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JULY/AUGUST 2015 | VOLUME 18, NUMBER 5

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CONSTRUCTION & DELIVERY METHODS

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Forecasting Future Inmate Population

By Meg Bower

Correctional facilities are mission driven. Data is a relatively low priority, yet it is often data, and what it reveals, that forms the basis of correctional needs assessments. Projected Average Daily Population (ADP), in particular, is the foundation of every needs assessment.

Straight Line Forecasting of ADP

Historical ADP is often used to estimate future ADP by projecting the mathematical trajectory of historical ADP (10 years or so) into the future using a trend line or linear regression. This analysis can be done using standard desktop software and produces a convincing trend line; however, the forecast is rigid and yields a straight line forecast, either up or down.

Because it is reliant on historical patterns that remain steady, this strategy is effective over short time periods with little change. This type of forecast should not be used beyond five years, and is most accurate for the first six to 24 months out in a stable system.

The Inevitability of Change

Correctional facility practitioners operate within a constantly shifting array of policies that have the potential to alter admissions (ADM) and duration of stay (length of stay or LOS) — two key factors that determine bed-space needs. No projection methodology can perfectly anticipate every change, but it is customary to strive for a long-term projection that takes possible fluctuations in ADM and ALOS into account.

Some factors that can influence admissions or length of stay include:

- (ADM) Increased use of pre-trial alternatives such as treatment courts
- (ADM) Changes in the number of law enforcement officers on the street
- (ADM) Increased crime and arrests in a jurisdiction
- (ALOS) Changes in sentence lengths (through good time or other rewards)
- (ALOS) Changes in prosecutorial policy and/or sentencing policies
- (ALOS) Decriminalization of certain offenses (such as minor drug offense)
- (ALOS) Policies that increase access to alternatives such as post-adjudication treatment options in lieu of incarceration

A projections method that allows adjustments for changes in ADM or ALOS is required.

Little's Law

ADP in a correctional facility is based on the ADM combined with the duration of stay (LOS for individuals or

ALOS for groups).

These three items fit together in a formula called Little's Law, which describes the relationship between time and accumulation of items (people). It is used to calculate anything from how to minimize goods in inventory to how

many baristas Starbucks needs at peak times.

Little's Law in corrections is as follows: $ADP = (ADM/T) * ALOS$

Where all averages are calculated over the same duration (weekly, monthly, yearly) of time, represented by T days.

Historical Analysis

Little's Law adapted to calculate historical ALOS (from ADM and ADP data) is as follows:

$$ALOS = (ADP * T) / ADM$$

In a system where annual ADP = 260 (T = 365 days), and ADM (admissions) = 1,900, the ALOS per inmate is $(260 * 365) / 1,900 = 49.5$

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Historical Fluctuation of ADM/ALOS and resulting ADP (Sample System)

ADM											
ALOS	1,900	2,000	2,350	2,600	3,000	2,850	3,100	3,400	3,500	3,750	4,000
20.0	104	110	129	142	164	156	170	186	192	205	219
24.0	125	132	155	171	197	187	204	224	230	247	263
28.0	146	153	180	199	230	219	238	261	268	288	307
32.0	167	175	206	228	263	250	272	298	307	329	351
36.0	187	197	232	256	296	281	306	335	345	370	395
40.0	208	219	258	285	329	312	340	373	384	411	438
44.0	229	241	283	313	362	344	374	410	422	452	482
48.0	250	263	309	342	395	375	408	447	460	493	526
52.0	271	285	335	370	427	406	442	484	499	534	570
56.0	292	307	361	399	460	437	476	522	537	575	614
60.0	312	329	386	427	493	468	510	559	575	616	658
64.0	333	351	412	456	526	500	544	596	614	658	701
68.0	354	373	438	484	559	531	578	633	652	699	745
72.0	375	395	464	513	592	562	612	671	690	740	789
76.0	396	416	489	541	625	593	645	708	729	781	833
80.0	416	438	515	570	658	625	679	745	767	822	877
84.0	437	460	541	598	690	656	713	782	805	863	921
88.0	458	482	567	627	723	687	747	820	844	904	964
92.0	479	504	592	655	756	718	781	857	882	945	1,008
96.0	500	526	618	684	789	750	815	894	921	986	1,052
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ADP	260	287	304	310	400	350	450	500	512	550	615

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365) / 1,900 or 49.94 days.

