

May 2015

# Examining the Association of Crime Laboratory Practices, Internal and External Determinants, and DNA Case Completion Time and Backlog

Eva Marie Lewis King  
*University of Wisconsin-Milwaukee*

Follow this and additional works at: <https://dc.uwm.edu/etd>

 Part of the [Epidemiology Commons](#)

---

## Recommended Citation

Lewis King, Eva Marie, "Examining the Association of Crime Laboratory Practices, Internal and External Determinants, and DNA Case Completion Time and Backlog" (2015). *Theses and Dissertations*. 816.  
<https://dc.uwm.edu/etd/816>

This Thesis is brought to you for free and open access by UWM Digital Commons. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of UWM Digital Commons. For more information, please contact [open-access@uwm.edu](mailto:open-access@uwm.edu).

EXAMINING THE ASSOCIATION OF CRIME LABORATORY  
PRACTICES, INTERNAL AND EXTERNAL DETERMINANTS AND  
DNA CASE COMPLETION TIME AND BACKLOG

by

Eva Marie Lewis King

A Thesis Submitted in  
Partial Fulfillment of the  
Requirements for the Degree of

Master of Science  
in Biomedical Sciences

at

University of Wisconsin – Milwaukee

May 2015

## ABSTRACT

# EXAMINING THE ASSOCIATION OF CRIME LABORATORY PRACTICES, INTERNAL AND EXTERNAL DETERMINANTS, AND DNA CASE COMPLETION TIME AND BACKLOG

by

Eva Marie Lewis King

The University of Wisconsin-Milwaukee, 2015  
Under the Supervision of Professor Ron Cisler

Crime laboratories across the country have reported caselog information that supports the fact that case submissions have resulted in very large DNA backlogs. The onset of these DNA backlogs developed a public safety and population health crisis. Literature suggests crime laboratories faced submission of DNA cases in a manner similar to the onset of an epidemic. Literature also suggests the use of novel approaches to tackling crime and public safety issues which influenced the approach to this study. Using a population health framework, the purpose of this study is to examine the association of determinants, the Crime Lab policies and programs, and the outcomes of case completion time, backlog status and the percent of cases completed annually. The specific aim of this study is to examine the association of Crime Lab practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory-Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status; and 3) Percent of backlogged cases remaining at the start of each year examined. This study follows an epidemiological retrospective study design and applies a population health framework to examine Crime Lab data for caselog status. Electronic case file data from December 2007

through December 2013 stored in the Laboratory Information Management System BEAST was retrieved using Crystal Reports<sup>®</sup>. Descriptive statistics using averages and counts with descriptive graphs were used to examine the data. The case completion time is derived by determining the difference in days to completion since the time of submission. The backlog definition of use here is a case in the Crime Lab greater than 30 days from case submission to case completion. A set of possible determinants including Crime Lab access, internal personnel behaviors and external suspect behaviors are indicated by case submissions, case completions and case offense type respectively. These determinants, the Crime Lab policies and programs, and the outcome of average case completion time, backlog status, and percent cases completed were examined. The associations of the examined determinants, Crime Lab policies and programs, case completion time and backlog status revealed a reduced case completion time, a reduced backlog, and an increase in case completion percentages. The implications of this study that meaningful examination of a DNA backlog using a population health framework are discussed with recommendation to explore the suspect geographical determinant and suspect biological determinants of age, sex and race for future study.

© Copyright by Eva Marie Lewis King, 2015  
All Right Reserved

## TABLE OF CONTENTS

ABSTRACT.....	ii
TABLE OF CONTENTS.....	v
LIST OF FIGURES.....	vi
LIST OF TABLES.....	vii
ACKNOWLEDGEMENTS.....	viii
INTRODUCTION.....	1
THE PROBLEM.....	2
Funding to Eliminate the DNA Backlog.....	4
Literature Review.....	5
THE POPULATION HEALTH FRAMEWORK.....	7
Possible Determinants.....	9
Crime Laboratory Policy and Programs.....	11
Outcomes.....	13
PURPOSE AND SPECIFIC AIM.....	14
METHODOLOGY.....	16
POPULATION AND SETTING.....	16
DESIGN OF THE STUDY.....	16
PROCEDURES.....	17
MEASURES.....	19
METHODOLOGICAL LIMITATIONS.....	22
RESULTS.....	23
DETERMINANTS.....	25
EXTERNAL LABORATORY FACTORS.....	28
CRIME LABORATORY POLICIES AND PROGRAMS.....	29
OUTCOMES.....	32
SUMMARY AND DISCUSSION.....	35
LIMITATIONS.....	37
FUTURE STUDY.....	37
REFERENCES.....	40
APPENDIX A: NIJ DNA BACKLOG REDUCTION PROGRAM AWARDS.....	43
APPENDIX B: EVIDENCE SUBMISSION GUIDELINES.....	45
APPENDIX C: ANNOUNCEMENT WISCONSIN BACKLOG ELIMINATED.....	52
APPENDIX D: IRB EXEMPT STATUS APPROVAL.....	54
APPENDIX E: WISCONSIN STATE CRIME LABORATORY CONSENT.....	55
APPENDIX F: EVIDENCE PRIVILEGED (WISCONSIN STATUTES AND CODES CHAPTER 165§79).....	56
APPENDIX G: EXCERPT FROM WISCONSIN STATUTE §165.75.....	57

## LIST OF FIGURES

FIGURE 1: Population Health Framework as Applied to Crime Lab DNA Backlogs .....	8
FIGURE 2: Wisconsin State Crime Laboratory-Milwaukee Service Area .....	10
FIGURE 3: WSCL-Milwaukee DNA Case Processing.....	11
FIGURE 4: Tecan Freedom EVO 100 (Robot) .....	12
FIGURE 5: Adjusted Population Health Framework as Applied to Crime Lab DNA Backlogs .....	15
FIGURE 6: Case Submissions 2008-2013.....	30
FIGURE 7: Case Completion Time 2007-2013.....	33
FIGURE 8: Annual Case Submissions and Case Completions .....	34

## LIST OF TABLES

TABLE 1: DNA Average Case Completion Time 2006-2008 .....	4
TABLE 2: Suspect Crime (Offense) Types .....	9
TABLE 3: Major Submitting Agencies .....	9
TABLE 4: Annual Pending Wisconsin DNA Cases 2003-2006 .....	16
TABLE 5: Variables .....	21
TABLE 6: Annual DNA Case Assignments .....	24
TABLE 7: Annual Pending Crime Lab-Milwaukee DNA Cases .....	24
TABLE 8: Monthly Case Submissions .....	25
TABLE 9: Average Monthly Case Submissions .....	26
TABLE 10: Monthly Case Completions .....	26
TABLE 11: Average Monthly Case Completions .....	27
TABLE 12: Suspect Offense Types (Number of Case Assignments) .....	28
TABLE 13: Case Completion Time by Offense Type (days).....	28
TABLE 14: Evidence Submission Guidelines.....	31
TABLE 15: DNA Case Completion Time in Days (2007-2013) .....	32
TABLE 16: Backlogged Cases .....	33
TABLE 17: Percent of Cases Backlogged.....	34



## ACKNOWLEDGEMENTS

I express heartfelt gratitude to the members of my thesis committee for their assistance, and direction toward completion of this study. I particularly would like to thank Dr. Ron Cisler. His great patience, direction and support was most encouraging. A special thank you to committee members and also to Biomedical Sciences Staff, Professor Janis Eells, Dr. Fred Anapol, Dr. Dean Nardelli and also Dr. Jeri-Ann Lyons who encouraged and inspired me in their unique ways at various times respectively. I acknowledge Anne Marie Talsky and Karen Pankowski for their role and support moving things forward. Sincere thanks to the Department of Justice for graciously permitting me opportunity to pursue at very specific times, and the Wisconsin State Crime Laboratory Staff for their support. I give thanks to Mrs. Veronica Britt, Ms. Pat McGowan and Mrs. Sabrina Foulks-Thomas who urged me to see completion, and Mrs. Marilyn McVicker for her marvelous light and encouragement. A special thanks to Precious Jewels, the Sunday School Class and the Prayer Line – Carolyn, Cathy, Darnell and Larlene; prayer works! Thank you to my family for their support: my parents, Joe and Bobbie Jean Lewis, my siblings, and my son Evan Lewis who, through his healthy competitive spirit encouraged me to complete this project even as he desires to be the first to receive an advanced degree (Evan: Civil Engineering B.S., International Engineering and Environmental Studies Certificates with two (2) years of law school under your belt are excellent accomplishments as I attain this degree – next year we celebrate your law school completion). I love and am grateful for my husband Clifford King for his support and desire for me to complete the program. Finally and most importantly, I would like to thank God whose faithfulness allowed me to see project completion.

## INTRODUCTION

Deoxyribonucleic Acid (DNA), the genetic material that determines the characteristics of all living organisms and provides uniqueness among human beings except for identical twins, has greatly developed and advanced over the past 25 years manifesting its use as a powerful clinical and forensic tool. In fact, according to Budowle and Van Daal, “forensic science has embraced the use of DNA molecular biology tools for diagnostic purposes more than any other scientific field. The discipline has been driven by the need for high resolution human identity testing techniques. Over the past 20–25 years, forensic science has developed and implemented various robust and reliable DNA typing technologies. Successes have enabled the reliable typing of extremely minute quantities of DNA, with a resolving power such that, in many cases, the number of evidence-sample contributors can be reduced to a few individuals, if not just one source. In addition, forensic molecular biology tools are very reliable because of well-defined validation requirements” (Budowle and Van Daal, 2009).

Nuclear DNA analysis represents a large portion of clinical and forensic analytical work. DNA analytical tests of bodily fluids are performed clinically in hospitals and clinics as a form of identification according to the State of Wisconsin Department of Justice (DOJ) Physical Evidence Handbook (2009). While other forms of DNA analysis exist, such as Y chromosome DNA and mitochondrial DNA, the DNA analysis focus of this study is limited to data related to nuclear DNA analysis in a forensic laboratory, specifically, the Wisconsin State Crime Laboratory-Milwaukee. Briody (2004) indicated the importance of DNA evidence on public safety. Forensic DNA analytical tests are performed in many different type cases, including sexual

assault, forensic post-mortem (homicide) and other criminal-type cases to determine the inclusion or exclusion of individuals as characteristic to crime that may have been committed, as stated in the Physical Evidence Handbook (2009).

All references from this point forward of the Wisconsin State Crime Laboratory-Milwaukee will be referred to as the Crime Laboratory or Crime Lab.

### **The Problem**

Forensically, it has been reported that untested requests for crime laboratory DNA analysis continues to grow and that new requests outpace the available capacity at crime laboratories to complete analysis on the incoming DNA requests (Hurst and Lothridge, 2011). With DNA cases presenting to crime laboratories in great numbers and deficiency in completing a similar number of cases daily, the potential for a DNA backlog increases. Attorney General J. B. Van Hollen reports, “The existence of a DNA backlog has a significant adverse impact on the security of persons and property. Though per case samples are consistent with national averages and those samples are processed by DOJ DNA analysts at a rate favorable to national averages, there currently exists a substantial and ever increasing DNA backlog at the State Crime Laboratory” (Wisconsin DOJ, 2009). The Attorney General further reported on the period of 2003 to 2006 where it was reported that the backlog grew “at a higher rate than the increased submissions” and the end of 2006 yielded as many cases pending analysis as were submitted during all of 2005. He reports, “Though 2,226 cases were submitted in 2006, the State Crime Laboratory was only able to work 1,152 cases. In stark terms, the current numbers indicate that for every two new cases submitted, the State Crime Laboratory has the capacity to process one, while one is added to the backlog” (Wisconsin DOJ, 2009). The Attorney General

presented information for both the Madison Lab and the Crime Lab DNA submissions.

A case is defined as evidence submitted from a single criminal investigation. Maintaining a caselog entails completing all cases in 30 days or less. A backlogged case is a case that is in the laboratory and remains unreported for a period > 30 days or more. “If there is an increased reliance on DNA analysis for crimes such as burglary, will today’s laboratories be equipped to process the anticipated heavy demand? Simply put, the answer is no. As it stands now, the United States’ crime laboratories do not have the capacity to test all of the evidence that is currently being submitted. As a result, there are already substantial backlogs” (Baskin, 2011). This increased DNA backlog can serve as a public health and safety risk as there is an increased likelihood that offenders not discovered through the assistance of crime laboratory analysis are present in the community as repeat offenders. Criminal activity is known to result in injury and death (Global Burden of Armed Violence, 2008). There are Crime Lab instances that reveal evidence linked to offenders of multiple crimes where the evidence of earlier crimes committed sat on shelves at the Crime Lab. The Combined DNA Index System (CODIS), under the management of the Federal Bureau of Investigation (FBI), was designed to assist law enforcement by providing potential investigative information in those cases in which crime scene evidence has yielded a DNA profile but no identified suspect (FBI 2010). If this powerful tool to connect suspects with crimes is not used to its full potential as evidence sits on shelves unworked in crime labs, instances of crimes committed present as true population health and safety concerns.

The existence of a crime lab DNA backlog epidemic poses a health and safety problem. Data collection in this study superfluously revealed some case-to-case links

where the older cases were not analyzed within six (6) months to a year, allowing subsequent cases to appear with the same DNA profile. These examples were depictions of the harmful nature on public safety and health. This indicates that if the older case had been analyzed sooner, the newer case may not have occurred. Peterson (2012) conveyed that forensic evidence consistently played a strong role in criminal justice case processing. The older cases are examples of cases with large DNA case completion times, where case completion time in this study is defined as the time from case Crime Lab submission to case Crime Lab administrative report completion. Shown below, Table 1: DNA Average Case Completion Time 2006-2008 lists the average Crime Lab case completion times for DNA cases submitted for those years.

