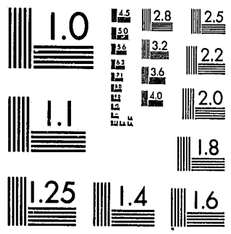

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Calspan

Technical Report

ANALYSIS OF CRIMINALISTICS LABORATORY EFFECTIVENESS IN CRIMINAL JUSTICE SYSTEMS

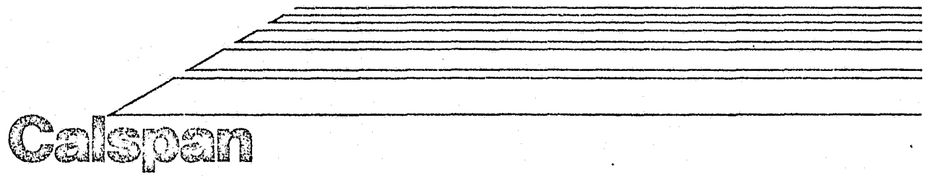
VOLUME IV

SUMMARY AND RECOMMENDATIONS

30 September 1974

Calspan Corporation
Buffalo, New York 14221

Formerly Cornell Aeronautical Laboratory, Inc.



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SUMMARY AND RECOMMENDATIONS

30 September 1974

Calspan Report No. DC 5414-X-1

by

P. Rosenthal and D. A. Travnicek
Computer Systems Department

On November 17, 1972 Cornell Aeronautical Laboratory (CAL) changed its name to Calspan Corporation and converted to for-profit operations. Calspan is dedicated to carrying on CAL's long-standing tradition of advanced research and development from an independent viewpoint. All of CAL's diverse scientific and engineering programs for government and industry are being continued in the aerosciences, electronics and avionics, computer sciences, transportation and vehicle research, and the environmental sciences. Calspan is composed of the same staff, management, and facilities as CAL, which operated since 1946 under federal income tax exemption.

Calspan Corporation
Buffalo, New York 14221

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PREFACE

The research on which this report is based has been performed as part of the National Institute for Law Enforcement and Criminal Justice program of addressing problems of resource allocation within forensic laboratories, performance and effectiveness measurement. The MITRE Corporation, as prime contractor for the program, has been assisted by two subcontractors: The PRC Systems Science Company has developed internal measures of criminalistics laboratory performance and the Calspan Corporation has been responsible for developing external measures of their impact on criminal justice systems. Both subcontractors collected data on on-going operations at three sites: Contra Costa County, California; Dade County, Florida; and Columbus, Ohio.

The study by the Calspan Corporation has been conducted during the period 1 October 1973 to 30 September 1974. Data were collected by resident observers at the three sites from November 1973 to July 1974. Results are reported as "Analysis of Criminalistics Laboratory Effectiveness in Criminal Justice Systems", in four volumes:

I - The Use of Physical Evidence Examination in Investigation of Crimes

II - The Use of Physical Evidence Examination in Adjudication of Crimes

III - Measures of Effectiveness

IV - Summary and Recommendations

The success of the study was predicated on full cooperation and support by the criminalistics, investigative and adjudicative agencies at the three sites. The cooperation and assistance of the following officials, their staff and colleagues, is gratefully acknowledged.

CONTRA COSTA COUNTY

Harry D. Ramsey, Acting Sheriff - Coroner
Cpt. Harry Deram, Chief, Investigation Division
Duayne J. Dillon, Chief, Criminalistics Laboratory
Gerald T. Mitosinka, Supervising Criminalist
Lourne G. Phelps, Chief, Richmond Police Department
Cpt. Robert W. Wood, Richmond Police Department
Cpt. John Huddleston, Concord Police Department
Lt. Bud Savage, Concord Police Department
Wm. A. O'Malley, District Attorney
Hon. Wm. R. Channel, Presiding Judge, Supreme Court
Wm. R. Higham, Public Defender

COLUMBUS

Earl Burden, Chief of Police
Maj. Lloyd V. Forbus, Chief, Investigative Subdivision
Richard O. Pfau, Supervisor, Crime Laboratory
Hon. Frederick T. Williams, Administrative Judge, Court of Common Pleas
Hon. G. W. Fais, Chief Judge, Municipal Court
George Smith, County Prosecutor
Daniel Johnson, City Prosecutor
Roy F. Martin, Director, Legal Aid and Defender Society

DADE COUNTY

E. Wilson Purdy, Director, Public Safety Department
Charles Black, Chief, Central Services Division, P.S.D.
Edward Whittaker, Supervisor, Crime Laboratory
Richard Gerstein, State Attorney
Hon. Gene Williams, Administrative Judge, Circuit Court
Phillip A. Hubbart, Public Defender

In addition, the leadership, guidance and assistance by the staff of the MITRE Corporation under Fernando Biagi, Group Leader, Forensic Laboratory Analysis Program, is gratefully acknowledged.

At Calspan, the project was under management supervision by Miles W. Hall, Head, Computer Systems Department. Paul Rosenthal was project manager and Dr. D. A. Travnicek, associate project manager. They were assisted by Dr. R. C. Sugarman, psychologist, and Barbara Frida, computer. The following served as part-time resident field observers: Grady L. Goldman, Keith E. Inman and Enrico N. Togneri, Contra Costa; Wm. F. Jankun, Michael Hohn, John W. Garland, Richard Kettler and John Czeciuk, Columbus; Robert C. Gross, Salli A. Gross, Mark Kaplan, Mark A. Siegel and Edward R. Young, Dade County.

The study was supported by three consultants: Professor Joseph D. Nicol, Criminal Justice Department, University of Illinois, actively participated in all phases of the program. The Hon. Charles Desmond, Chief Judge, New York Court of Appeals (retired) advised on court-related problems and D. M. Lucas, Director, Centre of Forensic Science, Toronto, Canada, provided helpful comment on the program plan during its formative stage.

Section 1

INTRODUCTION

The goal of the study reported in these volumes has been to develop means to improve the utilization of physical evidence in the investigation and adjudication of felony crimes. Four major problems prompted initiation of the study: (a) The low percentage of reported crimes in which physical evidence examination plays any role; (b) the diversion of criminalistics activity to dangerous drug and sobriety-related analyses; (c) lack of user motivation toward increased utilization of criminalistics; and (d) the need for systematic investigation of the use and effectiveness of criminalistics in criminal justice operations.

The study's objectives, which address problems (a), (c) and (d) are stated below, followed by definition of key terms.

1. Describe the role of criminalistics in criminal justice systems (Report Volumes I and II).
2. Develop and apply methods for measuring the effectiveness of criminalistics operation (Volume III).
3. Recommend steps to improve their utilization (Volume IV)

The use of the term "criminalistics operations" in the statement of the objectives is broader than the term "criminalistics laboratory". The latter denotes a facility. As used here, the former encompasses all scientific support of the criminal justice system involving physical evidence, excluding forensic pathology. For instance, lifting, processing and evaluating latent fingerprints, as well as comparing them with fingerprints on file, are considered criminalistics operations, though they may or may not be performed by criminalistics laboratory personnel or in a criminalistics laboratory.

