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From Budget to Deployment: Increasing Efficiency by Understanding the Mechanics and Math of Scheduling

By Rod Miller and John Wetzel

> *This is the eleventh article on jail staffing analysis, exploring the methodology developed by the National Institute of Corrections (NIC) and presenting enhancements developed since NIC's latest workbook[1] was published. In this article, we provide an overview of the mechanics associated with taking budgeted funds and deploying employees in the jail. We also provide new tools to sharpen scheduling efforts.*

Professional jail employees are essential and expensive. Few jurisdictions have enough tax dollars to add jail employees without careful consideration and analysis, or to use costly employee hours for activities that are not essential.

Jail managers cannot afford to waste the staff hours that are funded, but without measuring the efficiency of scheduling practices, that is precisely what happens. Admittedly, measuring is difficult—unless deliberate efforts are made to capture the right information and data.

In this article we provide an overview of the mechanics and math that take budget dollars and eventually deploy employees in your jail. There are several distinct steps in this process, and just about every step has the potential to "lose" paid hours if we do not understand, measure and manage it.

Figure 1 describes eight steps that take budget dollars and eventually deploy employees in the jail.

Working with jails throughout the United States, we have identified common mistakes that are made at *each step* of the process. Some of these are described below.

1. Budget Is Approved- FUNDS PROVIDED FOR EMPLOYEE HOURS.
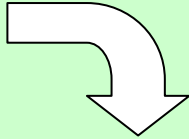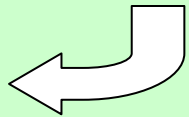
- Not enough funds requested (many potential causes)
- Too much money allocated for full-time employees leaving little for overtime/part-time hours

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[1] **Staffing Analysis Workbook for Jails**, First Edition. Rod Miller and Dennis Liebert. National Institute of Corrections, Washington D.C. 1987. Second Edition published 2003. The NIC methodology has been embraced by jails throughout the United States and has also been adopted by police, fire, transportation, health care and nursing home operations.

2. Employees Are HIRED/RETAINED.

- Hiring too many full-time employees compared to hourly employee hours
- Not accounting for turnover
- Missing opportunities to increase employee retention

Figure 1: From Budget to Deployment-- The Major Steps

1	**Budget Is Approved- FUNDS PROVIDED FOR EMPLOYEE HOURS.** Funds are provided to pay for employee hours, as salaries and associated benefits, overtime hours, and part-time hours.	
2	**Employees Are HIRED/RETAINED.** Recruiting, screening and selection, training, and retention all contribute to the total cost of the hours that salaried employees work. **Employee regular hours available for deployment are calculated using the Net Annual Work Hours (NAWH) figures.**	Some dollars used to purchase overtime hours and (in some agencies) part-time hours.
3	**Employees Are ASSIGNED TO TEAMS (Squads/Groups) for the Purpose of Scheduling.**	
4	**Employees Are SCHEDULED TO WORK Regular Hours On Shifts. Regular Days Off (RDO) Are Determined.**	
5	**Some Employees *SCHEDULE* ABSENCES.** Receive approval ahead of time for vacation, planned medical procedures, and other types of paid time off from work that may be anticipated and planned in advance.	
6	**Some Employees Fail to Appear for Scheduled Shift Due to *UNSCHEDULED* ABSENCES.** Employees call in sick, have family emergencies, and take other time off with pay without scheduling the time off in advance.	**Overtime and/or Part-Time Funds Are Used to Fill Deployment Vacancies**
7	**The Remaining Employees REPORT AS SCHEDULED for Work and Are DEPLOYED.** Sometimes there are shortfalls, sometimes excesses.	
8	**ADDITIONAL EMPLOYEES (part or full-time) ARE CALLED IN (As Needed) to Insure Minimum Staffing Needs Are Met.**	

3. Employees Are ASSIGNED TO TEAMS (Squads/Groups) for the Purpose of Scheduling.

- Dividing total employee cadre into too many units, decreasing scheduling flexibility and efficiency
- Assigning too many employees to a squad compared to net coverage needs-creating frequent excess deployment
- Assigning too many new employees to the same team or squad
- Not managing vacancies to spread them out equally among all teams

4. Employees Are SCHEDULED TO WORK Regular Hours On Shifts. Regular Days Off (RDO) Are Determined.

- *Inefficient* scheduling (e.g. not using data to adjust for days of the week that employees are differentially absent, not distributing shifts evenly, not distributing shifts to correspond to varied needs by day of the week)
- *Unfair* scheduling (e.g. favoritism, too much deference to veteran employees) that results in low employee morale and higher turnover
- Too many persons involved with scheduling (causes inconsistencies)
- Person(s) involved with scheduling not properly trained for the task