TABLE 1: DNA Average Case Completion Time 2006-2008

Year	<i>Average Case Completion Time (days)</i>
2006	207
2007	297
2008	275

### **Funding to Eliminate the DNA Backlog**

The National Institute of Justice (NIJ) has demonstrated great interest in the topic of crime laboratory DNA backlogs as demonstrated by its enormous funding provided for DNA backlog reduction and application and research on efficiencies over the years. The “2011 Strategic Approaches to Sexual Assault Kit (SAK) Evidence: An Action Research Project” grant funded opportunity was established to understand the underlying nature of the problem state and local jurisdictions are having as they struggle in dealing with large quantities of untested sexual assault kits. This grant was an action research project designed solely for this purpose with subsequent larger grant opportunity as follow-through of plans achieved for impact on this emerging epidemic. Several years of funding

by NIJ for the DNA Backlog Reduction Grant, DNA Enhancement and Efficiencies, and Convicted Offender/Arrestee Backlog Reduction Grant(s) that have become combined in different ways throughout the years (i.e., DNA Backlog Reduction/DNA Enhancement and Efficiencies to the current combination of DNA Backlog Reduction/ Convicted Offender/Arrestee Backlog Reduction) point to a need to increase efficiencies in application for DNA analysis and crime laboratory efficiencies. With the goal of assisting eligible states and units of local government to process, record, screen, and analyze forensic DNA and/or DNA database samples and to increase the capacity of public forensic DNA and DNA database laboratories to process more DNA samples, these NIJ funds have been distributed to certain state and local units of government (NIJ 2010). The funds distributed for the 2011 and 2012 grant periods are listed in Appendix A which provides a picture of the great resources focused on the cause of DNA backlog reduction which implies and recognizes a need.

Funding approximating almost 2 million dollars for Wisconsin in the two annual grant periods of 2011 and 2012 is just over 1% of the total funds distributed by the federal government for this purpose. These funds are divided and distributed to public agencies and are determined for each state by the state's crime statistics.

### **Literature Review**

Review of literature supports the fact that crime laboratories across the country have faced the submission of DNA cases in a manner similar to the onset of an epidemic (Peterson, 2013). Baskin and Sommers (2011) report that "The United States crime laboratories do not have the capacity to test all of the evidence that is currently being submitted. As a result, there are already substantial backlogs..." (p.83). A reason for this

state of the DNA crime lab has been attributed to the great amount of time necessary to process and analyze the DNA forensic evidence. Roby (2008) reports that it is time consuming to complete all steps necessary for DNA analytical review and entry into the national database (p.16).

As very little literature existed on DNA backlogs until very recently (Peterson 2010), program literature and articles that include media and political attention report that many crime laboratories across the nation developed very large DNA case backlogs including the Crime Lab DNA work units (Wisconsin DOJ, 2009). The program literature and articles indicate that without proper resources, and by not tackling and recognizing the criminal justice case processing epidemic, an emerging public safety and health crisis is at hand. These reports give insight to the problem of crime laboratory backlogs that must be reviewed and dealt with effectively to maintain good public safety and health.

Bond (2007) reports that “discussions on maximizing the opportunities to link offenders to crime scenes by means of DNA analysis have focused on the timeliness of processing the DNA material recovered from crime scenes.” The study conducted by Bond focused on predictors, other than timeliness, to determine whether DNA successfully detects the crime.

Tonkin, et al. (2007) conducted the first empirical test of whether it is possible to link different crime offense types using geographical and temporal proximity. While this study looked at the offender (suspect) behaviors, intentionally in the absence of forensic evidence, this type of novel approach to crime and the suspect, in the absence of DNA or fingerprint evidence, brings forth the idea of approaching the typical systematic process in a new and different way.

This literature from Bond (2007) and from Tonkin, et al. (2007), coupled with Baskin and Sommers' (2011) reiteration that “more extensive restructuring of crime laboratories is needed...” (National Academy of Science, 2009), a very different approach to tackling the DNA backlog was considered. The possibility of considerations of internal (personnel) behaviors, external (suspect) behaviors, and crime laboratory policies and programs was revealed. Seeing the issue of the DNA backlog like that described by Peterson, analogously to the epidemic, the use of a population health framework in the study of DNA backlogs looked to be a different yet innovative approach to reducing the DNA case completion time and backlog.

### **The Population Health Framework**

The population health framework (FIGURE 1) considers linkage of DNA forensic evidence (the case) Crime Lab outcomes of DNA case completion time and DNA caselog status, Crime Lab policy and programs, Crime Lab access, internal Crime Lab personnel behavior, and external Crime Lab factors attributed to the suspect. This dynamic model selected for the Crime Laboratory DNA caselog follows the model presented by Kindig (2008). The domains within the determinant categories are arbitrarily sized. With consideration of value in DNA evidence in detecting crime (Bond, 2007), and already establishing that criminal activity causes injury and death, the apparent systems outcome is considered the health outcome in the proposed population health framework. The quantity and type of DNA evidence recovered at the crime scene deemed as relevant in relation to detecting activity causing injury and death (Bond, 2007) makes it possible to view the outcomes of case completion time, backlog status and percentage of cases completed toward backlog reduction as health outcomes.



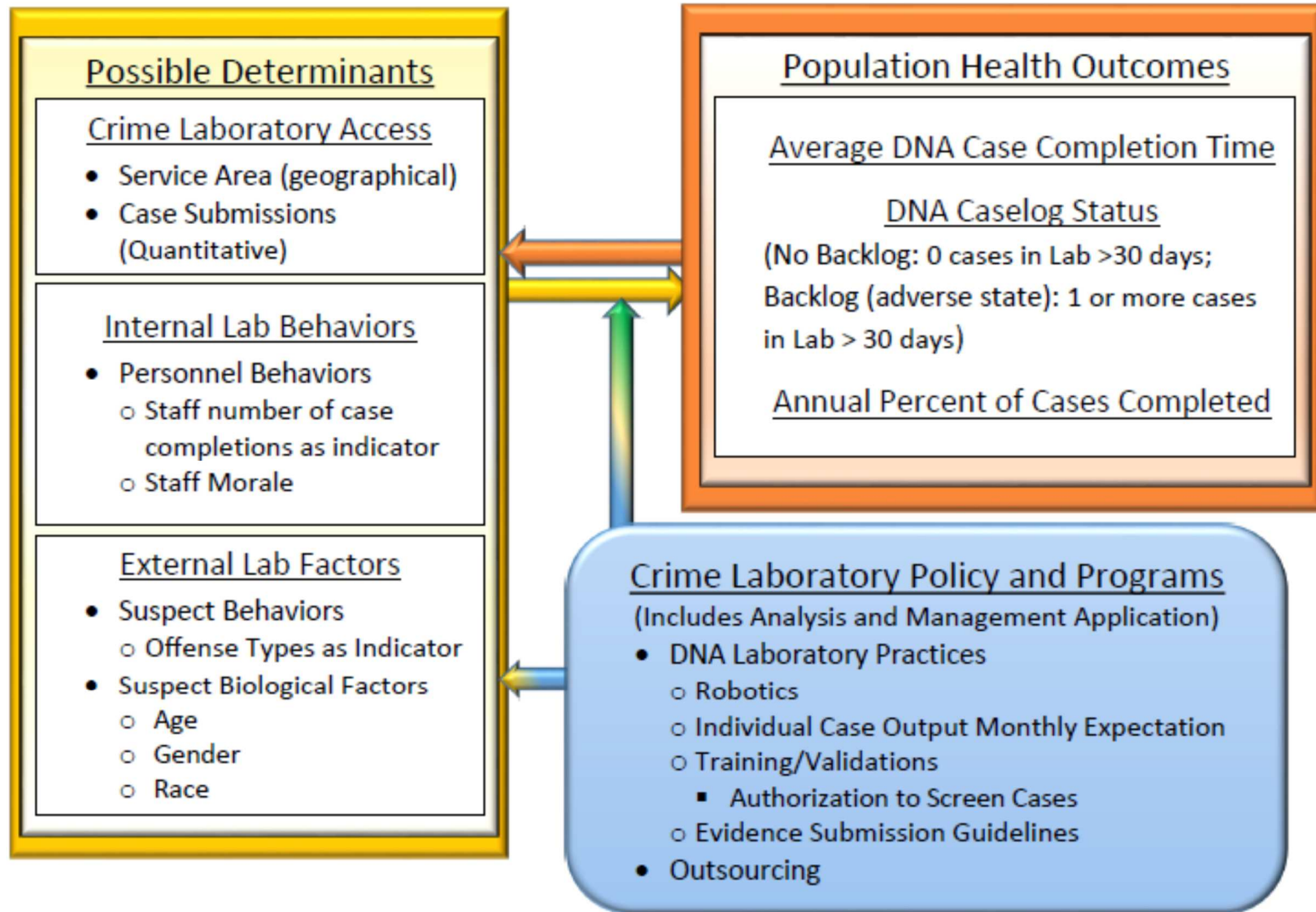


FIGURE 1: Population Health Framework as Applied to Crime Lab DNA Backlogs

### Possible Determinants.

Possible determinants are based on available data retrieved from the Crime Laboratory with an effort to encompass “all the primary determinants of health in human populations” (Kindig and Stoddart, 2003). The determinants include the internal Lab behaviors of the Crime Lab defined as personnel behaviors; the external lab behaviors of the Crime Lab defined by the crime (offense) type (TABLE 2) and the suspect biologic factors identified as age, sex and race/ethnicity; and Crime Laboratory access that includes the geographical service area and the number of case submissions.

TABLE 2: Suspect Crime (Offense) Types

<b>Suspect Crime (Offense) Types</b>
Homicide
Rape/Sexual Assault
Other Assault
Robbery
Property

Cases are received from numerous agencies within the Crime Lab eight (8) county service area. Major submitting agencies are listed in TABLE 3 below. Other agencies outside the service area present very few cases. Kenosha, Milwaukee, Ozaukee, Sheboygan, Racine, Walworth, Washington, and Waukesha counties comprise the Crime Lab service area. The service area, shown in FIGURE 2 below, is defined and established by Crime Lab Administration, the DOJ Division of Law Enforcement Services.

TABLE 3: Major Submitting Agencies

Kenosha County Sheriff's Office	West Allis Police Department
Washington County Sheriff's Office	Milwaukee County Sheriff's Office
Waukesha Police Department	Sheboygan County Sheriff's Office
Milwaukee Police Department	Racine County Sheriff's Office
Brown Deer Police Department	Wauwatosa Police Department
Brookfield Police Department	Greenfield Police Department
Racine Police Department	Oak Creek Police Department
Ozaukee County Sheriff's Office	Kenosha Police Department
Waukesha County Sheriff's Office	Sheboygan Police Department
Shorewood Police Department	Walworth County Sheriff's Office

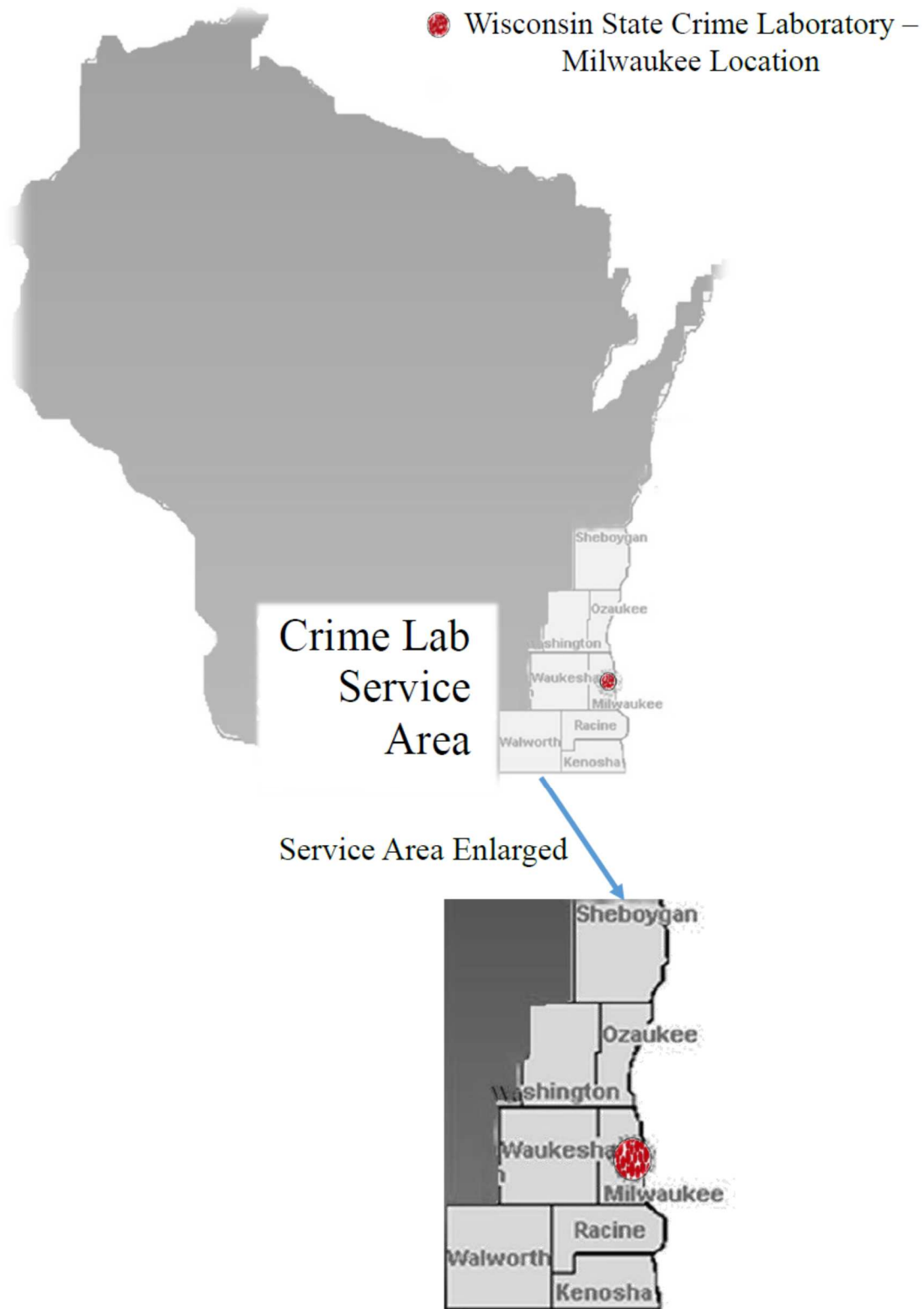
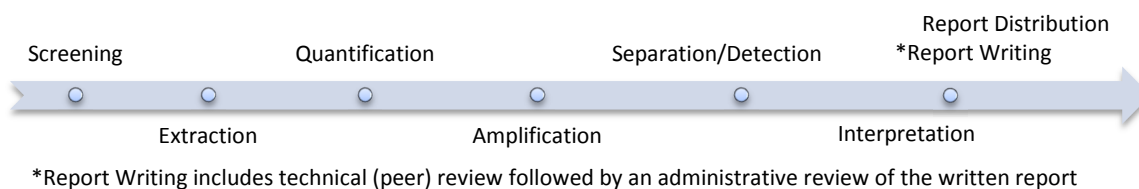


FIGURE 2: Wisconsin State Crime Laboratory-Milwaukee Service Area

## Crime Laboratory Policy and Programs

The framework also presents with Crime Laboratory policy and programs. The Crime Laboratory policy and programs in place targeted case completion efforts which included the use of robotics in case analysis and an increase in DNA analytical staff (Wisconsin DOJ, 2009), and management tools for case completion that included outsourcing mostly sexual assault cases to a private laboratory and instituting evidence submission guidelines (see Appendix B).

