; 1,222	Accurate
CALIFORNIA	No response								
COLORADO	22,350; 14,360[1]	None	No	N/A	Legislative Council and Department of Public Safety	20,923; 2,552	22,554; 3,032	24,711; 3,625	See footnote[2]
CONNECTICUT	23,738; N/A	Gyms; additional beds in dorms; and other areas	No	N/A	Office of Policy and Management with assistance from the Central Community State University	3% increase	N/A	N/A	Accurate
DELAWARE	6,927; 6,757	Gym, when needed	Yes	Solely based on the ADP during a 12-month period	N/A	6,671; 521	6,997; 546	7,292; 569	Accurate
FLORIDA	90,103; 91,789	None	No	N/A	Criminal Justice Estimating Conference	94,932 Total	106,283 Total	117,491 Total	Lower
GEORGIA	52,597; 50,283	Areas subsequently converted for residential use	No	N/A	Contract with private vendor	53,905; 3,817	56,517; 3,900	59,455; 4,011	Accurate
HAWAII	5,984; 3,487	None	Yes	Based on past statistics[3]	N/A	Under review	Under review	Under review	Higher
IDAHO	7,124; 6,075	County jails and out-of-state private prisons	Yes	Flow model method pioneered by Texas	N/A	6,922; 847	7,718; 935	8,586; 1,023	"Reasonably" accurate
ILLINOIS	No response								
INDIANA	24,046; 24,987	None	Yes	Prophet software	N/A	23,938; 2,194	25,697; 2,385	26,963; 2,548	Higher
IOWA	No response								
KANSAS	8,833; 9,397	None	No	N/A	Kansas Sentencing Commission	8,338; 737	8,249; 674	8,225; 668	Accurate within 2%
KENTUCKY	13,659; 11,504	None	No	N/A	JFA Associates	19,088; 2,316	2,585l 2,518	22,154; 2,687	Accurate within 5% with minor adjustments
LOUISIANA	No response								
MAINE	2,091; 1,815	Converted dorms	Yes	Computer generated	N/A	N/A	N/A	N/A	Unknown
MARYLAND	22,610; 24,054	Dormitories, with mattresses on floor	Yes	Modified arrest demographic model	Substance abusers[4]	21,887; 1,176	22,106; 1,188	22,157; 1,191	Lower, due to population growth in the past two years

[1] COLORADO: The rated figure is based on reported operational capacity and excludes contract facilities, community corrections centers and the Youthful Offender System.
[2] COLORADO: Projections are issued annually and readjusted semiannually; therefore, the accuracy is not measured.
[3] HAWAII: Projections are based on number of admissions and average length of stay disaggregated by gender, age, and offenses or legal status.
[4] MARYLAND: Since the fall of 2005, all sentenced inmates are given a self-report measure, providing annual projections for those being released.

