

## Strategy for Staffing Forensic Scientists<sup>1</sup>

Our nation needs a strategy for staffing forensic scientists in public forensic laboratories. Low salaries and demands for training time impact scientist productivity and turnover in our public forensic laboratories. New automation technologies can be leveraged to increase the capacities of our laboratories, and while construction of new laboratories is essential, the most difficult challenge ahead is the shortage of intellectual capital needed to staff our laboratories.

One cannot read a newspaper without learning of a cold case solved, a suspect excluded, or a wrongful conviction overturned using DNA technology. Expanding DNA data banks to lesser offenses will further reduce crime, as recidivists are incarcerated earlier in their criminal careers. Forensic science is at a critical juncture, in that new technology provides an unprecedented opportunity to resolve a backlog of criminal cases with greater efficiency. But while technological advances promise a bright future, the "people" issues may prove intractable for management. Specifically, we lack guidance on important staffing issues, such as the recruitment, selection, and retention of forensic scientists.

There is a scarcity of research relating to turnover costs of technical and scientific personnel in public agencies (1). Most forensic laboratories are part of the organizational structure of large police departments, thus they provide laboratory services free of charge. Smaller police departments cannot budget the funding for their own laboratory for even the analysis of routine cases, such as driving while intoxicated or narcotics. The demand for timely analyses of DNA cases means that public agencies must explore human resource staffing models to remain competitive with and avoid outsourcing to private laboratories.

There are also no firm data available on the number of forensic scientists employed in the United States (2). Table 1 shows estimates of the number of forensic scientists in each state of the northeastern U.S. compared with the population of the state (3). One method of forecasting personnel establishes a ratio of employees needed to serve a specific population. The 846 forensic scientists estimated in Table 1 provide a ratio of approximately 1 scientist per 61,000 population.

We estimate that one forensic scientist is needed per 30,000 population. This ratio would provide a timely (within 30 days of submittal) report to the criminal justice community (3). An additional 900 scientists are needed to reduce the ratio to one scientist per 33,333 population in the northeastern U.S. alone. And an *additional* 10,000 new forensic scientists are needed nationwide over the next decade to address the expanding case backlog.

Lab turn around for processing cases can be addressed using production principles of line balancing and cycle time (4). Desired cycle time (turn around time for forensic report from submission to completion) can be described as:

$$\text{Cycle}_d = \text{production time available/desired units of output}$$

Assume that the cycle time for forensic work is six months; in order to reduce cycle time to three months, the number of forensic scientists (and the associated productivity) needs to be doubled. This doubling of productivity would allow the average cycle time of forensic casework to approach a more desirable 30 days. Lab turn around is an issue that appears frequently in the media; see for

<sup>1</sup> This paper represents the opinions of the authors and does not reflect the views of their respective organizations.

example, Ref 5. The cycle time concept, in conjunction with the ratio of forensic scientists per capita needed to support a geopolitical area, are management tools needed to forecast human resource needs.

Recruitment and selection of forensic scientists is a time-consuming and labor-intensive process, involving a great investment for both candidates and the organization alike. Candidates must meet extensive educational requirements and successfully proceed through a series of demanding interviews. There is typically a thorough background investigation, as well as drug, polygraph and integrity tests. Only highly select individuals make it through the entire selection process. For public agencies operating within the civil service system, these selection phases are quite exclusive; our experience is that this can take up to a year. Hiring costs represent a significant portion of the forensic lab's budget, particularly when the impact of turnover is considered.

Once on the job, forensic scientists find themselves in hierarchical, often quasi-military organizations. While their positions are decidedly professional, the pay may not reflect the intensive education, training and experience that the incumbents have invested in their forensic careers. Motivation and retention of these core employees is crucial for the stability of the organization.

We conducted an evaluation of a recent staffing effort in a large public state forensic laboratory system in the northeastern United States. Due to increased capacity, this lab expanded, adding 53 new positions. Rather than hire 53 forensic scientists, the organization created a new staffing model, consisting of 15 forensic scientist positions and 38 lab technician positions. Two new lab technicians would partner with a senior scientist mentor for the first year; the senior scientists' time would be spent in training and in the more advanced laboratory work, while lab technicians were learning and getting up to speed. It was proposed that this model would save the organization money while creating a training program and a career ladder for newly hired technicians.

However, within one year, 16 of the carefully selected individuals exited the organization voluntarily. These departures were costly to the organization; we wanted to understand what had gone wrong. We contacted these 16 people (4 forensic scientists and 12 lab techs). Their interviews are revealing. We found that:

1. Ten left for positions at higher salaries; six of these individuals transferred to similar state, city or federal lab systems, but with an increase in pay;
2. Three left to enter law or medical school full-time;
3. One left to enter the state police academy; and
4. Two left for family and personal reasons; one for marriage and relocation, the other to remain home with small children.

