



January 2022

Medical Examiner and Coroner Outsourcing Study – A Qualitative Study and Cost-Benefit Analysis

FTCoE Contact:

Jeri Roper-Miller, PhD, F-ABFT
Senior Director, FTCoE
JeriMiller@rti.org

NIJ Contact:

Jonathan McGrath, PhD, MSFS
Senior Policy Analyst
Office of Investigative and Forensic Sciences
Jonathan.McGrath@usdoj.gov

Technical Contacts

BeLinda Weimer, MA, RTI International
weimer@rti.org

Paul Speaker, PhD, West Virginia University
Paul.Speaker@mail.wvu.edu

Jeri Ropero-Miller, PhD, RTI International
jerimiller@rti.org

Acknowledgments

We would like to thank the Medical Examiner and Coroner (MEC) agency staff that participated in this study. We are grateful for all who gave their time and insights on issues related to outsourcing in MEC agencies.

Public Domain Notice

All material appearing in this publication is in the public domain and may be reproduced or copied without permission from the U.S. Department of Justice (DOJ). However, this publication may not be reproduced or distributed for a fee without the specific, written authorization of DOJ. This publication must be reproduced and distributed in its entirety, and may not be altered or edited in any way.

Citation of the source is appreciated. Electronic copies of this publication can be downloaded from the FTCoe website at www.forensiccoe.org/.

Suggested Citation

Weimer, B., Speaker, P., Daye, C., Attaway, P., Gourdet, C., Ropero-Miller, J., & Barrick, K. (2021, January). *Medical examiner and coroner outsourcing study*. Research Triangle Park, NC: RTI International.

Table of Contents

| | |
|---|------------|
| Technical Contacts..... | i |
| Acknowledgments..... | i |
| Public Domain Notice..... | i |
| Suggested Citation..... | i |
| Executive Summary..... | 1 |
| Introduction..... | 2 |
| Methodology..... | 2 |
| <i>Literature Review and Focus Group</i> | 2 |
| <i>Focus Group</i> | 3 |
| <i>Qualitative Interviews</i> | 4 |
| <i>Cost-Benefit Analysis</i> | 4 |
| Qualitative Interview Findings..... | 11 |
| Operational and Organizational Structure..... | 11 |
| Outsourcing Laboratory Operations and Logistics..... | 11 |
| Legal Implications of Outsourcing..... | 12 |
| Opioid Epidemic and Other Drug Impacts..... | 14 |
| COVID-19 Impact..... | 15 |
| Cost-Benefit Analysis Results..... | 16 |
| Future Research..... | 19 |
| References..... | 21 |
| Appendix A. Literature Review Citations..... | A-1 |
| Appendix B. Qualitative Interview Guide: An Examination of Medical Examiner and Coroner Outsourcing..... | B-1 |
| Appendix C. Legal Review Findings on MEC Outsourcing..... | C-1 |
| The NIJ Forensic Technology Center of Excellence..... | Back Cover |
| Disclaimer..... | Back Cover |

Executive Summary

The National Institute of Justice's Forensic Technology Center of Excellence (FTCoE) partnered with West Virginia University's Project FORESIGHT to examine the outsourcing practices of Medical Examiner and Coroner (MEC) agencies that are implemented to mitigate the increased caseloads caused by the opioid epidemic, other drugs of interest, and the COVID-19 pandemic. Through a qualitative study, the FTCoE team interviewed MECs from across the United States to learn more about the contexts, policies and procedures, and costs and benefits associated with outsourcing various tasks. An examination of the cost of toxicological analysis using Project FORESIGHT data reveals that outsourcing is a lower cost alternative for many MEC agencies, depending on the annual caseload for a jurisdiction.

The qualitative interviews and cost study resulted in several key findings.

- The main reason agencies outsourced toxicology testing was because they did not have the capacity to complete certain tests in house because of lack of instrumentation or staffing. None of the MEC staff interviewed reported that they were prohibited from outsourcing under their specific, corresponding state laws. All five interviewees stated that either the forensic pathologist in charge of the case or the head of the agency would decide what services to outsource to a private laboratory.
- Most MECs said that they were limited by the number of appropriate private forensic laboratories or consultants because the testing they need is so specialized and there are limited entities or individuals with the required capabilities.
- Many MECs and private laboratories have increased the comprehensiveness of the drugs and substances they test for and are now routinely testing for an expanded drug panel. As a result, some MECs decide to outsource toxicology analysis and other forensic tasks related to opioid-related overdose deaths instead of testing in house. This has caused many laboratories to expand their ability to provide expert testimony supporting this testing in a court setting as needed.
- Several participants described increases in the use and presence of certain illicit substances, such as methamphetamine and cocaine, and stated that poly-drug use is now the norm.
- Project FORESIGHT data across time support the additional complexity of the required toxicological analysis. Inflation-adjusted costs are rising along with higher laboratory productivity to meet growing demands from the opioid crisis.
- Project FORESIGHT data reveal that there are significant economies of scale in toxicological analysis to support the MEC participants' comments. Independent laboratories operate at near perfect economies of scale, where average costs are near their minimum level. This permits jurisdictions to outsource at a much lower cost than they could accomplish on their own.
- Emerging drug threats and the continued opioid crisis have led to increases in the volume of requests for MEC toxicology analysis. Although productivity has improved significantly, turnaround times have expanded and backlogs increased dramatically for public forensic laboratories.
- The main impacts of COVID-19 on MECs were related to the decreased capacity of private laboratories to test samples in a timely manner because of the influx of potential COVID-19 samples that needed analyzed and supply chain shortages for consumables and other necessary instrumentation and resources.

Introduction

Medical examiners and coroners (MECs) are often at the center of highly stressful and emotional situations as a part of their daily job duties. Those events are compounded by continued and escalating high caseloads and inadequate funding and access to other resources, but most critical is the severe shortage of forensic pathologists. Estimates indicate that there are currently only about 500 forensic pathologists across the country, but double that number are needed to serve all jurisdictions (Lucchesi 2021, Weedn and Menendez 2020). Though more recent data suggest that there are 890 pathologists performing autopsies, the number of full-time equivalent (FTE) autopsy pathologists, coroners, and other medical examiners employed by MEC agencies has notably increased by merely 5% between 2004 and 2018 (from 2,870 to 3,020; (Brooks 2021)). Furthermore, laboratory staff, including forensic analysts and toxicologists, indicated as FTE in MEC agencies accounted for less than 630 professionals nationally. These numbers, combined with higher numbers of consultants and on-call professionals, suggest that a good proportion of toxicology testing is outsourced (Brooks 2021). Moreover, the COVID-19 pandemic, increase in opioid-related deaths, and other emerging drug threats compound the challenges that MECs face. Evidence suggests that MECs are doing more work with fewer resources as their caseloads increase substantially. The National Institute of Justice's Forensic Technology Center of Excellence (FTCoE), led by RTI International, partnered with West Virginia University's Project FORESIGHT to examine the contexts as well as the costs and benefits of outsourcing among MEC agencies across the United States. This study involved a qualitative study—a literature review, focus group, and qualitative interviews—and a cost study to examine these issues. The qualitative study explored outsourcing related to a variety of disciplines, while the cost-benefit analysis focused on toxicology outsourcing. This report discusses the methodology, results, and key findings of this study.

Methodology

Literature Review and Focus Group

Prior to conducting the qualitative interviews, a literature review was conducted to summarize the state of the MEC system with respect to outsourcing overall and by discipline. Search terms and the specific search strings used for the literature review included the following:

- INCLUDE WITH ALL SEARCHES: medical examiner OR autopsy pathologist OR pathologist OR forensic pathologist
- INCLUDE WITH ALL SEARCHES: coroner OR death investigator OR justice of the peace OR forensic investigator
- INCLUDE WITH ALL SEARCHES: outsource OR contract out OR outsourcing OR vendor
- Medical examiner OR coroner AND outsource OR outsource testing OR subcontracting OR contract out OR sub-contracting OR contracting -out
- Evidence OR proof OR confirmation OR corroboration OR documentation OR exhibit OR verification
- Toxicology OR postmortem toxicology OR postmortem toxicology testing OR toxicology testing
- Toxicology services OR reference testing OR commercial testing OR sends out testing
- Opioid overdose OR opioid related overdose OR opioid induced overdose OR overdose by opioid OR opioid death
- Synthetic drug death OR synthetic drug induced death

- Policy OR procedure OR guidelines OR approach OR process
- COVID-19 OR coronavirus
- Standard drug panel OR standard drug panel testing OR drug panel OR drug testing OR postmortem drug testing
- Death investigation OR postmortem investigation OR autopsy investigation
- Autopsy OR postmortem examination OR dissection OR analysis OR review
- Operation OR management OR administration OR organization OR operational AND Burden OR impact
- Overdose OR death by drug use OR drug poisoning OR accidental overdose
- Resources OR equipment OR materials
- Cost OR assets OR capital OR budget OR grant funding OR line item
- Economies of scale OR low cost OR reduction OR discount
- Casework OR workload OR case OR Scope of work OR work scope OR caseload OR Turnaround Time
- Staffing OR analysts OR forensic specialists OR forensic analysts
- Efficiency OR cost effectiveness OR productivity OR effectiveness

The literature review yielded 17 publications related to MEC outsourcing (see Appendix A for a list of the identified citations). These publications were used to help develop the focus group questions and identify topics of discussion.

Focus Group

As a first step to conducting more thorough interviews with MEC staff, a focus group was conducted to test potential discussion questions. A focus group guide was developed to include introductory information, consent, and topical questions. Critical or core questions were identified as those that were most important to ask during the focus group. The focus group questions were informed by the literature review findings and by input and suggestions from forensic science experts. Multiple iterations of the focus group guide were developed and reviewed for accuracy before it was finalized.

Staff from eight MEC agencies were invited to participate in the focus group. To gather the most representative information, MECs of varying sizes, geographic locations, and operational type were invited to participate. Email invitations were sent to each MEC contact explaining the study and parameters of the focus group. The focus group was conducted via Zoom. Out of the eight invited MEC agencies, staff from four agreed to be part of the focus group.

During the focus group, participants consented to the session being recorded. The recording was used to complement notes taken during the focus group and ensure that important information was not missed. In addition

Description of Focus Group Participants

- ▶ Two medical examiner and two coroner agency representatives.
- ▶ Three were midsize (jurisdictions with 250,000 to less than 1,000,000 people), and one was large (jurisdictions with 1,000,000 or more people).
- ▶ Two served urban areas, and two served a mix of urban and rural areas.
- ▶ Two were in the West, one was in the South, and one was in the Northeast.

to the recording, participants shared information in the Zoom chat box. The chat box contents were downloaded for reference and inclusion in the analyses. The focus group findings were used to further refine the questions. The refined focus group questions were used to conduct the qualitative interviews.

Qualitative Interviews

Like the focus group, staff from eight different MEC agencies of varying sizes, geographic locations, and operational type were invited via email to participate in the qualitative interviews (see Appendix B for the qualitative interview guide). Of the eight that were invited, three agreed to participate. To recruit more participants, three additional MEC agencies were invited to participate, of which staff from two more agreed to participate. Overall, staff from five MEC agencies participated in the qualitative interviews.

Each interview was conducted virtually via Zoom and lasted 60 minutes. The same methods used for the focus groups were used for conducting the qualitative interviews, including participants consenting to the session being recorded; interviewers taking notes to compliment the recording; and downloading information shared in the Zoom chat box for inclusion in the analyses. The qualitative interview findings are presented in the next section. Results are summarized by the five main topic areas.

Description of Qualitative Interview Participants

- ▶ Three medical examiner and two coroner agency representatives.
- ▶ Two were small (jurisdictions with less than 250,000 people), one was midsized (jurisdictions with 250,000 to less than 1,000,000 people), and two were large (jurisdictions with 1,000,000 or more people).
- ▶ Two served urban areas, and three served a mix of urban and rural areas.
- ▶ Two were in the West, two were in the South, and one was in the Midwest.

Cost-Benefit Analysis

Cost Estimates. The cost analysis of forensic toxicology (i.e., postmortem) includes an inspection of both the dollar cost of the analysis and the cost in analytical time. Project FORESIGHT data support the analysis of average expenditures and time spent in the analytical queue by collecting forensic laboratory data on casework, personnel allocation, and expenditures (Houck et al. 2009) benchmarks are established with voluntarily submitted data. The [annual benchmarking studies](#) and corresponding [forensic “industry” studies](#) serve as the basis for the cost analysis that follows.

The average cost to conduct toxicological analysis and the marginal cost of that analysis are key metrics to review. The concentration on the metric average cost offers a direct metric interpretation of the mission of forensic toxicology to perform for high-quality processing of as many of the case submissions as possible for the budget allocated. The question of outsourcing versus insourcing the analysis requires an examination of the cost to process cases internally versus externally. It also requires a consideration of the turnaround time for the analysis because delays can result in additional societal costs (Roper-Miller et al. 2020).

The focus on minimizing average cost is akin to maximizing case throughput for the allocated budget (Speaker 2009b). That is, the generic interpretation of mission calls for maximizing throughput for a given budget (maximize Cases/Total Cost), which provides the same result as minimizing average cost (minimize Total Cost/Cases). The minimization metric has an interpretation that provides a simpler comparative measure (average cost) than a direct inspection of the mission metric (cases per dollar spent). It also provides a direct comparison to alternative analysis via outsourcing (internal cost versus price of an outsourced case).

This cost assessment relies on Project FORESIGHT data from fiscal years 2013 through 2020 (Speaker 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021). The cost data across years are adjusted for inflation using the U.S. Bureau of Labor Statistics Consumer Price Index (<https://www.bls.gov/cpi/>). All cost data from Project FORESIGHT are converted to “real” dollars reflecting fiscal year 2020 prices.

The fiscal year 2013 data correspond to the first year that a U.S. state experienced an overdose rate that exceeded 30 deaths per 100,000 population. The severe impact of the opioid crisis on toxicological analysis follows the period highlighted from fiscal year 2013 through the present. Opioids, particularly synthetics, have expanded the drug panels analyzed, increased testing costs, increased testing time, and have diverted resources from other public sector uses (Ropero-Miller and Speaker 2019, National Institute of Justice (NIJ) 2020).

Metric Interpretation. The metric directly related to mission (cases processed per dollar expended) or the inverse (cost per case) assist in the determination of decisions to examine data internally or to outsource the analysis when broken down into additional metrics (see formula below). These additional metrics shed information on laboratory performance with breakdowns into metrics related to productivity, policy & procedures, analytical processes, and local economic conditions (Speaker 2009a).

