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FORESIGHT: A Business Approach to Improving Forensic Science Services

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Abstract *Managers of scientific laboratories see themselves as scientists first and managers second; consequently, they tend to devalue the managerial aspects of their jobs. Forensic laboratory managers are no different, but the stakes may be much higher given the importance of quality science to the criminal justice system. The need for training and support in forensic laboratory management has been recognized for many years, but little has been done to transition the tools of business to the forensic laboratory environment. FORESIGHT is a business-guided self-evaluation of forensic science laboratories across North America. The participating laboratories represent local, regional, state, and national agencies. Economics, accounting, finance, and forensic faculty provide assistance, guidance, and analysis. The process involves standardizing definitions for metrics to evaluate work processes, linking financial information to work tasks, and functions. Laboratory managers can then assess resource allocations, efficiencies, and value of services—the mission is to measure, preserve what works, and change what does not. A project of this magnitude for forensic laboratories has not been carried out anywhere.*

Keywords Economics, management, process improvement

"It is not for me to change you. The question is, how can I be of service to you without diminishing your degrees of freedom?"
—Buckminster Fuller

Introduction

Preparation to become a laboratory manager is largely neglected in the education of scientists (Forde, 2005). The assumption is that management skills will come through on-the-job experience, if at all necessary. Scientists who manage laboratories see themselves primarily as scientists and then as managers; consequently, they tend to devalue the managerial aspects of their jobs (Geles et al., 2000), particularly what are considered the "softer" skills, such as time and project management (Forde, 2005).

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As the *Chronicle of Higher Education* put it,

> The world of science offers a perplexing career track: Scientists spend nearly a decade learning how to do great, clean experiments, interpret data accurately, and think creatively and independently. Then they land a professorship and are faced with the responsibility of overseeing their own laboratory. All of a sudden they are thrust into a new type of job for which they've never been trained: management. And like any business, a laboratory can flourish or flounder by the quality of that management. (Beckman, 2003)

Scientists rarely receive managerial education or training; the expectation on the scientists' part is that being highly educated in the sciences is enough of a prerequisite for management. However, as a professor of strategy at UCLA said, "If you know how to design a great motorcycle engine, I can teach you all you need to know about strategy in a few days. If you have a PhD in strategy, years of labor are unlikely to give you the ability to design great new motorcycle engines" (as quoted in Mintzberg, 2005, p. 13). Scientists thus move from a "science-only"

environment to one where the motivations are different, money matters, and the education and training are very different (Picker et al., 2005).

Forensic laboratory managers are no different, but the stakes may be much higher given the importance of quality science to the criminal justice system. The need for training and support in forensic laboratory management has been recognized for many years (NIST, 1999), but little has been done to transition the tools of business to the forensic laboratory environment. The FORESIGHT Project is a volunteer project to identify, adapt, field test, and refine standardized definitions and metrics to forensic laboratory managers to measure, assess, and benchmark performance for improving efficiencies, quality, and service. Providing a uniform basis for evaluation is the first step toward training and support—without a consensus of what specific words, terms, and processes mean, no meaningful conversations can take place. An agency's strategic value is a function of benefits as well as costs, and managers frequently will focus on the wrong measures (Campbell, Whitehead, & Finkelstein, 2009).

Motivation for the Project

A study in Europe called QUADRUPOL (2003) conducted an in-depth analysis of four forensic laboratories in the European Union, namely Sweden, the Netherlands, Poland, and Finland. At the 2006 International Forensic Business and Economics Colloquium, sponsored by the West Virginia University Forensic Science Initiative, it was proposed that a similar study would benefit North American forensic laboratories.

Benchmarking is improving performance by recognizing, understanding, and integrating best—or at least better—practices from either inside the organization or from outside entities (Camp, 1995). To move forward on a benchmarking project, a standard of comparison must be established. Currently in forensic science, no such standard, as it relates to business practices, exists.