"Effectiveness" of criminalistics operations is defined as the frequency of use and the value of information on physical evidence examination in obtaining investigative resolution and/or adjudicatory disposition of a reported offense. This definition, as applied to investigation, implicitly rates "resolution" (by arrest, exceptional clearance, or finding the complaint unfounded) as a desirable outcome; as a corollary "unresolved" investigations are implicitly rated undesirable. No such value judgment is implied in adjudicative disposition; here we consider it axiomatic that any contribution to termination of a case (at the pretrial stage, by guilty plea or at trial) is rendering physical evidence examination effective, because physical evidence is considered more valuable than other evidence. As defined above, the effectiveness of criminalistics operations may be expressed on a crime-specific basis, in objective terms and as perceived by their users.

"Criminal justice system" is defined in the context of the study objectives to encompass all actual and potential uses of criminalistics. Functions unrelated to criminalistics, e.g., detention or parole, are not included. It is depicted as the largest block in Figure 1 and includes crime scene search, investigation and adjudication. The crime scene is searched for physical evidence by criminalistics laboratory or other personnel. Physical evidence (containing information) is brought to the criminalistics laboratory with a request for examination. The criminalistics laboratory reports its findings to the investigator and a dialog with the investigator may ensue. Information on the findings of the criminalistics operation may be used in the adjudicatory process. Typical outputs from the investigation subsystem are information leading to arrest, dismissal, prosecution of a suspect. The adjudicatory process typically results in a guilty plea, verdict, appeal, etc. The two information links shown by heavy lines are the outputs of the criminalistics operation whose effectiveness is measured. The flow of information from crime scene to the criminalistics operation is recognized as a strong influence on effectiveness.

Each of the blocks in Figure 1 represents a complex activity. Figure 2 expands on the activities represented by each of its blocks and indicates some of the key physical evidence related activities. The division of the criminal justice system into four stages, crime scene search, criminalistics operations, investigation and adjudication as indicated in both figures, has guided the study effort and the report on its results.

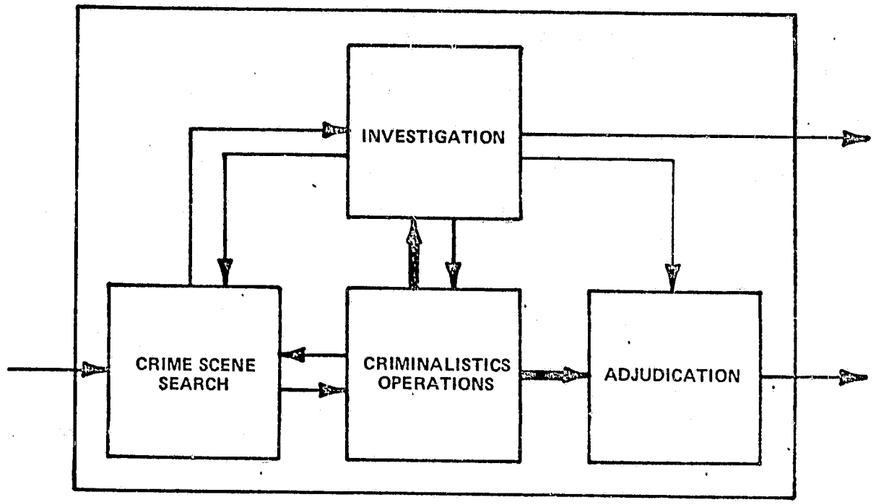

Figure 1 THE CRIMINAL JUSTICE SYSTEM

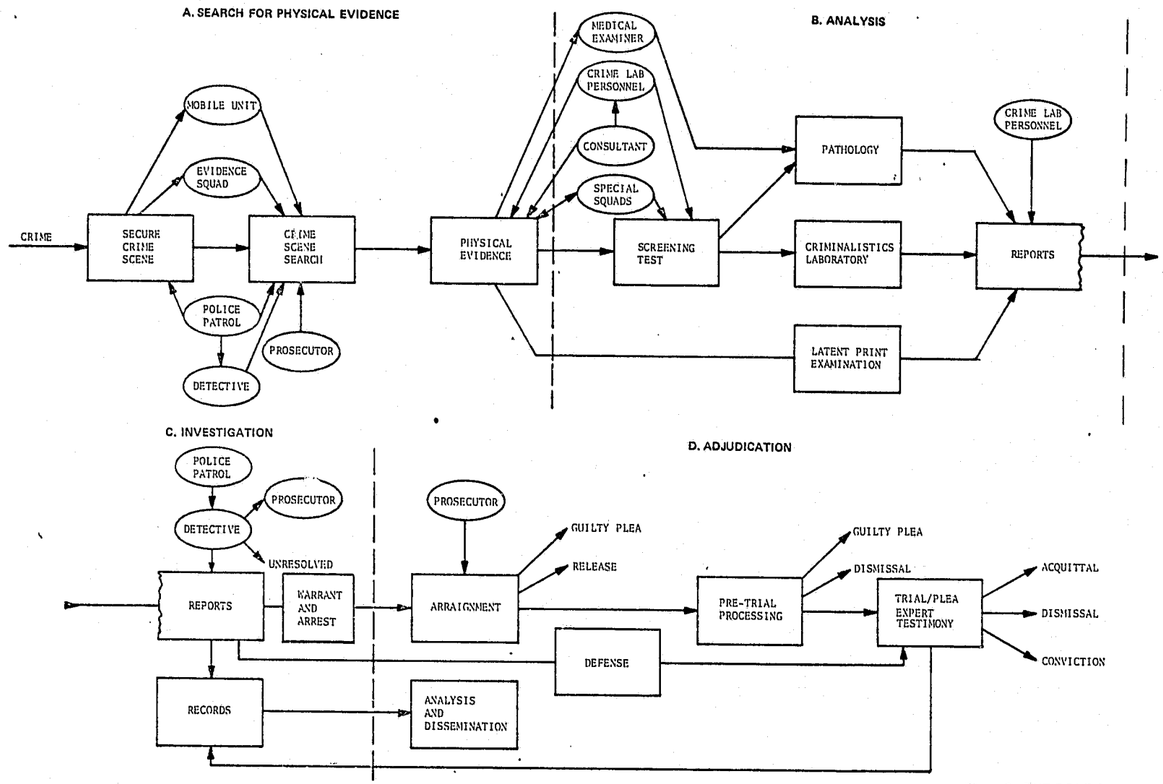

Figure 2 THE ROLE OF PHYSICAL EVIDENCE

To meet the study objectives, detailed information on ongoing criminal justice operations had to be obtained. A major part of the study was therefore devoted to data collection and observation of criminal justice operations. Three locations, a California county, a Florida county and an Ohio city, were the designated study sites. In each of these sites data were obtained by resident field observers during an eight-month period. Data were obtained on a case-by-case basis on the first nine offense categories listed below and, in summary fashion, on investigation of three additional categories, Nos. 10-12.