To highlight the role of these other metrics, take the average cost metric and multiply it by 1 in the form of (FTE/FTE), (PCOST/PCOST), and (TEST/TEST), where FTE is the number of full-time equivalent employees, and PCOST is the total personnel expenditures, including salary, benefits, and overtime. TEST follows the Project FORESIGHT definition of “an analytical process, including but not limited to visual examination, instrumental analysis, presumptive evaluations, enhancement techniques, extractions, quantifications, microscopic techniques, and comparative examinations.” The multiplications by these various forms of the number 1 allow a recombination of numerator and denominator terms that have specific business implications highlighting productivity (CASE/FTE, output per person), policy & procedures (TEST/CASE, testing intensity), resource allocation (PCOST/COST, percentage personnel expenditures), and market conditions (PCOST/FTE, average compensation).

PCOST/COST, percentage personnel expenditures), and market conditions (PCOST/FTE, average compensation).

$$\begin{aligned} \frac{COST}{CASE} &= \frac{COST}{CASE} \times \frac{FTE}{FTE} \times \frac{PCOST}{PCOST} \times \frac{TEST}{TEST} \\ &= \left(\frac{PCOST}{FTE} \right) \times \left(\frac{TEST}{CASE} \right) \\ &= \left(\frac{PCOST}{COST} \right) \times \left(\frac{CASE}{FTE} \right) \\ &= \text{Average Compensation} \times \text{Testing Policy} \\ &\quad \text{Percentage Personnel Expenditures} \times \text{Productivity} \end{aligned}$$

When either numerator term increases, it increases the average cost. (PCOST/FTE) represents the average compensation and is a local economic or market metric that reflects the local labor market and grows with local salaries. (TEST/CASE) represents internal policies & procedures with influence from jurisdictional legal requirements. It also reflects some of the growth trends from novel synthetics. Increases in the denominator metrics have the opposite effect on the average cost. An increase in (PCOST/COST) reflects a borrowing from the future for current period analysis as increase in the current expenditures tend to accompany decreases in capital expenditures. (CASE/FTE) reflects the productivity of the laboratory. This has shown to be the most critical factor to lower average costs (Houck and Speaker 2020).

Performance over Time. Table 1 highlights a few summary statistics for the average cost of forensic toxicology over recent years. As noted above, 2013 was the first year that any U.S. state recorded overdose deaths that exceeded 30 deaths per 100,000 population. Note that the annual average costs have been adjusted for inflation to provide a “real” cost (i.e., inflation-adjusted cost). For MEC operations, 2013 offers a reasonable stepping off point for the escalated demand for toxicological services and the growing demand as the opioid crisis intensified.

Table 1. Average Cost of Forensic Toxicology, 2013–2020.

| Fiscal Year | Quartile 1 (\$) | Median (\$) | Quartile 3 (\$) |
|-------------|-----------------|-------------|-----------------|
| 2013 | 478 | 720 | 864 |
| 2014 | 724 | 720 | 938 |
| 2015 | 557 | 709 | 1,132 |
| 2016 | 558 | 737 | 1,014 |
| 2017 | 635 | 961 | 1,313 |
| 2018 | 785 | 902 | 1,252 |
| 2019 | 772 | 932 | 1,149 |
| 2020 | 772 | 959 | 1,258 |

Source: [Project FORESIGHT](#) 

The annual quartile data represent voluntary submissions to Project FORESIGHT rather than a random sample or census of forensic laboratories with 185 forensic laboratories (or laboratory systems) submitting data for fiscal year 2020.¹ The dollar costs have been converted to fiscal year 2020 mid-year prices (2019.12 = 100) using the Consumer Price Index.² The trends found in the growth of the median laboratory’s average cost suggests an average annual growth in costs at 4.7% with even higher growth at the first and third quartiles of 9.2% and 6.4%, respectively. The cost of toxicology analysis of postmortem cases grew at a rate that far outpaced the general level of inflation (1.6%) and likely reflects the growing complexity of the toxicological analysis as described in the MEC interviews.

Although costs are growing at rapid rates, toxicology staff productivity has grown even faster. Table 2 highlights the quartile performance of cases processed per FTE (i.e., caseload) for the 2013–2020 period. The first quartile laboratories have experienced a steady rise in productivity over this period. Likewise, the median laboratory has experienced a similar productivity growth over time, reflecting the economic expectation as the higher caseload results in economies of scale.

Productivity growth for the first quartile (the least productive laboratories) rose at an annual rate of 6.4% and 13.9% for the most productive laboratories. The median laboratory’s productivity grew at an 8.2% annual rate.

Another cost consideration arises with a review of the turnaround time for the analysis to take place, this being a cost to society. Table 3 provides a summary view of turnaround time over the same years. As wait time increases,

¹ Taken from Project Foresight, the benchmark data for the 2019-2020 performance period includes laboratory submissions for a variety of fiscal year definitions. However, all submissions have December 31, 2019 as part of their fiscal year accounting. The majority of submissions follow a July 1, 2019 through June 30, 2020 convention. Others follow a year that begins as early as January 1, 2019 (ending December 31, 2019) while the other extreme includes laboratories with a fiscal year originating October 1, 2019 and ending September 30, 2020.”

² 2019.12 = 100 indicates that all prices in Table 1 have been converted to the price level in December 2019 to correspond with the most frequent fiscal year submission to Project FORESIGHT.

there is a delay in the benefit from the information provided by the analysis. This impacts any sentinel benefit that laboratories might provide to public health as trends in drug abuse emerge.

Table 2. Forensic Toxicology Cases per FTE (Caseload), 2013–2020.

| Fiscal Year | Quartile 1 | Median | Quartile 3 |
|-------------|------------|--------|------------|
| 2013 | 82 | 92 | 108 |
| 2014 | 69 | 140 | 247 |
| 2015 | 86 | 108 | 210 |
| 2016 | 81 | 118 | 201 |
| 2017 | 78 | 119 | 207 |
| 2018 | 115 | 148 | 171 |
| 2019 | 113 | 141 | 160 |
| 2020 | 113 | 138 | 175 |

Source: [Project FORESIGHT](#)

Table 3. Forensic Toxicology Turnaround Time, 2013-2020.

| Fiscal Year | Quartile 1 | Median | Quartile 3 |
|-------------|------------|--------|------------|
| 2013 | 20 | 24 | 27 |
| 2014 | 30 | 37 | 55 |
| 2015 | 33 | 38 | 57 |
| 2016 | 21 | 29 | 47 |
| 2017 | 37 | 55 | 86 |
| 2018 | 45 | 68 | 84 |
| 2019 | 45 | 60 | 69 |
| 2020 | 65 | 78 | 87 |

Source: [Project FORESIGHT](#)

The increases in TAT averaged 23.5% per annum for the median laboratory. The increased demand for toxicological services and the costs in both time and money influenced one of the interviewed laboratories to invest in DART-MS (direct analysis in real time mass spectrometry) for toxicological and drug chemistry services (Sisco and Forbes 2021, Strayer et al. 2018). DART-MS requires a large capital expenditure for higher fixed costs but lower marginal costs and can result in dramatic improvements in turnaround time to counter the trends in Table 3.

These high growth rates in TAT delay analysis, which reverberates throughout the justice system. Increases in TAT lead to declines in case submissions by policing agencies. Likewise, delayed reports disrupt the flow of cases to prosecutors and courts (e.g., Kenney (2019), Meyers (2020), The Buffalo News (2015), WRAL (2013). In addition, IACME and NAME optimal standards for TAT measure whether 90% of toxicology examinations are completed within 60 calendar days of case submission, with the minimum standard being with 90 days. The increased TAT shown in Table 3 jeopardizes the ability of MEC agencies to complete cases within the standards and could lead to loss of accreditation. Beyond the justice system are other societal costs from increased TAT, including the costs to families from the delay in answers for the cause of death. Table 4 highlights the impact of these delays within the

laboratory. For backlog, count a backlogged case as one for which the case was received by another laboratory more than 30 days previously. The backlog percentages in Table 4 represent the number of cases that exceed 30 days in the laboratory, relative to the total annual case submission. As the opioid crisis bloomed, jurisdictions reallocated resources to interrupt the growth in backlogs, which had grown nearly sevenfold. Even with those additional resources, backlog of the median laboratory represents over 3 months of submissions.

Table 4. Forensic Toxicology Backlog Percentages, 2013–2020.

| Fiscal Year | Quartile 1 (%) | Median (%) | Quartile 3 (%) |
|-------------|----------------|------------|----------------|
| 2013 | 6 | 9 | 14 |
| 2014 | 4 | 6 | 10 |
| 2015 | 3 | 6 | 11 |
| 2016 | 5 | 7 | 13 |
| 2017 | 45 | 52 | 63 |
| 2018 | 35 | 60 | 69 |
| 2019 | 19 | 21 | 22 |
| 2020 | 7 | 28 | 63 |

Source: [Project FORESIGHT](#) 

The Dynamic Cost Structure. Figure 1 illustrates the forensic toxicology cost/case versus caseload from Project FORESIGHT submissions for fiscal year 2020 (Speaker 2021). Each data point represents an individual submission. The rough shape of these submissions is suggestive of a U-shaped curve as predicted by economic theory. On the downward-sloped portion, laboratories experience perfect economies of scale at the minimum cost/case. The illustrated curve (in black) is an econometric estimate of this non-linear relationship. This curve represents the efficient frontier,³ which shows the level of cost/case that can be expected for a given caseload. The horizontal line (in red) represents the cost/case for the median laboratory. Notice the large number of laboratories with caseload levels below 1,000 cases per year and a corresponding average cost that is well above the median average cost. Private laboratories operate near the bottom of the efficient frontier with annual caseloads between 2,750 and 4,500, experiencing near perfect economies of scale.⁴

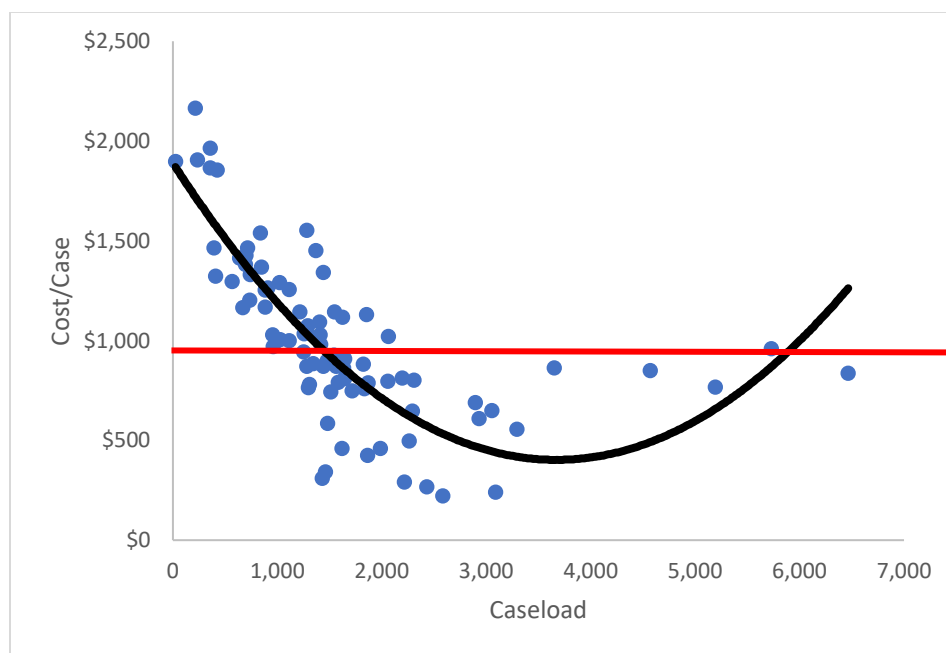


Figure 1. Forensic Toxicology Cost/Case vs. Caseload

³ The efficient frontier refers to the estimate of the lower bound average cost for a given caseload. Along the downward-sloped portion of the curve, increased caseloads realize economies of scale. The lowest point on the curve is associated with the caseload that results in perfect economies of scale. Beyond the caseload, average cost rises as diseconomies of scale occur.

⁴ The near perfect economies of scale recognizes that private “for profit” laboratories would also need to generate a return to owners. That return, in addition to the cost, is embedded in the price charged to laboratories for the outsourcing service.

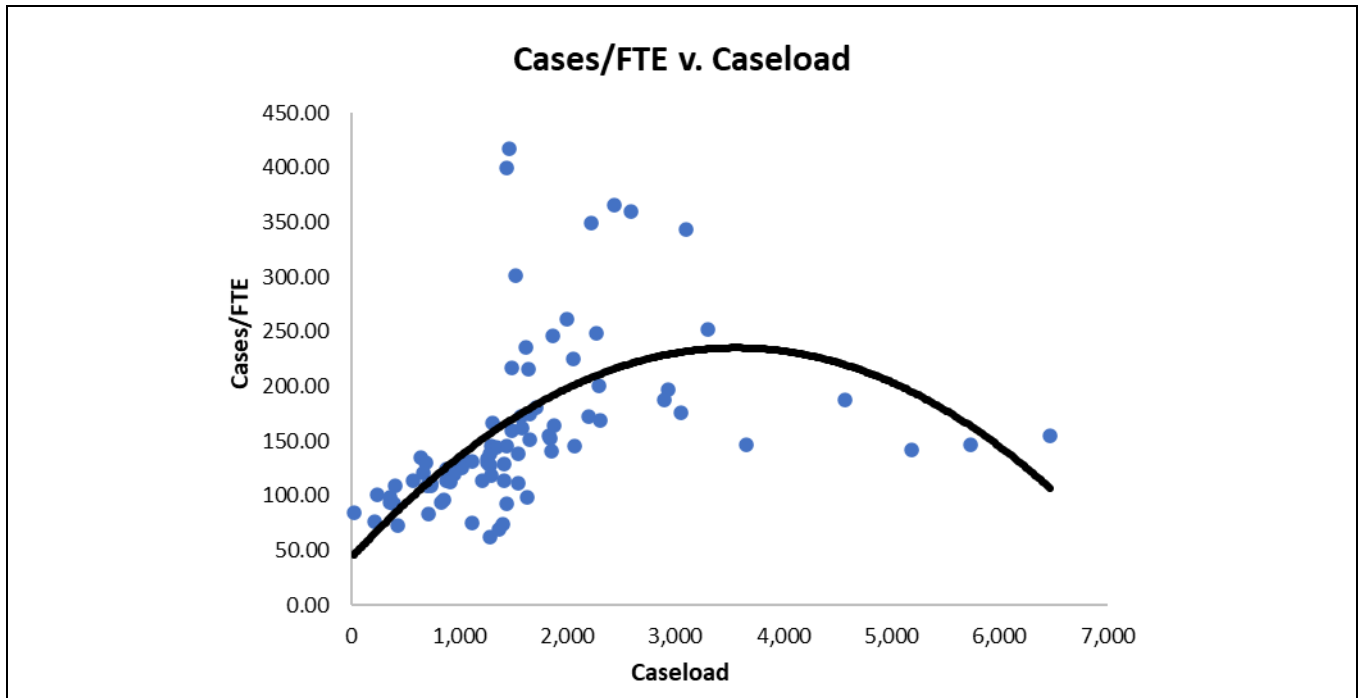


Figure 2. Forensic Toxicology Cases/FTE v. Caseload

The decision to outsource for many laboratories is explained by the low caseload and the corresponding high costs associated with the level of activity. The breakdown of Cost/Case highlighting productivity (CASE/FTE, output per person), policy & procedures (TEST/CASE, testing intensity), resource allocation (PCOST/COST, percentage personnel expenditures), and market conditions (PCOST/FTE, average compensation) suggests factors that may explain the economies of scale illustrated in Figure 1. The productivity metric, Cases/FTE, is most closely aligned with the economies of scale performance. Figure 2 highlights this relationship for each of the laboratories in Figure 1. Notice that a mirrored relationship between caseload and productivity exists. As analytical productivity increases, the laboratory processes more cases per person, and costs fall until the caseload is associated with perfect economies of scale. Thereafter, the effects of the Law of Diminishing Marginal Returns⁵ are evident as productivity begins to decline, influencing higher average costs.