The FORESIGHT Project created the standard methods to collect management data, and these provide the basis for broad, yet deep, comparisons between forensic laboratories using robust measures. The FORESIGHT Project is a business-guided self-evaluation of forensic science laboratories across North America. The project involved standardizing definitions for metrics to evaluate work processes, and linking financial information to work tasks, and functions. Laboratory managers can use these functions to assess resource allocations, efficiencies, and value of services—the mission is to measure, preserve what works, and change what does not. While the Census of Publicly Funded Crime Laboratories (Durose, 2008) and other surveys (Childs & Witt, 2009) approach the forensic industry broadly, FORESIGHT uses cross-laboratory data comparisons to identify and examine processes, strategies, resources, and allocations at a detailed level. The goal was not simply more information; most forensic laboratories have laboratory information management systems (LIMS; Durose, 2008) and, therefore, the assumption is that information already may be useful to some degree. From discussions with the participant laboratories, it is the authors' opinion that LIMS systems in forensic science are designed more for routine record-keeping tasks, like chain of custody, than truly managing information. Some participants knew the data were in their systems but could not extract it because of software limitations. More information by itself solves nothing. The goals here are human goals, after all, to improve the efficiency of the science offered to the criminal justice system from a business perspective, while also maintaining quality. In FORESIGHT, the intent was to distinguish between "know that" (data or information) and "know how" (putting "know that" to use; Ryle, 1949), and facilitating the latter through standardization, collaboration, and analysis while retaining innovation to solve complex problems (Brown & Duguid, 2002).

A project of this magnitude for forensic laboratories has not been carried out anywhere. Previous studies have been limited in scope or are simply dated (Law Enforcement Assistance Administration, 1968; Benson & Stacy, 1970; Rosenthal & Travnicek, 1974). National and international interest has increased participation in the FORESIGHT Project from nine to fourteen laboratories; it is hoped that international cooperation will improve forensic laboratory performance and increase the quality and efficiency of their services to their respective justice systems. As will be discussed later, any public forensic science laboratory can participate in the FORESIGHT Project. The participating laboratory managers see the value of this type of project and how it can aid them in managing their laboratories' resources, communicating achievements and needs up and down the hierarchy, supporting and justifying decisions, and laying the groundwork for improvement processes. Ultimately, the more laboratories that participate, the more statistically significant and representative the data become and, therefore, the greater benefit to laboratories who participate. The cost of the central project is free to public forensic laboratories, the costs initially being borne by a cooperative agreement with the National Institute of Justice.

Building a Performance Evaluation Model: Methodology

FORESIGHT is based on the plan-do-check-act cycle of Shewhart (1939) and Deming (1986), an iterative four-step process to solve problems and improve processes.

Plan: Establish objectives processes necessary to achieve the stated output.

Do: Implement the processes.
Check: Measure the new processes and compare them against previous and expected results evaluating any variances.
Act: Analyze any differences or variances to determine cause.

A single pass through this cycle rarely solves the problem, and the cycle continues until the expected output is achieved. FORESIGHT is predicated on facilitating the plan, check, and act steps of the cycle, leaving the "do" step to the laboratories to implement the improvements in their own laboratories. Interestingly, the cycle is based upon the scientific method (Shewhart, 1939) and so should be readily sensible to scientific laboratory managers. The FORESIGHT Project managers also collaborate to identify and share best or "better" practices through periodic meetings. The West Virginia University (WVU) faculty helps guide the participants with experience, resources, and input. In this method, the FORESIGHT Project managers collect the data; the WVU faculty analyzes it; and the participants—as a collective—discuss and vet processes, innovations, and solutions.