5. Employees SCHEDULE ABSENCES.

- Ineffective policies that govern employee absence scheduling
- Unfair policies regarding scheduling of absences
- Lack of incentives (or penalties) for using less time off
- Unrealistic limits on the proportion of scheduled absences, making it impossible for some employees to schedule all hours to which they are contractually entitled
- Inaccurate recording and communication of scheduled time off

6. Employees Fail to Appear for Scheduled Shift Due to UNSCHEDULED ABSENCES.

- Lack of effective policies to reduce the frequency of unscheduled absences
- Lack of incentives (or penalties) for reducing unscheduled time off

7. Employees REPORT AS SCHEDULED for Work and Are DEPLOYED.

- Too many employees report and are not assigned to posts or details that are funded in the budget
- Too few employees report causing serious shortfalls

- In larger jails, or in jails that divide into many teams, excess employees on one team not "shared" to meet shortfalls on another team (and/or specialization inhibits the sharing of employees).

8. ADDITIONAL EMPLOYEES ARE CALLED IN (As Needed) to Ensure Minimum Staffing Needs Are Met.

- Too much overtime has already strained employees, causing morale and performance problems
- Unfair and/or inconsistent practices that offer overtime to employees
- Mandatory overtime causes morale and performance problems for some employees

In our ninth article (March-April 2007) we demonstrated that most schedules are not perfect. Schedules usually assign varying numbers of employees to shifts from day to day, even if the needed level of staffing is fixed.

When the number of employees who actually present themselves for a shift is below the level needed to ensure safety and security, various responses address the shortfall (bringing in employees on overtime, using part-time employees, holding employees over for another shift, reducing operations to adjust to the shortfall). But when *more* employees report, it is possible to waste costly staff hours.

Some jail managers assert that it is rarely possible to have too many employees on a shift because there are always extra duties that may be performed. In many instances, this may be true. But when an employee's regular hours are expended for activities that are not funded in the budget (e.g. not identified in the coverage needs, or not anticipated in Net Annual Work Hours calculations), at the very least a budget problem is created.

Because the excess hours are not free, they are essentially wasted. The come out of your budget, but do not reduce the hours you need to operate your jail. At worst, funds will run out before the end of the budget year and staffing levels may be forced to drop below safe levels in order to reduce overtime.

How often do more employees report for duty than are needed in your jail? Probably more often than you think. More important, if you are not able to provide a quick and accurate answer, you are not measuring your losses.

Most jails are not armed with the tools to identify and analyze this situation. Rarely does a jail collect needed detailed information about actual deployment that allows for thorough analysis. We will identify new tools and techniques improve such data collection practices later in this series. For now, we assert that intermittent (and sometimes periodic) staff overages are common, but are rarely recognized. In some instances, we have found over 20% of employees hours are worked at times, and for activities, that were not included in the coverage plan or NAWH.

The most common symptom of this ailment is a shortfall of funds at the end of the budget year—employee regular hours do not go as far as they were expected to go. This provokes three types of responses:

1. Unexpected use and levels of overtime
2. Temporary curtailment of jail activities in order to stay within the budget (such as canceling visitation, canceling inmate dayroom time)
3. Failure to staff key posts

When these unwelcome budget surprises are identified, any of these responses produces serious management and operational problems.

If overtime is used to respond to shortfalls, employees will be working more hours and days, resulting in fatigue, diminished performance, and a disruption of their personal lives. This degrades employee performance and often erodes employee morale.

When the second response—curtailment—is used, the routine operation of the jail is interrupted. In many instances, this diminishes the extent to which the jail's mission is achieved during the curtailment. Sometimes the effects of curtailment are cumulative and impact operations in later days and weeks.

But when key posts are vacant, there may be immediate threats to the safety and security of the jail.

Most jails use a combination of these three responses. The proactive manager also learns from these unpleasant experiences and improves future management and budgeting practices.

It is common for a jail manager to simply add the amount of the current year's shortfall to the request for next year—easy but clearly imprecise. We suggest a more calculated approach that accurately identifies the hours that were not accounted for, and then explores whether there is another way to address the ebb and flow of the schedule without throwing more money at the problem.

Figure 2 in our ninth article[2] demonstrated how often a simple schedule produces varied levels of employees on the daily roster, sometimes exceeding the level of coverage that was determined to be necessary. We identified various responses that respond to the *insufficient* level of staffing, including:

- Asking employees to volunteer to work overtime, or instituting mandatory overtime to fill vacancies
- Calling on part-time personnel to fill vacancies

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[2] *Measuring the Efficiency of Schedules*, Miller, Rod and John Wetzel. P. 63 *Sheriff*, March-April 2007. National Sheriffs Association, Alexandria, VA.