The dynamic situation of increasing productivity and lower costs as caseloads increase influences the optimal choice regarding outsourcing toxicology services. Although low case volume MEC agencies will find outsourcing to be cost effective, those with rising caseloads will experience lower costs as long as economies of scale may be achieved. Each agency will need to consider the cost situation in the present and expectations of caseload in the future.

⁵ The Law of Diminishing Marginal Returns indicates that as additional inputs are added to the provision of any good or service, we will reach a point where output increases at a decreasing rate.

Qualitative Interview Findings

Operational and Organizational Structure

The MEC agencies represented in the focus group had different operational and organizational structures, including one sheriff-coroner, one county coroner, two county medical examiners, and one state medical examiner. Each MEC served between 175,000 and 3 million people. Each agency had between five and 33 staff members solely focused on death investigations, and only two agencies did not have any staff vacancies. Agencies were funded by a variety of sources, including the county government, state government, and general standalone funds. All individuals interviewed stated that they were very involved in making budgetary decisions for their agency, with two individuals stating that they are the ones who create their agency's budget. Three MECs have no specific line item for outsourcing in their agency's budget, while one had lines in their budget for outsourcing various disciplines like forensic anthropology, odontology, and toxicology. One MEC mentioned that their agency has applied for grants to cover costs associated with storing decedents when their cause of death was related to COVID-19, but no one stated that COVID-19 has led to an increase in their overall budget or specific outsourcing budget. One MEC had two different contracts from which they receive funding, and one of those contracts covers all the agency's outsourcing needs.

Only one MEC had an in-house toxicology laboratory, but they still outsource toxicology testing that their in-house laboratory does not see often or if they need to quantify a sample that their in-house laboratory does not have the proper instrumentation to test.

Outsourcing Laboratory Operations and Logistics

The main reason MEC agencies outsourced certain aspects of their cases was because they did not have the capacity to complete certain services in-house. This lack of capacity was due to instrumentation and staffing shortages. In addition, although some agencies were fully staffed, the staff lacked the necessary training which made outsourcing necessary. All participants interviewed stated that either the forensic pathologist in charge of the case or the head of the agency would decide what services to outsource. Two MECs had to follow state or county procurement procedures and put out a Request for Proposal to decide on an outsourcing private laboratory. Only one participant was able to make their own decision on where to outsource services, whereas another works with their state medical examiner agency to determine outsource private laboratories.

Agencies outsourced various forensic disciplines, including toxicology testing, genetic analysis, odontology, and anthropology and multiple services such as cremations permit or waiver reviews of decedents, histology, transportation, and even the cleaning of the MEC's office space. The turnaround time for outsourced services, specifically toxicology, varied on average from 1–1.5 weeks to 4–8 weeks. One of the largest reference laboratories conducting postmortem testing indicates that their turnaround times for basic blood analysis is 7 days or 12 days if positive (NMS Labs n.d.-a). An expanded testing panel that includes synthetic novel psychoactive substances is 8 days or 15 days if positive (NMS Labs n.d.-b). Only one participant interviewed stated that the turnaround time for their in-house laboratory to complete toxicology testing was shorter than for their outsourcing laboratory. Another participant stated that their private laboratory has an exceptionally longer turnaround time than their state crime laboratory. One participant stated that they generally only use one private laboratory because of a long-term established relationship between the private laboratory and their agency. Other participants stated that they have multiple private laboratories that they utilize depending on the private laboratories' capacity at the time they need testing or analysis completed. Four participants stated that they were limited by the number of appropriate private laboratories because the testing they need is so specialized, and there are limited individuals with the skill sets needed to analyze or test certain things.

Operational and Legal Implications of Outsourcing

Participants from our interviews represented MEC agencies from around the country. Some required explicit approval from the state legislature or a designated body to outsource a task involving a contract above a specific threshold dollar amount, whereas other participants did not need to first seek approval from any formal authorities or entities. If approval from a specific commission, board, or other party is routinely required before a MEC can outsource certain tasks, this decision can take weeks or even months. That general timeframe of approval for outsourcing can in turn increase the backlog of the MECs' cases or delay the ability to determine the cause of death. Participants mentioned the need to seek approval most commonly when requesting a larger budget for their overall functions. One participant stated that they did seek county governmental approval to obtain additional funding in the middle of their fiscal year to meet the additional increase in deaths because of circumstances such as opioid-related overdose deaths.

None of the participants stated that their agencies were prohibited from outsourcing under their specific, corresponding state laws. However, more than one participant shared that their agency is required to identify an external laboratory or outsourcing facility by adhering to a specific procedure, such as a competitive bidding process. That type of process builds cost considerations into the process of selecting a private laboratory. One participant whose agency must go through the competitive bidding process stated that this often leads to selecting the lowest-cost private laboratory, unless there is a good reason to make a different decision. Another participant shared that they do not have to go through a competitive bidding process if the amount of the bid falls below a specified amount.

In one jurisdiction, the state law had been recently amended to move the MEC agency out of the criminal justice sector and into public health. An early draft of this legislation contained a requirement that the MEC use only a specifically named laboratory for the variety of their testing needs. This participant and others were able to convince lawmakers to drop this provision because it would have likely created a backlog. The participants confirmed that they are generally not required to submit separate, specific reports on the contract work they outsourced, but they can include the findings or work of the outsourced laboratory or professional as part of their overall report or work product. However, one participant shared that their agency is required to submit periodic reports about the performance of an outsourced private laboratory, if the contract exceeds a specified dollar amount.

Most participants did not face significant restrictions or requirements regarding to which laboratories they could outsource certain tasks. However, some jurisdictions require or strongly recommend that the MEC outsource only with accredited laboratories. This requirement limits the pool of laboratories MECs can use, which in turn could affect costs, turnaround time, and backlog. One participant explained that utilizing an accredited laboratory offers the additional benefit of helping to establish the credibility of the MEC agency in the context of a jury trial or other court proceeding.

Participants who work in agencies that serve larger geographic or more densely populated jurisdictions tended to have a broader range of in-house capabilities that might require less outsourcing. Smaller jurisdictions were more likely to have fewer in-house capabilities and need to outsource more services to laboratories or professionals located outside of the immediate jurisdiction. Some participants stated that their agency may have a very small staff, which can lead to a limited capacity to process a sudden increase in deaths, or other demands on their time. Other jurisdictions may not employ certain types of professionals and may therefore need to outsource the specialized work performed by professionals such as anthropologists. For some participants it may make sense to outsource tasks that pertain to certain types of crimes, such as violent crimes, in which the relevant evidence may be more likely to end up in a forensic database such as CODIS. Limitations on the amount of funding a MEC may receive can also factor into the breadth of capabilities that can be performed in house by full- or part-time staff.

None of the participants expressed any concerns about the ability, willingness, or capability of staff from an outsourced laboratory to testify in court or otherwise participate in any court or legal proceedings. The participants stated that testifying in court or participating in a court proceeding is a routine part of an external laboratory or outsourced private laboratory's scope of work. This may include having the laboratory technicians or scientists who conducted or interpreted certain tests provide testimony or otherwise participate in court or legal proceedings. Substitute testimony may be allowed if the original professional is later unavailable.

Some of the participants stated that the need for additional funding to hire more staff and increase capacity in house is an ongoing issue. Obtaining sufficient financial resources to meet the increasing demand was an issue before the COVID-19 pandemic. Then, even when funding is available to bring on certain professionals it can be challenging to identify qualified staff.

To complement the interview findings related to the legal implications of outsourcing, this study also included a legal review on outsourcing (see complete findings in Appendix C). Using LexisNexis, the following Boolean search string was used to search within each state's statutes and regulations, in LexisNexis:

*text ((forensic! or DNA or toxicolog! or genetic! /6 test! or process! or lab! or case or toxicolog!
or (medico /2 legal)) or "medical examiner" or (autopsy /3 patholog!) or pathologist or
(forensic! /4 patholog!) or coroner or (death or justice or forensic! /5 peace or investigat!) /35
contract! or outsourc! or test! or (referenc! or external! /4 lab! or test!)) /150 "medical
examiner" or coroner or pathologist or "death investigat ")*

The legal review, current as of August 30, 2021, did not find any state laws prohibiting or banning outsourcing and did find that state laws leave decisions on outsourcing to the MEC or state decision makers (Figure 3). The review also found that 24 states and the District of Columbia have laws that authorize outsourcing, including which specific entities are authorized or permitted to enter into an outsourcing agreement, what types of task can be outsourced, which (if any) external or appointing body or board must approve outsourcing if it exceeds a certain threshold dollar amount, and actual cost and rate structures.

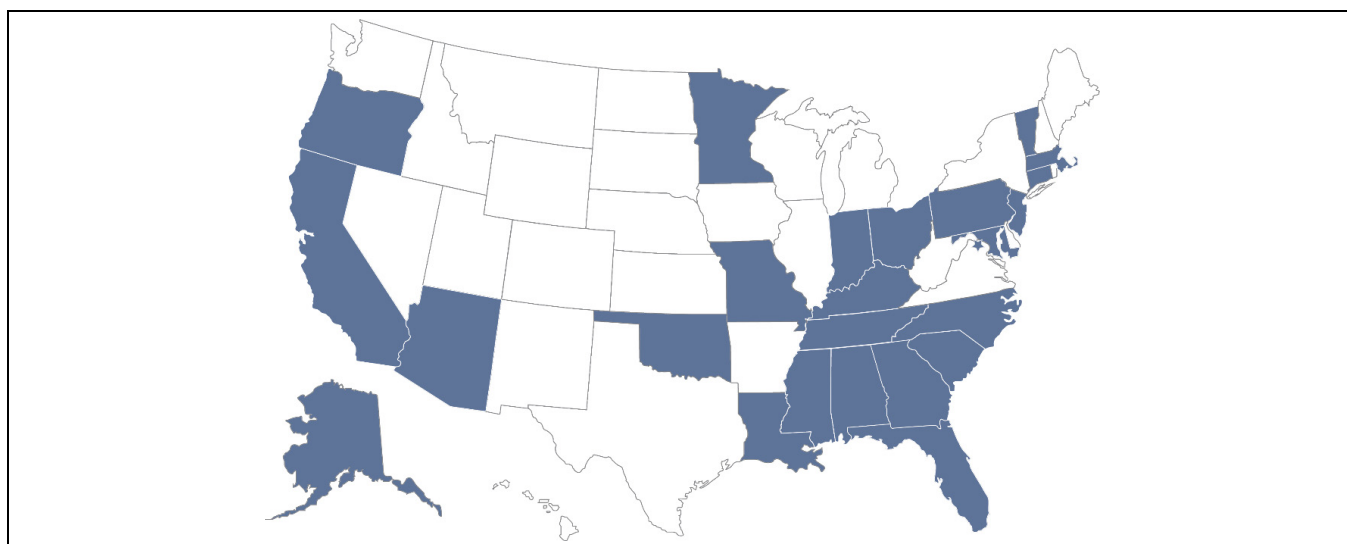


Figure 3. States with Laws that Authorize Outsourcing

Some states, such as Arizona, broadly authorize MECs to outsource “...to a person meeting the qualifications prescribed in this chapter who is employed by or who has contracted with the county to provide death investigation services” (Ariz. Rev. Stat. § 11-594). Other states, such as Florida, grant this authority to a specific, designated body, called the Medical Examiners Commission, which can “Oversee the distribution of state funds for the medical examiner districts and may make such agreements and contracts, subject to approval of the executive director of the Department of Law Enforcement, as may be necessary to effect the provisions of this chapter” (Fla. Stat. § 406.02).

Under Georgia’s state laws, the “chief medical examiner” is specifically authorized to “Employ forensic consultants and other independent contractors **with the approval of the division director**,” (Ga. Code Ann. § 35-3-153, emphasis added). Louisiana law authorizes coroners within that state to “...contract with any competent physician or other expert to assist in the conduct of an investigation or autopsy” (La. Rev. Stat. § 13:5710). North Carolina’s language is even broader, simply requiring that the outsourced personnel be “qualified persons”: “The Chief Medical Examiner may contract with qualified persons to perform or to provide support services for autopsies and other studies and investigations” (N.C. Gen. Stat. § 130A-381). Alaska law includes language providing maximum cost and rate structures for specific services and that that departments cannot pay more for the services (7 Alaska Admin. Code 35.145).

Only the District of Columbia and Florida were identified as having laws that include wording specific to testing or facilities. No laws were identified specific to outsourcing for toxicology testing.