1. Homicide
2. Rape
3. Robbery
4. Assault
5. Burglary
6. Larceny
7. Arson
8. Bombing and explosives
9. Hit and Run
10. Forgery
11. Narcotics and dangerous drugs
12. Driving under influence of alcohol

Data were recorded on forms, one for each of the four criminal justice system stages. A total of 84 questions were listed on these forms Some of the questions were answered by the observers from available records, some were posed to the users of the system. The latter category included unrecorded objective information, e.g. the number of hours spent on a case by an investigator; other questions posed to users were perceptual, e.g. the question as to the extent of his reliance on physical evidence information in conducting the information.

Data collection served a dual purpose: to provide information on the use of physical evidence information in present practice at the three sites and to serve as a vehicle for formulation and validation of measures of criminalistics laboratory effectiveness.

The findings reported in Volumes I, II and III are summarized in Section 2, followed by our recommentions Section 3, and an epilogue, Section 4.

Section 2

SUMMARY OF FINDINGS

Before summarizing the findings in each of the three report volumes, some observations and findings pertaining to the entire study are presented. They concern the fragmented and non-systematic use of physical evidence information, record-keeping practices, the underutilization of potential criminalistics services, and the lack of communication.

The criminal justice system, defined in the Introduction as encompassing all actual and potential uses of criminalistics, does not have a "system administrator" who coordinates and controls these uses. There is no formal link between criminalistics laboratories and adjudicatory agencies; such links exist at the study sites between some laboratories and investigation, except where laboratories serve more than one investigative agency. However, even where these partial formal links exist, there is in practice little coordination. A striking example of this lack was found, at all sites, in the separate case numbering systems employed. The need for separate numbering may be justified because it facilitates keeping records in sequence; however, tracking cases and categorically analyzing physical evidence use becomes difficult unless record numbers are at least cross-referenced. The lack of physical evidence orientation by administrators is evident also in the lack of recording requirements; for instance, the absence of physical evidence reference in police offense reports. We find that the lack of record is symptomatic of the absence of systematic attention to and appreciation of the role of physical evidence in investigation and adjudication. Further, this lack of systematic record also is a hindrance to effective management and supervision of these operations.

Both the capacity and the potential quality of criminalistics services are found underutilized. The fact that capacity is underutilized was one of the premises of the study and is exemplified by possible physical evidence that is not examined. Underutilization of quality became apparent (to our observers and upon analysis of the data) in the infrequent use of criminalistics to develop suspects and the actual and self-perceived tendency of investigators and adjudicators to use physical examination only to "corroborate" their conclusions. In interviews with investigators at the sites, this lack of appreciation of criminalistics service quality manifested itself sometimes in unrealistically low, in other instances in unrealistically high expectations. Instances of laboratory use to solve crimes in joint and well-coordinated effort with police, that were found at each site, only serve to illustrate the potential for such service and its haphazard use.

Part of the inadequacy of record and fragmentation of service is the lack of observed communication among all users of physical evidence information, from crime scene technician to criminalist, investigator and prosecutor or defense counsel. We have concluded that communication itself is lacking, not only its record. More frequent communication would improve the quality (and timeliness) of criminalistics service rendered. The recording requirement would stimulate communication, and the record would make management analysis and control possible.

2.1 Volume I

The principal focus of Volume I is on following the steps in crime investigation from incident report to investigative disposition; on describing the criminalistics aids that are available at each step; and on presenting analyses of their use based on case by case observation. These data include arrival times at the crime scene, search duration, number of physical evidence items collected and analyzed, the significance of physical evidence information related to investigative outcome, latent print utilization, and the crime-specific utilization of physical evidence by evidence category. Significant findings are that physical evidence information is used predominantly to corroborate when there is a suspect and very little use is made of criminalistics in cases in which there is no named suspect at the outset.

Figure 23 of Volume I analyzes physical evidence utilization in the 9 offense categories surveyed. The top number in each cell denotes the number of cases in which the physical evidence category of the cells column was examined. The middle number in each cell denotes the relative number of physical evidence utilizations for its offense category. The bottom number in each cell is the decimal fraction of physical evidence utilizations relative to all utilizations in the evidence category. The most and the next-to-most frequency used evidence categories for five major crimes are excerpted below with their relative frequency (middle number of Figure 23):

	CASES	1 FINGER AND PALM PRINTS	2 PHYSIOLOGICAL MATERIAL	3 PHYSICAL MATCH PROBLEMS	4 WEAPONS	5 STRUCTURAL MATERIAL	6 TRANSFER MATERIAL	7 DOCUMENT MATERIALS	8 CHEMICAL PROBLEMS
1. HOMICIDE	90	18[1] .14[2] .16[3]	22 .17 .17	13 .10 .12	66 .51 .25	2 .02 .04	5 .04 .24	2 .02 .15	3 .02 .15
2. RAPE	132	16 .10 .15	89 .57 .68	15 .10 .14	23 .15 .09	3 .02 .06	1 .06 .05	5 .03 .42	5 .03 .25
3. ROBBERY	46	26 .41 .24	2 .03 .02	6 .10 .06	23 .36 .09	3 .05 .06	1 .02 .05	1 .02 .08	1 .02 .05
4. ASSAULT	163	13 .07 .12	11 .06 .08	12 .07 .11	129 .73 .48	6 .03 .12	1 0 .05	1 0 .08	4 .02 .20
5. BURGLARY	121	35 .22 .32	7 .04 .05	52 .33 .50	18 .11 .07	30 .19 .60	9 .06 .43	4 .03 .31	3 .02 .15
6. LARCENY	6	0	0	0	3 .60 .01	1 .20 .02	0	0	1 .20 .05
7. ARSON	13	2 .15 .02	0	2 .15 .02	3 .23 .01	3 .23 .06	1 .07 .05	0	2 .15 .10
8. BOMBING, Expl.	4	0	0	2 .40 .02	1 .20 0	1 .20 .02	0	0	1 .20 .05
9. HIT & RUN	10	0	0	3 .38 .03	0	2 .25 .04	3 .38 .14	0	0

[1]CASES IN OFFENSE CATEGORY WITH PHYSICAL EVIDENCE UTILIZATION.

[2]CASES IN OFFENSE CATEGORY WITH PHYSICAL EVIDENCE UTILIZATION /ALL PHYSICAL EVIDENCE UTILIZATIONS IN OFFENSE CATEGORY

[3]PHYSICAL EVIDENCE UTILIZATION IN OFFENSE CATEGORY/PHYSICAL EVIDENCE UTILIZATION IN 9 OFFENSE CATEGORIES

Figure 23 CRIME-SPECIFIC UTILIZATION OF PHYSICAL EVIDENCE

Homicide: Weapons .51, Physiological Material .17

Rape: Physiological Material .57, Weapons .15

Robbery: Latent Prints .41, Weapons .36

Assault: Weapons .73, Latent Prints .07

Burglary: Physical Match Problem .33, Latent Prints .22

The numbers in Figure 23 indicate the pattern of evidence utilization found at the three sites. A question not answered by the tabulation is whether the frequency of examination of certain evidence categories relative to crime categories is a reflection of the perception of the investigator as to the gravity of the case or whether it is merely a reflection of evidence submission activity.*

Volume I also contains data on reported offenses and their investigative dispositions at two sites in a period preceding the study. The use of such data as a base line comparison in measures of effectiveness is illustrated in Volume III.