Robotics were placed into full operation in 2008 for bulk extraction, quantification, and preparation for amplification. These were identified steps of DNA case processing that take a considerable amount of time if performed manually one case item at a time (see FIGURE 3: WSCL-Milwaukee DNA Case Processing). With the possibility of 80-96 samples per robotic run, in lieu of one item at a time for manual analysis, time efficiency in productivity is expected with robotics.



\*Report Writing includes technical (peer) review followed by an administrative review of the written report

FIGURE 3: WSCL-Milwaukee DNA Case Processing

Incorporating Tecan Freedom EVO 100 robotics into the analytical scheme for DNA analysis introduced liquid handling using robotic arms that provided a consistent sample handling method. Using deep well plates and disposable tips to batch multiple samples for analysis, efficiencies via robotics was expected. To maximize and improve upon robotic use, the extraction system DNA IQ™ was immediately instituted as part of the analytical scheme. This was a result of management direction for an efficient, reliable and reproducible robot extraction method since manual extraction was traditionally a

bottleneck. The robot proved to be very flexible with the automated DNA IQ™ extraction system. “Automation offers quality control, consistent results, and data management with lower operational costs. By removing the human component from the process, results tend to be more consistent and high-quality. Error is reduced primarily by minimizing the chance of sample switching and carryover contamination. Software developments enable tracking of sample handling throughout the process. Lower reagent volumes translate into fewer consumables and less waste” (Budowle & Van Daal, 2009).



FIGURE 4: Tecan Freedom EVO 100 (Robot)  
Source: <http://www.equipnet.com/auctions/Webcast-Auction/219/>

The management tool of evidence submission guidelines requires pre-submission case scrutiny by investigators. This involved management contact with service area agency representatives. Management contacted law enforcement agencies within the Crime Lab service area in late January 2009 and requested each case undergo scrutiny by agency investigators to determine an absolute need for DNA analysis. If there was not an absolute need for analysis given the case circumstances, request was made to forego submission of the evidence to the Crime Lab. Management asked investigators to do

their part to conduct a thorough investigation prior to case submission to the Crime Laboratory for DNA analysis and to scrutinize the evidence prior to submission to determine if DNA analysis is actually needed. The request to agencies was communicated as a temporary request through the end of February until the backlog was eliminated. Ultimately, the pre-case submission scrutiny requests were made for the purpose of reducing or eliminating the Crime Laboratory backlog. This was consistent with reported standard practice regarding crime scene evidence: “physical evidence present at the crime scene is often filtered before it ever reaches the laboratory examiner’s bench. This process begins with the report of the crime to the police and decisions made by patrol and investigators to call (or not call) crime scene investigators to the scene. Much physical evidence is never recovered as a succession of police personnel evaluates the predicted value of evidence to the investigation and prosecution of crimes. Physical evidence will sometimes make it as far as the police property room as personnel weigh the necessity and value of scientific evidence to a case against the costs and further delays of requesting a laboratory analysis of that evidence” (Peterson, 2013).

In early March 2010, the Attorney General’s Office announced the State’s DNA backlog was eliminated (see Appendix C).

### **Outcomes**

The outcomes of reduced completion time and no backlog represent the healthy state. This means that all cases are completed within 30 days of submission. Worthy of notation is the fact that there was no standard definition for backlog prior to 2011. As such, the Crime Laboratory adopted a transitional definition of backlog to reach case completion time milestones then set new targets to strive and achieve. For example, case

completion time goals were set as follows: September 2007 - 120 days case completion time; July 2008 - 90 days case completion time; July 2009 - 60 days case completion time; and July 2010 - 45 days case completion time with encouragement to strive for 30 days case completion time. Due to the national standard established as 30 days case completion during the course of this study, the 30 day case completion standard was applied for every year examined in this study.

### **Purpose and Specific Aim**

The purpose of this study is to examine the association of determinants, the Crime Lab policies and programs, and the outcomes of case completion time, backlog status and the percent of cases completed annually. The subset of determinants studied include case submissions under Crime Laboratory access, personnel behaviors under internal Laboratory behaviors, and suspect behaviors by offense type under external Laboratory factors. These are examined with the Crime Laboratory policies and programs for impact on the case completion time and backlog.

The specific aim of this study is to examine the association of Crime Lab practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory-Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status; and 3) Percent of backlogged cases remaining at the start of each year examined; using the adjusted population health framework. The framework is adjusted for this study as depicted in FIGURE 5: Adjusted Population Health Framework of Crime Lab Backlogs, displaying the subset of determinants, Crime Lab policies and programs, and outcomes.

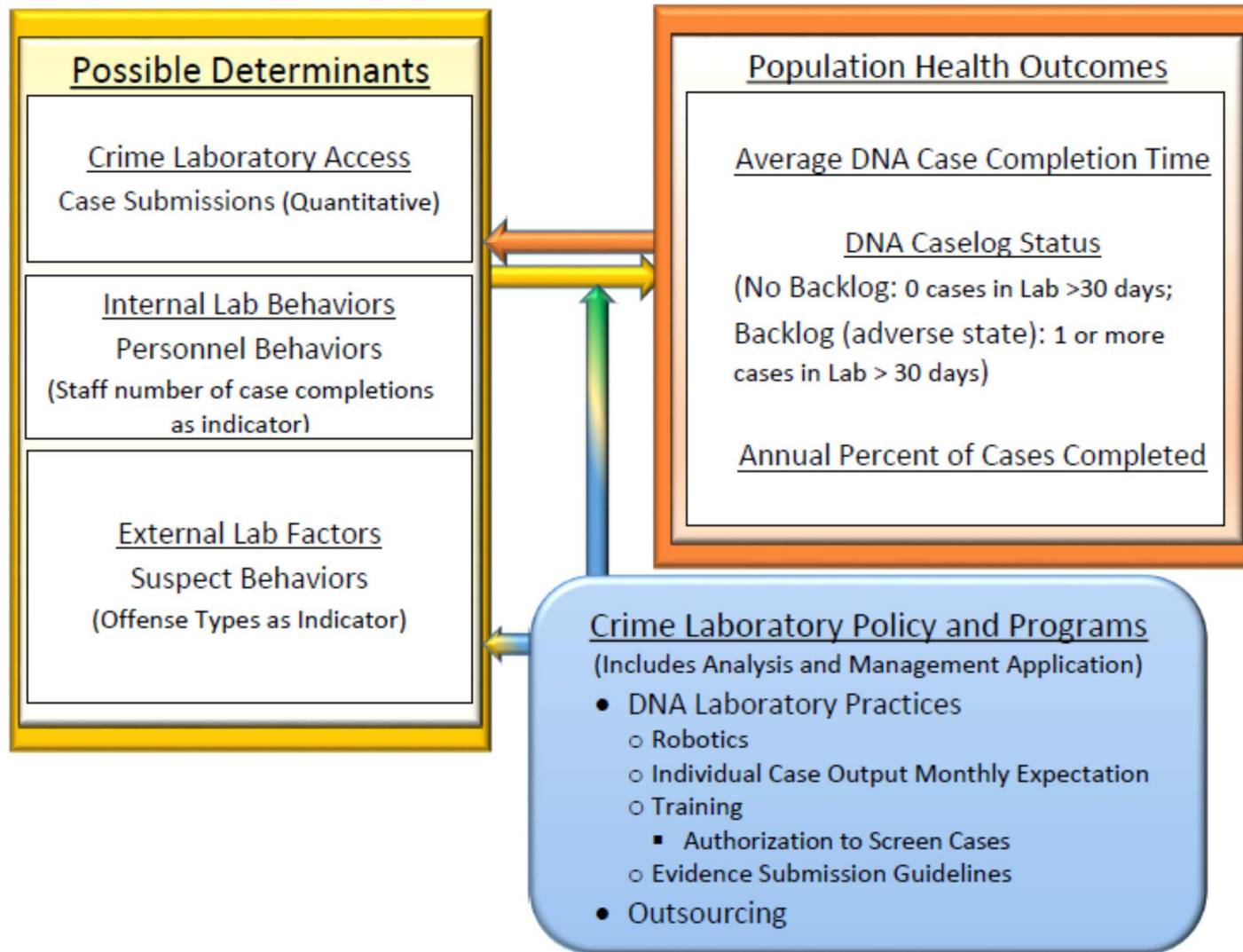


FIGURE 5: Adjusted Population Health Framework as Applied to Crime Lab DNA Backlogs



## METHODOLOGY

### Population and Setting

This study was completed at the Wisconsin State Crime Laboratory – Milwaukee DNA Analysis Unit which covers the eight (8) county service area.

The scope of this study is limited to the Crime Lab from December 2007 – December 2013. Prior to 2007, the number of Crime Lab cases from the Crime Lab service area awaiting analysis and remaining at the end of each year 2003-2007 is depicted in TABLE 4 and is provided here for historical context. This historical information provides insight to the self-reported state of the Crime Lab at the start of the designated study period. It shows the glaring rise in the number of cases waiting to be processed which gives particular emphasis to the large contribution of cases submitted but unopened for processing at the Crime Lab (Wisconsin DOJ, 2009). The almost 3.7-fold increase of cases awaiting analysis from 2003 to 2007 indicates a backlogged state.

TABLE 4: Annual Pending Wisconsin DNA Cases

Year	WSCL-Milwaukee	WSCL (Madison and Milwaukee)
2003	302	473
2004	354	552
2005	907	1375
2006	1203	1785
2007	1112	1735

(Wisconsin DOJ, 2009)

### Design of the Study

This study followed a retrospective cohort design to accomplish the specific aim of this study is to examine the association of Crime Lab practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory-Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status; and 3) Percent of backlogged

cases remaining at the start of each year examined.

McDowell (2004) suggested that population health measurement designs should reflect their purpose (p. 388) and introduced the broadening scope of population health measures (p.391). This dynamic view of the Crime Lab as a process emphasizes resources as well as physical capacities. It first introduces variables that may effectively change or cope with the Crime Lab environment (McDowell, 2004). It then identifies the Crime Laboratory's goal or desired outcome to exist with an eliminated DNA backlog. This dynamic process also must consider Crime Laboratory policies and programs in place to affect change in some of the possible determinants and the outcome. Crime Lab data from December 2007 through December 2013 were retrieved for use with the dynamic framework model depicted in FIGURE 3. These are the data that constitute the population

### **Procedures**

Permission to conduct research was granted by the Institutional Review Board at the University of Wisconsin-Milwaukee (see Appendix D) in August 2010. Prior to beginning the study, proper authorities were consulted and approved the use of all Wisconsin State Crime Laboratory data to conduct the study (See Appendix E) with commitment to honor policy congruent with State statute 165.79 Evidence Privileged (see Appendix F) which explains that information and analyses of evidence submitted by law enforcement are privileged information. In accordance to honoring policy congruent to Evidence Privileged, no individual names or Laboratory case numbers are presented in the study. Although, Crime Lab case numbers were used in data collection and stored in

records as a key for necessary reference and review.

The retrospective cohort study approach allowed for the collection of large amounts of data focusing on submitted and completed Crime Lab case file primary data. Crime Lab hardcopy case files and electronic case file primary data were available. The electronic file primary data was obtainable from the Laboratory Information Management System (LIMS). The LIMS, acquired from Porter Lee Corporation and named BEAST, is a customized system for data storage that was designed to record and track all Crime Lab case related information for indefinite storage. Every case that submitted to the Crime Lab received an individual identifier where all related case information was entered into the LIMS by Crime Lab staff under that same identifier. Specifically, the case information was entered to maintain chain of custody tracking of the forensic evidence from case submission through case completion and evidence return to the submitting agency. Crime Lab staff electronically entered all case related information into BEAST and printed hardcopy case related submission reports that started the hardcopy case file. During the study data collection period, the Crime Laboratory defined a case completion as the date administrative review was completed. Administrative review was indicated by notation on the hardcopy report and was automatically dated in BEAST upon the click of two buttons that entered and confirmed the administrative review completion.

Ultimately, electronic file retrieval replaced initial hardcopy data retrieval effort and was done using Crystal Reports® software that interacts with BEAST to retrieve and collect selected data. Crystal Reports® captured specified data from various tables in BEAST and placed the information into a user designed report form for export into Microsoft Excel spreadsheets (Crystal Reports, 2009).