There are several potential reasons why half of the U.S. states do not have any such state laws governing the scope of MECs’ authority to outsource. There may be state-level policies within these jurisdictions that have not been codified as statutes or regulations. State lawmakers may have determined that these types of contractual decisions are best left to local-level lawmakers or leadership personnel within MECs as part of the scope of their professional activities. MECs may be bound by other professional and ethical laws and policies within their jurisdiction that fall outside the scope of state laws.

Opioid Epidemic and Other Drug Impacts

Each of the participants stated that the opioid crisis has directly impacted their work. One participant described the opioid epidemic as both a blessing and a curse. On one hand, the opioid crisis has enabled MECs to receive additional funding, to bring on more staff or to secure increased in-house resources. On the other hand, the magnitude of the opioid crisis has, in some cases, greatly strained the resources and capacity of existing staff by generally increasing the caseload and demand for MEC staff. Many MECs and outsourced private laboratories have increased the comprehensiveness of the drugs and substances they are testing for, so that now these professionals are routinely testing for an expanded drug panel that can detect a wider range of substances. This has sometimes directly led to the decision to outsource toxicology analysis and other forensic tasks related to opioid-related overdose death cases. Some of the participants’ agencies already had the in-house capacity to test for fentanyl, other synthetic opioids, or other novel psychoactive substances. Other participants stated that they had to outsource some of these capabilities. However, the participants said that the drug testing landscape has become more complex, in some ways, because of the types of substances appearing in toxicology tests more often. For example, one of the participants stated that they had seen an increase in cases where both the MEC and outsourced laboratory would be unable to confirm a positive test result because the individual had consumed a fentanyl analog that was “out of scope” for the substances that were regularly tested. Some jurisdictions have responded to this by requiring that any detected presence of a substance be documented, even if the presence of the substance has not been confirmed. One participant described the challenge of having a strict liability state law that authorizes prosecutors

to take certain legal actions if a certain level of a substance is detected. A strict liability law that presumes harm if a detectable level of a substance is found in someone's system can be a challenge for the MEC because poly-substance use is common. A strict liability law may not necessarily account for such nuances as whether the level of a detected substance is considered sufficient to likely be the primary cause of death.

One challenge many MECs face is the rapid and ever changing appearance and presence of various types of synthetic opioids and other illicit substances. An existing toxicology screen may therefore not capture new or emerging substances. A participant stated that they have been outsourcing much more regularly recently because of a notable increase in drug-related overdose deaths. In some cases, multiple toxicology screening is necessary to understand and determine the causes of death. Several participants described witnessing increases in the use and presence of certain illicit substances such as methamphetamine and cocaine in the past several years. Similarly, many of the participants described how common poly-drug use has become. One participant stated that it is becoming increasingly rare to only find one substance within a person's system (i.e., polydrug, multidrug). It is therefore not uncommon to find combinations like methamphetamine and benzodiazepines; alcohol, cocaine, and methamphetamine; or cannabis and one additional substance. Several participants stated that there is often the presence of either alcohol or cannabis in combination with various other substances. In addition, alternating misuse of a depressant such as heroin with a stimulant such as methamphetamine is a widely documented practice to facilitate intoxication, reduce negative side effects, or enhance ineffective opioid substitution therapy treatment (Palmer et al. 2020).

One participant described how the increase in opioid-related overdose deaths over the past few years has made it more challenging to determine which drugs are involved in, or the primary cause of, an overdose death. Some participants have sought to work more directly with local stakeholders, such as public health departments, District Attorney's offices, local law enforcement, and healthcare facilities, to better identify the drugs involved in fatal overdoses. Other participants described a tension between their agency and the objectives of law enforcement or prosecutors. For example, a participant described how local law enforcement would prefer the MEC to classify a drug-related overdose as a homicide, to help the prosecutors build a stronger case against the individual or organization that sold or provided the drugs that factored into a victim's death.

Several participants expressed how helpful it is to have good partnerships with other agencies and organizations. Open lines of communication can make it easier for a MEC to pivot and respond to emerging issues such as the rise of synthetic opioids and fentanyl, changing trends in illicit poly-substance use, and the COVID-19 pandemic. One participant noted that the opioid epidemic has placed consistently higher demands on staff and created complications when the deceased individual is screened for drugs while in the hospital. A hospital laboratory may screen for a different set of substances than what the MEC would test for, which can create confusion. In addition, the screening tests may not identify and confirm a specific substance, rather they only screen to identify a drug class.

COVID-19 Impact

Three participants stated that COVID-19 has not impacted their outsourcing practices, while two participants stated that their outsourcing practices have been impacted negatively by COVID-19. The main impact of COVID-19 on MEC agencies is that the outsourcing laboratories are being pressed with analyzing COVID-19 tests, supply chain shortages for consumables and other necessary instrumentation, and an influx of cases, such as overdoses and homicides, that compounded the number of COVID-19 deaths. One participant stated that they developed detailed standards for how their agency was going to be involved in COVID-19 deaths. Based on their established standards, they would bring decedents in to confirm COVID-19 as the cause of death if they had not been tested and were not in the hospital. However, if the decedent died in the hospital and was confirmed to have had COVID-19, they asked

hospitals to call them so they could go to the hospital to sign the death certificate there rather than bringing the decedent into their agency. None of the participants believe that these changes will be permanent, and many participants stated that their caseloads are returning to pre-COVID-19 numbers.

One participant stated that they had to apply for grants funds to obtain storage containers for body storage because they assisted other regions with portable containers for 20 decedents. One participant stated that their agency brought on another investigator and pathology assistant (e.g., autopsy technician) to increase capacity. Multiple participants stated that there was a delay in sending samples for outsourcing because the private laboratory did not have the capacity to test because of an influx of COVID-19 tests and supply chain disruptions.

Cost-Benefit Analysis Results

The decision to outsource toxicological analysis requires an evaluation of both time and money. As noted in the interviews, outsourcing generally provided results within 1 to 2 weeks, whereas Project FORESIGHT data indicate an internal turnaround time at a median of 78 days (10–12 weeks) during fiscal year 2020. The cost-benefit analysis includes a comparison of both dollar costs and wait time costs of turnaround time associated with in-house analysis versus outsourced toxicological analysis. As highlighted in Figure 4, it is not a one-size-fits-all decision. Average costs are expected to decline to a point as forensic toxicology caseloads increase because of the inherent economies of scale.

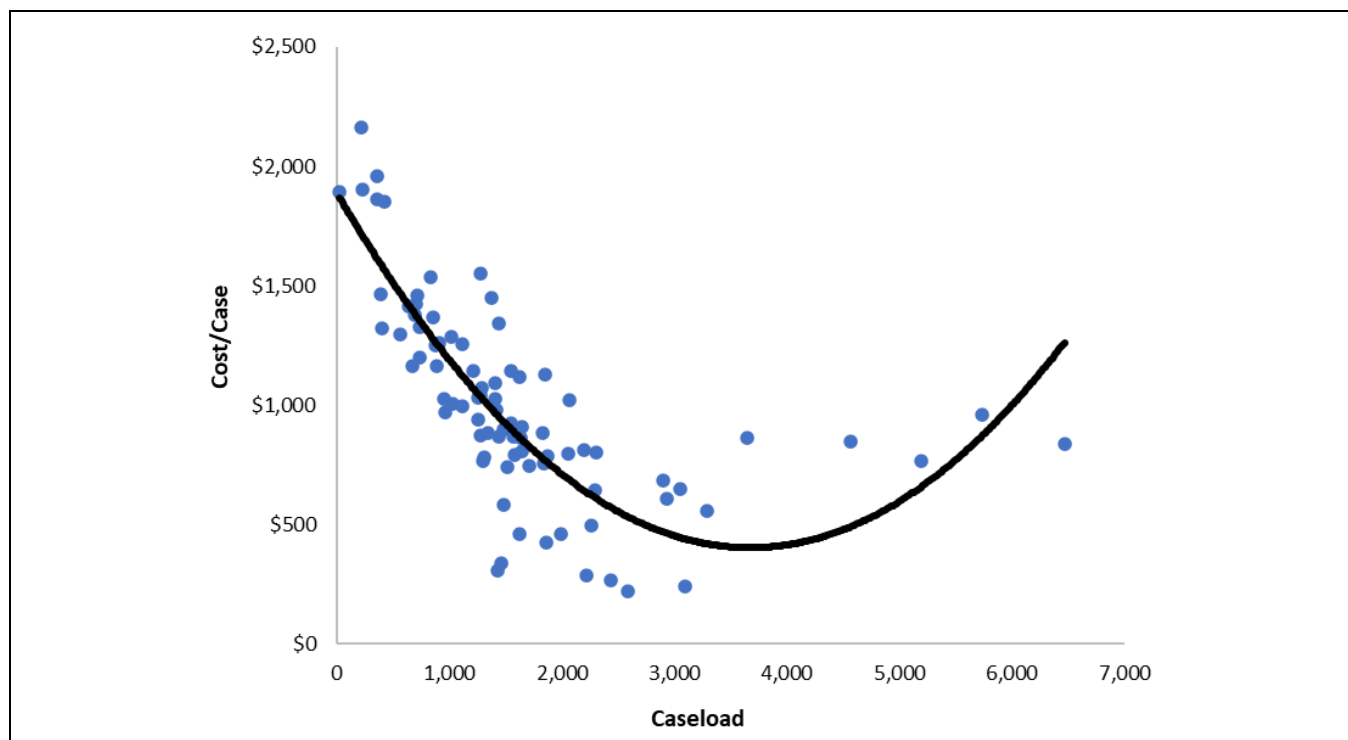


Figure 4. Forensic Toxicology Cost/Case

The term cost-benefit analysis represents a shorthand description of the comparison of marginal costs with marginal benefits. The decision to outsource, rather than to perform toxicological analysis internally, presumably follows a determination that outsourcing expenses are less than internal costs. One measurable net benefit from outsourcing (or internal analysis) obtains from the reduction in costs from the alternative. Additional benefits (costs) follow from a reduction (increase) in turnaround time.

Figure 5 highlights the relationship between the average cost and the marginal cost of forensic toxicology analysis. Note that although caseloads are increasing toward the level where average costs are minimized, the marginal cost falls below the average cost. As shown in the scatter plot of Figure 5, the majority of forensic toxicology laboratories respond to a caseload associated with a marginal cost that is less than their average cost. Couple this relationship with the rising caseloads during the opioid crisis and the average costs are expected to continue to decline, thus affecting the decision over outsourcing for upcoming years.

Figure 6 highlights the metric that offers the greatest explanation for declining costs. The Law of Diminishing Marginal Returns suggests that analyst productivity will improve as shown with the rising marginal productivity curve. As productivity increases, average costs decline. The laboratory's marginal cost versus marginal benefit decision begins with an estimation of the expected caseload. With that anticipated caseload, convenient tables in the [annual Project FORESIGHT report](#) provide estimates of the productivity and average costs that can be compared with the pricing of private laboratories to determine the lower cost alternative.

Although economies of scale suggest greater potential benefits from in-house analysis as caseloads grow, there is no equivalent benefit from caseload volume and turnaround time. Figure 7 provides a scatter plot of turnaround time for forensic toxicology analysis versus caseload. Econometric analysis of the relationship between turnaround time and caseload does not offer a strong relationship for linear or non-linear alternative models.