The FORESIGHT Project laboratories participate on a volunteer basis. The participating laboratories represent local, regional, state, and federal agencies. The authors from the WVU College of Business and Economics provide assistance, guidance, and analysis to the laboratories in the design of business process definitions. Standardization of terminology is critical to successful comparison and benchmarking. Definitions were kept as similar as possible to the QUADRUPOL study to promote collaboration; Appendix A contains the glossary for the FORESIGHT Project definitions, and Appendix B contains the investigative area definitions for the project. Most of the FORESIGHT Project managers came to the initial meeting with a clear, if parochial, idea of what professional terms, such as "case," "item of evidence," and "test," meant. The discussion about these words lasted three days over two meetings. Clearly, the meanings were not uniform across all laboratories. For example, one of the participant laboratories had been criticized for having a longer turnaround time (that is, cycle time; De Feo & Barnard, 2005) than a laboratory with fewer employees and a smaller budget; the implication being that the larger, better-resourced laboratory should be able to perform proportionately to its resources. The larger laboratory defined turnaround time as the time from when the first item of evidence was submitted in a case until the date the case report was issued. However, the smaller laboratory measured turnaround time as the time from when the *last* item of evidence was submitted until the date the case report was issued; the rationale was that the casework could not be completed until *all* the evidence was available for analysis. This obviously made a huge difference in the reported metrics, but no one had thought to ask *if the terms were defined differently*—and the assumption was that all laboratories use the same definitions. Extensive discussions among the participants revealed that differences in human resource and management structure made some terms unrelated or irrelevant, while others had to be redefined for use in North America (in *italics* in the Tables).

There is a seemingly endless array of potential metrics that might be devised from the data in any crime laboratory. The FORESIGHT Project created but has not completely evaluated numerous metrics requested by participants or as viewed by other standards in the accounting and finance literature. Not all of these measures were used initially but may be useful for specific evaluative purposes germane to laboratories' needs. These measures include but are not limited to:

Correlation between pay and mobility	Analysis of backlog
Correlation between pay and training (per FTE)	Ratio: Staff FTEs/Manager FTEs
Correlation between pay and experience	R&D: Hours as a percent of total
Turnaround Times	R&D: Dollars as a percent of total expenditure
Casework versus non-casework	Training funding/FTE
FTE/Case	Expenditure by area/case
Correlation between T&E and productivity	Expenditure by area/item
Correlation between experience and productivity	Expenditure by area/exam (test)
Case output/FTE (by investigative area)	Gap analysis/best practices
Floor space/FTE	Cost per case by investigative area
Floor space/Case	Training of clients & customers/total hours
FTEs by job type (e.g., analysts) per population	Correlation between training and mobility
Percent of casework by investigative area	Casehours/total hours
Percent of items by investigative area	Training/demographics

It was decided that ratios proved to be the most robust, easily compared metrics (Speaker, 2009). The ratios used are collected through the Laboratory Reporting and Analysis Tool (LabRAT). LabRAT is a condensed, active, data-collection tool that allows for easy entry of information most forensic laboratory directors should have or be able to get readily (Appendix C). With LabRAT, examples are offered to assist in the tallying of items, cases, and tests (Appendix D). The data collected from LabRAT is collated and compared to produce analyses and reports; an executive summary on the 2008 FORESIGHT study is available

online at www.be.wvu.edu/forensic. Any public forensic science laboratory can participate in FORESIGHT by completing a LabRAT form; using the standard investigative areas, definitions, and tallies; and submitting it to the corresponding author (MMH).

The goal of the FORESIGHT project is improvement, not punishment—inherent in the goal of quality is the promise of redemption (Deming, 1986). Laboratories not in the upper quartile were self-aware of their results and performance relative to the other laboratories. The laboratories in the upper quartile then represented a "better practice" contact to discuss what processes may have led to that performance.

Conclusions

The FORESIGHT Project stresses that the metrics themselves are not the answers, but are pointers or flags to the processes that are the answers to questions of improved performance. The job of management is "the messy stuff—the intractable problems, the complicated connections" (Mintzberg, 2005, p. 13), and information should feed judgment, not command it (Brown & Duguid, 2002); regrettably, that is often not the case. Critics may be quick to latch onto one or another number from this type of study and start laying blame. Poor laboratory management or obvious mistakes of science are easy enough to identify. The forensic profession will not be able to distinguish the good from the better, however, unless some standardized measures are in place as a platform for the conversations about processes, methods, and solutions.

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Appendix A: Terminology Definitions for FORESIGHT Glossary

Assistant/Analyst An individual carrying out general casework examinations or analytical tests under the instruction of a reporting scientist or reporting analyst and who is able to provide information to assist with the interpretation of the tests.

Backlog Open cases that are older than 30 days as measured at the end of the year.

Case-Institute Case A request from a crime lab "customer" that includes forensic investigations in one or more investigative areas.