We also asked the remaining new hires who remained in the organization, what *was* working for them. Most cite the continuing education programs, flexible hours and tuition reimbursement to be attractive components of their employment. In addition, all seventeen individuals hired from the internship program have remained with the organization. Many of these individuals were referred by employees, both current and retired. In addition to being well qualified, the interns also possessed a "cultural fit" to the organization that ultimately, resulted in zero turnover.

It appears that external inequities in salary represent the most basic reason for the early departures. In addition, differences in em-

TABLE 1—*Forensic Scientists in the North Eastern United States.*

State	Population (millions)	# Forensic Scientists
Connecticut	3.5	65
Maine	1.2	17
Massachusetts	6.1	66
New Hampshire	1.2	20
New Jersey	8.1	95
New York	18	400
Pennsylvania	12	150
Rhode Island	1	21
Vermont	0.6	12
Total	51	846
Present FS per capita Supply Ratio	846 FS/51 m	1 FS/61,000
900 scientists needed for a 1/33,333 ratio	1800 FS/60 m = 1 FS/33,333	

Estimates taken from New York State Police Forensic Investigation Straw Pole of New England States Forensic Scientists (2001).

Employee perceptions and lab realities create employee retention problems. We conclude that:

1. There is an alarming lack of data available to formulate local, state and national forensic staffing models;
2. Salaries in public systems are not competitive with the private sector and often lack consistency even within and between public labs;
3. Job analysis descriptions of the knowledge, skills, abilities and other characteristics (KSAOs) needed in forensic science positions must be consistent with the KSAOs possessed by those selected into the lab positions;
4. Individual employee motivation is an important factor in forensic scientist retention; and
5. Individual employee perceptions of fit with the organization should be monitored after hire, using surveys along with supervisory communications and intervention.

We offer the following eight recommendations:

1. A national strategy is needed to properly fund forensic education programs to supply forensic scientists of the future.
2. Factors affecting forensic scientist turnover costs can be identified using human resource staffing models.
3. Forensic scientist positions need to be upgraded. Career ladders need to be established such that salaries are competitive with other public agencies, as well as private laboratories.
4. Forensic science organizations must develop realistic job previews that provide information to candidates about the reality of the job, including the day-to-day routines and the realities of organizational life.
5. Forensic science labs should assess individual personal career motivations as well as the skills, education and experience of applicants.

6. Forensic labs must develop shadow programs, in which high school students are given an opportunity to observe scientists at work.
7. Forensic labs must develop internship programs, both paid and unpaid, in which college level students participate in science activities as a forerunner to a career.
8. Forensic labs should partner with universities to develop new curricula and state-of-the-art forensic science programs. Mentor in-house training programs are inefficient and should be replaced with post-graduate degree programs coupled with dedicated mirror training laboratories. A new program at the University at Albany in partnership with the New York State Police is one such model.

These challenges for political administrators and senior management come at a time of increased positive exposure to the field of forensic science in the media. Television and the media alike have popularized forensic science as a profession. The dramatic coverage of recovery efforts at the World Trade Center has brought recognition to the importance of forensic science.

The hand full of post-graduate forensic degree programs that now exist need a significant increase in funding to provide the staff needed to analyze an increasingly oppressive backlog of casework and to design the automated systems of the future.

We have examined the factors affecting turnover of forensic scientists in a large public forensic laboratory, factors that have led to the establishment of a post-graduate degree program in forensic DNA to increase the supply of forensic scientists. We must develop a national strategy to increase the number of forensic scientists by teaming with human resource professionals and by working with the academic community to significantly increase support for the existing undergraduate and post graduate programs in forensic science.

## References

1. Selden SC, Moynihan DP. A model of voluntary turnover in state government. *Review of Public Personnel Administration*, 2000;20, 2, 63–74.
2. Dillon H. Forensic scientists: a career in the crime lab. *Occupational Outlook Quarterly*, 1999;43, 3, 2–7.
3. New York State Police Forensic Investigation Straw Pole of New England States Forensic Scientists (2001).
4. Russell RS, Taylor BW. *Operations management* (3rd ed.). Upper Saddle River: Prentice Hall, 2000.
5. Cape cases are part of State's crime lab backlog, *Cape Cod Times*, September 9, 2002.

W. Mark Dale, Director  
NYPD Laboratory  
150-14 Jamaica Avenue  
Jamaica, NY 11432-3725

Wendy S. Becker, Ph.D.  
Assistant Professor Management  
School of Business BA 327  
University at Albany  
1400 Washington Avenue  
Albany, NY 12222-0100