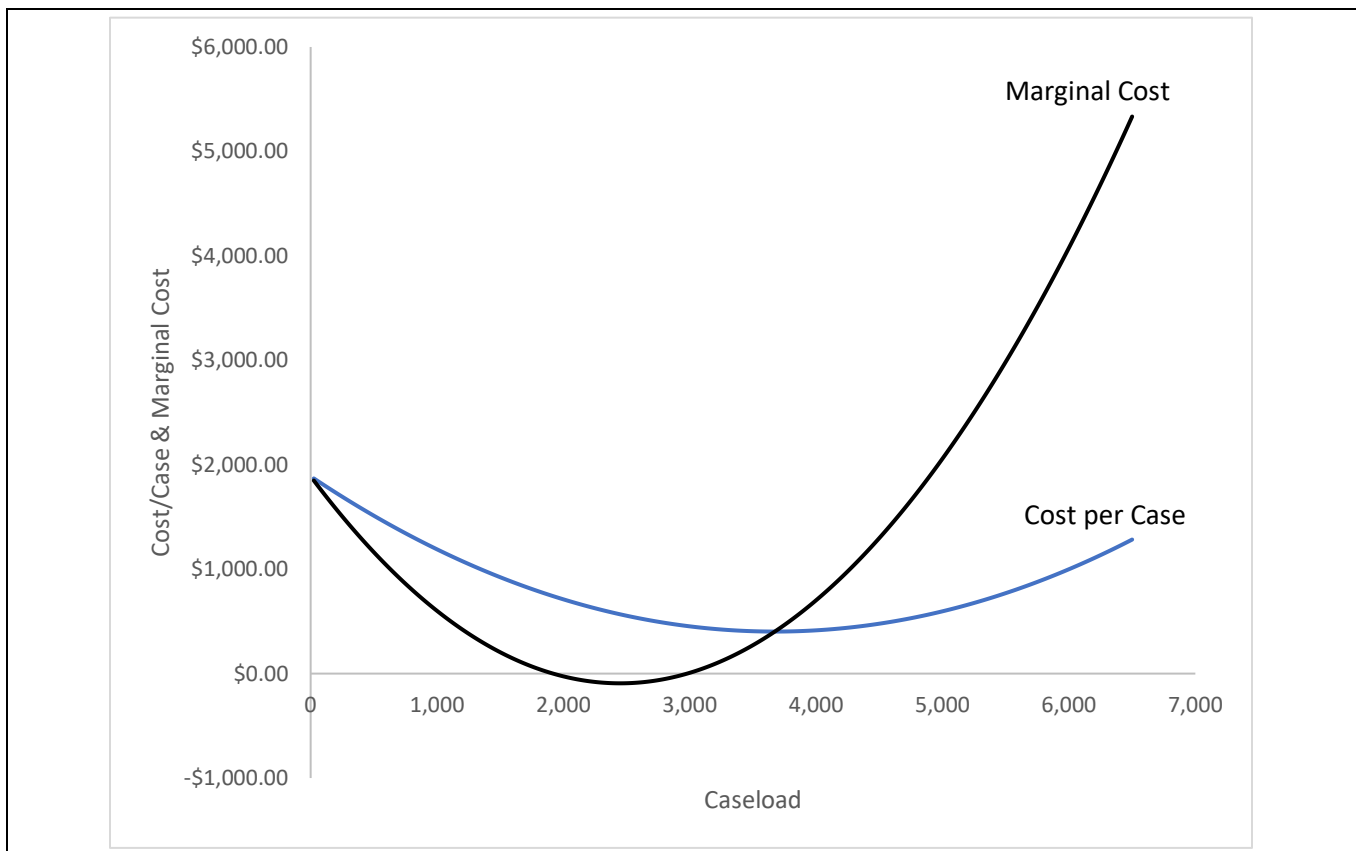


Figure 5. Forensic Toxicology Efficient Frontier

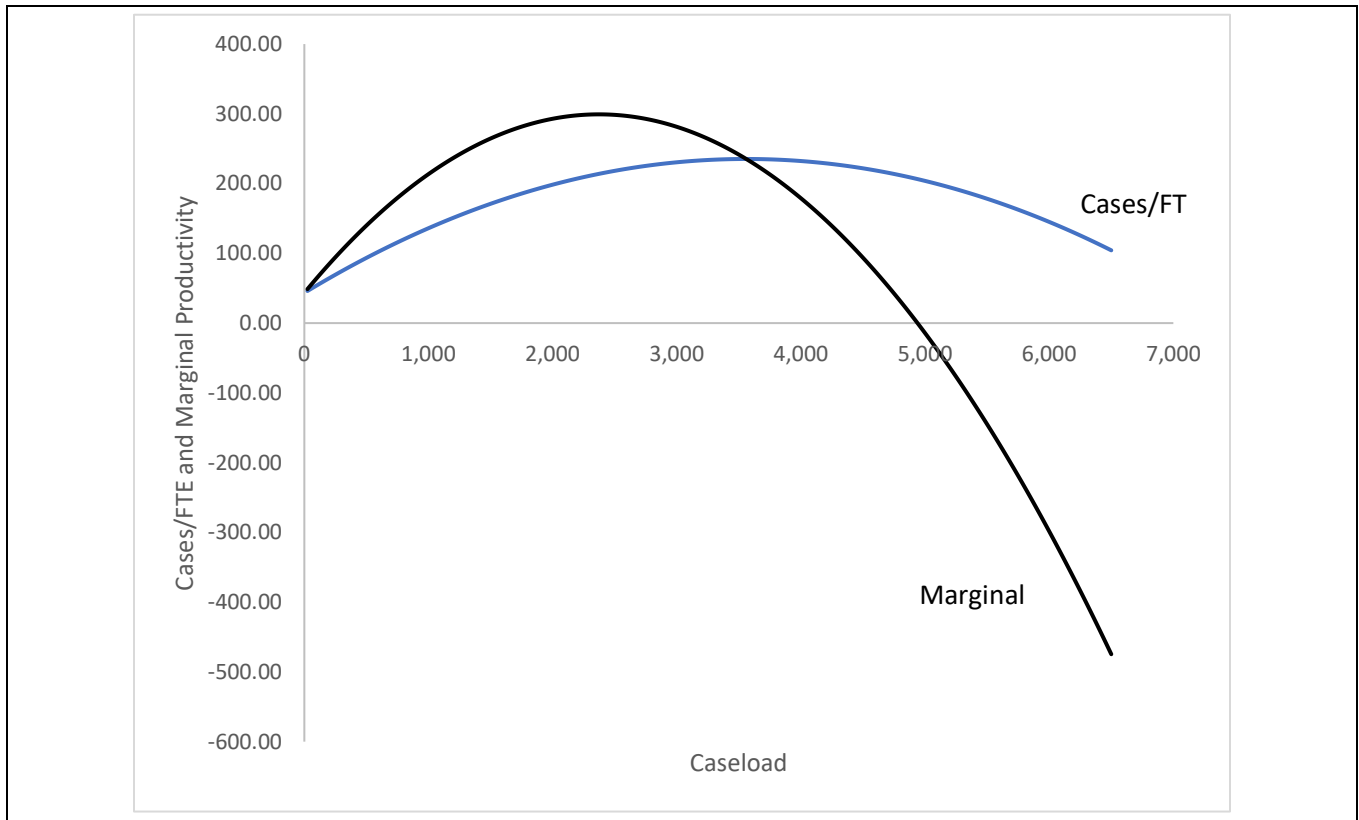


Figure 6. Forensic Toxicology Efficient Productivity Frontier⁶

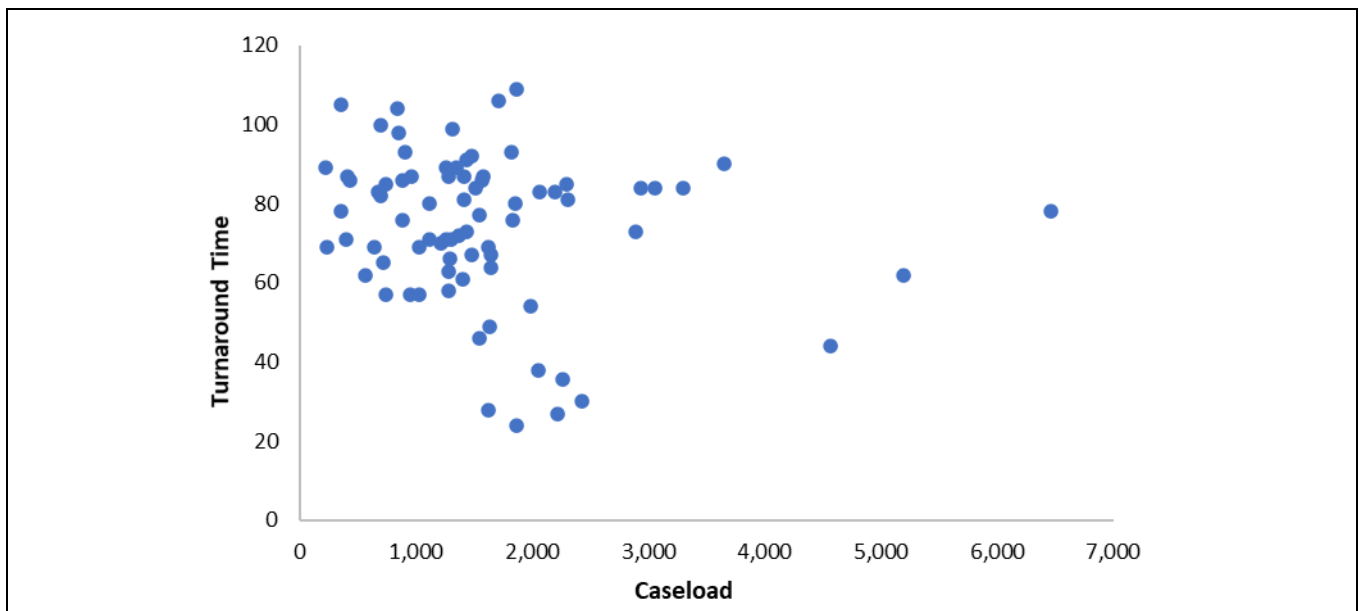


Figure 7. Forensic Toxicology Turnaround Time

⁶ The efficient productivity frontier highlights the level of productivity (CASES/FTE) that is associated with the efficient frontier for the Cost/Case illustrated in Figure 5.

Turnaround time will influence the decision according to the value of time for the jurisdiction. If the toxicology results are required for the justice system, then the benefits from faster turnaround time depend on the ability of the justice system to act upon the results. If the toxicology results are key to the identification of new trends in drug use, then the sentinel value of faster turnaround time may yield benefits that call for societal benefits that justify outsourcing (Ropero-Miller and Speaker 2019).

Consistent with the MEC interviews, it is common for most MECs to outsource for toxicological services. Figure 8 highlights the scatter plot of the costs per sample analyzed (Speaker 2021). Economic theory informs us that private sector operators will gravitate toward a volume of activity that hovers near perfect economies of scale. The red line represents the cost per sample for a laboratory that operates at perfect economies of scale with the addition of a return on investment for the equity holders of the laboratory (for illustrative purposes, a 20% return on investment is embedded in the red line). Note that all but a few of the laboratories in the scatter plot experience costs above that level, suggesting that outsourcing may provide the greatest net benefits.

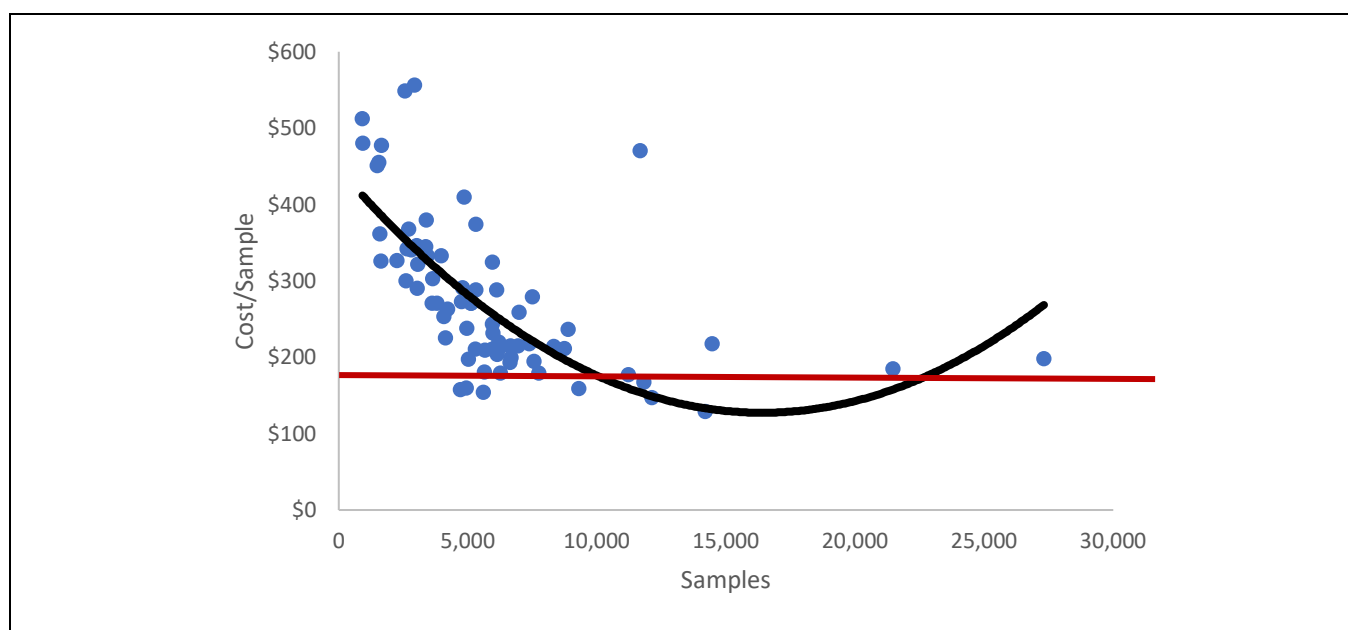


Figure 8. Forensic Toxicology Cost per Sample

Future Research








This study examined the contexts and the costs and benefits of outsourcing by MECs. MECs are a vital component of our public health and safety systems. Yet, they receive far less funding and fewer resources than other sectors. MECs often have high caseloads, and few forensic pathologists and toxicologists are available to help address the caseload issue. Expenditure data suggest that outsourcing may provide a faster and lower cost alternative for analysis. Based on the findings presented in this report and the study's limitations, a few suggestions for future research are described below:

- This study included qualitative interviews with only five MECs. Conducting a similar study with a larger number of MECs would provide additional insights and context to the outsourcing issue.
- Future research should explore the possibility of conducting an outsourcing survey of MECs. A survey would provide quantitative data that could be paired with the qualitative data collected for this study and

data for an expansion of this study as described in the previous bullet. However, an MEC survey would be challenging because MECs are asked to complete many surveys and they are often understaffed.

- Additional data collection might capture the contracts for outsourcing for comparison to the in-house analysis. Private laboratories have been reluctant to share tiered pricing details but would likely benefit from cooperation in such a comparative study.
- An exploration of MECs' place within the justice system could reveal the importance of turnaround time in the decision to outsource. How quickly the analysis is acted upon will suggest the benefits of reducing turnaround time.
- As indicated in the cost-benefit analysis included in this report, outsourcing toxicology services may provide the greatest net benefits to MECs. Future research could include a full cost-benefit analysis for MECs interested in closing their in-house laboratory and moving solely to outsourcing toxicology services.
- This study identified that transportation services were outsourced by the participating MECs. Further exploration of MECs' approaches to transporting decedents could identify the positive and negative aspects of handling transport in house or contracting out the service.
- MEC relationships with odontologists, anthropologists, and histologists is another topic to be explored. Future research could examine how MECs are securing those skills and the use of NamUS and FBI services in those areas.
- Finally, while not explored in this study, because of the shortage of board-certified forensic pathologists, research on the forensic pathologist supply, relationships forensic pathologists have with MEC agencies, and the use and impact of locum tenens forensic pathologists (substitute forensic pathologists) should be explored. MECs are regularly utilizing locum tenens forensic pathologists to help keep caseloads down and retain accreditation status which may also impact outsourcing practices.