## Measures

### Determinants

The subset of possible determinants proposed in the adjusted population health framework of Crime Laboratory Access, Internal Laboratory Behaviors, and External Laboratory Factors were examined based on availability from the Crime Lab files.

**Crime Laboratory Access.** Crime Laboratory access is defined by Wisconsin Statute §165.75(3) (see Appendix G). Agencies from defined geographical service areas submitted cases to the Crime Lab. Case submissions are used as indicator of Crime Lab access and directly contribute to the Crime Lab DNA analysis caselog.

**Internal Laboratory Behaviors.** Internal Crime Laboratory behaviors are defined as personnel behaviors indicated by the number of DNA analyst case completions.

**External Laboratory Factors.** External Crime Laboratory factors are defined as suspect behaviors indicated by the case crime (offense) type. The offense type data used in this study is based on cases completed at the Crime Lab. While there are many offense types, the major DNA submissions focus primarily in the offense types of robbery, and property crimes and violent crimes which include homicides, rape/sexual assault, and other assaults (those other than sexual assaults). The scope of suspect behaviors focuses on these offense type behaviors only.

### Crime Laboratory Policies and Programs

Crime Laboratory policies and programs were considered when data retrieved

provided indication that policy and programs may have affected determinants or outcomes. These policies and programs were described above as DNA analyst case completion efforts which included the use of robotics in case analysis and additional DNA analytical staff (Wisconsin DOJ, 2009), screening authorization, management tools that include analyst case output expectations, outsourcing mostly sexual assault cases to a private laboratory and instituting evidence submission guidelines.

### **Outcomes**

Pending DNA cases are the Crime Lab measure of all cases in the lab awaiting DNA analysis and provided in this study as a general snapshot of the DNA case status. This study looked at: 1) case completion time defined by the number of days from case submission to case completion; 2) Backlog status defined by the number of DNA cases in the Crime Lab  $> 30$  days indicating the backlogged state and  $\leq 30$  days indicating the normal (healthy) caseload state; and 3) Percent of cases completed within ( $\leq$ ) 30 days of submission. Using the time checkpoint of the end of the month and the end of the year, counts of DNA cases per month for each year of the study provided indication of Crime Laboratory case status information.

### **Data Conversion and Analyses**

Data collection consistent with the retrospective cohort study use of secondary data was accomplished with no case names recorded or associated with the study data due to the Crime Laboratory confidentiality policy.

Data collection focused on several variables that are expected to possibly relate to the existence of a backlog or a caseload. The variables chosen for this study were selected

based on the dynamic framework that focuses on the responsibility and capacity of a population to help itself with use of internal and external forces to most effectively improve health (McDowell, 2004). But practically, the variables chosen are also based on Crime Lab primary data available with the goal to explore association based on the proposed framework. Submission information, and Crime Lab personnel behavior using case completion counts as indicator are framework considerations that may lead to the contributing dynamics of the DNA case status.

The variables listed in TABLE 5 were collected and listed in Excel spreadsheets.

TABLE 5: Variables

<b>Data Collection Variables</b>
<b><u>Determinants</u></b>
Case Number
Case Year Completed (Date Completed: mm/dd/yyyy)
Date Submitted (mm/dd/yyyy)
Case Offense Type
<b><u>Crime Lab Policy and Programs</u></b>
Management Tools for Case Completion
DNA Analyst Case Completion Efforts
<b><u>Outcomes</u></b>
Case Completion Time (Calculated Date Submitted minus Date Completed); Backlog Status: *No Backlog (healthy state $\leq 30$ days) *Backlog (unhealthy state $> 30$ days) * Percent of backlogged cases remaining at the start of each year examined

Exploratory data analysis was used; as such, descriptive statistics such as averages and counts were performed. Data visualization was also performed.

These statistical tools provided opportunity to make associations that may help speak to why the Crime Lab backlog exists (or not) and point to ways of tackling it. Review and analysis allowed opportunity for data to be placed into annual case submissions (input) and case completions (output) summaries to support an examination and accomplish the specific aim of this study is to examine the association of Crime Lab

practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory-Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status; and 3) Percent of backlogged cases remaining at the start of each year examined.

### **Methodological Limitations**

Extracting data manually via hardcopy files was a cumbersome and overwhelming task, very time consuming, and incomplete without recorded completion dates in the hardcopy case files. The overwhelming nature made it necessary to make contact with a Department of Justice Bureau of Computing Services employee and request assistance on extracting information from BEAST. The request provided very limited assistance but revealed that BEAST operated on an Oracle object-relational database system with numerous tables. This information and previous basic and advanced Crystal Reports XI training provided promise to collect data in a usable manner. Learning the various BEAST Oracle data tables to determine how to link them for the purpose of retrieving selected variables (Table 5) was challenging. While use of Crystal Reports for export to Microsoft Excel spreadsheets made it easier for data collection (Crystal Reports, 2005) and less time consuming, data extraction from BEAST was limited by the numerous and complicated BEAST tables coupled with a lack of complete understanding to extract other data that may have been available and useful to the study. For example, instead of extracting case completion time data from BEAST, dates submitted and dates completed were extracted and the case completion time was calculated in the Excel spreadsheet due to the unfamiliarity to properly retrieve usable case completion time data. Another limitation was the time necessary to manually restore original completion dates for cases that required a corrected report. When a case report is corrected in

BEAST, the completion date is updated to the current corrected report date.

The case as defined in this study is evidence submitted from a single criminal investigation. Even as the Crime Lab uses this definition, assignments to multiple Crime Lab forensic disciplines are made on the single case as necessary. For example, if an investigator requests firearms examination on evidence and also requests DNA analysis on the same or another item of evidence from the same case; two assignments – one to the Firearms Unit and another to the DNA Unit – are made for that single case. Because the population subset focus of this study is defined as DNA case submissions, the term “assignments” of those submissions is interchangeable with cases. Multiple submission assignments to the DNA Analysis Unit for one single case posed a defined limitation. Multiple submission assignments of different DNA evidence items from the same case occurred in some instances. Because Crime Laboratory policy does not allow for reanalysis of an item of evidence unless in the extremely rare court ordered instance, all DNA assignments are included in the examination.

A very small number of DNA supplemental Crime Laboratory case reports to an existing case are created internally to provide case follow-up information. These were otherwise and generally specified in this study as “additional” when presenting results. Counting each suspect per case once provides a more accurate depiction of the external factors examination.

## RESULTS

The specific aim of this study is to examine the association of Crime Lab practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory-Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status;



and 3) Percent of backlogged cases remaining at the start of each year examined, using the adjusted population health framework.

Initial counts of DNA case assignments for 2007-2013 are depicted in TABLE 6. Cases Assigned represent the number of DNA cases assigned to the Crime Lab DNA Analysis Unit. The Total Pending is the number of cases assigned the given calendar year plus the amount of cases pending analysis the last day of the previous calendar year.

TABLE 6: Annual DNA Case Assignments

<i>Year</i>	<b>Cases Submitted</b>	<b>Total Annual Case Assignments</b>	<b>Cases Completed</b>	<b>Pending Dec. 31<sup>st</sup></b>
2007	-	-	-	1112
2008	1506	2618	2295	323
2009	2052	2375	2063	313
2010	2601	2914	2369	545
2011	2361	2906	2358	548
2012	1745	2293	1958	365
2013	1654	2019	1710	309

Based on the above, the information presented in TABLE 4: Annual Pending Wisconsin DNA Cases 2003-2006 (and highlighted below) is updated for Milwaukee as depicted in TABLE 7: Annual Pending Crime Lab-Milwaukee DNA Cases displaying peak pending cases in 2006 and 2007 and displaying a notable increase in 2010 and 2011.

TABLE 7: Annual Pending Crime Lab-Milwaukee DNA Cases

<i>Year</i>	<b>WSCL-Milwaukee Pending Cases 31<sup>st</sup> of December</b>
2003	302
2004	354
2005	907
2006	1203
2007	1112
2008	323
2009	313
2010	545
2011	548
2012	365
2013	309

## Determinants

**Crime Laboratory Access.** There was a noticeable and consistent increase in DNA case submissions ( $\geq 190$  cases) immediately after the backlog elimination announcement in 2010 and is represented in TABLE 8 below (see the highlighted notations in the table below).

TABLE 8: Monthly Case Submissions\*

<i>Year</i>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
<i>January</i>	186	168	188	236	147	168
<i>February</i>	119	151	162	122	126	123
<i>March</i>	139	157	254	216	109	107
<i>April</i>	109	156	241	195	123	145
<i>May</i>	77	160	209	146	119	122
<i>June</i>	97	174	240	220	169	122
<i>July</i>	99	170	226	214	139	144
<i>August</i>	78	179	236	308	163	157
<i>September</i>	156	205	237	234	136	158
<i>October</i>	180	175	193	178	148	173
<i>November</i>	145	204	225	142	234	108
<i>December</i>	121	153	190	150	132	127
<i>Year Total</i>	1320	1884	2413	2125	1598	1486
<i>Additional Assignments</i>	186	168	188	236	147	168
<i>Total Cases</i>	1506	2052	2601	2361	1745	1654

\*Note: Yellow highlight indicates DNA case submissions  $\geq 190$  cases in the month; Blue highlight indicates annual DNA case submissions  $\geq 2000$  cases.

The dramatic increase in case submissions indicated that the earlier request for submitters to scrutinize evidence through the end of February 2010 ended or that the DNA backlog eliminated was actually a DNA backlog displaced, applying the definition of a backlog according to this study. A backlog displaced means that cases may have been held at the agencies for submission after the requested temporary period of case scrutiny. TABLE 9 below also shows the 2010 case submission increase as an annual average.

TABLE 9: Average Monthly Case Submissions

<b>Average Monthly Case Submissions (cases)</b> (yellow highlight notes high submission year)						
<b>Year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Submissions	110	157	201	177	133	124

\*Notables: 2010 high case submission average 2010 (post backlog elimination announcement). 2012 and 2013 decrease in case submissions (post Evidence Submission Guidelines implementation).

Tables 8 and 9 both depict the impact submissions have on the caselog by displaying additional cases that potentially hinder attention to performing DNA analysis on cases waiting to be processed, or by having the potential to wait for a period greater than 30 days for DNA processing.

**Internal Laboratory Behaviors.** DNA analyst case completions are depicted in TABLE 10 where June-October 2008 show an increase in case completions by DNA Analysts. This is indicative of the time period for which newer DNA analysts completed the training program and became authorized to perform DNA analysis on case work.

TABLE 10: Monthly Case Completions

<b>Year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
<i>January</i>	161	169	210	153	212	197
<i>February</i>	176	187	309	192	162	127
<i>March</i>	170	163	229	260	170	145
<i>April</i>	148	165	169	177	147	138
<i>May</i>	126	124	220	188	179	153
<i>June</i>	216	176	227	208	165	138
<i>July</i>	279	208	178	208	152	148
<i>August</i>	242	168	201	207	149	150
<i>September</i>	195	189	165	239	132	166
<i>October</i>	230	158	146	191	164	164
<i>November</i>	188	200	191	180	169	117
<i>December</i>	164	156	124	186	190	123
<i>Year Total</i>	<b>2295</b>	<b>2063</b>	<b>2369</b>	<b>2389</b>	<b>1991</b>	<b>1766</b>

Note: Highlighted months in 2008 indicates a period when newer DNA hires transitioned from the training program to contributing DNA analysts.

February 2010 was atypical and unusual as case files indicated increased output by all DNA staff. This is a significant time as it immediately preceded the backlog eliminated announcement that was well circulated prior to formal announcement (Staff did not take leave and worked overtime during the February 2010 monthly period).

TABLE 11 below also shows the 2010 case submission increase as an annual average.

TABLE 11: Average Monthly Case Completions

<b>Average Monthly Case Completions (cases)</b>						
<b>Year</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Completions	191	172	197	199	166	147

Tables 10 and 11 both depict the impact completions have on the caselog by displaying the removal of cases from the backlog through case completion by the DNA analysts. Robotics were used by DNA analysts. The first five (5) months of 2008 displayed the usefulness of robotics as the same number of DNA analysts increased monthly case completion output 2.3, 2.5, 2.4, 2.1, and 1.8 times the average case completion output for 2007 of 70 cases respectively. This increase is attributable to the implementation of robotics. Newly trained DNA analysts began processing DNA cases beginning May 2008 with all completed by October 2008. Each DNA analyst was required to perform good quality analysis on at least 12 DNA cases monthly (this target was adjusted to 10 DNA cases monthly in 2010 and to the achievable 7 cases monthly in 2013). With approximately 20 full time DNA analysts performing case completion duties (one DNA analyst is generally assigned to quality assurance duties), the management directed case completion targets were not achieved until 2013 when target case completions were decrease to an achievable goal.

## External Laboratory Factors

Violent crimes and property crimes were examined for impact on the backlog by the annual case assignments are depicted in TABLE 12: Suspect Offense Types.

TABLE 12: Suspect Offense Types (Number of Case Assignments)

Year	2008	2009	2010	2011	2012	2013
Homicide	129	200	175	223	211	548
Rape/Sexual Assault	264	300	341	305	406	32
Other Assault	66	57	98	55	66	470
Robbery	464	421	457	337	192	282
Property*	2030	2298	2908	2304	902	902

Property offense types present with great numbers as several submissions of suspect DNA buccal swabs (standards) often follow initial submissions within a single case. All multiple submissions related to the case are included in TABLE 12: Suspect Offense Types and reflect case assignments. The average case completion times associated with the offense type are listed in TABLE 13: Case Completion Time by Offense Type (days).