While the study has largely been concerned with cases in which physical evidence is collected, a brief survey of all investigative methods employed in 3 offense categories was included and the investigative outcomes associated with these methods are discussed. The survey clearly demonstrates the high utilization of eyewitness and informer evidence and the rare reliance on physical evidence in crime investigation.

* See Crime and Evidence specific recommendations Section 3.3.b

Another separate survey was made of the role of latent prints at the three sites. The findings are (i) that there are significant differences among the sites in the number of offenses resolved with the aid of finger print match; and that these differences can be explained in terms of local resources and practice; (ii) that the latent print potential in crime investigation is underutilized at all three sites.

2.2 Volume II

In keeping with the recognition that the entire process is prosecution-dominated, Volume II follows physical evidence information as the prosecution takes the felony case from warrant or complaint to its termination at trial or earlier. Also discussed are defense use of physical evidence; defense, court and jury perceptions of the role of physical evidence in observed cases; the criminalist's view; training and education; and the communications problem.

One finding of the study is that only a small fraction of the reported offenses that involve physical evidence examination enter adjudication and, of those that do, few go to trial. This is a nation-wide trend and not believed to be significantly related to physical evidence information.

Access to independent criminalistics examination by defense was found possible at each of the sites, but at only one site is this possibility put to practice with any regularity.

The report includes data on the use of physical evidence information at the pre-trial stages, on its role in guilty pleas before trial and at trial. Of particular interest are data on guilty pleas. They indicate, in several crime categories, that physical evidence information increases the ratio of guilty pleas as charged to guilty pleas to a reduced charge (see columns 2 and 3, Figure 14a).

The role of physical evidence in adjudication is found to be primarily corroborative. It has been found difficult to determine from examination of the record and observation to what extent in a given case the balance between reliance on physical evidence and, say, eye witness testimony, is a preference of prosecution and defense, or is controlled by the evidentiary value of the two.

The role of physical evidence information, particularly in the earlier stages of adjudication where so many cases terminate, is not readily apparent from the record. Therefore, review and control by administrators of courts, prosecution and criminalistics operations over frequency, timing and manner of physical evidence use in those early stages is not now possible.

CASES WITH PHYSICAL EVIDENCE EXAMINATION	NO. OF CASES	NO BILL	GUILTY PLEA AS CHARGED	GUILTY PLEA REDUCED CHARGE	GUILTY BY JURY	ACQUITTED BY JURY	GUILTY BENCH TRIAL	ACQUITTAL BENCH TRIAL	DISMISSAL BY JUDGE	NOL. PROS.
		1	2	3	4	5	6	7	8	9
1 MURDER, N.N.M.	24[1]	0	0	9	11	0	0	2	1	1
	19[2]	0	0	8	10	0	0	0	1	0
2 RAPE	6	0	2	3	0	0	1	0	0	0
	10	0	1	8	0	0	0	0	1	0
3 ROBBERY	12	0	6	4	0	0	2	0	0	0
	73	0	0	48	13	3	0	0	8	1
4 AGG. ASSAULT	15	0	5	7	2	0	0	0	0	1
	29	0	1	21	5	1	0	0	1	0
5 BURGLARY, B & E	26	0	13	6	2	1	2	1	1	0
	176	0	6	149	3	5	0	1	10	2
6 GRAND LARCENY	1	0	0	0	0	1	0	0	0	0
	33	0	0	26	3	0	0	0	3	2
7 ARSON	2	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
8 BOMBING & EXPL.	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
9 HIT & RUN	0	0	0	0	0	0	0	0	0	0
	1	0	0	1	0	0	0	0	0	0
9 CRIME CATEGORIES	86	0	27	29	16	2	5	3	2	2
	341	0	8	261	32	10	0	1	24	5

[1]3 AGENCIES, CASES WITH PHYSICAL EVIDENCE EXAMINATION

[2]ENTIRE COUNTY, ALL CASES, 7.5 MONTHS

Figure 14a CASE DISPOSITIONS, CONTRA COSTA COUNTY

Finally, it is recognized that the actual and potential role of physical evidence information in adjudication differs from that in investigation. In the latter, a dynamic, interactive role appears possible and desirable. In adjudication, in the adversary system, the role of physical evidence information must be passive. It is used at the discretion of counsel. However, this passive role "on stage" does not preclude a more active role in providing information subject to counsel's decision on use.

2.3 Volume III

In this volume the measures of effectiveness are developed. Their purpose is to serve as an evaluation tool for (a) laboratory managers and administrators and (b) planners at government levels from municipal to state or federal.

Development and selection of measures of effectiveness are followed through their consecutive stages from system definition and initial postulation of measures to data collection and effectiveness measurement. The results of 250 statistical analysis of paired variables (from the data collected at the sites) are reported in detail. They are discussed in terms of their statistical significance, the trends they indicate, and the interpretation of these trends on the basis of site information and experience. In the following paragraphs we summarize the report's candidate measures of effectiveness and their application to intra and inter-site comparison.

Volume III also discusses introduction of these measures into practice, extension of the program to arrive at combined measures of effectiveness, and development of a model focusing on effectiveness of criminalistics in investigation. These topics are reported below in Section 3, Recommendations.

In Figure 5 of Volume III a total of 35 candidate measures of effectiveness are listed. They are grouped according to their pertinence to the four stages of the criminal justice system that have been recognized throughout the study: search, analysis, investigation and adjudication. Most of the effectiveness measures have been formulated on the basis of statistical analysis of the data collected on site (Basis "A" in Figure 5). Other measures are based directly on field observation (Basis "O"). A third set of measures is based on potential observations, i.e., a gap in data base was observed and it was concluded that such data should be recorded by laboratories or user agencies (Basis "P"). An example of a recommended potential measure is the number of contacts between criminalist and investigator, whose record would indicate the intensity of laboratory involvement and would serve as a stimulus to desirable collaboration.