References

- Brooks, Connor. 2021. Medical examiner and coroner offices, 2018. Washington, DC: U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics.
- Houck, Max M., Richard A. Riley, Paul J. Speaker, and Tom S. Witt. 2009. "FORESIGHT: A business approach to improving forensic science services." *Forensic Science Policy & Management: An International Journal* 1 (2):85-95. doi: 10.1080/19409040902810723.
- Houck, Max M., and Paul Speaker. 2020. "Project FORESIGHT: A ten-year retrospective." *Forensic Science International: Synergy* 2:275-281. doi: <https://doi.org/10.1016/j.fsisyn.2020.08.005>. 
- Kenney, Kara. 2019. "State toxicology lab faces huge backlog of OWI cases." WRTV, Last Modified May 7, accessed Mar 4. <https://www.wrtv.com/news/call-6-investigators/state-toxicology-lab-faces-huge-backlog-of-owi-cases>. 
- Lucchesi, Emilie L. 2021. "Autopsies on hold: Why we need more medical examiners." *Discover Magazine*.
- Meyers, Donald W. 2020. "More of the story: Backlog at state toxicology lab means delays for local prosecutor, coroner — and families." Yakima Herald-Republic, accessed Mar 4. https://www.yakimaherald.com/news/local/more-of-the-story-backlog-at-state-toxicology-lab-means-delays-for-local-prosecutor-coroner/article_3dd4080a-5430-5b89-ad90-f1ccdbcd9dd8.html. 
- National Institute of Justice (NIJ). 2020. Comprehensive needs assessment of forensic laboratories and medical examiner/coroner offices points to solutions for a system under stress. Washington, DC: National Institute of Justice.
- NMS Labs. n.d.-a. "Postmortem, basic blood (Forensic). Test Code 8051B." NMS Labs, accessed Mar 4. <https://www.nmslabs.com/tests/8051B>. 
- NMS Labs. n.d.-b. "Postmortem, expanded with NPS, blood (Forensic). Test Code 8054B." NMS Labs, accessed Mar 4. <https://www.nmslabs.com/tests/8054B>. 
- Palmer, Anna, Nick Scott, Paul Dietze, and Peter Higgs. 2020. "Motivations for crystal methamphetamine-opioid co-injection/co-use amongst community-recruited people who inject drugs: a qualitative study." *Harm Reduct J* 17 (1):14. doi: 10.1186/s12954-020-00360-9.
- Ropero-Miller, Jeri D., Hope M. Smiley-McDonald, Stephanie A. Zimmer, and Katherine M. Bollinger. 2020. "A census of medicolegal death investigation in the United States: A need to determine the state of our Nation's toxicology laboratories and their preparedness for the current drug overdose epidemic." *Journal of Forensic Sciences* 65 (2):544-549. doi: 10.1111/1556-4029.14277.
- Ropero-Miller, Jeri D., and Paul J. Speaker. 2019. "The hidden costs of the opioid crisis and the implications for financial management in the public sector." *Forensic Science International: Synergy* 1:227-238. doi: <https://doi.org/10.1016/j.fsisyn.2019.09.003>. 
- Sisco, Edward, and Thomas P. Forbes. 2021. "Forensic applications of DART-MS: A review of recent literature." *Forensic Chemistry* 22:100294. doi: <https://doi.org/10.1016/j.forc.2020.100294>. 

- Speaker, Paul J. 2009a. "The decomposition of return on investment for forensic laboratories." *Forensic Science Policy & Management: An International Journal* 1 (2):96-102. doi: 10.1080/19409040902800260.
- Speaker, Paul J. 2009b. "Key performance indicators and managerial analysis for forensic laboratories." *Forensic Science Policy & Management: An International Journal* 1 (1):32-42. doi: 10.1080/19409040802624075.
- Speaker, Paul J. 2014. "FORESIGHT benchmark data 2012-2013." *Faculty & Staff Scholarship* 1141.
- Speaker, Paul J. 2015. FORESIGHT benchmark data 2013-2014. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2016. FORESIGHT benchmark data 2014-2015. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2017. FORESIGHT benchmark data 2015-2016. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2018. Project FORESIGHT annual report, 2016-2017. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2019. Project FORESIGHT annual report, 2017-2018. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2020. Project FORESIGHT annual report, 2018-2019. Morgantown, WV: The Research Repository @ WVU.
- Speaker, Paul J. 2021. Project FORESIGHT Annual Report, 2019-2020 In *Faculty & Staff Scholarship*.
- Strayer, Kraig E, Heather M Antonides, Matthew P Juhascik, Raminta Daniulaityte, and Ioana E Sizemore. 2018. "LC-MS/MS-based method for the multiplex detection of 24 fentanyl analogues and metabolites in whole blood at sub ng mL(-1) concentrations." *ACS Omega* 3 (1):514-523. doi: 10.1021/acsomega.7b01536.
- The Buffalo News. 2015. "Erie County has to solve toxicology lab delays that threaten to impact criminal cases." The Buffalo News, accessed Mar 4. https://buffalonews.com/opinion/editorial/erie-county-has-to-solve-toxicology-lab-delays-that-threaten-to-impact-criminal-cases/article_02c44f3c-6cec-550b-ac6a-d8b5c3922a79.html. ↗
- Weedn, Victor W, and M J Menendez. 2020. "Reclaiming the autopsy as the practice of medicine: A pathway to remediation of the forensic pathology workforce shortage?" *Am J Forensic Med Pathol* 41 (4):242-248. doi: 10.1097/PAF.0000000000000589.
- WRAL.com. 2013. "Lack of resources at state crime lab causing delays in drug case prosecutions." WRAL, accessed Mar 4. <https://www.wral.com/lack-of-resources-at-state-crime-lab-causing-delays-in-drug-case-prosecutions/12798653/>. ↗

Appendix A. Literature Review Citations

- Aesif, Scott W., David M. Parenti, Linda Lesky, and John F. Keiser. 2014. "A cost-effective interdisciplinary approach to microbiologic send-out test use." *Archives of Pathology & Laboratory Medicine* 139 (2):194-198. doi: 10.5858/arpa.2013-0693-OA.
- Atherton, Daniel Stephen, and Stephanie Reilly. 2017. "The Regional Autopsy Center: The University of Alabama at Birmingham Experience." *The American Journal of Forensic Medicine and Pathology* 38 (3):189-192. doi: 10.1097/paf.0000000000000316.
- Beety, V. 2019. "Symposium: Facing opioids: Drug enforcement and health policy in today's epidemic: Prosecuting opioid use, punishing rurality, 80 Ohio St. L.J. 741."
- Crane, Marshall. 2015. "Coroner's inquests in South Carolina: a unique, impartial, and public opportunity to seek justice." *South Carolina Law Review* 66 (4):785-808.
- Durose, Matthew. R., Andrea. M. Burch, Kelly Walsh, and Emily Tiry. 2016. Publicly funded forensic crime laboratories: resources and services, 2014. Bureau of Justice Statistics, U.S. Department of Justice.
- Johnson County Kansas. 2019. Opioid grant funds promote efficiency at medical examiner's office.
- Kulick, Gail T., Tadd M. Johnson, Rebecca St. George, and Emily Segar-Johnson. 2016. "From dysfunction and polarization to legislation: Native American religious freedom rights and Minnesota autopsy law." *Mitchell Hamline Law Review* 42 (5):1700-1721.
- McCleskey, Brandi C., Stephanie D. Reilly, and Dan Atherton. 2017. "The value of outsourcing selected cases in a medical examiner population: a 10-year experience." *Journal of Forensic Sciences* 62 (1):99-102. doi: <https://doi.org/10.1111/1556-4029.13269>. 
- Mrak, Robert E., Tristram G. Parslow, and John E. Tomaszewski. 2018. "Outsourcing of Academic Clinical Laboratories: Experiences and Lessons From the Association of Pathology Chairs Laboratory Outsourcing Survey." *Academic Pathology* 5:2374289518765435. doi: 10.1177/2374289518765435.
- National Institute of Justice. 2019. Report to Congress: Needs assessment of forensic laboratories and medical examiner/coroner offices. Washington, DC: U.S. Department of Justice, Office of Justice Programs.
- Richard, Melinda, and Timothy D. Kupferschmid. 2011. Increasing efficiency of forensic DNA casework using lean six sigma tools. Final report. In *Forensic DNA Unit Efficiency Improvement Grant*): Louisiana State Police Crime Laboratory.
- Ropero-Miller, Jeri D., Hope M. Smiley-McDonald, Stephanie A. Zimmer, and Katherine M. Bollinger. 2020. "A census of medicolegal death investigation in the United States: A need to determine the state of our Nation's toxicology laboratories and their preparedness for the current drug overdose epidemic." *Journal of Forensic Sciences* 65 (2):544-549. doi: 10.1111/1556-4029.14277.
- Ropero-Miller, Jeri D., and Paul J. Speaker. 2019. "The hidden costs of the opioid crisis and the implications for financial management in the public sector." *Forensic Science International: Synergy* 1:227-238. doi: <https://doi.org/10.1016/j.fsisyn.2019.09.003>. 

Rubenfire, Adam. 2016. "Quest, LabCorp forge divergent paths to hospital lab deals." *Mod Healthc* 46 (16):10-10.

Smith, Todd T. 2020. "Forensic autopsies in Missouri: Navigating the road from the morgue to the courtroom." *The Missouri Bar*, 76(1). 76 (1).

Wharton Jr., Keith A., Benjamin H. Lee, Pierre Moulin, Dale Mongeon, Rainer Hillenbrand, Arkady Gusev, Bin Ye, and Xiaoyu Jiang. 2015. "Outsourcing tissue histopathology investigations in support of clinical trials for novel therapeutics: Considerations and perspectives." In *Molecular histopathology and tissue biomarkers in drug and diagnostic development* edited by Steven J. Potts, David A. Eberhard and Keith A. Wharton Jr., 43-63. New York, NY: Humana Press.

Appendix B. Qualitative Interview Guide: An Examination of Medical Examiner and Coroner Outsourcing

Purpose: *The qualitative study will provide context surrounding outsourcing of services by MECs and inform the cost analysis portion of this task.*

Moderator Instructions: *Please use the following guide to direct the interview. Most of the text provided in this guide (below the Welcome section) can be used as a script to facilitate your interview. In a few places, instructions have been placed in the guide to help the facilitator insert the appropriate word(s); these instructions appear in ALL CAPS. Instructions should NOT be read to the participant.*

*The interview guide is divided into **five** major sections. Many of the questions have probes to assist you in prompting further. As you facilitate the discussion, focus on the primary questions but allow yourself time to do some probing so that you can gain a better understanding of the participants' views.*

In total, this interview will be no more than 60 minutes to be held in one online session.

Participants: *The participants are medical examiners and coroners.*

Welcome and Ground Rules (5 MINUTES)

Hello, thank you very much for agreeing to let us interview you to inform our understanding of medical examiner and coroner outsourcing practices and needs. Your input is a critical component of our study and will help inform your profession.

I'm [NAME] and I'll be your interviewer today. We will be using a set of questions and topics to guide our discussion. Peyton Attaway (RTI) will be helping me by facilitating some of the topics and taking notes. Camille Gourdet (RTI) will assist with questions regarding the legal implications of outsourcing. We also have a few other team members who will be listening in today, including Dr. Paul Speaker (West Virginia University) and Ms. BeLinda Weimer (RTI). We're from RTI International, a non-profit research organization, headquartered in Durham, NC. Our organization is working with the National Institute of Justice, through the Forensic Technology Center of Excellence as part of a cooperative agreement, to gather input from medical examiners and coroners on outsourcing practices.

Group Objectives

Our project will review current field practices for the outsourcing of specific medical examiner and crime laboratory testing functions and the context for which those practices are implemented. We would like to examine the contexts, policies and procedures, and the costs and benefits of outsourcing or reference testing and provide a technical report concerning this approach.

During this interview we will discuss topics such as how outsourcing decisions are made; the process of ordering tests/services, receiving results, and billing; legal issues with outsourcing; and current issues such as what the impact of drug epidemics and the current COVID-19 pandemic have had on outsourcing. The information we gather from this interview will help create technical report concerning outsourcing practices in the medicolegal death investigation field.

Consent and Confidentiality Statement

This interview will last no more than 60 minutes. Your participation today is voluntary. You do not have to answer any of the questions asked, and you may stop participating in this interview at any time.

We will be recording this session to allow for our full attention so we can understand your input without being distracted by too much notetaking. No one except project staff will have access to the recordings. The recording and transcript will be used to document key ideas, themes, and suggestions from the sessions. Once the key ideas and themes have been written up, the recording and transcript will be permanently deleted. No identifying information, including your names, will be included in the write-ups of key ideas, themes, and suggestions. The summaries of ideas from the sessions will be housed on our secure project share drive and used only for the purposes of qualitative study, development, and refinement.

I need to ask you formally: Do you consent to participate in this interview?

[Verbal response will be obtained from participant before proceeding.]

INTRO

Are there any questions before we begin?

Just briefly, can you please tell me in what capacity and how long you have been in this profession.

Great. Now let's begin the interview.

OPERATIONAL AND ORGANIZATIONAL STRUCTURE (10 MINUTES)

Let's start the discussion with some questions related to your office's operational and organizational structure.

- ****How many staff does your agency have?**
 - **PROBE:** How many are operational staff, support staff, and administrative staff?
- ****Do you currently have any staff vacancies? If so, why are there vacancies?**
 - **PROBE:** For example, vacancies due to COVID-19, budget cuts, other?
- ****How many people reside in your jurisdiction? What are the demographics of your jurisdiction?**
- ****What entity funds your agency?**
 - **PROBE:** Does your agency receive any funding beyond public funding, such as fee-for-service, grants, etc.?
- ****How involved are you in making budgetary decisions for your agency? IF NOT INVOLVED, what agency is in charge of making budgetary decisions for your agency?**
- ****Do you know your annual outsourcing budget?**
 - **PROBE:** Do you receive any funding specific for outsourcing? Do you receive grants that you can utilize for outsourcing?
- **Do you have an in-house testing laboratory, or do you rely on a state crime laboratory for testing? How does that relationship influence testing turnaround times and outsourcing decisions?**

OUTSOURCING LABORATORY OPERATIONS & LOGISTICS (15 MINUTES)

- ****How are decisions made on what services your office outsources? Who makes these decisions?**
 - PROBE for example, are decisions made based on internal policy, by a specific department, or by a city/county/state agency?
- ****What types of services does your agency outsource? What disciplines have any type of outsourcing services? Do you outsource all these services or only when needed?**
- ****What are your agency's reasons for outsourcing? SKIP IF ANSWERED ABOVE.**
 - PROBE: For example, budget, lack of proper equipment, maintenance costs, staff caseload capacity, skilled staff, turnaround time, etc.
- ****What is the process for choosing private laboratories? Do you have any documents that outline this process?**
- ****What is the current turnaround time associated with outsourcing laboratory services?**
 - PROBE: Be specific for the type of outsourcing requested.
 - How does that relate to your local or state crime laboratory's typical turnaround time?
- Does your agency outsource to multiple private laboratories? Why?
- Are you limited by the number of appropriate private laboratories for outsourcing needs?
 - PROBE: For example, some laboratories may have a stranglehold on the market.

LEGAL IMPLICATIONS OF OUTSOURCING (10 MINUTES)

Now we would like to now ask a few questions about how state and local laws may shape the selection and role of outsourcing laboratories in your jurisdiction.