TABLE 13: Average Case Completion Time by Offense Type (days)

Offense Type /Year	2008	2009	2010	2011	2012	2013	Mean Average CCT by Offense Type
Homicide	80	95	72	82	42	51	<b>70</b>
Rape/Sexual Assault	96	76	81	91	50	42	<b>73</b>
Other Assault	69	57	51	91	38	73	<b>63</b>
Robbery	56	39	42	52	34	28	<b>42</b>
Property	64	34	33	42	66	63	<b>50</b>
<b>Mean Average CCT by Year</b>	<b>73</b>	<b>60</b>	<b>56</b>	<b>72</b>	<b>46</b>	<b>51</b>	

TABLE 13 shows higher case completion times for violent crimes 2008-2011. Violent crimes that includes homicide, rape/sexual assault, and other assaults. Robbery and property crimes attained case completion time averages nearest to the less than or equal to 30 days targeted completion time, with property crimes representing the greatest number of case assignments for DNA analysis which suggests a driving force when considering averages based on the entire caselog. Violent crime cases generally presented to the Crime Lab with a greater number of items per case requiring DNA analysis. The property crimes and robberies were generally quite the opposite as fewer items were presented per case for DNA analysis. Given the results of 2012 and 2013 in TABLE 13 where violent crimes and robbery decreased in case completion time but property crimes increased in case completion time, the violent crime and robbery focus appeared to have impacted case completion time of the great numbers of property crime assignments. Similarly, the earlier focus on decreasing the number of property crime cases while processing the violent crimes from 2008-2011 indicates that the focus on eliminating the number of property crimes impacted the case completion time of violent crimes which show higher case completion times. These inferences are made by the results. However, the application of the population health framework considers a more complete view of the true dynamic and will be discussed below in the Summary and Discussion section.

### **Crime Laboratory Policies and Programs**

As a result of the case submission increase in 2010, DNA Evidence Submission Guidelines (ESG), in Appendix B, were management directed to increase efficiencies and began in October 2011 with the largest submitter, the Milwaukee Police Department and subsequently rolled out to the rest of the Crime Lab- Service Area January 2012.

FIGURE 6 displays the trend of increased DNA submissions in 2010. It also shows a trend of case submission increases during the period prior to Evidence Submission Guidelines (ESG) implementation in October 2011. With notable decrease in submissions 2012 and 2013 (see Table 11), the ESG may have had an impact on these decreased submissions due to limitations placed on submissions to the Crime Lab.

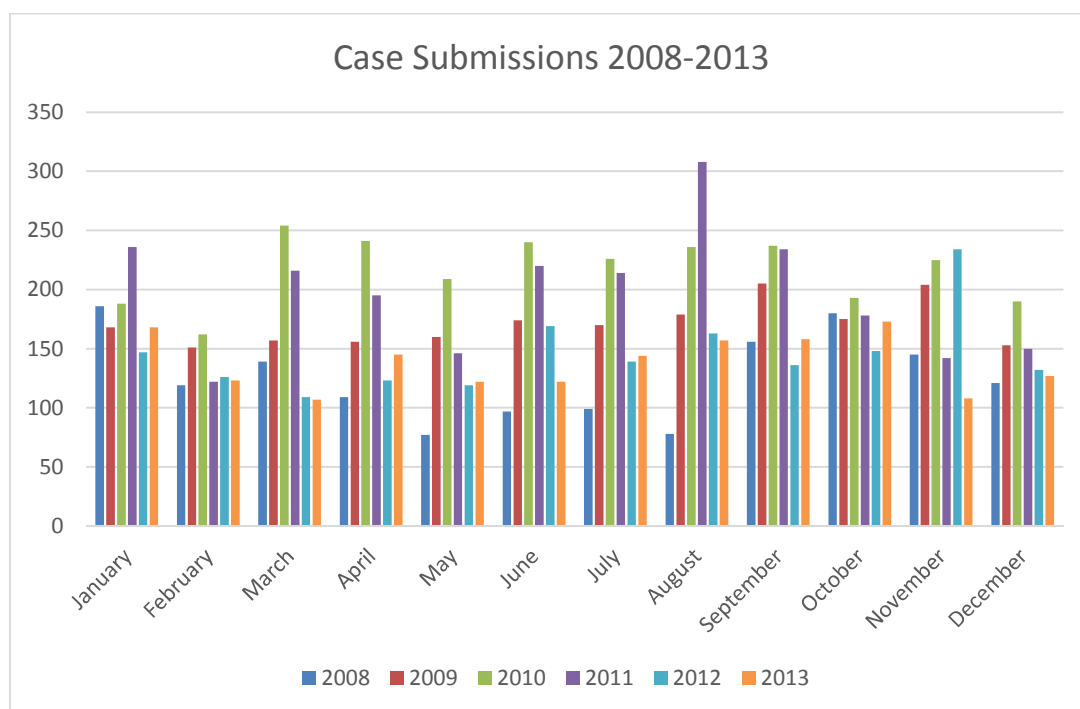


FIGURE 6: Case Submissions 2008-2013

The ESG outlined requirements (or submission limitation) for routine evidence submission to the Crime Lab DNA Analysis Unit are summarized in TABLE 14. This included the requirement to submit items of evidence connected with potential felonious criminal investigations as per Wisconsin §165.75(3)(e) only. Misdemeanors would not be accepted for DNA analysis. It also meant the guidelines precluded analysis for private individuals, corporations or any agency outside of those listed in §165.75(3)(a) and §165.75(3)(b). See Appendix G for excerpt from Wisconsin Statute §165.75.

TABLE 14: Evidence Submission Guidelines

Case Type (Felony Offense)	1 <sup>st</sup> Submission (Number of Items)	2 <sup>nd</sup> (Number of Items) & Subsequent Submission(s) <i>Only if items from 1<sup>st</sup> submission negative</i>
Homicide	10	10
Rape/Sexual Assault (SA)	1 Victim SA kit plus underwear & 1 Suspect SA kit & condom	Crime Laboratory Management Approval
Burglary/Property	3	3
Other	3	3
Criminal Parentage	Alleged parents and child buccal swabs	Additional alleged parent
Touched Evidence (i.e., Controlled Substances Packaging, Weapons & etc.)	3 items only per special Request by Prosecutor	More items by Special request by Prosecutor

In 2007 nine (9) DNA analysts were hired and increased the DNA analytical staff to 21 DNA analysts. This was done with the management purpose to “eliminate the backlog” (Wisconsin DOJ, 2009). The newly hired DNA analysts were not fully trained to work DNA cases to completion. The DNA analyst training program required at least six months to one year of training prior to working cases, and also to adhere to FBI Quality Assurance Standards. The training process for eight of the nine additional DNA analysts hired in 2007 was completed in approximately one year. The training process typically removed qualified case-working DNA analysts from casework completion as they had to devote time to train the new analysts. To minimize this effect of removing qualified DNA analysts from completing casework, management arranged and commissioned the National Forensic Science Technology Center to send trainers to Wisconsin and train the new DNA analysts. This proved successful in minimizing staff participation in training new analysts, keeping them focused on completing casework. It also proved useful to help streamline DNA case processing as the new DNA analysts were trained in the technique of screening within six to eight (6-8) weeks. Management partitioned the DNA training process into two (2) segments, Serological Screening and



DNA Analysis. Upon completing the Serological Screening training program within 6-8 weeks, management authorized the new DNA analysts to assist other DNA Analysts in case completion by assigning the task of screening cases to the new analysts in preparation for DNA analysis.

Management also required DNA analysts to use robotics in DNA case processing and instituted the requirement that each qualified DNA analyst complete at least 12 DNA cases with good quality. All practices were DNA Backlog Reduction Grant recipient reported by management to the National Institute of Justice every year. As a result, these practices were supported by program literature by the National Institute of Justice (National Institute of Justice (NIJ), June 2010 and December 2013).

## Outcomes

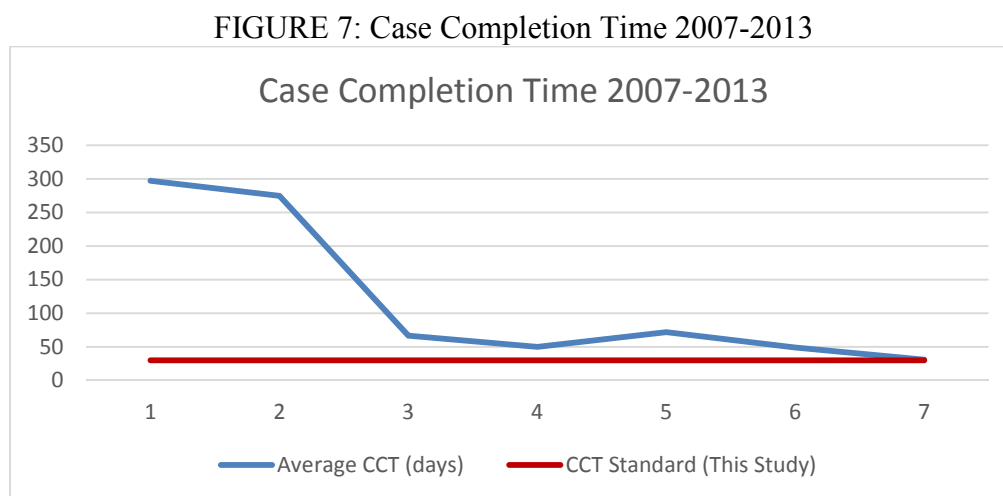
**Case Completion Time.** Case completion times for case submissions were examined based on the definition of  $\leq 30$  days targeted for completion. TABLE 15: DNA Case Completion Time in Days (2007-2013) shows the actual Crime Lab average case completion time and also lists the Crime Lab case completion time goal that is the established target case completion time put in place and effective June of the each year by Crime Lab management for the time period specified.

TABLE 15: DNA Case Completion Time (CCT) in Days (2007-2013)

Year	Crime Lab CCT Goal (days)	Average CCT* (days)
2007	120	297
2008	90	275
2009	60	67
2010	45	50
2011	45	72
2012	45	49
2013	30	31

\*Average CCT is based on this study's definition targeting  $\leq 30$  days for completion.

TABLE 15 shows the average case completion times decreased from 2007 through 2013. The decrease was almost a 10-fold decrease in days to completion and is displayed in FIGURE 7: Case Completion Time 2007-2013



**Backlog Status.** Further examination revealed the number of backlogged cases as represented in TABLE 16: Backlogged Cases

TABLE 16: Backlogged Cases

<i>Year</i>	<b>Cases Pending December 31<sup>st</sup></b>	<b>Backlogged Cases</b>
2007	1112	1097
2008	323	313
2009	313	301
2010	545	536
2011	548	522
2012	365	336
2013	309	276

Examination of the data to determine case status revealed a backlog existed at the Crime Lab from December 2007 through December 2013 with notable decrease of backlogged cases from 2007 through 2008 by 71%.

**Percent of backlogged cases remaining at the start of each year examined. Of**

the annual cases pending December 31<sup>st</sup> of the previous year, 89-99% of the DNA cases awaiting analysis were backlogged to begin the year. Except for 2010, TABLE 17:

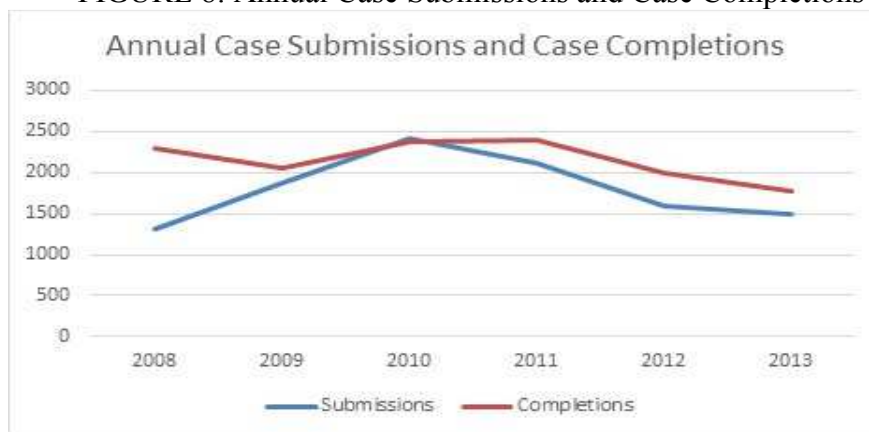
Percent of Cases Backlogged shows a consistent decrease in the percentage of backlogged cases annually as it relates to all cases awaiting DNA analysis. This provides indication that the backlog is reducing and moving towards a healthier state.

TABLE 17: Percent of Cases Backlogged

<i>Year</i>	<b>Cases Pending January 1<sup>st</sup></b>	<b>Backlogged Cases</b>	<b>% of Cases Backlogged</b>
2007	1112	1097	99
2008	323	313	97
2009	313	301	96
2010	545	536	98
2011	548	522	95
2012	365	336	92
2013	309	276	89

This dynamic is depicted differently below in FIGURE 8: Annual Completions and Case Submissions where annual case completions exceed case submissions, except for 2010. This trend indicates continued progress toward backlog reduction – more cases going out than coming in.

FIGURE 8: Annual Case Submissions and Case Completions



## SUMMARY AND DISCUSSION

The proposed adjusted population health framework was useful to achieve the specific aim of this study to examine the association of Crime Lab practices, internal and external determinants, and outcomes on the Wisconsin State Crime Laboratory- Milwaukee DNA caselog for: 1) Case completion time; 2) Backlog status; and 3) Percent of backlogged cases remaining at the start of each year examined from December 2007 through December 2013. Application of the population health framework allowed opportunity to examine association. Examination revealed Crime Lab practices (submission guidelines) resulting from the DNA caselog status (backlogged state) affected Crime Laboratory Access with decreased submissions, Crime Laboratory practices (robotics) increased internal case completions. Crime Laboratory Access (case submissions) had an effect on DNA caselog status as some case submissions await analysis beyond 30 days, internal case completions influenced the decreased annual percent of cases backlogged, and external suspect offense (crime) types impacted DNA case completion times and are discussed further below along with other Crime Lab practices and determinants. The impact of management directed monthly individual case completion expectations is not clear based on the data.