ADM, ALOS and ADP can be placed in a matrix to illustrate changes in the system and to explore potential future scenarios. In this matrix, ALOS is represented in even intervals (four days, in this case) along the left axis and actual ADM is entered along the top. ADP is calculated and entered in the matrix using Little's Law ($ADP = (ADM * ALOS / 365)$).

- ADP from a sample facility is highlighted in yellow.
- The capacity of the sample facility (200 beds from 2001 to 2005; 300 beds from 2006 to 2010) is blue.
- A pink band across ALOS 88 to 92 days is shaded to show how many beds would be required with the same admissions if ALOS doubled.

Historical ADP, ADM & ALOS

These analyses of historical data are also possible using historical ALOS, ADP and ADM:

- Determine the ALOS of pre-trial defendants versus sentenced offenders in a jail.
- Calculate average pre-trial time to disposition for felons and misdemeanants to ensure compliance with time-to-trial standards.
- Determine increases or decreases in ALOS over time to help pinpoint periods of change in the system, which may inform on factors that affect ALOS.
- Quantify the impact of changes in the criminal justice system on admissions or ALOS and therefore ADP.
- Determine whether ADM or ALOS may have a greater effect on ADP to help develop appropriate population reduction strategies.

These analyses offer insights into the pressures and changes in the system over time.

Forecasting Future ADP – Admissions First

Admissions-based forecasts produce versatile ADP models because they forecast admissions first and then apply ALOS to determine ADP. A number of statistical tests can be used to determine which mathematical formula best fits admissions data and complete the forecast. For non-statisticians, an outside planner or analyst

can complete the analysis and admissions forecasting.

The admissions forecast should:

- Retroactively forecast one to three years of historical admissions to test the methodology.
- Include a range (confidence interval) typically +/-5 percent from the forecast line. If the confidence interval is narrow, the model had a better "fit" to the historical data.
- Limit itself to a projection that is not longer than the period of historical data (preferably 10 years).
- Emphasize accuracy over a range equal to less than half the period of historical data (usually three to five years, a reasonable capital facility-planning window).

Forecasted admissions can also be used to determine intake space needs, calculating:

- The number of average daily intakes (used to determine holding/waiting areas, examination/interview rooms, etc.)
- Clothing inventory needs in intake versus warehouse storage
- Property storage
- Intake staffing and space requirements
- Facilities for outside law enforcement (for jails)
- Arraignment space and caseload (for jails with on-site court)

Estimating Future ADP

The basic ADP projection shows the status quo or the future with no system changes, which provides a benchmark against which new initiatives can be measured.

The following approaches are used to estimate ALOS, then applied to the ADM forecast to produce ADP:

1. Examine historical ALOS data. Select one ALOS to apply over the whole duration based on recent history. For example, if the system is steady, use the average of the ALOS over the past three to five years.
2. Use an increasing or decreasing ALOS, based on the historical fluctuation in ALOS. (If ALOS increased one day per year over five years, assume a continued increase of one day per year.)
3. Establish a benchmark ALOS. For example, a goal of ALOS of 52 days might be reasonable.

Record all ALOS assumptions and the data used for future back checks.

The Assumption of Change

Once the status quo forecast is completed, possible alternate scenarios can be derived. Common alternate scenarios include:

- High and low status quo, based on confidence intervals for the admissions forecast
- Modified admissions scenarios (high or low), taking anticipated system changes into account
- Alternate ALOS scenarios, based on alternate assumptions

The various forecasts should each be considered carefully in order to select the best possible model to use for future planning.

Meg Bowers is a national criminal justice facility planner with 18 years of experience working with jails, courts and prison systems. She currently works at Dewberry.

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of force incidents.

An interesting point to note is that some counties are funding the body cameras with inmate telephone revenue. Another county obtained PREA funding to purchase the cameras.

Correctional staff are used to scrutiny and being under the microscope. Unfortunately, public perception is often negative and focuses only on the exceptions to the good work most staff do on a daily basis. Video footage can show the strong but restrained and humane way that officers deal with violent inmates to subdue them and prevent loss of life.

Interestingly, in an article in the November/December 2014 edition, we cited a prominent forward-thinking leader in corrections who projected that, in the future, body cameras will be employed and will ultimately improve transparency, staff safety and accountability.