PRISON POPULATIONS – TABLE 1: PROJECTIONS

SYSTEM	ADP 1-1-07; RATED CAPACITY	OPTIONAL HOUSING DUE TO CURRENT CROWDING	PROJECTION DEVELOPMENT			PROJECTION BY YEAR			PAST ACCURACY RATE OF PROJECTIONS
			By DOC	Method	By Other	2008 M;F	2010 M;F	2012 M;F	
MASSACHUSETTS	11,022; 7,802	Varies, such as programming areas	Yes	In-house demographer	Consultant	10,170; 740	10,430; 750	N/A	Lower, especially for males
MICHIGAN	51,454; 51,925	None	Yes	Stochastic entity simulation model[5]	N/A	48,218; 2,058	49,599; 2,103	52,503; 2,204	Accurate, barring legislative, executive or court policy actions
MINNESOTA	8,900; 7,955	Contract with private and county facilities	Yes	Microsimulation model	N/A	8,488; 572	8,947; 604	9,413; 615	Accurate within .3%
MISSISSIPPI	21,692; 22,083	None	No	N/A	N/A	20,992; 1,988	22,680; 2,148	23,677; 2,242	Accurate
MISSOURI	30,056; 30,797	None	Yes	Short-term forecast[6]	N/A	27,397; 2,558	27,688; 2,780	27,967; 2,993	Higher, about 17% on the long-term forecast
MONTANA	2,483; 1,661	Private prison	Yes	Time series offender flow model	N/A	Under review	Under review	Under review	Accurate
NEBRASKA	4,407; N/A	Day rooms at the diagnostic center	No	N/A	JFA Associates	4,465; 489	4,610; 526	4,720; 569	Unknown, first year of contracted services
NEVADA	13,183; 12,812	None	No	N/A	A private consultant prepares a 19-year forecast, as legislated by statute	12,512; 1,253	13,901; 1,433	15,306; 1,584	Long-term, low; short-term within 2%, est.
NEW HAMPSHIRE	2,701; 2,090	Day rooms and common areas of housing pods	Yes	Not currently in use	Research by nonpartisan third parties such as the New Hampshire Center for Public Policy Studies	N/A	N/A	N/A	Unknown
NEW JERSEY	27,375; 16,876	Various[7]	Yes	Simulation or admissions, length of stay, and departure	N/A	26,014; 1,432	26,156; 1,441	N/A	Accurate
NEW MEXICO	No response								
NEW YORK	63,315; 59,962	None	Yes	Multivariate trend analysis	Supplemental model by Division of Criminal Justice Services	60,700; 2,850	60,700; 2,850	N/A	Accurate
NORTH CAROLINA	37,658; 33,366	Day rooms	Yes	Based on figures from the North Carolina Sentencing Commission	N/A	35,609; 3,005	36,918; 3,150	38,443; 3,327	Accurate
NORH DAKOTA	1,407; 1,011	None	Yes	Simple linear regression, modified by expert staff	N/A	1,392; 145	1,484; 147	1,576; 159	Accurate
OHIO	48,491; 37,610	Open bay/lounges of direct-observation pods	Yes	Microsimulation	N/A	48,458; 4,168	53,467; 4,696	57,197; 4,957	Lower at present
OKLAHOMA	23,941; 24,919	None	No	N/A	Not specified	N/A	N/A	N/A	Unknown
OREGON	13,291; N/A	None	No	N/A	State Office of Economic Analysis	12,918; 1,035	13,499; 1,090	13,956; 1,134	Accurate
PENNSYLVANIA	44,365; 38,547	None	Yes	Admissions and length of stay[8]	N/A	Under review	Under review	Under review	Lower, census-based in prior years

[5] MICHIGAN: The model was initially developed by the National Council on Crime and Delinquency and adapted by the Michigan DOC research staff.

[6] MISSOURI: The method used is based on the average for the past 12 months and a four-year regression for the long-term forecast.

[7] NEW JERSEY: Optional housing due to crowding includes contracted halfway houses and county jails, as well as double-bunking and single cells converted to dormitories.

[8] PENNSYLVANIA: The forecast methodology is determined by a joint committee of the DOC, the Pennsylvania Commission on Crime and Delinquency, the Pennsylvania Board of Probation and Parole, the Pennsylvania Sentencing Commission, and the Office of the Budget.