With decreased case completion times and case completions meeting or exceeding case submissions, the management tools, and internal personnel behavior of working to complete cases in a timely manner, there was apparent Crime Laboratory policy and programs impact. Robotics and the DNA Evidence Submission Guidelines indicated a decrease in the DNA backlog. These proved impactful as part of the staff was in training for more than a year when the backlog was decreased and case submissions were better

controlled with less submissions due to request for investigator case scrutiny prior to submission. Also, in an effort to combat the potential bottleneck hindering case completions, trainees were assigned to screen case submissions using serological techniques in order to streamline the process for the DNA analysts. This practice immediately demonstrated effective backlog reduction as case submissions moved from waiting on the shelf unopened to moving through the DNA case process already screened. None of the policies and programs could have demonstrated success if not for staff behaviors of cooperation to complete the cases and complete them in a timely manner. The suspect behaviors crime types impacted Crime Lab DNA processing. Property crimes generally process faster in the Crime Lab but appear in the Crime Lab in greater numbers which impact the completion of other type cases such as the violent crimes of homicides, sexual assaults, and other assaults. Management attention focusing to eliminate case numbers through 2011 and with a notable switch to focus on clearing violent crimes with greater case completion times helped reveal the dynamic as it relates to the suspect offense types presented to the Crime Lab. Unlike the study performed by Tonkin (2007) that assumed distinctiveness within the offense type, this study revealed similarity within the offense types as it relates to case completion time. The time of implementation of all of these practices and the resulting impact or association on the DNA backlog, as shown in the results regarding case completion time, backlog status, and backlog reduction, provided indication for association assessment to these internal personnel behavior, external suspect behavior and policy and program variables.

Crime Laboratory policy and programs demonstrated that the lab, performing its duty to “collaborate fully” with law enforcement agencies, promoted collaboration by

requiring the agencies to identify items of greatest significance for analysis. This permitted the Crime Lab ability to focus its resources on case items for faster case completion time toward a reduced backlog. This also provided reminder that Crime Lab cases are very dependent on submissions from law enforcement agencies or authorized submitters as defined by statute.

### **Limitations**

The dynamic approach to this retrospective study design implies advantage that the information obtained can be used to find associations and not specific cause and effect circumstances. This is arguably an advantage as direct study prior to the fact is generally preferred over judgments made after the fact. This study focused on the Crime Lab for a long period time while removing the need for random sampling. The disadvantage of the necessary time to retrieve and examine the data is just one of a few identified. Other disadvantages include the many variables that can be introduced as input for association or some effect and also the potential of those variables to remove focus from the established scope of the study. If that potential is achieved, the study could appear too large and become overwhelming, when in essence and according to the conception of population, the aggregate actually defines the broad framework for population health measurement (McDowell, 2004).

### **Future Study**

This study focused on a population health approach to a problem in the forensic DNA community. However, with DNA forensics rapidly emerging in the molecular biology realm, there is much by way of future study that may lend to the problem of

DNA backlogs. For example, future studies may follow in the area of improvement on the use of genetic information to provide investigative leads by review of the chemistries used for DNA analysis; improvements on robotics, and emerging technology in genetic sequencing for single nucleotide polymorphisms (SNPs) that shows promise to do as has been indicated with robotics by potentially improving upon the DNA analytical process and decrease the DNA backlog (Budowle and Van Daal, 2009). With emerging technologies such as genetic estimates of ancestry and physical features (known as forensic DNA phenotyping) that provide estimates of features such as hair pigmentation and structure, face shape, skin pigmentation and eye pigmentation to be used to construct a visual of what an individual looks like, there are several avenues to look in effort to improve case completion time in forensic DNA analysis. Looking ahead to Next Generation Sequencing (NGS) in forensic DNA, provides new applications in human identity for mixtures, degraded samples, biogeographical ancestry, forensic phenotyping, complex kinship and other applications (Butler, 2013)

Collaborations with other labs or with colleges and universities can serve to improve upon laboratory practices. Exploration of analyst training as part of the academic curriculum has the potential to assist the Crime Lab by keeping its trained analysts working cases rather than being removed from casework to train other DNA analysts. State resources currently spent training a DNA analyst for well over a year can potentially be avoided as the appropriate program or coursework can be provided through the college or university. This has the potential to contribute to backlog reduction as DNA analysts can move faster toward contributing to backlog reduction upon hire.

Due to the application of the ESG, the concern exists that there are certain cases not being analyzed by the Crime Lab if guideline conditions are not met. This does not mean there does not exist a need to have the evidence worked forensically. Considering the recommendation to strengthen Forensic Science in the United States as recommended by the National Academy of Sciences to oversee education standards in colleges and universities and strengthening Forensic Science programs (NAS 2009), future studies may seek to establish alternative DNA analytical processing centers privately or in colleges and universities for cases that do not meet Crime Laboratory acceptance criteria.

Finally, a broader population health framework can be explored to consider more determinants and try to “understand the continuing linkage of race, crime and punishment focus tenor of law and social policy...The time has come to reaffirm a commitment to decoupling the intertwining of race, crime and punishment...the right mix of scholars, policy makers, researchers and law enforcement officials...on the basis of goodwill, deep expertise and knowledge, and broad skill possessed by folks...we can indeed make progress” (BoBo 2011). The proposed model for future study could explore linkages of other factors such as geographical service areas, suspect biologic factors of age, sex, and race, and other policy and programs not examined. FIGURE 1 provides a complete depiction of these determinants that may be considered in future study.



## REFERENCES

- Azevedoa, L.F., et al., How to write a scientific paper—Writing the methods section Portugese Journal of Pulmonology, 2011;17(5):232—238.
- Baskin D, Sommers I. Solving residential burglaries in the United States: the impact of forensic evidence on case outcomes. International Journal Police Science & Management, Volume 13 Number 1, January 2011.
- BoBo, L. “The Importance of Research on Race, Crime and Punishment.” National Institute of Justice Conference Keynote Address, Arlington, Virginia. June 20, 2011.
- Bond, J., Value of DNA Evidence in Detecting Crime, Journal of Forensic Sciences, 2007, Vol.52(1), pp.128-136.
- Briody, M. (2004). The effects of DNA evidence on homicide cases in court. Australian and New Zealand Journal of Criminology, 37, 231–253.
- Budowle, B., Van Daal, A., Extracting evidence from forensic DNA analyses: future molecular biology directions BioTechniques 46:339-350 (April 2009 Special Issue), Vol.46 (5), pp.339-40, 342-50.
- Butler, J., (2013), State-of-the-Art Forensic DNA [PowerPoint Slides]. Retrieved from [http://www.cstl.nist.gov/biotech/strbase/pub\\_pres/State-of-the-Art-Forensic-DNA\\_May2013.pdf](http://www.cstl.nist.gov/biotech/strbase/pub_pres/State-of-the-Art-Forensic-DNA_May2013.pdf).
- Carturan, Elisa et al. “Postmortem Genetic Tesiting for Conventional Autopsy-Negative Sudden Unexplained Death: An Evaluation of Different DNA Extraction Protocols and the Feasibility of Mutational Analysis From Archival Paraffin-Embedded Heart Tissue.” American Journal of Clinical Pathology 129 (2008): 391-397.
- Cohen, B. “Population Health as a Framework for Public Health Practice: A Canadian Perspective.” American Journal of Public Health 96: 1574-1576.
- Fine GA. Review of the Federal Bureau of Investigation laboratory’s forensic DNA case backlog. Darby, PA: DIANE Publishing, 2011.
- Friedman, D. “Models of Population Health: Their Value for US Public Health Practice, Policy, and Research. American Journal of Public Health 9: 367-369.
- Global Burden of Armed Violence, "Lethal Encounters: Non-conflict Armed Violence." Geneva, Switzerland: Geneva Declaration Secretariat. September 2008. pp. 67–88.

- Kemp S, Pinchin R. Decreasing turnaround time of DNA analysis by improving processes in the laboratory. *Am Lab* 2007;39 (16):12.
- Kindig, D.A., "A Population Health Framework for Setting National and State Health Goals." *Journal of the American Medical Association* 299 (2008): 2081-3083.
- Kindig, DA and G Stoddart. 2003. What is Population Health? *American Journal of Public Health*, Vol 93. No. 3:366-369, March 2003.
- McDowell, I., Spasoff, R., Kristjansson, B., On the Classification of Population Health Measurements, *American Journal of Public Health*, Vol 94, No. 3, March 2004.
- National Academy of Sciences, "Strengthening Forensic Science in the United States: A Path Forward PrePublication Copy. National Academies Press website. Retrieved 2010 from <http://www.nap.edu/catalog/12589.html>.
- National Institute of Justice (NIJ). "Evidence Backlogs and Their Impact on the Criminal Justice System." Panel Discussion National Institute of Justice Conference, Arlington, Virginia 2010.
- National Institute of Justice (NIJ). "Evidence Backlogs and Their Impact on the Criminal Justice System." Panel Discussion National Institute of Justice Conference, Arlington, Virginia 2010.
- Office of Behavioral and Social Sciences Research National Institutes of Health Publication No. 01-5020. *Progress And Promise In Research On Social And Cultural Dimensions Of Health: A Research Agenda*. Bethesda, Maryland, 2001.
- Peterson, J., Hickman, Strom, K., Johnson, D., Effect of Forensic Evidence on Criminal Justice Case Processing, *Journal of Forensic Sciences*, Volume 58, Issue Supplement s1, pages S78–S90, January 2013,
- Peterson, J., Sommers, I., Baskin, D., & Johnson, D. (2010). The role and impact of forensic evidence in the criminal justice process (Final Report, No. 2006-DN-BX-0094). Washington, DC: National Institute of Justice.
- Roby, Rhonda K., Expert Systems Help Labs Process DNA Samples, U.S. Department of Justice Office of Justice Programs, National Institute of Justice NIJ Journal Issue 260; 2008.
- Schroeder D. DNA and homicide clearance. *Journal of the Institute of Justice & International Studies*, 2007;7:286–306.
- Tonkin, Matthew, et al., Linking Different Types of Crime Using Geographical and Temporal Proximity, *Criminal Justice And Behavior*, Vol. 38 No. 11, 1069-1088, November 2011.

- Thurmon, Theodore F.– no date – DNA Testing. Louisiana State University Health Sciences Center website. Retrieved 2010 from [http://www.medschool.lsuhsu.edu/genetics\\_center/louisiana/article\\_DNA\\_testing.htm](http://www.medschool.lsuhsu.edu/genetics_center/louisiana/article_DNA_testing.htm).
- United States Department of Justice Federal Bureau of Investigation (FBI), Frequently Asked Questions (FAQs) on the CODIS Program and National DNA Index System. FBI.gov. Retrieved 2012 from <http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis-and-ndis-fact-sheet>.
- United States Department of Justice Federal Bureau of Investigation (FBI), Uniform Crime Report Crime in the United States, Table 43 Arrests by Race 2012, 2013
- United States Department of Justice National Criminal Justice Reference Service (NCJRS), 2007 DNA Evidence and Offender Analysis Measurement: DNA Backlogs, Capacity and Funding, Document #230328, Award Number 2006-MU-BX-K002, June 2010.
- Ventola, C. Lee. “Pharmacogenomics in Clinical Practice Reality and Expectations.” P&T 36 (2011): 412-450.
- Wisconsin Department of Justice, Review of State Crime Lab Resources for DNA Analysis. February 12, 2007.
- Wisconsin Department of Justice State Crime Laboratories, Physical Evidence Handbook 8<sup>th</sup> Edition. Madison, Wisconsin, 2009.
- Wilson D, McClure D, Weisburd D. Does forensic DNA help to solve crime? Journal of Contemporary Criminal Justice 2010;26:458–69.