		EFFECTIVENESS MEASURE	BASIS A	BASIS O	BASIS P	IMPORTANCE	PRACTICABILITY
SEARCH	DIRECT	% SCENES SEARCHED		X		HIGH-BASIC	REQUIRES MERGING OF RECORDS OF OFFENSES AND SEARCH UNIT
		EVIDENCE TYPES COLLECTED/SEARCH	X			HIGH	REQUIRES LARGE DATA BASE (OVER LONG TIME OR MANY SITES)
		a) LATENT LIFTS/SEARCH	X			MODERATE	EXISTS IN SEARCH UNIT RECORDS
		b) STANDARD TYPES/SEARCH	X			LOW-MODERATE	REQUIRES EXPANSION OF SEARCH UNIT RECORDS
		SUSPECT SEARCHED/SUSPECT INITIALLY IN CUSTODY	X			HIGH	MAY REQUIRE POLICY AND RECORD KEEPING CHANGES
	INDIRECT	CONDITION OF SCENE	X			LOW	REQUIRES MODIFICATION OF SEARCH UNIT REPORTS
		AVERAGE RESPONSE TIME		X	X	LOW	EXISTS IN SOME SEARCH UNIT RECORDS
		DURATION OF SEARCH	X	X		LOW-MODERATE	EXISTS IN SOME SEARCH UNIT RECORDS
		LATENTS OF VALUE/LATENTS LIFTED	X			MODERATE-HIGH	REQUIRES MERGING OF LAB, SEARCH AND IDENTIFICATION UNIT RECORDS
ANALYSIS	DIRECT	LAB REQUESTS, BY EVIDENCE TYPE & CRIME CATEGORY	X			HIGH-BASIC	REQUIRES REFINEMENT OF LAB RECORDS
		ELAPSED LABORATORY TIME	X	X		MODERATE	EXISTS (CASE BY CASE) IN LABORATORY REPORTS
		ANALYSES PERFORMED, BY EVIDENCE TYPE	X			BASIC	REQUIRES REFINEMENT OF LAB RECORDS
		REPORT CONTENT	X			LOW	REQUIRES REFINEMENT OF LAB RECORDS
	INDIRECT	SUBMISSIONS/COLLECTIONS	X			MODERATE	REQUIRES MERGING OF SEARCH, LAB, AND PROPERTY ROOM RECORDS
		ANALYSES/SUBMISSIONS	X			LOW-MODERATE	REQUIRES REFINEMENT OF LAB RECORDS
		EVIDENCE CATEGORIES ANALYZED (RANKING)			X	MODERATE (LONG RANGE)	
		NUMBER CONTACTS WITH INVESTIGATOR			X	MODERATE-HIGH	REQUIRES REFINEMENT OF LAB RECORDS (SEE TEXT)
		% CASES, SCHEDULING NEEDS			X	LOW	
INVESTIGATION	DIRECT	% P.E. CASES RESOLVED/% ALL CASES RESOLVED	X			HIGH	REQUIRES REFINEMENT AND MERGING OF VARIOUS SQUAD RECORDS
		AVERAGE TIME ON CASE	X			LOW	REQUIRES EXPANSION OF SQUAD RECORDS
	INDIRECT	% CASES, SUSPECT INITIALLY IN CUSTODY	X		X	MODERATE-HIGH	EXISTS IN OFFENSE RECORDS
		% CASES, COMMUNICATION WITH LAB	X		X	HIGH	REQUIRES EXPANSION OF LAB RECORDS (SEE FURTHER DISCUSSION IN VOL. IV)
		% CASES ANALYSIS REQUESTED		X		HIGH	REQUIRES MERGING OF OFFENSE, SEARCH AND LAB RECORDS
		% CASES PRINT ID MADE		X	X	HIGH	EXISTS IN ID AND SQUAD RECORDS
		RELIANCE ON P.E.	X			HIGH	
		CONTRIBUTION OF P.E. TO OUTCOME	X			HIGH	DIFFICULT TO MEASURE – SUBJECTIVE
		DECISION TO INVESTIGATE	X			HIGH	
ADJUDICATION	DIRECT	% GUILTY VERDICT P.E. CASES/% GUILTY VERDICT ALL CASES	X			HIGH	
		GUILTY PLEAS: AS CHARGED/REDUCED CHARGE (P.E. CASES/ALL CASES)		X	X	HIGH	
		% GUILTY VERDICT (P.E. TESTIMONY CASES/ ALL P.E. CASES)	X			HIGH	
		% GUILTY VERDICT (DEMONSTRATIVE EVIDENCE/ALL P.E. CASES)	X			HIGH	REQUIRES MAJOR RECORD KEEPING CHANGES PERMITTING FOLLOW-UP OF ALL CASES INVESTIGATED RESULTING IN FELONY CHARGE, AND SUBSEQUENT PROSECUTION.
	INDIRECT	% TRIALS P.E. USED IN COURT		X	X	HIGH	
		% TRIALS, DEMONSTRATIVE EVIDENCE		X	X	HIGH	
		STIPULATIONS + P.E. TESTIMONY/P.E. TRIALS		X	X	HIGH	
		STIPULATIONS/STIPULATIONS + P.E. TESTIMONY		X	X	HIGH	

Figure 5 LIST OF EFFECTIVENESS MEASURES

Effectiveness measures for the search stage are included because (1) the collection of physical evidence at a crime scene is a criminalistics operation and (2) this operation largely determines the type, quantity and quality of physical evidence that enters the criminalistics laboratory thereby governing its effectiveness. An example of a basic search measure of effectiveness is the percentage of crime scenes searched; this measure was selected on the basis of field observation. The number of suspect searches/ suspects initally in custody was selected as a measure because data analysis indicated a significant relation. It is expected to serve as an indicator of quality and thoroughness of search.

In the analysis stage, classification of laboratory service requests by evidence type and crime category is recommended as the most basic measure. It will be useful in conjunction with measures related to investigative resolution and adjudication, below. High quantity of an evidence type will not by itself enhance effectiveness. Implementation of the measure requires long periods of observation in order to capture enough data on crimes infrequently involving the laboratory, e.g., arson. The number of contacts between criminalist and investigator has already been noted as a potential, high-interest, measure of laboratory effectiveness.

The percentage of resolved investigations with physical evidence examination/all resolved investigations is suggested as the most basic measure of effectiveness in investigation. The criminalistics contribution to investigative outcome has been found to yield the effectiveness of the laboratory as perceived by its users. The measure was selected as a candidate although it is subjective and difficult to implement, because increased utilization of criminalistics must in large part come from user satisfaction, which is what is measured.

The adjudication stage measures differ from the investigation measures in that a single global measure, analogous to percentage of investigations resolved, cannot be defined. Here, the measures are applied to each adjudication substage at which a case may terminate and the measurement determines whether physical evidence information contributed to its termination. These measures are devised so as not to be prosecution-oriented. For instance, the percentage of guilty verdicts in trials involving physical evidence examination is compared with the percentage of guilty verdicts in all trials. (If the prospect of getting large enough counts were high enough, a similar measure could determine criminalistics contribution to acquittals in trials.) A performance-type measure in the adjudication stage, the number of stipulations/stipulations plus physical evidence testimony cases, determines the frequency of stipulation in instances where it might be applicable, because the case went to trial.

Application of Measures of Effectiveness

At one site, the ratio between physical evidence cases and all cases of guilty pleas as charged/reduced charges could be measured. For rape, robbery, assault and burglary, the ratio substantially exceeds unity, indicating that in the presence of physical evidence information there is a lower incidence of charge reduction (plea bargaining). The results were not applicable to homicide, and plausible reasons therefor are cited.