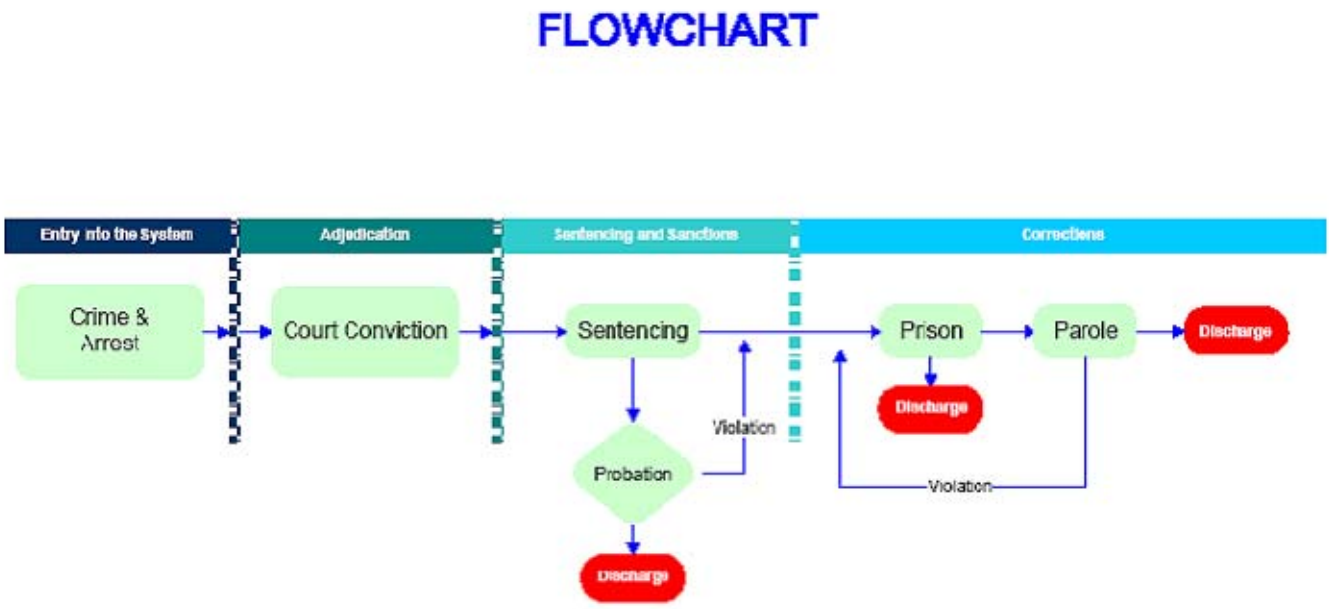
APPENDIX F: CORRECTIONS COMPENDIUM PRISON PROJECTIONS

PRISON POPULATIONS – TABLE 1: PROJECTIONS

SYSTEM	ADP 1-1-07; RATED CAPACITY	OPTIONAL HOUSING DUE TO CURRENT CROWDING	PROJECTION DEVELOPMENT			PROJECTION BY YEAR			PAST ACCURACY RATE OF PROJECTIONS
			By DOC	Method	By Other	2008 M;F	2010 M;F	2012 M;F	
RHODE ISLAND	3,996; 3,892	Pretrial detainees in committing room	No	N/A	JFA Associates	3,763; 249	3,966; 274	4,120; 306	Accurate
SOUTH CAROLINA	22,953; 23,435	None	Yes	Flow model[9]	N/A	N/A	N/A	N/A	Higher
SOUTH DAKOTA	3,317; N/A	None	Yes	Analyze last year's growth; admissions and releases	N/A	3,085; 402	3,229; 453	3,379; 509	Accurate
TENNESSEE	19,396; 19,670	None	No	N/A	JFA Associates	24,796; 1,997	25,395; 2,054	25,617; 2,093	Accurate
TEXAS	152,672; 156,618	None	No	N/A	Texas Legislative Budget Board	157,029 Total	162,298 Total	168,166 Total	Accurate
UTAH	6,468; 6,439	Temporary beds in various locations	Yes	Various regression methods	N/A	6,070; 715	6,304; 823	6,694; 1,003	Accurate
VERMONT	2,232; 1,716	Gyms, day rooms, triple-celling and contracted beds	Yes	Empirical analysis of trends	N/A	N/A	N/A	N/A	Accurate within 0.05% for the past 15 years
VIRGINIA	37,767; 31,741	None	Yes	Autoregression integrated moving average (ARIMA) model	N/A	36,092; 3,255	37,705; 3,587	39,720; 3,839	Accurate
WASHINGTON	17,752; 15,222	None	No	N/A	Caseload Forecast Council	19,117 Total	20,891 Total	21,965 Total	Accurate
WEST VIRGINIA	5,710; 4,615	Regional jails	No	N/A	Criminal Justice Statistical Analysis Center	6,239 Total	6,633 Total	7,132 Total	Accurate
WISCONSIN	22,494; 16,446[10]	Dayrooms	Yes	Extrapolated historical growth rates, adjusting for new population reduction initiatives	Reevaluated by the Department of Administration and the Legislative Fiscal Bureau	21,946; 1,386	23,049; 1,438	24,059; 1,492	Lower, adjusted through a biennial budget process
WYOMING	2,087; 1,511	None	Yes	Flow model (impact) and statistical	N/A	1,915; 255	2,022; 279	2,090; 293	Accurate within 3%
CANADIAN SYSTEMS									
NEWFOUNDLAND	249; 279	None	Yes	Historical counts analysis	N/A	N/A	N/A	N/A	Unknown
NOVA SCOTIA	414; 450	None	Yes	ARIMA time series analysis	N/A	510 Total	518 Total	522 Total	Higher
ONTARIO	8,370; 9,212[11]	None	Yes	Multivariate autoregression time series analysis	N/A	Under review	Under review	Under review	Accurate