Case-Area Case A request for examination in one forensic investigation area. An area case is a subset of an institute case.

Casework All laboratory activities involved in examination of cases.

Casework Time Total FTEs for the operational personnel in the investigation area (in hours) subtracted by the hours of R & D, E & T, and support and service given to external partners.

Crime Perceived violation of the law that initiates a case investigation.

Direct Salary Total salary paid to employees, including overtime compensations, vacation salary, bonuses, etc.

Examinations (Exams) The word QUADRUPOL used for "test"; see both "test" and "sample" in this glossary for the changes adopted by FORESIGHT.

Facility Expense Sum of rents, cleaning and garbage collection, security, energy, water, communication, ICT infrastructure, and facility maintenance.

Floor Area Total of all floor area including office, laboratory and other.

Full-Time Equivalent (FTE) The work input of a full-time employee working for one full year.

Full-Time Researcher A forensic scientist whose primary responsibility is research and who is not taking part in casework.

Investigation Area Area limited by item type and methods as they are listed in the benchmarking model.

Investment Expense Sum of purchases of equipment, etc., with a lifetime longer than three years and a cost above $1,000 (alternatively capital expenses).

Item A single object for examination submitted to the laboratory. Note: One item may be investigated and counted in several investigation areas.

Laboratory Area Floor area used for forensic investigation, including sample and consumable storage rooms.

Non-Reporting Manager An individual whose primary responsibilities are in managing and administering a laboratory or a unit thereof, and who is not taking part in casework.

Office Area Floor area of offices (square feet).

Operational Personnel Personnel in operational units providing casework, research and development (R & D), education and training (E & T), and external support services. Non-reporting unit heads are included.

Other Area Floor area of space not belonging to laboratories or offices, i.e., corridors, lunch corners, meeting rooms, etc. (square feet).

Overhead Time Total FTEs in hours in the investigation area subtracted by the total hours of casework, R & D, E & T, and support and service given to external partners.

Personnel Expense Sum of direct salaries, social expenses (employer contribution to FICA, Medicare, workers comp, and unemployment comp), retirement (employer contribution only towards pensions, 401(k) plans, etc.), personnel development and training (internal or external delivery, including travel), and occupational health service expenses (employer contribution only).

Report A formal statement of the results of an investigation, or of any matter on which definite information is required, made by some person or body instructed or required to do so.

Reporting Analyst An analyst responsible in non-complicated cases (e.g., simple drugs analysis) for performing the examination of the items submitted, interpreting the analysis results, writing the analysis report and, if necessary, providing factual evidence for the court.

Reporting Scientist The forensic scientist responsible in a particular case for performing or directing the examination of the items submitted, interpreting the findings, writing the report, and providing evidence of fact and opinion for the court.

Representation Expense The costs for hosting guests, i.e., lunches, dinners, coffees offered by the lab, and presents given to guests or during visits abroad, etc.

Running Operational Expense Other costs than investment costs, personnel costs and facilities costs, e.g., consumables, traveling, QA, literature, contracting, representation, service and maintenance, information and advertisement.

Sample An item of evidence or a portion of an item of evidence that generates a reported result.

Scientist in Training An individual with no reporting rights being trained to become a reporting scientist.

Student Hours The sum of teaching hours in a course multiplied by the number of students attending the particular course.

Support Personnel Forensic laboratory staff providing various internal support services. Management and administration personnel not belonging to the operational units are included.

Teaching Hours Time spent teaching in the lecture room in hours (60 min).

Test An analytical process including, but not limited to, visual examination, instrumental analysis, presumptive evaluations, enhancement techniques, extractions, quantifications, microscopic techniques, and

comparative examinations. This does not include technical or administrative reviews.

Total Expense The sum of the direct expenses (personnel, operating, and investment) and any administrative or other overhead expenses.

Total Funding The sum of all funding sources including jurisdictional budgeting, grant awards, bequests, and revenue sources.

Total Items Includes all items to which the laboratory assigns an item or tracking number. This is different than the number of items the laboratory receives. (The lab may split items up for analysis.)

Workload Total time spent on all work related to job, including overtime.