### APPENDIX A: NIJ DNA Backlog Reduction Program Awards

State	Agency/Jurisdiction	2011	2012	Total
Alaska	Alaska Department of Public Safety	\$314,852	\$0	<b>\$314,852</b>
Alabama	Alabama Department of Forensic Sciences	\$1,489,966	\$1,116,829	<b>\$2,606,795</b>
Arkansas	Arkansas State Crime Laboratory	\$1,030,056	\$882,246	<b>\$1,912,302</b>
Arizona	Multiple Agencies &/or Jurisdictions	\$1,828,787	\$1,573,521	<b>\$3,402,308</b>
California	Multiple Agencies &/or Jurisdictions	\$11,106,548	\$9,104,356	<b>\$20,210,904</b>
Colorado	Multiple Agencies &/or Jurisdictions	\$1,173,573	\$973,176	<b>\$2,146,749</b>
Connecticut	Department of Emergency Services and Public Protection	\$0	\$601,552	<b>\$601,552</b>
District of Columbia	Metropolitan Police Department	\$483,515	\$430,520	<b>\$914,035</b>
Delaware	Delaware Health and Social Services	\$387,580	\$349,869	<b>\$737,449</b>
Florida	Multiple Agencies &/or Jurisdictions	\$7,588,563	\$6,066,180	<b>\$13,654,743</b>
Georgia	Georgia Bureau of Investigation	\$2,756,031	\$2,268,462	<b>\$5,024,493</b>
Hawaii	City and County of Honolulu	\$263,212	\$242,239	<b>\$505,451</b>
Iowa	Iowa Department of Public Safety	\$461,560	\$499,464	<b>\$961,024</b>
Idaho	Idaho State Police	\$261,474	\$236,376	<b>\$497,850</b>
Illinois	Multiple Agencies &/or Jurisdictions	\$5,771,617	\$4,530,499	<b>\$10,302,116</b>
Indiana	Multiple Agencies &/or Jurisdictions	\$1,472,220	\$1,224,079	<b>\$2,696,299</b>
Kansas	Multiple Agencies &/or Jurisdictions	\$760,552	\$566,438	<b>\$1,326,990</b>
Kentucky	Commonwealth of Kentucky	\$718,511	\$616,282	<b>\$1,334,793</b>
Louisiana	Louisiana State Police	\$1,793,272	\$1,422,382	<b>\$3,215,654</b>
Massachusetts	Multiple Agencies &/or Jurisdictions	\$1,905,325	\$1,711,045	<b>\$3,616,370</b>
Maryland	Multiple Agencies &/or Jurisdictions	\$2,123,066	\$1,772,581	<b>\$3,895,647</b>
Maine	Maine State Police	\$200,000	\$200,000	<b>\$400,000</b>
Michigan	State of Michigan	\$3,308,790	\$2,830,324	<b>\$6,139,114</b>
Minnesota	Multiple Agencies &/or Jurisdictions	\$889,050	\$754,004	<b>\$1,643,054</b>
Missouri	Multiple Agencies &/or Jurisdictions	\$2,007,211	\$1,626,902	<b>\$3,634,113</b>
Mississippi	Mississippi Department of Public Safety	\$559,464	\$483,001	<b>\$1,042,465</b>
Montana	Montana Department of Justice	\$200,000	\$200,000	<b>\$400,000</b>
North Carolina	Multiple Agencies &/or Jurisdictions	\$2,495,722	\$2,009,725	<b>\$4,505,447</b>
North Dakota	North Dakota	\$200,000	\$200,000	<b>\$400,000</b>
Nebraska	Nebraska State Patrol	\$353,073	\$324,535	<b>\$677,608</b>
New Hampshire	New Hampshire Dept. of Safety	\$200,000	\$200,000	<b>\$400,000</b>
New Jersey	Multiple Agencies &/or Jurisdictions	\$1,831,523	\$1,332,960	<b>\$3,164,483</b>
New Mexico	New Mexico Department of Public Safety	\$808,675	\$702,235	<b>\$1,510,910</b>
Nevada	Las Vegas Metropolitan Police Department	\$1,181,498	\$1,009,635	<b>\$2,191,133</b>
New York	Multiple Agencies &/or Jurisdictions	\$4,926,151	\$4,368,586	<b>\$9,294,737</b>
Ohio	Multiple Agencies &/or Jurisdictions	\$2,737,774	\$2,250,037	<b>\$4,987,811</b>
Oklahoma	City of Oklahoma City	\$1,214,684	\$1,042,561	<b>\$2,257,245</b>
Oregon	Oregon State Police	\$737,848	\$621,886	<b>\$1,359,734</b>
Pennsylvania	Multiple Agencies &/or Jurisdictions	\$3,151,354	\$2,691,776	<b>\$5,843,130</b>
Puerto Rico	Instituto de Ciencias Forenses	\$678,552	\$614,345	<b>\$1,292,897</b>
Rhode Island	Health, Rhode Island Department of	\$209,355	\$200,000	<b>\$409,355</b>

State	Agency/Jurisdiction	2011	2012	Total
South Carolina	Multiple Agencies &/or Jurisdictions	\$2,010,233	\$1,605,628	\$3,615,861
South Dakota	South Dakota Office of The Attorney General	\$200,000	\$200,000	<b>\$400,000</b>
Tennessee	Tennessee Bureau of Investigations	\$2,346,924	\$2,190,753	<b>\$4,537,677</b>
Texas	Multiple Agencies &/or Jurisdictions	\$7,922,796	\$6,522,498	\$14,445,294
Utah	Utah Department of Public Safety	\$417,873	\$372,125	<b>\$789,998</b>
Virginia	Virginia Department of Forensic Science	\$1,447,358	\$1,165,649	<b>\$2,613,007</b>
Vermont	Vermont Department of Public Safety	\$200,000	\$200,000	<b>\$400,000</b>
Washington	Washington State Patrol	\$1,548,332	\$1,287,439	<b>\$2,835,771</b>
Wisconsin	Wisconsin Department of Justice	\$1,036,095	\$871,137	<b>\$1,907,232</b>
West Virginia	West Virginia State Police	\$373,262	\$363,585	<b>\$736,847</b>
Wyoming	Wyoming Office of the Attorney General	\$200,000	\$200,000	<b>\$400,000</b>
<b>Total</b>		<b>\$88,707,086</b>	<b>\$74,347,305</b>	<b>\$163,054,391</b>

Source: Office of Justice Programs National Institute of Justice DNA Backlog Reduction Program Awards

## APPENDIX B: Evidence Submission Guidelines



Pilot

**STATE OF WISCONSIN  
DEPARTMENT OF  
JUSTICE**

---

**J.B. VAN HOLLEN  
ATTORNEY GENERAL**

**Kevin St. John  
Deputy Attorney General**

Division of Law Enforcement Services  
State Crime Laboratory-Milwaukee  
1578 S. Eleventh Street  
Milwaukee, WI 53204-2860  
Telephone (414) 382-7500  
Fax (414) 382-7507

The following evidence guidelines are set forth in order to increase efficiencies at the Wisconsin State Crime Laboratory-Milwaukee, particularly within the DNA unit. These guidelines set the standard requirements for routine submission of evidence to the WI State Crime Laboratory-Milwaukee. The Crime Lab acknowledges that, in some circumstances, there may be a need to analyze evidence that falls outside the stated guidelines. Requests for analysis of evidence that fall outside these guidelines should be made by the submitting agency's case officer to either the Laboratory DNA Supervisors or the Laboratory Director of the Wisconsin State Crime Laboratory-Milwaukee.

### **CASES HANDLED**

Submission of all items of evidence must be connected with potential felonious criminal investigations as per WI Statute 165.75. No misdemeanors will be accepted for DNA. No examinations will be conducted for private individuals or corporations.

### **CASE ACCEPTANCE GUIDELINES FOR DNA**

1. DNA testing will be completed when an association is established from probative evidence. For example, an association is established between a subject and a victim. A scenario must be provided with the submitted evidence. The scenario will establish the value of each item as to its likelihood to provide probative results or an investigative lead.
2. The type and number of items accepted per submission is based on case type. For all cases, known standards from victim(s) or subject(s) will not count against the number of items that may be submitted. An item is expected to be comprised of one piece of evidence. If items are received packaged together, the number of items in the package will be considered to be the number of items submitted (i.e. pants, shirt and shoes packaged together will be considered three items).
  - a. Sexual Assaults

- The first submission is limited to a sexual assault evidence kit plus one pair of underwear, one condom, and suspect evidence collection kit, if applicable.
  - If the kit is negative, additional items such as clothing or bedding may be submitted in a separate submission-limited to 5 items per submission.
  - If the kit is positive, no additional items will be accepted for DNA, unless case circumstances (such as multiple subjects) dictate the need for additional processing.
  - Large items such as mattresses and car seats are not to be submitted. These types of items of evidence will only be processed when no other probative evidence exists. Prior to submission of these items contact the DNA Laboratory Supervisors for further direction.
  - Buccal swab standard(s) from any consensual partner(s) who had sexual contact with the victim within 72 hours of evidence collection must be submitted.
- b. Homicides
- DNA evidence is limited to a maximum of 10 items per submission.
  - If probative DNA results are obtained from any of the 10 items in the initial submission, additional items will not be examined, unless case circumstances dictate the need for additional processing.
  - If no probative results are found on the first submission, the next tier of probative items (maximum of 10) may be submitted.
- c. Burglary/Property Crimes
- The first submission is limited to a maximum of 3 items for DNA-typically blood sample(s) from the scene, or items that may have been left at the scene (cigarette butt, item of clothing).
  - If a profile is developed additional items will not be examined, unless case circumstances dictate the need for additional analysis.
- d. Other Case Types (robbery, assault, etc.)
- The first submission is limited to a maximum of 3 items for DNA.
  - If a profile is developed additional items will not be examined, unless case circumstances dictate the need for additional analysis.
  - Any items of evidence directly taken from a subject in a possession case (i.e. body cavity, pockets, or waistband) will not be processed for DNA.
- e. Criminal Parentage Cases
- Submissions must include a buccal swab standard from the mother or alleged mother, father or alleged father, the child and if necessary, the product of conception (frozen with no preservatives).
  - No partial submissions will be accepted, unless dictated by case circumstances (such as mother is deceased or maternity is in question and the father is unknown).

### 3. Touched Evidence

- a. Touched evidence is defined as evidence which has no visible staining and would contain DNA that only results from touching an item with the skin. Touched evidence does not include cigarette butts, swabbing from cans, bottles, straws or other items in which the substance being tested is most likely saliva. Touched evidence does not include items submitted for wearer of such shirts, shoes, hats, etc. where there is probability of prolonged contact.
- b. Touched evidence will be accepted for possible STR DNA analysis when there is a high degree of likelihood that the evidence submitted will provide probative results or investigative leads. A high degree of likelihood may be established by means of witness corroboration, visual monitoring systems, or sound deductive reasoning.
- c. Touched evidence will be processed on violent crime cases only.
- d. Touched evidence accepted will be processed only when no other probative evidence exists.
- e. Touched evidence accepted will be processed for DNA only if it has not been previously processed by another discipline.
- f. Touched evidence will be processed for DNA only if it has been properly stored and handled.
- g. Items submitted for touched evidence processing will comply with existing policy relating to the number of items of evidence that may be submitted based on case type.
- h. Charred or burnt evidence and fired cartridge casings will not be processed for DNA.
- i. Touched evidence collected from the floor, countertop, doorknob/handle, or payphone of a public place will not be processed for DNA, unless there is direct evidence that the object was touched/handled by the subject.
- j. Elimination standards must be submitted with touched evidence where appropriate (i.e. owner of hijacked vehicle).

If you have any questions, concerns or comments please direct them to me either via e-mail, [championjl@doj.state.wi.us](mailto:championjl@doj.state.wi.us), phone, or in writing. We are committed to provide you with the best possible service we can in a timely fashion.

Sincerely,



Jana L. Champion, CPM  
Laboratory Director  
Wisconsin State Crime Laboratory-Milwaukee



## WISCONSIN STATE CRIME LABORATORY SUBMISSION GUIDELINES

### GENERAL

- Submission of all items of evidence must be connected with potential felonious criminal investigations as per WI Statute §165.75.
- No misdemeanors will be accepted for DNA.
- No examinations will be conducted for private individuals or corporations.
- These guidelines set the standard requirements for routine submission of DNA evidence to the WI State Crime Laboratory-Madison & Milwaukee in order to increase efficiencies at the Wisconsin State Crime Laboratory System.
- The Crime Lab acknowledges that, in some circumstances, there may be a need to analyze evidence that falls outside the stated guidelines. Requests for analysis of evidence that fall outside these guidelines should be made by the submitting agency's case officer to either the Laboratory DNA Supervisors or the Laboratory Manager of the Wisconsin State Crime Laboratory-in the appropriate service area.
- When multiple sections of the laboratory are involved, the submitting agency's case officer should contact either the Laboratory DNA Supervisors or the Laboratory Manager of the Wisconsin State Crime Laboratory-in the appropriate service area. Processing by one section of the laboratory may have a detrimental effect of the other section (s) ability to process the item(s) of evidence.
- If and when the submitting agency or prosecuting attorney's office becomes aware that a case has been disposed and analysis is no longer needed, the submitting agency or prosecuting attorney's office should notify the Laboratory.
- These are submission guidelines and are not intended to replace the practice of proper crime scene collection techniques. The Wisconsin State Crime Laboratory System supports the preservation and proper collection of all evidence, regardless of submission to the Laboratory.

### DNA EVIDENCE SUBMISSION

1. DNA testing will be completed when an association is established from probative evidence. For example, an association is established between a subject and a victim. A scenario must be provided with the submitted evidence. The scenario will establish the value of each item as to its likelihood to provide probative results or an investigative lead. If appropriate standards are not presented at time of initial submission analysis could be delayed.
2. The type and number of items accepted per submission is based on case type. For all cases, known standards from victim(s) or subject(s) will not count against the number of items that may be submitted. An item is expected to be comprised of one piece of evidence. If items are received packaged together, the number of items in the package will be considered to be the number of items submitted (i.e. pants, shirt and shoes packaged together will be considered three items).
  - a. *Sexual Assaults*

- The first submission is limited to a sexual assault evidence kit (recovered from a victim and/or suspect) plus one pair of underwear, and one condom.
- If the kit is negative, additional items such as clothing or bedding may be submitted in a separate submission.
  - Second and subsequent submissions are limited to 5 items per submission. Based on discussions with the submitting agency and/or prosecuting attorney, every attempt will be made to focus on probative evidence.
- If the kit is positive, no additional items will be accepted for DNA, unless case circumstances (such as multiple subjects or the DNA detected is attributable to a consensual partner) dictate the need for additional processing.
- Large items such as mattresses and car seats are not to be submitted. These types of items of evidence will only be processed when no other probative evidence exists. Prior to submission of these items contact the Laboratory DNA Supervisors for further direction.
- Buccal swab standard(s) from any consensual partner(s) who had sexual contact with the victim within 72 hours of evidence collection must be submitted.
  - Standards from consensual partners up to 120 hours prior to evidence collection may be requested at a later time. These standards do not count toward the number of items allowed per submission.

***b. Homicides***

- DNA evidence is limited to a maximum of 10 items per submission.
- If probative DNA results are obtained from any of the 10 items in the initial submission, additional items will not be examined, unless case circumstances dictate the need for additional processing.
- If no probative results are found on the first submission, the next tier of probative items (maximum of 10) may be submitted.

***c. Burglary/Property Crimes***

- The first submission is limited to a maximum of 3 items for DNA- typically blood sample(s) from the scene, or items that may have been left at the scene (cigarette butt, item of clothing).
- If a profile is developed additional items will not be examined, unless case circumstances dictate the need for additional analysis.

***d. Other Case Types (robbery, assault, etc.)***

- The first submission is limited to a maximum of 3 items for DNA.
- If a profile is developed additional items will not be examined, unless case circumstances dictate the need for additional analysis.

- Items of evidence directly taken from a subject in a possession case (i.e. body cavity, pockets, or waistband) will not be processed for DNA.

**e. Criminal Parentage Cases**

- Submissions must include a buccal swab standard from the mother or alleged mother, father or alleged father, the child or the product of conception (frozen with no preservatives).
- No partial submissions will be accepted, unless dictated by case circumstances (such as mother is deceased or maternity is in question and the father is unknown).