[9] SOUTH CAROLINA: The flow model mimics future admissions and releases (from future admissions and beginning stock populations).
[10] WISCONSIN: Beds also are contracted in county jails and at the Wisconsin Resource Center (mentally ill inmates), and some double-bunking that is not included in the rated capacity.
[11] ONTARIO: The rated capacity includes 616 beds open only on weekends.

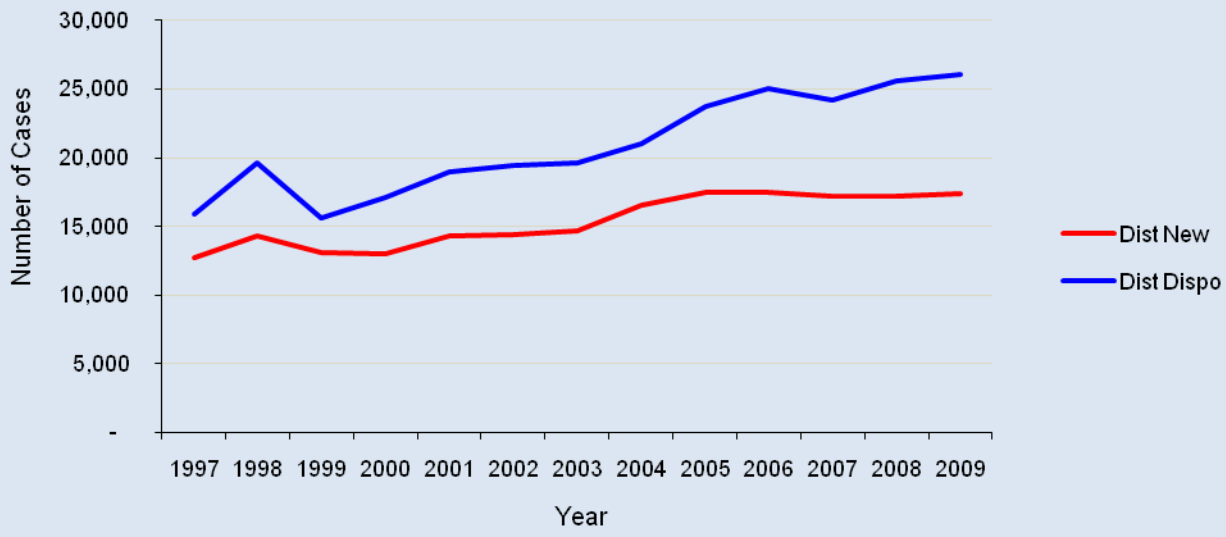
APPENDIX G: NEW MEXICO CRIMINAL JUSTICE SYSTEM



The Sequence of Events in the NM Criminal Justice System

This flowchart of the events in the New Mexico criminal justice system was prepared by the New Mexico Sentencing Commission. The chart summarizes the most common events in the felony criminal justice systems including entry into the system, adjudication, sentencing and sanctions, and corrections.

APPENDIX H: NEW MEXICO JUDICIARY DATA



Source: Compiled by NMSC from published NM AOC Annual Reports 1996-2009