- ****First, are you required to obtain approval from a local or state entity to initiate any type of outsourcing? (e.g., for example over a certain dollar amount)**
 - PROBE: If so, does this approval process create certain challenges (e.g., delays in selecting/hiring an outsourcing lab, extra paperwork), or is the process fairly streamlined?
- Do you have to consider certain types of outsourcing laboratories as part of the selection process (e.g., accredited laboratories, minority-owned businesses)?
- In your experience, do outsourced laboratories tend to have greater capabilities than in-house labs (e.g., more sophisticated/newer equipment that can perform more sensitive tox screens; more available staff; more up-to-date reference samples; broader array of staff capabilities)?
- ****What are the expectations for court testimony from the external laboratory? Are they required to participate in legal proceedings (including providing expert testimony in court) as a function of their services?**
 - PROBE: Would an external laboratory's refusal to offer expert testimony influence or shape your decision to work with them?
 - PROBE: Would an external laboratory's cost for expert testimony influence or shape your decision to work with them?

- Are there any legal barriers, budgetary implications, or other considerations that might make it more difficult to outsource certain types of laboratory services (e.g., equipment, procedures, or staffing expertise)?

OPIOID EPIDEMIC AND OTHER DRUG IMPACTS (10 MINUTES)

- ****How has the opioid epidemic impacted the level of outsourcing (e.g., increasing the volume of tox screens and other forensic tests/analyses that may need to be run)?**
 - **PROBE:** For example, slower turnaround times, increased caseload, increased backlog, inability to keep standards at the lab because of new synthetic opioids being released into illicit markets, etc.
- ****Have you seen an increase in drug use other than opioids (e.g., meth, cocaine)? If so, has that created a greater need for outsourcing in your office?**
 - **PROBE:** For example, slower turnaround times, increased backlog, novel psychoactive drugs (including the influx of synthetics), etc.
 - **PROBE:** [If a greater need] Is this increase because of more cases or more extensive testing in expanded panels?
- ****Relatedly, have you seen an increase in poly-drug use generally?**
- ****Has the opioid epidemic changed the way that you report deaths that have any drug involvement?**
 - **PROBE:** Reports that get disseminated (e.g., new parties or stakeholders, such as law enforcement and public health) or ways in which the drugs are listed on death certificates (categories vs. specific drugs).
- How are drug test results obtained through outsourcing indicated in the final reports?
- Are there any other items, issues, or considerations that we should discuss regarding outsourcing in the context of the opioid epidemic and other drug impacts that you think would be important for us to know?

COVID-19 IMPACT (8 MINUTES)

- ****How has COVID-19 impacted outsourcing?**
 - **PROBE:** If it has impacted outsourcing, do you think these changes will be permanent after COVID-19 is under control?
- ****How has your agency responded to changes in outsourcing because of the COVID-19 pandemic?**

WRAP UP (3 MINUTES)

Those are all the questions we had to discuss today. Do you have any questions you would like to ask, or any comments to share, about any aspect of this study?

That concludes our interview. Thank you very much for your participation!

Appendix C. Legal Review Findings on MEC Outsourcing

As part of this study, a legal review on MEC outsourcing was conducted using LexisNexis. LexisNexis is a leading global provider of legal, regulatory, and business information and analytics. The legal review findings are included in this appendix. The following table provides the actual language of the laws, by state, that specifically require or recommend the circumstances under which MECs may enter into contractual agreements to outsource certain types of tasks. The review did not identify any laws in which outsourcing was prohibited.