- Operating below minimum levels and altering operations to compensate for staffing shortfalls (e.g. which post[s] may be unfilled, what services or activities are to be suspended)

Employee *shortfalls* on a shift present operational problems which, if not addressed effectively may pose safety and security risks, and heighten agency liability exposure.

Employee *excesses* rarely pose such operational problems—after all, more hands and heads to implement the many jail tasks are always welcome. Rather, these excesses create budget and management problems.

There are many ways to respond to intermittent employee excesses. These include:

1. Sharing employee(s) with another team that has a shortfall
2. Assigning employee(s) to special details and activities that were anticipated in the budget, such as shakedowns or security inspections
3. Assigning employee(s) to activities that were anticipated in the Net Annual Work Hours (NAWH) calculations, such as training
4. Allowing employee(s) to leave early, using some of their earned time off

The first two responses apply the extra employee to activities that were part of the coverage plan. The latter two use employee hours that were budgeted as part of the NAWH calculations. In both situations, the activity was anticipated and funded in the budget. When employees work "outside the budget," managers often find themselves in trouble at the end of the year.

A New Tool to Hone Your Scheduling Skills

The NAWH calculations that were created earlier in the process once again prove helpful. They may be used to refine the scheduling process. NAWH expresses the "net" hours that an average employee will actually be deployed every year. Using this as a starting point, it is possible to create a:

- "Scheduling discount" that calculates the net number of employees that may be expected to actually report for duty
- "Scheduling premium" that calculates how many employees would be needed on the schedule to net the number of employees sought for a shift

Figure 2 provides examples of scheduling discounts and premiums, and presents the simple formula that is used to create these factors.

Figure 2: Scheduling Discounts and Premiums

A	B	A ÷ B	B ÷ A	Example 1	Example 2
Annual Hours Employee is Scheduled	NAWH	Discount	Premium	# of employees who would report for work on a average day, out of 10 names on the schedule	# of employee names needed on the schedule to have 10 employees report for work on an average day
2086 40 hours per week times 52.14 weeks	**1,550**	0.74	1.35	7.43	13.46
	1,600	0.77	1.30	7.67	13.04
	1,650	0.79	1.26	7.91	12.64
	1,700	0.81	1.23	8.15	12.27
	1,750	0.84	1.19	8.39	11.92
2190 42 hours per week times 52.14 weeks	**1,550**	0.71	1.41	7.08	14.13
	1,600	0.73	1.37	7.31	13.69
	1,650	0.75	1.33	7.53	13.27
	1,700	0.78	1.29	7.76	12.88
	1,750	0.80	1.25	7.99	12.51

If you use a "relief factor" instead of NAWH, use the information in Figure 3 to make the necessary conversion.

Figure 3: Example of Net Annual Work Hours (NAWH) Compared to "Shift Relief Factor" (SRF) and "Relief Factor" (RF)

A	B	C	D	E	F
Annual Coverage Hours	Number of hours in a single shift	NAWH	SRF for 1 shift (A ÷ B)	Number of Shifts in 24 Hours	RF for 24hr coverage
2,920 hours (8 hours times 365 days)	**8 hours**	1,550 hours	**1.88**	**3** shifts in 24 hours	**5.65**
	8	1,600	**1.83**		**5.48**
	8	1,650	**1.77**		**5.31**
	8	1,700	**1.72**		**5.15**
	8	1,750	**1.67**		**5.01**
4,380 hours (12 hours times 365 days)	**12 hours**	1,550 hours	**2.83**	**2** shifts in 24 hours	**5.65**
	12	1,600	**2.74**		**5.48**
	12	1,650	**2.65**		**5.31**
	12	1,700	**2.58**		**5.15**
	12	1,750	**2.50**		**5.01**

Of course, not all days of the week, and not all months of the year, experience the "average" number of employee scheduled and unscheduled absences. Therefore it is

necessary to collect and analyze data about your employees and their habits in order to further refine your scheduling efforts.

More tools and techniques will be provided in the next article, continuing our effort to expand resources for staffing analysis.

The materials identified in this article, along with many other resources, are available at no cost at our on-line staffing analysis clearinghouse: www.staffinganalysis.com. The clearinghouse is a service provided by CRS, Incorporated, a non-profit organization (www.correction.org).

Rod Miller has headed CRS Inc. since he founded the non-profit organization in 1972. He is the author and co-author of numerous texts and articles on various aspects of jail planning, design, and operations. For more information, contact him at rod@correction.org, 925 Johnson Drive, Gettysburg, PA 17325, or (717) 338-9100.

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