Application of the ratio of suspect identification to cases in which latent fingerprint of value were found is demonstrated with data collected at four agencies in three sites. Two agencies are located in one site, permitting an intra-site comparison, that indicates drastic differences in effectiveness. These differences and inter-site differences for the same measure were found explainable in terms of local practice in Volume I. In the same discussion, low effectiveness in this area, i.e., low magnitude of the above ratio, at all three sites is pointed out.

Application of the measure, fraction of investigative resolutions in physical evidence cases/fraction of investigative resolutions in all cases is demonstrated for robbery and burglary in two sites. The ratio indicates effectiveness if it is larger than unity. Higher effectiveness was indicated for burglary than for robbery, in which one site measured only unity, the other 1.2. However, the case counts were low, so that no significance could be attached to small numerical differences.

Section 3

RECOMMENDATIONS

This study has collected data on the use of criminalistics in the criminal justice system in three sites, described the use of criminalistics in the system, developed measures for measuring the effectiveness of criminalistics in the system and applied them to the three sites. Recommendations of steps to improve criminalistics utilization in the system have evolved throughout the study period, some of these recommendations have been alluded to in Volumes I-III and in the preceding sections of this report; also, some of these recommendations have been transmitted to the study's sponsor during the course of the year's research. In this section our recommendations are presented in four categories: (1) communication, training and control, (2) effectiveness measurement, (3) crime and evidence-specific recommendations, and (4) dissemination of project results.

3.1 Communication, Training and Control

This first category of recommendations encompasses the general findings stated at the beginning of Section 2. The objective of these recommendations is to improve the quantity and quality of physical evidence utilization in the criminal justice system.

The fact that this criminal justice system does not have a systems administrator has been stated and we do not advocate creation of an administrative superstructure to accommodate such a function. We do recommend that laboratory managers, through continuing attention to communication and training raise the user level of awareness of criminalistics potential so that actual utilization is improved. This effort needs to be sanctioned through LEAA guidelines, through agreement by the heads of the user agencies in investigation and adjudication; its success will depend on the extent that the laboratory managers can demonstrate to the users that their voluntary cooperation will pay off.

The effectiveness improvements expected therefrom are largely included in those measures which are labelled as potential (P) in Figure 5, Volume III. These measures were listed as candidates although, due to the very site weaknesses which are to be attacked, a data base and the existence of significant relations for the measures could not be established.

Specific recommendations are:

a. A project of periodic, say monthly, inter-agency case review meetings at at least two sites. These meetings would include supervisors of crime scene search, criminalistics, investigative and adjudicatory operations. There would be at least day-long and in-depth reviews of completed cases selected by project staff. Cases would be selected for review on the basis of an adopted sampling plan, freshness and completeness of the needed information. They would serve a two-fold purpose: (1) to develop formal routine information feedback procedures that can be incorporated in routine case-by-case evidence utilization reports; (2) to institutionalize informal review meetings serving to foster understanding of mutual problems and a spirit of cooperation between crime scene search, criminalist, investigative and adjudicatory personnel.

In the crime scene search - criminalist area these review meetings and the improved reporting procedures could be used to develop methods for active involvement of the criminalist in scene processing activities. It is believed that his contributions to a case would be improved if he were able to obtain a fuller picture of what was done and what might have been done at the scene. The meetings would explore how the selection, quantity, quality and potential of evidence submitted can be balanced against their contribution to case outcome, establishment of priorities, workload and desirable turnaround times.

In the investigator - criminalist area, case review, in conjunction with "on-line" communications procedures discussed below (3), would deepen the understanding of the potential role of both criminalist and investigator. Outcome of the investigation, type of aid rendered and timeliness of the criminalist contribution would be reviewed.

In keeping with the smaller volume of cases reaching adjudication, adjudicators might participate less frequently in such meetings. What needs to be developed is improved understanding on the part of investigators of the evidentiary needs of adjudicators; adjudicators need to review the potential physical evidence information in selected cases; and criminalist analytical methods and their testimony must be reviewed periodically in such meetings. While outcome of adjudication would be one of the recorded items in the procedures to be developed, emphasis would be on developing a report format that would include the significance and quality of the physical evidence contribution.

The procedures of case review developed under such a project should have broad applicability for control of initial, in-process, and resultant evidence utilization. While the case numbering and cross-referencing problem mentioned in Section 2 is trivial in substance, it would in practice be a severe impediment to case review and its resolution would be a desirable by-product of the project.

While communication in a broad sense is the subject of the first recommendation, some immediate revision in recording contacts by criminalists is desirable. The candidate measures of effectiveness have recognized the importance of communications as an indicator of criminalist participation in the resolution of investigations and in the adjudicatory process. The absence of the record is taken to mean a lack of participation, as well as a lack of opportunity for management control and effectiveness measurement.

b. It is recommended that a record of communications, by number, category and result, be incorporated in the laboratory's copy of its analysis report. The information can be provided in a summary fashion by the criminalist at the time the report is completed; this summary procedure relieves the criminalist of the undue burden of having to record an inquiry on one case, while he is working on another. Trial procedures for the report format and for the aggregation of the information need be developed and tested.

The summary of findings in this Volume has indicated that under-utilization, particularly of the quality (or level) of criminalistics aid that is available is at least in part due to lack of understanding and training on the part of the user.

c. We recommend institution of new or intensification of existing training procedures at several levels.

The need to convey acquaintance of criminalist capabilities and requirements, not the criminalist skill itself, to the patrol as the most generally and least specifically trained among those having potential contact with physical evidence was pointed out in Volume I. The need to educate and train exists at the investigator's level also. While the patrol needs to recognize possible evidence and must be trained in securing it as well as maintaining chain of evidence, investigators should have some familiarity with results they can expect from the criminalist's analytical procedures. Very similar information is required by prosecution, defense and court personnel.

It is understood that to some extent such training is provided at two of the study sites. We advocate extending such training sessions as a regular continuing education program. The purpose of such extension is to maintain and periodically update user awareness of criminalistics procedures. These training and continuing education programs should include the management levels, e.g., police sergeants, lieutenants and captains, because without their reinforcement of the message and audit of results the training expenditure may be wasted. Further the criminalist would need to be encouraged to meet the investigator half-way in the latter's effort at improved utilization. The criminalist should be encouraged to suggest avenues of investigation to the investigator, in effect to share the risk inherent in selecting the lead to be followed.* A similar need exists for the criminalist to be informed of procedural changes in investigation and adjudication.

Finally, it should be noted that the three recommendations made above have only long range effects and remedial action should proceed without waiting for application of the measures of effectiveness discussed next.

*Kirk's classical example of five clues associated by a criminalist with the finding of a glove at the scene of a crime and pointing to the ethnic origin, occupation and residence of the culprit is a good example of such active participation; see Reference 1, Section 5.

3.2 Effectiveness Measurement

a. Field Testing of Candidate Measures

Figure 5, Volume III, contains 35 candidate measures of effectiveness. It is expected that a smaller number will eventually be introduced as a matter of routine practice.

We recommend review of the record keeping requirements associated with each of these measures by a number of criminalistics laboratories and user agencies before any trial introduction of the measures. Further, we recommend that trial introduction of these measures be followed by elimination of impractical or unproductive measures, upon review by LEAA.