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|---|
| AK | <p>(d) The state medical examiner may, through contracts for services, appoint local, regional, and district medical examiners throughout the state to perform or assist in performing the duties assigned to the state medical examiner. To be eligible for appointment as a local, regional, or district medical examiner, a person must be a physician licensed to practice in this state or, if the physician is licensed in another jurisdiction, the physician must be employed by the state or by an agency of the United States government within the state. An appointment under this subsection may be for a term of up to two years. (Alaska Stat. § 12.65.015)</p> <p>"Sec. 36.30.850. Application of this chapter.</p> <p>(a) This chapter applies only to contracts solicited or entered into after January 1, 1988, unless the parties agree to its application to a contract solicited or entered into before that date.</p> <p>(b) This chapter applies to every expenditure of state money by the state, acting through an agency, under a contract, except that this chapter does not apply to...(35) contracts between the state medical examiner and a provider of medical services to perform or assist in performing the duties assigned to the state medical examiner in AS 12.65.020;" (Alaska Stat. § 36.30.850)</p> <p>"(e) In its discretion, the department will investigate a claim to determine whether goods and services were actually provided, whether the goods and services provided were ordered by the state medical examiner, or whether the goods and services were necessary. The department will, in its discretion, delay payment of the costs claimed for a reasonable time pending investigation. The department will not pay costs for goods or services if it finds that the goods or services were not provided or were not related to an autopsy or post-mortem examination by the state medical examiner or the state medical examiner's designee. The department will not pay the costs of cosmetology that it finds was not necessary to make the head, face, and hands of the deceased presentable after those parts were disfigured by an autopsy.</p> <p>(f) Except for contracts for services for a local, regional, and district medical examiner under AS 12.65.015, the department will pay no more for the costs described in AS 12.65.025 than the lower of either the amount charged by the claimant to the general public for the same goods or service, or the maximum amount or rate set in this subsection, as follows:</p> <p>(1) embalming -- \$500;</p> <p>(2) restoration of the body and wound repair after the autopsy -- \$100;</p> <p>(3) body storage</p> <p>(A) first five days -- \$0;</p> <p>(B) 6th through 30th days -- \$15 a day;</p> <p>(C) upon prior approval by the state medical examiner and with notice to the department after 30 days -- \$15 a day;</p> <p>(4) facility use and administration for medical examination involving internal examination by autopsy -- \$115;</p> <p>(5) if a state-transfer case is unavailable, as determined by the state medical examiner, transfer case rental (round-trip) -- \$50;</p> <p>(6) transportation of human remains by a funeral director, embalmer, medical examiner, or state agency</p> <p>(A) \$100 unless otherwise approved by the state medical examiner;</p> <p>(B) each mile that the remains are transported in excess of 25 miles, upon prior approval by the state medical examiner -- \$2;</p> <p>(C) actual costs of ferry charges or tolls (include receipts with billing).</p> |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|--|
| AK | (g) A person who enters into a contract with the state medical examiner for services described in AS 12.65.025 or provides services for payment by the state medical examiner agrees that (1) the state may audit the financial records of the person; (2) the person will not, pending payment of a claim, delay provision of services or delay the return of a body to persons responsible for the burial of the body; and (3) the person will not bill the family or person making final disposition of the deceased for services for which the state will pay under AS 12.65.025." (7 Alaska Admin. Code 35.145) |
| AL | "Ala. Code § 45-27-60.01. County medical examiner.The county medical examiner shall be a physician licensed to practice medicine in Alabama. The Escambia County Medical Examiner shall be appointed by the senior state medical examiner in Region IV of the Alabama Department of Forensic Sciences. The appointment shall be made, with the approval of the Director of the Alabama Department of Forensic Sciences, from a list of qualified physicians submitted by the Escambia County Medical Society after review by the district attorney of the county. The appointment shall establish the Escambia County Medical Examiner as a contract employee of the Alabama Department of Forensic Sciences with the same liability coverage as provided to Merit System employees of the State of Alabama."Ala. Code § 45-27-60.02. Appointment of assistant county medical examiners.The Escambia County Medical Examiner shall appoint one or more assistant county medical examiners to assist the investigation and certification of deaths from the list of qualified physicians provided by the Escambia County Medical Society. Each assistant county medical examiner shall also have approval of the senior medical examiner of Region IV and the Director of the Alabama Department of Forensic Sciences and also shall be a contract employee of the Alabama Department of Forensic Sciences."Ala. Code § 45-27-60.14. Reimbursement for services.The County Medical Examiner of Escambia County shall be reimbursed for his or her services by the Alabama Department of Forensic Sciences through a contract that shall be negotiable and renewable each year." |
| AZ | "B. The county medical examiner or alternate medical examiner may:...3. Delegate any power, duty or function whether ministerial or discretionary vested by this chapter in the medical examiner or alternate medical examiner to a person meeting the qualifications prescribed in this chapter who is employed by or who has contracted with the county to provide death investigation services. The medical examiner or alternate medical examiner shall be responsible for the official acts of the person designated pursuant to this section and shall act under the name and authority of the medical examiner or alternate medical examiner." (A.R.S. § 11-594)" |
| CA | Notwithstanding any other provision of law, the coroner is authorized to do all of the following...(e) Enter into agreements with one or more procurement organizations to coordinate organ recovery procedures within that coroner's jurisdiction or in cooperation with other coroners throughout the state.(f) Contract with or receive assistance of any kind from any public or private entity for the purpose of providing education and training to his or her personnel in pathology or any other area of the healing arts and sciences that will assist in timely determination of the causes of death." (Cal Gov Code § 27491.44)"(b) The department shall collect data on violent deaths as reported from data sources, including, but not limited to, death certificates, law enforcement reports, and coroner or medical examiner reports. The department shall post on its Internet Web site a summary and analysis of the collected data.(c)(1) The department may enter into a contract, grant, or other agreement with a local agency to collect the data specified in subdivision (b) within the agency's jurisdiction." (Cal Health & Saf Code § 131230) |
| CT | "For the purposes of sections 19a-41-6 through 19a-41-11, inclusive of the Regulations of Connecticut State Agencies: (1) "Medical Examiner" means any physician licensed to practice medicine in this state who is employed by the Office of the Chief Medical Examiner for the purpose of investigating and certifying the cause and manner of death. For the purpose of these regulations, "medical examiner" does not include physicians who perform the duties of a medical examiner through a contractual agreement with the Department of Administrative Services; (2) "Certifier" means the practitioner who attests to the cause and manner of death and signs the death certificate." (Regs., Conn. State Agencies § 19a-41-5) |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|---|
| DC | DC Code § 5-1403. Supporting services and facilities. (a) The CME {Chief Medical Examiner} shall appoint such qualified professional, investigative, technical and clerical personnel as the OCME may require, including administrators, medicolegal investigators, and a General Counsel. The General Counsel shall be appointed pursuant to subchapter VIII-B of Chapter 6 of Title 1. (b) The Mayor shall provide such facilities and equipment, as the OCME shall require. The Chief Medical Examiner may arrange or contract for such services, equipment and facilities as deemed necessary to carry out the duties and responsibilities of the OCME, pursuant to Chapter 3 of Title 2. |
| FL | "(5) Autopsy and laboratory facilities utilized by the district medical examiner or his or her associates may be provided on a permanent or contractual basis by the counties within the district." (Fla. Stat. § 406.08)"(4) The Medical Examiners Commission shall:(a) Initiate cooperative policies with any agency of the state or political subdivision thereof.(b) Remove or suspend district medical examiners pursuant to this act and have the authority to investigate violations of this act.(c) Oversee the distribution of state funds for the medical examiner districts and may make such agreements and contracts, subject to approval of the executive director of the Department of Law Enforcement, as may be necessary to effect the provisions of this chapter." (Fla. Stat. § 406.02) |
| GA | "(c) It shall be the duty of the chief medical examiner to: (1) Establish death investigation regions throughout the state and establish policies concerning the requirements for appointment of regional medical examiners to oversee death investigation activities in each established region; (2) Appoint regional medical examiners; (3) Employ forensic consultants and other independent contractors with the approval of the division director; (4) Organize and conduct regular educational sessions as may be needed for medical examiners and coroners in the state in cooperation with the Georgia Coroner's Training Council and the Georgia Police Academy; (5) Maintain permanent death investigation records for all jurisdictions in the state; (6) Establish death investigation guidelines for coroners and medical examiners; and (7) Cooperate with other state agencies, as appropriate, to ensure public health and safety. O.C.G.A. § 35-3-153 |
| IN | "(f) The district and associate medical examiners shall, at the request of coroners in their districts: (1) provide medical assistance in investigating deaths; (2) provide or contract for laboratory facilities for performing autopsies and investigations; (3) provide for the keeping of reports of all investigations and examinations; and (4) provide other functions which may be specified in rules adopted by the commission." (Burns Ind. Code Ann. § 4-23-6-6) |
| KY | "Ky. Rev. Stat. 72.220. Justice and Public Safety Cabinet to provide medical assistance to coroner investigating deaths. The Justice and Public Safety Cabinet shall, within budgetary limitation, provide medical assistance to coroners in investigating deaths; provide or contract for laboratory facilities for performing autopsies and investigations pursuant to KRS 72.210 to 72.275; provide for the keeping of reports of all investigations and examinations; and provide such other functions and duties as may be specified in KRS 72.210 to 72.275 or in the administrative regulations of the secretary of justice and public safety." |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|--|
| LA | <p>"La Rev. stat. § 13:5710. Coroner's experts; fees. The coroner may contract with any competent physician or other expert to assist in the conduct of an investigation or autopsy. The physician or other expert, upon the certificate of the coroner, shall be paid by the parish or municipality such compensation for his services as shall be mutually agreed upon by the coroner and governing authority of the parish or municipality responsible for the expenses of the investigation or autopsy. However, such compensation, including any expenses, tests, costs, or fees, shall not exceed the sum of five hundred dollars, unless otherwise mutually agreed upon by the coroner and the chief executive officer or chief fiscal officer of the parish or municipality."</p> <p>"La Rev. Stat § 13:5719. Establishment of parish or municipal laboratory. Any parish or municipality may establish a laboratory for the use of the coroner. In any parish where there is no coroner's laboratory, the coroner may contract with the coroner or laboratory of another parish to perform such examinations, analyses, or tests as he deems necessary and advisable. The fees for such examinations, analyses, or tests shall not exceed those customarily charged in other similarly qualified laboratories. The fees shall be paid by the governing authority of the parish of origin on approval of the coroner of that parish.</p> <p>"La Rev. Stat. § 28:215.6. Limitation of liability. A. Any and all personnel of the office of the coroner, who are performing duties in conjunction with the Coroner's Strategic Initiative for a Health Information and Intervention Program ("CSI/HIP"), shall be immune from criminal penalties or civil damages resulting from any act, decision, omission, communication, or any failure to act, which is made in good faith, including but not limited to any action pursuant to Part XXIII of Chapter 5 of Title 40 of the Louisiana Revised Statutes of 1950, while engaged in the performance of the functions provided for in R.S. 28:215.2, unless the damage or injury is caused by willful or wanton negligence or gross misconduct. B. For the purposes of this Section, the "personnel of the office of the coroner" shall mean any person who provides services or furnishes assistance pursuant to this Part, including an employee, contractor, or volunteer."</p> |
| MA | <p>"4.04: 4.04: Payment of Fees to District Medical Examiners and Forensic Investigators (1) The Office of the Chief Medical Examiner may establish contracts with district medical examiners or forensic investigators for the purpose of conducting views of decedents intended for cremation or burial at sea. (2) The district medical examiner or forensic investigator shall conduct the inquiry set forth in 505 CMR 4.03(1) and (2). (3) The district medical examiner or forensic investigator shall submit documentation regarding the inquiry and view of decedents intended for cremation or burial at sea as specified by the Office of the Chief Medical Examiner. (4) Upon receipt of satisfactory documentation the Office of the Chief Medical Examiner shall compensate the district medical examiner or forensic investigator at a rate of \$ 50 as set by the Secretary of Public Safety pursuant to M.G.L. c. 38, § 14 for each completed examination."</p> |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|--|
| MD | <p>(a) In general. --</p> <p>(1) The Commission may employ a staff in accordance with the State budget for the operation of the Commission and to maintain accreditation.</p> <p>(2) The staff shall include:</p> <p>(i) 1 chief medical examiner;</p> <p>(ii) 2 deputy chief medical examiners;</p> <p>(iii) Assistant medical examiners;</p> <p>(iv) 1 chief State toxicologist, 1 deputy chief State toxicologist, lead toxicologists, and assistant toxicologists;</p> <p>(v) 1 serologist;</p> <p>(vi) 4 resident medical doctors who are training in forensic pathology;</p> <p>(vii) 1 chief forensic investigator, 2 deputy chief forensic investigators, lead forensic investigators, and assistant forensic investigators; and</p> <p>(viii) 1 autopsy services supervisor, 1 deputy supervisor, lead autopsy technicians, and assistant autopsy technicians.</p> <p>(3) The Commission may employ any physician on a contract basis for part-time services." (Md. HEALTH-GENERAL Code Ann. § 5-305)</p> |
| MN | <p>"Minn. Stat. 390.252 CONTRACTS FOR SERVICES</p> <p>A county board may contract to perform coroner or medical examiner services with other units of government or their agencies under a schedule of fees approved by that board."</p> |
| MO | <p>"Missouri Rev. Stat. § 58.765. Two or more counties may contract for medical examiner to serve them jointly (certain counties)</p> <p>Any two or more counties adopting the provisions of sections 58.010, 58.020, 58.060, 58.090, 58.160, 58.375, 58.451, 58.455 and 58.700 to 58.765 or to whom sections 58.010, 58.020, 58.060, 58.090, 58.160, 58.375, 58.451, 58.455 and 58.700 to 58.765 apply may by contract among themselves join in the appointment of a county medical examiner to serve all such counties. The governing body of all the counties shall approve the contract, administer the appointment and allocate the costs among the counties."</p> |
| MS | <p>(2) In order to provide proper facilities for investigating deaths as authorized in Sections 41-61-51 through 41-61-79, the State Medical Examiner may arrange for the use of existing public or private laboratory facilities. The State Medical Examiner may contract with qualified persons to perform or to provide support services for autopsies, studies and investigations not inconsistent with other applicable laws. Such laboratory facilities may be located at the University of Mississippi Medical Center or any other suitable location. The State Medical Examiner may be an affiliate or regular faculty member of the Department of Pathology at the University of Mississippi Medical Center and may serve as a member of the faculty of other institutions of higher learning. He shall be authorized to employ, with the approval of the Commissioner of Public Safety, such additional scientific, technical, administrative and clerical assistants as are necessary for performance of his duties. Such employees in the Office of the State Medical Examiner shall be subject to the rules, regulations and policies of the Mississippi State Personnel Board in their employment." (Miss. Code Ann. § 41-61-77)</p> |
| MS | <p>"Miss. Code § 41-61-79. Radio system; pager/beeper; morgue or morgue facility; photographic equipment; vehicle; costs.</p> <p>(1) The county medical examiner, county medical examiner investigator or deputies thereof may be furnished by the board of supervisors of the county:</p> <p>(a) A two-way radio for countywide communication, using similar frequencies to those used by the sheriff. The responsibility for the installation, maintenance and removal of such equipment may be vested in the sheriff by the board of supervisors.</p> <p>(b) A pager/beeper which can be employed countywide.</p> <p>(c) A morgue or morgue facilities with proper examination equipment as directed by the State Medical Examiner. The facility may be at a hospital, funeral home or other suitable location. The county may contract with an individual or establishment to provide these facilities."</p> |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|---|
| NC | <p>"NC Gen Stat § 130A-381. Additional services and facilities</p> <p>In order to provide proper facilities for investigating deaths as authorized in this Part, the Chief Medical Examiner may arrange for the use of existing public or private laboratory facilities. Each county shall provide or contract for an appropriate facility for the examination and storage of bodies under Medical Examiner jurisdiction. The Chief Medical Examiner may contract with qualified persons to perform or to provide support services for autopsies and other studies and investigations."</p> |
| NJ | <p>"NJ Rev. Stat § 26:6B-19. Annual report</p> <p>a. The Office of the Chief State Medical Examiner, in conjunction with the Medical Examiner Review Team, shall issue an annual report, which shall be made publicly available.</p> <p>b. The annual report shall contain, at a minimum:</p> <p>(1) the budget and expenditures for each medical examiner office in this State, including its direct and indirect expenses, including a summary of the terms and conditions of each contract for the professional services of the Office of the Chief State Medical Examiner and the office of each county or intercounty medical examiner;"</p> <p>"c. All contracts or agreements that have been executed, as of the effective date [Sept. 1, 2018] of this act, between the Office of the Attorney General and the Northern or Southern Regional Offices of the State Medical Examiner shall be transferred to the Office of the Chief State Medical Examiner in the Department of Health, and continued as if the Office of the Chief State Medical Examiner was the original party to the contract or agreement.</p> <p>d. Whenever the term "State Medical Examiner" occurs or any reference is made thereto in any law, rule, regulation, order, contract, document, judicial or administrative proceeding, or otherwise, the same shall be deemed to mean or refer to: the "Chief State Medical Examiner" designated as the head of the Office of the Chief State Medical Examiner in the Department of Health established hereunder; or any person appointed to the position of "Deputy Chief State Medical Examiner" and acting on behalf of the Chief State Medical Examiner." (N.J. Stat. § 26:6B-5)</p> |
| OH | <p>"§ 313.05 Deputy coroners, other employees.</p> <p>(A)</p> <p>(1) The coroner may appoint, in writing, deputy coroners, who shall be licensed physicians of good standing in their profession, one of whom may be designated as the chief deputy coroner. The coroner also may appoint pathologists as deputy coroners, who may perform autopsies, make pathological and chemical examinations, and perform other duties as directed by the coroner or recommended by the prosecuting attorney. The coroner may appoint any necessary technicians. The coroner may contract for the services of deputy coroners to aid the coroner in the execution of the coroner's powers and duties. Contracts for the services of deputy coroners are exempt from any competitive bidding requirements of the Revised Code." (Ohio Rev. Code ORC Ann. 313.05)</p> <p>"§ 313.04 Disability or absence.</p> <p>When the coroner is absent temporarily from the county, or when on duty with the armed services of the United States, the state militia, or the American red cross, or when unable to discharge the duties of the office of coroner, such coroner may appoint a person with the necessary qualifications to act as coroner during such absence, service, or disability.</p> <p>When there is a vacancy in the coroner's office as a result of death or resignation and the vacancy cannot be filled by election or appointment as provided in section 305.02 of the Revised Code, or if no one runs for the office of coroner and, for that reason, the office is vacant, the board of county commissioners may contract with another county's coroner to exercise the powers and perform the acts, duties, or functions of the coroner. In addition to the applicable amounts of compensation specified in sections 325.15 and 325.18 of the Revised Code, the coroner with whom the board contracts may receive a supplemental payment for services rendered. The duration of the contract shall not extend beyond the last day of the term for which there was a vacancy." (ORC Ann. 313.04)</p> |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|--|
| OK | <p>**CONTRACTING OUT THE TRANSPORT OF BODIES**63 Okl. Stat. § 951. Transporting of Bodies for Autopsy or Scientific Tests</p> <p>The Chief Medical Examiner shall maintain a contract transport service authorized to transport bodies of deceased persons of whose death he or she is officially informed to an appropriate place for autopsy or for the performance of scientific tests; provided that, after the autopsy shall have been performed or such tests made, the bodies of such deceased persons shall be returned to the county from which they were brought, or, when so authorized by the district attorney of the county and upon request of the nearest relative of the deceased or other person who may be responsible for burial, the body may be transported to some place other than the county. The Chief Medical Examiner or his or her designee may authorize payment for the services in transporting the body to the place designated for autopsy, which shall be submitted upon a claim filed with the Board of Medicolegal Investigations."</p> |
| OR | <p>"(8) The services of the Deputy State Medical Examiner may be contracted by the Department of State Police. These contracts may be terminated by either party at any time by written notice to the other party to the agreement and, upon termination, the appointment of such Deputy State Medical Examiner is terminated." (ORS § 146.065)</p> |
| PA | <p>"(b) Professional personnel.—</p> <p>(1) The board shall contract for the services of a chief medical examiner, an actuary, investment advisors, counselors, an investment coordinator, and such other professional personnel as it deems advisable.</p> <p>(2) The board may utilize the same individuals and firms contracted under this subsection for both the system and the plan but shall allocate the fees, costs and expenses incurred under this subsection between the system and the plan as appropriate." (24 Pa.C.S. § 8502)</p> |
| SC | <p>"The coroner of the county in which a body is found dead or the solicitor of the judicial circuit in which the county lies shall order an autopsy or post-mortem examination to be conducted to ascertain the cause of death. If any person dies while detained, incarcerated, or under the jurisdiction of a municipal, county, or regional holdover facility, holding cell, overnight lockup or jail, a county or regional prison camp, or a state correctional facility, the coroner of the county in which the death occurs or, should that be unknown, the county in which the institution is located shall order an autopsy immediately upon notification of the death. However, if the official in charge of the institution is unable to arrange an autopsy within the State of South Carolina, he shall provide the coroner with an affidavit attesting to this inability.</p> <p>In this event, the coroner shall consult with the physician who pronounced death, and, if not the same, with any other physician who is known to have treated the person within twelve months prior to his death. If the deceased person had a previously diagnosed contagious, terminal illness or condition which is considered to be the reason for death, written confirmation must be obtained from at least two physicians who attended him prior to his death, and at least one of these physicians may not have been employed by or under contract with the institution or agency which was responsible for custody of the deceased person.</p> <p>The coroner may then determine that an autopsy is not required, and shall so certify in writing. Nevertheless, if the coroner decides that an autopsy is appropriate, he may order that one be arranged outside the State of South Carolina. Documentation of the death, the circumstances surrounding it, and all subsequent actions and decisions regarding the autopsy must be filed with the Jail and Prison Inspection Division of the Department of Corrections according to Section 24-9-35." (S.C. Code Ann. § 17-7-10)</p> |
| TN | <p>"(2) If the county has an elected coroner, the coroner shall serve as the medical investigator for the county; provided, that such coroner meets the qualifications for a medical investigator set out in subdivision (f)(1). If the coroner is not qualified to serve as medical investigator, then the county legislative body shall, by resolution, either authorize the county medical examiner to appoint a medical investigator subject to confirmation by the county legislative body, or provide for this function through a contract for service approved by the county medical examiner and the county legislative body; provided, however, that, if the county has an elected coroner who has served in that capacity for ten (10) years or more, such coroner shall serve as the medical investigator for the county, regardless of whether the coroner meets the qualifications set out in subdivision (f)(1)." (Tenn. Code Ann. § 38-7-104)</p> |

(Continued)

MEC Outsourcing Qualitative Study Report
January 2022

| State | Excerpts from State Laws |
|-------|--|
| VT | <p>"The State Board of Health may contract with any person, institution, or State department for the performance of any or all of the duties of the Chief Medical Examiner. Such services shall be paid for from the biennial budget of the Department of Health." (18 VSA § 507)</p> <p>"(1) If the disposition of the remains of a decedent is determined under subdivision (a)(10) of this section, the Office of the Chief Medical Examiner may contract with a funeral director or crematory operator to cremate the remains of the decedent." (18 V.S.A. § 5227)</p> |

The NIJ Forensic Technology Center of Excellence

RTI International (RTI) and its academic and community based-consortium of partnerships, including its Forensic Science Education Programs Accreditation Commission partners, work to meet all tasks and objectives put forward under the National Institute of Justice (NIJ) Forensic Technology Center of Excellence (FTCoE) Cooperative Agreement (award number 2016-MU-BX-K110). These efforts include determining technology needs; developing technology program plans to address those needs; developing solutions; demonstrating, testing, evaluating, and adopting potential solutions into practice; developing and updating technology guidelines; and building capacity and conducting outreach. The FTCoE is led by RTI, a global research institute dedicated to improving the human condition by turning knowledge into practice. The FTCoE builds on RTI's expertise in forensic science, innovation, technology application, economics, data analytics, statistics, program evaluation, public health and information science.



Disclaimer

The NIJ FTCoE, led by RTI International, is supported through a Cooperative Agreement from the NIJ (2016-MU-BX-K110), Office of Justice Programs, U.S. Department of Justice. Neither the U.S. Department of Justice nor any of its components operate, control, are responsible for, or necessarily endorse, this landscape study.

Information provided herein is intended to be objective and is based on data collected during primary and secondary research efforts available at the time this report was written. Any perceived value judgments may be based on the merits of device features and developer services as they apply to and benefit the law enforcement and forensic communities. The information provided herein is intended to provide a snapshot of current alternate light source developers and a high-level summary of available devices; it is not intended as an exhaustive product summary. Features or capabilities of additional instruments or developers identified outside of this landscape may be compared with these instrument features and service offerings to aid in the information-gathering or decision-making processes. Experts, stakeholders, and practitioners offered insight related to the use of alternate light sources for law enforcement agencies.

NIJ is the research, development, and evaluation agency of the U.S. Department of Justice. NIJ is dedicated to improving knowledge and understanding of crime and justice issues through science. NIJ provides objective and independent knowledge and tools to inform the decision-making of the criminal and juvenile justice communities to reduce crime and advance justice, particularly at the state and local levels.

The NIJ Office of Investigative and Forensic Sciences (OIFS) is the federal government's lead agency for forensic science research and development. OIFS' mission is to improve the quality and practice of forensic science through innovative solutions that support research and development, testing and evaluation, technology, information exchange, and the development of training resources for the criminal justice community.