Appendix B: Definitions for FORESIGHT Investigation Area Definitions, Derived From QUADRUPOL and ILAC

Definitions in italics were created or redefined for FORESIGHT.

Accident Investigation All non-traffic accident investigations, such as work-related accidents.

Biology (Non-DNA) *The detection, collection, and non-DNA analysis of biological fluids.*

Computer Analysis The analysis of computers, computerized consumer goods, and associated hardware for data retrieval and sourcing.

Crime Scene Investigation The collection, analysis, and processing of locations for evidence relating to a criminal incident.

Digital Evidence—Audio & Video The analysis of multimedia audio, video, and still-image materials, such as surveillance recordings and video enhancement.

DNA Casework *Analysis of biological evidence for DNA in criminal cases.*

DNA Database Analysis and entry of DNA samples from individuals for database purposes.

Document Examination The analysis of legal, counterfeit, and questioned documents, excluding handwriting analysis.

Drugs-Controlled Substances The analysis of solid dosage licit and illicit drugs, including precursor materials.

Entomology Forensic entomology is the application of the study of arthropods, including insects, to criminal or legal cases.

Evidence Screening & Processing *The detection, collection, and processing of physical evidence in the laboratory for potential additional analysis.*

Environmental Analysis [See QUADRUPOL]

Explosives The analysis of energetic materials in pre- and post-blast incidents.

Fingerprints The development and analysis of friction ridge patterns.

Fire Analysis *The analysis of materials from suspicious fires to include ignitable liquid residue analysis.*

Firearms & Ballistics The analysis of firearms and ammunition, to include distance determinations, shooting reconstructions, NIBIN, and toolmarks.

Forensic Engineering & Material Science Failure and performance analysis of materials and constructions.

Forensic Pathology Forensic pathology is a branch of medicine that deals with the determination of the cause and manner of death in cases in which death occurred under suspicious or unknown circumstances.

Gun Shot Residue *The analysis of primer residues from discharged firearms (not distance determinations).*

Hairs & Fibers The analysis of human and animal hairs (non-DNA) and textile fibers as trace evidence.

Handwriting The evaluation of handwritten materials to categorize or identify a writer.

Marks & Impressions The analysis of physical patterns received and retained through the interaction of objects of various hardness, including shoeprints and tire tracks.

Odontology The identification of human remains through dental materials, for example by postmortem X-rays of the teeth compared to antemortem X-rays. Some forensic odontologists also analyze and compare bitemarks.

Other Specialties Other forensic science applications not covered by the other categories.

Paint & Glass The analysis of paints—generically, coatings—and glass as trace evidence.

Road Accident Reconstruction Analysis of criminal incidents involving vehicles and accidents (hit and run, for example).

Speech & Audio: The analysis of live and recorded vocalizations in criminal investigations.

Trace Evidence The analysis of materials that, because of their size or texture, transfer from one location to another and persist there for some period of time. Microscopy, either directly or as an adjunct to another instrument, is involved.

Toxicology, Antemortem Toxicology involves the chemical analysis of body fluids and tissues to determine if a drug or poison is present in a **living** individual, to include blood alcohol analysis (BAC). Toxicologists are then able to determine how much and what effect, if any, the substance might have had on the person.

Toxicology, Postmortem Toxicology involves the chemical analysis of body fluids and tissues to determine if a drug or poison is present in a **deceased** individual. Toxicologists are then able to determine how much and what effect, if any, the substance might have had on the person.

Appendix C: The Laboratory Reporting and Analysis Tool (LabRAT) forms

LabRAT Template

Welcome to the Laboratory Reporting and Analysis Tool (LabRAT), part of the FORESIGHT project. The following worksheets address a variety of questions regarding the allocation of resources within your laboratory. With each worksheet, the requested items are highlighted in the yellow shaded cells. Other cells, with white background, may have data in the form of automated calculations. Do not worry about completion of items in those white background cells.