Timing of this trial introduction to permit incorporation, preferably in the first trial introduction, of potential measures predicated on revised record keeping and communication procedures outlined in Section 3.1 is suggested.

b. Effectiveness Equation

In Section 9, Volume III, we introduced a method for combining measures of effectiveness. In the example in that Volume, measures of criminalistics effectiveness in investigation were illustrated. Similar measures may be set up for each of the four stages of the criminal justice system.

We recommend a project to implement the procedure for establishing such effectiveness equations.

The necessary steps were indicated in Figure 6, Volume III. They are (i) isolation of key measures of effectiveness, (ii) collection of data in a large number of sites, say 10-20, (iii) calculation of coefficients (a) in effectiveness equations of the form

$$e = \sum a_i e_i$$

and (iv) application of the results to intersite comparison, and resource allocation models.

c. Investigation Centered Model of Criminalistics

An investigation centered model of the role of criminalistics was introduced in Volume III, Figure 7. Three distinct roles in which criminalistics may aid investigation are explored: (A) Determination whether or not an offense was probably committed; (B) Support of investigation, when a suspect has not been identified, in developing clues, reconstruction of events and suspects; (C) Corroborative aid, when a suspect has been identified.

The model was developed in recognition of the tendency, observed in this project and noted by earlier investigators, not to use criminalistics aid (and not to pursue investigation diligently) in cases in which a suspect has not been seen, named or apprehended at the beginning of investigation.

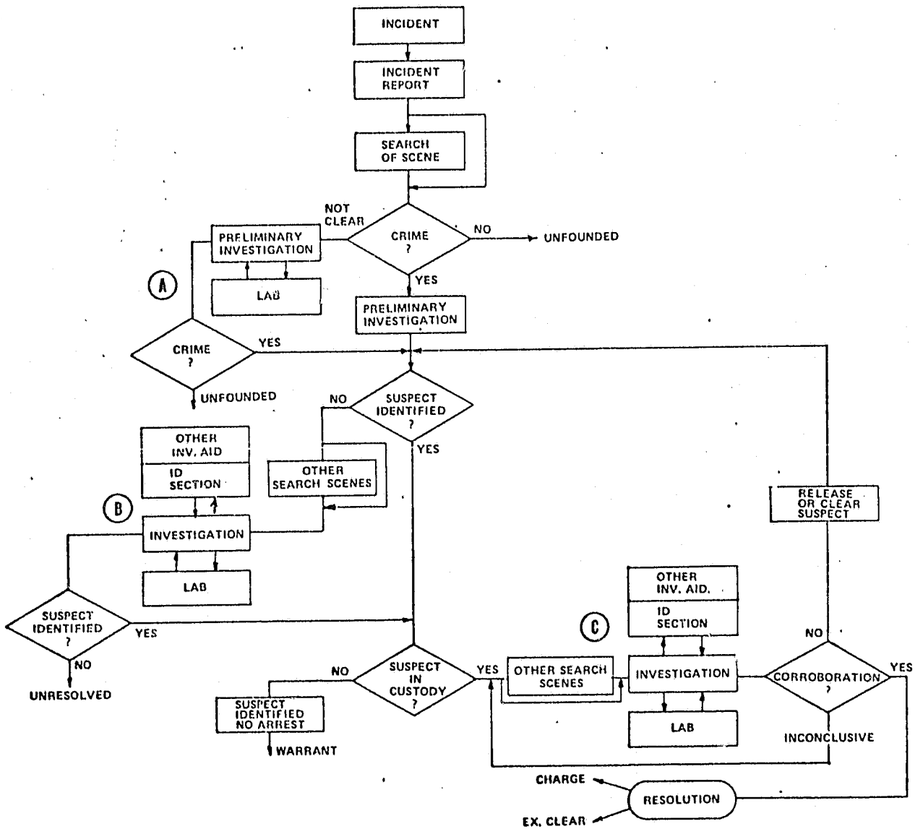

Figure 7 INVESTIGATION CENTERED MODEL

We recommend that investigator's progress reports and criminalistics laboratory reports be modified, in a trial project, to indicate allocation of criminalist aid specific to the three identified roles. Measures of effectiveness for each role should be formulated as illustrated in an example in Volume III for one role.

The effort required to modify report forms and formulate measures of effectiveness is comparatively small. Trial introduction of the measure at one or two sites could be accomplished, in conjunction with field testing of candidate measures, as recommended under 3.2 above.

d. Extension of Effectiveness Measurement

The 35 candidate measures of effectiveness do not constitute an exhaustive list. Even that list included a number of "potential" measures, i.e., measures which we had postulated at the outset but for which the record did not yield sufficient data. Such potential measures were included where, we believe, the data can be collected with revision of recording requirements as proposed in this Volume.

Omitted from the list are two categories of measures of effectiveness: (1) Measures postulated at the outset for which information was not found at all. This category includes measuring the number of times criminalist aid led to a change of direction of the investigation. The questionnaires had several questions aimed at exploring this role. Practically no response was obtained, apparently because the investigators do not perceive the role of the criminalist in such terms. It is believed that with increased emphasis on training and communication, as recommended in Section 3.1 of this Volume, such measures of effectiveness will become practical and valuable. (2) Other measures of effectiveness will become apparent when criminalistics practices at other sites are considered. For instance, some sites (among them Chicago and Detroit) have instituted routine checks of guns and bullets recovered by police. The effectiveness of these operations in solving crimes should be considered as an additional measure of effectiveness.

We recommend that extension of effectiveness measurement to criminalistics aids which are currently underutilized or not utilized at all at the three study sites be planned for a suitable time, say 3 years, after introduction of the list of measures recommended here.

3.3 Crime and Evidence Specific Recommendations

It was a part of the concept for the study reported in these four volumes that information on criminalistics practice and utilization at the three sites should point the way for one or more projects in which the effects of improved practices and utilization would be demonstrated. Such information was transmitted to the sponsor during the course of the study, as early as a briefing held after four months of study effort. In this section we present these recommendations of areas in which improved effectiveness may be demonstrable or in which demonstration projects may already be planned.

a. Reduced Laboratory Turnaround Time

Elapsed time in the laboratory was recorded at each of the sites. It was noted that this time was long in Site 1, particularly for certain evidence categories such as document examination and physiological materials. A significant relation between elapsed time and investigative outcome did not become apparent from the collected data.