**3. Touched Evidence**

- Touched evidence is defined as evidence which has no visible staining and would contain DNA that only results from touching an item with the skin. Touched evidence does not include cigarette butts, swabbing from cans, bottles, straws or other items in which the substance being tested is most likely saliva. Touched evidence does not include items submitted for wearer of such shirts, shoes, hats, etc. where there is probability of prolonged contact.
- Touched evidence will be accepted for possible STR DNA analysis when there is a high degree of likelihood that the evidence submitted will provide probative results or investigative leads. A high degree of likelihood may be established by means of witness corroboration, visual monitoring systems, or sound deductive reasoning.
- Touched evidence will be processed on violent crime cases only.
- Touched evidence accepted will be processed only when no other probative evidence exists.
- Touched evidence accepted will be processed for DNA only if it has not been previously processed by another discipline.
- Touched evidence will be processed for DNA only if it has been properly stored and handled.
- Items submitted for touched evidence processing will comply with existing policy relating to the number of items of evidence that may be submitted based on case type.
- Charred or burnt evidence and fired cartridge casings will not be processed for DNA.
- Touched evidence collected from the floor, countertop, doorknob/handle, or payphone of a public place will not be processed for DNA, unless there is direct evidence that the object was touched/handled by the subject.
- Elimination standards must be submitted with touched evidence where appropriate (i.e. owner of hijacked vehicle).
- It is recommended that touched evidence be collected using DNA free swabs.

These guidelines are meant to address the unnecessary analysis of evidence, not eliminate the analysis that is really needed. They are designed to provide a mechanism for increased dialogue between the submitters and laboratory management regarding the particular needs involved with the case, and to request additional work if necessary. If the submitter is unsure about how to handle the submission of a particular case, we encourage you to contact the laboratory in your service area. We are always going to allow the opportunity, based on the case, to submit additional evidence if needed.

We are committed to providing you with the quality forensic analyses in a timely fashion. Questions, concerns or comments may be directed to the appropriate Laboratory in your service area, see contact information below:

Madison Laboratory  
4626 University Avenue  
Madison, WI 53705  
608-266-2031  
608-267-1303 fax

Milwaukee Laboratory  
1578 S 11<sup>th</sup> Street  
Milwaukee, WI 53204  
414-382-7500  
414-382-7507 fax

## APPENDIX C: Announcement Wisconsin Backlog Eliminated

### DNA backlog eliminated, Van Hollen says

By Jason Stein and Ryan Haggerty of the Journal Sentinel

April 21, 2010

The State Crime Laboratory has eliminated a backlog of DNA cases that slowed the pace of justice in criminal cases around the state, Attorney General J.B. Van Hollen announced Wednesday.

The backlog was a key issue in the Republican attorney general's 2006 campaign, and his announcement sets the table for a re-election campaign this year.

The backlog was eliminated by hiring 31 new DNA analysts in 2007 - double the previous number - as well as using new technology and overhauling the way the lab does business, said Van Hollen, who also credited the work of the analysts.

The increase in funding for the lab was a bipartisan decision by lawmakers and Gov. Jim Doyle as part of the state budget process.

"To be able to actually accomplish getting rid of the backlog at a time when the backlog was so much more egregious than it ever had been is a great success," Van Hollen said in an interview.

The crime lab has usually quickly analyzed DNA evidence from high-profile crimes such as homicides and sexual assaults, but the lab is now improving the turnaround time on other crimes, such as burglaries and prosecutions of felons accused of possessing guns, Milwaukee County District Attorney John T. Chisholm said.

"By pushing down those backlogs, they have been much more responsive, and we've been able to get different degrees of cases handled more expeditiously," Chisholm said.

"We always got great service on the really high-profile homicide and sensitive crime cases, but that service came with a cost in the past, in that other important cases would get triaged and pushed down in priority a little bit. But now we're getting fairly solid and consistent service on all the cases."

Prosecutors in Racine County also have noticed an improvement in the time it takes the lab to analyze DNA evidence and are no longer encountering a wait of up to six months for test results, Deputy District Attorney Rich Chiapete said.

"In terms of general everyday cases, we're submitting stuff and getting results, and they're able to give us a solid timeline of when this is going to be done," Chiapete said.

The lab has gone from analyzing an average of 96 cases a month in all of 2006 to 504 cases a month for the first three months of 2010, according to state Department of Justice FIGURE.

At the end of 2006, law enforcement agencies had submitted 1,785 DNA cases that were waiting to be analyzed.

At that time, the department was receiving roughly twice as many new submissions each month compared with the number it was testing, causing the backlog to grow.

Van Hollen's Democratic predecessor, Peg Lautenschlager, said that, given the new resources, Van Hollen had gotten the backlog resolved at roughly the pace she would have expected after leaving office.

"It's not a political issue. It's a scientific issue and an issue of funding and resources," she said. "Do I find fault in how he did things? No, because he did things as anyone who cared about the crime lab would have done."

Scott Hassett, a former state Department of Natural Resources secretary who is running against Van Hollen as a Democrat, said the credit should go to lawmakers and Doyle, because "in tough budget times they funded the necessary positions to get the work done."

A case is considered part of the backlog if it is not being worked on within 30 days of receipt by the crime lab. Work on cases is usually complete within 60 days, according to the Department of Justice.

After taking office in January 2007, Van Hollen asked lawmakers to authorize the hiring of 31 more DNA analysts to help eliminate the backlog.

The Democrat-held Senate, the GOP-controlled Assembly and Doyle, a Democrat, approved that hiring and additional supplies and services at a cost of nearly \$8 million for the 2007-'09 budget, according to the Legislative Fiscal Bureau.

The crime lab is now authorized to employ 59 analysts. Eight of those jobs are open.

But Van Hollen said he had taken other steps to make the crime lab more productive, including overhauling the way it processes DNA samples.

To speed the testing, he said, he also started using two robotic machines that had been purchased by Lautenschlager but not yet put into use and then put into use three more machines that were purchased later.

Van Hollen said there had been no decrease in accuracy or heavy use of overtime as part of the efforts to get rid of the backlog.

The elimination of the backlog comes as authorities are still trying to close a gap in the state's databank of DNA submitted by felons.

Last year that databank was found to be missing [more than 12,000 DNA samples](#).

The state Senate [passed a bill](#) last week that would require felons who have not submitted DNA for the databank to do so even if they already have served their sentences.

The bill is now before the Assembly, which could take it up on Thursday.

Van Hollen said he didn't expect the bill to pass but expected that if it did, the crime lab could handle any additional DNA submissions that could result.

## APPENDIX D: IRB Exempt Status Approval



### New Study - Notice of IRB Exempt Status

**Date:** August 5, 2010

**To:** Ron Cisler, PhD  
**Dept:** Health Sciences

**Cc:** Eva Marie Lewis King

**IRB#:** 11.024

**Title:** A Study that Follows an Epidemiological Retrospective Cohort Study Design on Crime Laboratory DNA Backlogs

**Melissa Spadanuda**  
*IRB Administrator*  
*Institutional Review Board*  
 Engelmann 270  
 P. O. Box 413  
 Milwaukee, WI 53201-0413  
 (414) 229-3173 phone  
 (414) 229-6729 fax

<http://www.irb.uwm.edu>

[spadanud@uwm.edu](mailto:spadanud@uwm.edu)


After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under **Category 4** as governed by 45 CFR 46.101(b).

Unless specifically where the change is necessary to eliminate apparent immediate hazards to the subjects, any proposed changes to the protocol must be reviewed by the IRB before implementation. It is the principal investigator's responsibility to adhere to the policies and guidelines set forth by the UWM IRB and maintain proper documentation of its records and promptly report to the IRB any adverse events which require reporting.

It is the principal investigator's responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities the principal investigator may seek to employ (e.g., [FERPA](#), [Radiation Safety](#), [UWM Data Security](#), [UW System policy on Prizes, Awards and Gifts](#), state gambling laws, etc.) which are independent of IRB review/approval.

Contact the IRB office if you have any further questions. Thank you for your cooperation and best wishes for a successful project

Respectfully,

  
 Melissa C. Spadanuda  
 IRB Administrator

CC: Study File

## APPENDIX E: Wisconsin State Crime Laboratory Consent

Wisconsin State Crime Laboratory Participation Letter (Waiver/Consent Form)

I am Eva Marie Lewis King, a student at the University of Wisconsin – Milwaukee in the College of Health Sciences Biomedical Sciences (formerly Clinical Lab Sciences) Program. I am seeking to perform a study that follows an epidemiological retrospective cohort study design with meta-analysis on Crime Laboratory DNA backlogs. I would appreciate your participation in this study by allowing me access to your 2007-201<sup>15</sup>~~10~~ case records and files for the purpose of retrieving and summarizing DNA submission and output data and results from the discipline of DNA. Data retrieved from your files will answer the following questions and other questions to be determined throughout the course of study to achieve the objective listed below: 1. *What case types were submitted to the DNA Analysis Unit?* 2. *How many of each case type were submitted each month?* 3. *How many of each case type were completed each month?* 4. *What was the date of submission?* 5. *What factors, if any affected case submission each month?* 6. *What factors, if any affected case output each month?* 7. *Is there any other information to be gained from the data that is useful?*

If you agree to allow me access to your agency's files/records for this particular purpose, please be advised that data retrieved will be reported for graduate study and may be subject to general publication. Risks to your agency are considered minimal. The study objective will entail review of de-identified case file records that is designed to study and evaluate information to assess backlog status and examine procedures practiced and currently in place for assessment and recommendation of possible changes or alternatives to better approach the DNA backlog epidemic.

Information collected for this study is completely confidential and no individual case file subjects will be identified in the research information as a result of case file review. Data from this study will be saved on password protected computer for at least three (3) years after project completion. Only Eva Marie Lewis King will have access to the information. However, Eva's Biomedical Sciences Masters Faculty Advisor/Committee, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review this study's records.

If you have questions about the study or study procedures, you are free to contact Eva at the address and phone number below. If you have questions or complaints about your rights as a study participant, contact the Institutional Review Board at (414)229-3173 or irbinfo@uwm.edu.

Your signature below indicates that you consent to use of files and records for this study and that result data can be used for educational and professional purposes. It also indicates that you are at least 18 years old and are giving your informed consent for your agency to participate in this study.

JANA CHAMPION

(Print Name) Agency Representative

Signature/Title of Agency Representative

Date

This research project is currently seeking approval by the University of Wisconsin-Milwaukee Institutional Review Board for the Protection of Human Subjects for a one year period.

Eva Marie Lewis King

EMLK note: Consent was extended through study completion by same authority (See marking above)



**APPENDIX F: Evidence Privileged (Wisconsin Statutes and Codes Chapter 165§79)**

165.79 Evidence privileged. 165.79(1)(1) Evidence, information and analyses of evidence obtained from law enforcement officers by the laboratories is privileged and not available to persons other than law enforcement officers nor is the defendant entitled to an inspection of information and evidence submitted to the laboratories by the state or of a laboratory's findings, or to examine laboratory personnel as witnesses concerning the same, prior to trial, except to the extent that the same is used by the state at a preliminary hearing and except as provided in s. 971.23. Upon request of a defendant in a felony action, approved by the presiding judge, the laboratories shall conduct analyses of evidence on behalf of the defendant. No prosecuting officer is entitled to an inspection of information and evidence submitted to the laboratories by the defendant, or of a laboratory's findings, or to examine laboratory personnel as witnesses concerning the same, prior to trial, except to the extent that the same is used by the accused at a preliminary hearing and except as provided in s. 971.23. Employees who made examinations or analyses of evidence shall attend the criminal trial as witnesses, without subpoena, upon reasonable written notice from either party requesting the attendance.

165.79(2)(2) Upon the termination or cessation of the criminal proceedings, the privilege of the findings obtained by a laboratory may be waived in writing by the department and the prosecutor involved in the proceedings. The employees may then be subpoenaed in civil actions in regard to any information and analysis of evidence previously obtained in the criminal investigation, but the laboratories shall not engage in any investigation requested solely for the preparation for trial of a civil matter. Upon appearance as a witness or receipt of a subpoena or notice to prepare for trial in a civil action, or appearance either with or without subpoena, the laboratories shall be compensated by the party at whose request the appearance or preparation was made in a reasonable amount to be determined by the trial judge, which fee shall be paid into the state treasury. In fixing the compensation the court may give consideration to the time spent in obtaining and analyzing the evidence for the purposes of criminal proceedings. (Wisconsin Statutes and Codes Chapter 165§79)

**APPENDIX G: Excerpt from Wisconsin Statute §165.75****Wisconsin Statute §165.75(3)(a-g)**

- (a) The purpose of the laboratories is to establish, maintain and operate crime laboratories to provide technical assistance to local law enforcement officers in the various fields of scientific investigation in the aid of law enforcement...
- (b) ...Employees shall not undertake investigation of criminal conduct except upon the request of a sheriff, coroner, medical examiner, district attorney, chief of police, warden or superintendent of any state prison, attorney general or governor. The head of any state agency may request investigations but in those cases the services shall be limited to the field of health, welfare and law enforcement responsibility which has by statute been vested in the particular state agency.
- (c) Upon request under par. (b), the laboratories shall collaborate fully in the complete investigation of criminal conduct within their competence in the forensic sciences including field investigation at the scene of the crime and for this purpose may equip a mobile unit or units.
- (d) The services of the laboratories available to such officer shall include appearances in court as expert witnesses.
- (e) The department may decline to provide laboratory service in any case not involving a potential charge of felony.
- (f) The services of the laboratories may be provided in civil cases in which the state or any department, bureau, agency or officer of the state is a party in an official capacity, when requested to do so by the attorney general.
- (g) Deoxyribonucleic acid testing ordered under §974.07 shall have priority, consistent with the right of a defendant or the state to a speedy trial and consistent with the right of a victim to the prompt disposition of a case.