Organization (Data Source)	
Fiscal Year (e.g., 2007)	
Fiscal Year Period (e.g., Jul 1-Jun 30)	

Laboratory Detail		**Laboratory LabRAT project manager**	
Jurisdiction (federal, state, local, private)			**Contact Information:**
Size Population Served		Phone:	
Geographic Size Served		Fax:	
Number of separate facilities		email:	
		Mailing Address:	
LIMS Provider / Version			
Standard Work Week (hrs)		City:	
Facilities - Square Feet		State/Prov:	
Administrative Office Area		Country:	
Laboratory Area		Zip:	
Other Area			

Please provide a brief descriptive profile of your organization and laboratories:

Please provide a brief description of any anomolies in the reported year versus a "normal" year of operation.

In the box below, add any special notes regarding your completion of this worksheet.

Investigation area	case areas	total items	items outsourced	items examined internally	total samples from items examined internally	tests on samples examined internally	area reports	Median turn around time, days from last submission (internal)	Median turn around time, days from first submission (internal)	Median turn around time for analyst, days	open area cases at end of year	open area cases older than 30 days at end of year (backlog)	number of institutional cases in one area only	Floor area (sq ft)	Hrs in casework	Operational Staff FTE	Support Staff FTE
Accident Investigation																	
Blood Alcohol																	
Computer Analysis																	
Crime Scene Investigation																	
Digital evidence - Audio & Video																	
DNA Casework																	
DNA Database																	
Document Examination																	
Drugs - Controlled Substances																	
Entomology																	
Evidence Screening & Processing																	
Environmental analysis																	
Explosives																	
Fingerprints																	
Fire analysis																	
Firearms and Ballistics *																	
Forensic engineering and material science																	
Forensic Pathology																	
Gun Shot Residue (GSR)																	
Hairs & Fibers																	
Handwriting																	
Marks and Impressions **																	
Odontology																	
Paint & Glass																	
Road accident reconstruction																	
Serology/Biology																	
Speech & Audio																	
Toxicology ante mortem (excluding BAC)																	
Toxicology post mortem (excluding BAC)																	
Trace Evidence																	
Other Specialties (describe below)																	
TOTAL	-	-	-	-		-	-	-	-	-	-	-	-	-	-	0.00	0.00

*Includes toolmarks
**Includes tires and shoes

In each cell, enter the requested number for that row's investigation area

Amount Budgeted (from all sources of funding) for the Investigation area for the year	Investigation area	*In each cell, indicate the actual dollar expenditure for the Fiscal Year.*															0							
		Capital Expenditures current year	Capital Expenditures previous four years	Operational Staff Salary	Support Staff Salary	Benefits	Overtime and Temporary	Chemicals, reagents, consumables, gases	Travelin (non-training related)	QA and accreditation	Literature purchased	Subcontracting lab. investigations (cases)	Other subcontracts (e.g. consulting)	Representation costs	Service of instruments	Information / publications produced	Advertise-ments (for vacancies)	Non-instrument Repairs & maintenance	Equipment leasing	Facilities Rent - Leasing	Utilities	Telecommunic ation	Other	Total Expenditures
	Accident Investigation																							0
	Blood Alcohol																							0
	Computer Analysis																							0
	Crime Scene Investigation																							0
	Digital evidence - Audio & Video																							0
	DNA Casework																							0
	DNA Database																							0
	Document Examination																							0
	Drugs - Controlled Substances																							0
	Entomology																							0
	Evidence Screening & Processing																							0
	Environmental analysis																							0
	Explosives																							0
	Fingerprints																							0
	Fire analysis																							0
	Firearms and Ballistics *																							0
	Forensic engineering and material science																							0
	Forensic Pathology																							0
	Gun Shot Residue (GSR)																							0
	Hairs & Fibers																							0
	Handwriting																							0
	Marks and Impressions **																							0
	Odontology																							0
	Paint & Glass																							0
	Road accident reconstruction																							0
	Serology/Biology																							0
	Speech & Audio																							0
	Toxicology ante mortem (excluding BAC)																							0
	Toxicology post mortem (excluding BAC)																							0
	Trace Evidence																							0
	Administration and Support																							
	Other Specialties (describe below)																							
	0																							0
	0																							0
	0																							0
	0																							0
	0																							0
	0																							0
	0																							0
	0																							0
$0	TOTAL																							0
	TOTAL	$0							$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
*Includes toolmarks	**Includes tires and shoes	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	$0