The apparent condition of stable equilibrium, where investigators know what to expect from the laboratory and submit only what they are willing to wait for, was noted. It is believed that an intensive effort to reduce the time for laboratory examination, coupled with a coordinated effort of cooperation by investigators and prosecutors, will result in demonstrable improvement in utilization and effectiveness.

b. Rape Investigation

At Site 2, the number of laboratory involvements in rape investigations is high, but the number of resolved investigations is not, both compared to the other two sites. Closer observation of practice and record reveals that laboratory involvement usually consists of examination of vaginal fluid obtained on swabs and slides upon examination at a hospital. The low resolution rate appears to stem from the fact that the laboratory analysis does not help establish sufficient evidence of forcible rape. Its principal value would appear to be when the finding is negative, indicating that the complaint is unfounded. It is believed that a coordinated cooperative effort between police, evidence unit, laboratory and investigators may improve investigative resolution rate for this crime. Involved might be more frequent search of crime scenes for other physical evidence, and submission of clothing as well as use of photography, to establish the use of force or to obtain trace evidence, such as hair.

c. Burglary Investigation

Toolmark comparison has in principle a prospect of development analogous to latent print comparison. At Site 3, a modest effort to establish open evidence files is underway. In conjunction with other planned intensified burglary investigation at that site, it may be possible to include stepped-up effort to characterize toolmarks in a format suitable for computerized recording As in the rape problem above, coordination with evidence technicians and investiagors, would be a requirement for success. It is believed that even incomplete toolmark characterization, communicated regularly to investigators, would help in resolution of investigations.

d. Latent Print Utilization

A weakness in latent print matching capability was observed at all three sites although at one site, and a police agency at another site, this utilization was much better than at the others. The use of cold search for latent print matching can be expanded with the help of technological advances in characterization, storage, retrieval and matching. Assessment of the extent of mechanization that is economically feasible for a given size agency is needed.

3.4 Dissemination of Project Results

Volumes I and II of this report deal with the use of physical evidence examination for the benefit of investigators, prosecutors and criminalists to improve understanding of their interaction and lead to improved utilization of physical evidence. It is suggested that these reports provide the basis for a series of regional seminars, perhaps in areas other than the study sites. While the reports would be available before the seminars, their contents would be gone over initially and at least one of the three site agencies would be represented for a panel discussion. Round-table workshop sessions of small groups might follow and formulation of recommendations for follow-on action would be the formal result of the seminar, the informal result being impetus toward improvement on the part of each participant.

Section 4

EPILOGUE

This concluding section of the four-volume report will attempt to provide some perspective on the study, its findings and its recommendations. What was its approach and what would other approaches have produced? What do its findings mean? What problems were encountered? What limited the scope of the study? How does it relate to other research on criminal justice systems?

Approach

The study started with the premise that physical evidence information is underutilized. In looking for means to increase utilization, one can either investigate the 98% of reported offenses in which physical evidence information is not used or the 2% in which it is used. The latter approach was chosen (with some survey excursion into the investigation of all cases) because it was felt that much can be applied from the manner in which physical evidence is used, when it has at least entered the system. Conversely, a study of the many cases in which physical evidence is not used, would have to provide detail on alternate methods which, while useful, would require much more than the four man years of effort that have gone into the present study. The current Rand Corporation study on investigation[(2)*] is but one example of current, larger project topics that would have to be encompassed by research on non-use of physical evidence. Further, that approach would not have produced detailed measures of effectiveness which can be used for control of physical evidence utilization.

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*References are listed in Section 5.

The study relied on aggregating data from observed case histories. An alternate approach would be to postulate measures of effectiveness a priori and apply them to each observed case. That approach would not have been productive, because the course of any one case investigation or adjudication may be influenced by many factors not related to physical evidence, and these factors would have to be accounted for in case-by-case analysis. However, other approaches are feasible and may be fertile grounds for future effort. For instance, professional criminals - by definition - commit many crimes of a kind. The term "crime analysis" has been applied to methods for recognizing and investigating professional or chain crimes. A recent publication on crime analysis[3] does not recognize at all the potential contribution of criminalistics in such effort. This potential contribution could be made the focus of an effectiveness study.

The Findings

An apprehension voiced by criminalists at the beginning of the study was whether it will show that criminalistics laboratories ought to be utilized more. We believe that this proof has been brought in some offense and evidence categories. In many areas the case for criminalistics is not nearly so clear. We believe that we are faced here with (a) the generally low current utilization at all three sites which does not produce large enough numbers to produce proof and (b) the interaction between users of physical evidence information who are not aware of its potential and criminalists who are not asked or not ready to help where they could. Conversely, we believe that improved utilization will feed on itself. Once conditions for improved utilization are generated and made known, increased and improved use will follow.

The report has produced crime and evidence specific data on criminalistics involvement. We hope that even in the "meager" aggregated form presented in Volume I they will provide planning information to laboratory directors and detective bureau chiefs. The data are "meager" in that 879 cases did not fill the crime and evidence matrix with large enough numbers in each cell. However, extension of such records over longer period is readily possible.

Problems

The report has emphasized the fragmented records and data gaps that were encountered. They were mentioned as symptoms of the non-systematic use of physical evidence information and as impediments to justifying certain measures of effectiveness. This record problem and the lack of awareness of physical evidence utility were also very significant impediments to the conduct of the study. Added to the mentioned problems was reluctance of detectives to divulge information or on-going investigations, reluctance of judges to discuss a case or grant access to the jury foreman, antiquated hand-written court ledgers and, driving in the other direction, reluctance to talk frankly so as not to expose weakness. It is believed that future studies of this type, would proceed more smoothly if each agency whose records would be used were compensated for their contribution in a definite way, say, by paying for extra clerical help.

Scope

The study has been limited in scope through its selection of sites and its definition of effectiveness. Regional and state laboratories were not included, nor were large-city laboratories and very small laboratories. The consequent limitations on findings as to use pattern and on data for measures of effectiveness have been pointed out. However, we believe that a very useful beginning toward both purposes, guiding use and measuring effectiveness, has been made through the rather homogeneous sample selected by the sponsor. Extension of effectiveness measurement to a larger sample so as to be more comprehensive and to be able to objectively combine measures of effectiveness has been recommended.

The limitation of the effectiveness definition, which was dictated by the constraints of time and funding, needs clarification: The definition used includes the aid given to investigation, its contribution to resolved investigations, and its effect on adjudication outcomes compared to outcomes without criminalistics involvement. Not included are effects on the speed of the judical process and deterrent effects. Not included are also most quality of justice measures, although some are possible under the adopted definition, e.g. the number of physical evidence examinations for defense counsel and the recommended guilty as charged/guilty to reduced charge measure. Certainly, the study constraints did not permit inclusion of the social benefit of criminalistics services in the sense used by Parker and Gurgin[4]. Such larger views of the criminalistics contribution are so far from clarification and agreement that they would not permit reduction to useful practice of measures of effectiveness for a long time.

Relation to Other Research

A number of problems which must be resolved in order to derive full benefit from measurement of criminalistics effectiveness have been pointed out by us [5]: (1) Norms for the criminalistics contribution must be established. While for this study it sufficed to state that the laboratories are patently underutilized, we must establish what percentage of crimes (by category and maybe even by evidence type) should be investigated with the aid of criminalistics. (2) The allowable cost for the criminalistics contribution, its value, must be determined. We note that the extended effectiveness equation can be used to establish the cost of the criminalistics contribution. Its value must be established by political or social processes.

Finally, we call attention to the fact that the criminalistics contribution to the reduction of crime[6] needs to be assessed eventually, as better means are developed for evaluating any crime-reduction measures.

Section 5

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