Investigation area	Expenditures Total	Personnel Expenditures	FTE	Area Cases	Items	Samples	Tests	Cost per Case	Cost per Item	Cost per Test	Average Compensation	Personnel Budget / Total Budget	Cases per FTE	Tests per Case	Tests per Sample	Tests per FTE
Accident Investigation	$0	$0	0.00	0	0	0	0									
Blood Alcohol	$0	$0	0.00	0	0	0	0									
Computer Analysis	$0	$0	0.00	0	0	0	0									
Crime Scene Investigation	$0	$0	0.00	0	0	0	0									
Digital evidence - Audio & Video	$0	$0	0.00	0	0	0	0									
DNA Casework	$0	$0	0.00	0	0	0	0									
DNA Database	$0	$0	0.00	0	0	0	0									
Document Examination	$0	$0	0.00	0	0	0	0									
Drugs - Controlled Substances	$0	$0	0.00	0	0	0	0									
Entomology	$0	$0	0.00	0	0	0	0									
Evidence Screening & Processing	$0	$0	0.00	0	0	0	0									
Environmental analysis	$0	$0	0.00	0	0	0	0									
Explosives	$0	$0	0.00	0	0	0	0									
Fingerprints	$0	$0	0.00	0	0	0	0									
Fire analysis	$0	$0	0.00	0	0	0	0									
Firearms and Ballistics *	$0	$0	0.00	0	0	0	0									
Forensic engineering and material science	$0	$0	0.00	0	0	0	0									
Forensic Pathology	$0	$0	0.00	0	0	0	0									
Gun Shot Residue (GSR)	$0	$0	0.00	0	0	0	0									
Hairs & Fibers	$0	$0	0.00	0	0	0	0									
Handwriting	$0	$0	0.00	0	0	0	0									
Marks and Impressions **	$0	$0	0.00	0	0	0	0									
Odontology	$0	$0	0.00	0	0	0	0									
Paint & Glass	$0	$0	0.00	0	0	0	0									
Road accident reconstruction	$0	$0	0.00	0	0	0	0									
Serology/Biology	$0	$0	0.00	0	0	0	0									
Speech & Audio	$0	$0	0.00	0	0	0	0									
Toxicology ante mortem (excluding BAC)	$0	$0	0.00	0	0	0	0									
Toxicology post mortem (excluding BAC)	$0	$0	0.00	0	0	0	0									
Trace Evidence	$0	$0	0.00	0	0	0	0									
Other Specialties (describe below)																
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
0	$0	$0	0.00	0	0	0	0									
	$0	$0	$0	$0	$0	$0	$0									

Appendix D: Two example sets of tallies for items, cases, and tests in FORESIGHT

Biology/Serology case: *In a case of sexual assault, the kit, the victim's underwear, and a bedsheet are submitted; due to the context of the crime, the bedsheet is not examined. The laboratory does not perform microscopic hair examinations.*

	Total Items	Total Samples From Items Examined Internally	Tests on Samples Examined Internally	Tests Conducted			
				Visual	AP	P30	Microscopic
Biology/Serology case	4	4	17				
1. Sexual assault kit							
1.1 Vaginal swab					1	1	1
1.2 Oral swab					1	1	1
1.3 Anal swab					1	1	1
1.4 Hair sample (not tested)							
1.5 Victim known sample							
2. Underwear (Two stains: one +, one −)				2	2	2	2
3. Bedsheet (not tested)							
4. Suspect known sample							

Fingerprints case: *Two soda cans and three latent lifts are submitted from the scene as well as two sets of tenprint cards from the suspects.*

	Total Items	Total Samples From Items Examined Internally	Tests on Samples Examined Internally	Tests Conducted			
				Visual	Develop (2 @)	Comparison	Photography
Fingerprints case	7	7	18				
1. Two (2) soda cans (1 print @)		*1 print* @		2	4	4	2
2. Three (3) latent lifts		3				6	
3. Two (2) tenprint cards*		2					

*Each tenprint set counts as 1 item, to include major case prints, palms, etc.