

Fostering Innovation Across the U.S. Criminal Justice System

Identifying Opportunities to Improve Effectiveness, Efficiency, and Fairness

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INTRODUCTION

The three central pillars of the criminal justice system—law enforcement, the courts, and corrections agencies—work together toward the common goal of addressing the challenge of criminal behavior. Law enforcement agencies are charged with protecting the public from crime, holding offenders accountable, and providing security and first-responder support during emergency incidents, all while attempting to maintain positive relations and trust with the communities they serve. Courts are the link between law enforcement and the corrections system, adjudicating disputes, prosecuting crime, and providing a venue for negotiation and resolution. Corrections agencies manage offenders confined in prisons and jails, along with those released into the community on probation and parole. These agencies seek to protect the public while rehabilitating the individuals they manage for eventual reintegration into the community.

Because of the wide variety of issues and incidents to which the criminal justice system

responds, it should not be surprising that the system faces many challenges. Such challenges include new types of technological crime facing the police; new demands complicating court operations; and, in the corrections context, practical challenges from managing aging offender populations to dealing with drones used to smuggle contraband over prison walls. Moreover, as society changes, the challenges facing the criminal justice system can be expected to continue to shift.

Addressing these challenges requires innovation by justice agencies, including using new technologies, making changes to policy or practice, and developing new strategies for taking on the societal problems the system is expected to solve. As the research and evaluation agency of the U.S. Department of Justice, the National Institute of Justice (NIJ) is the focal point for research, with the goals of addressing challenges faced by state and local criminal justice agencies and fostering the adoption of new technologies, policies, and

CHALLENGES FOR THE U.S. JUSTICE SYSTEM



RESULTS

We identified the following four categories of challenges that come from changes in society as a whole:

- shifts in the amount and nature of crime
- changing needs of contact populations
- public trust and staff accountability
- fairness in and access to justice.

We identified the following five categories of operational challenges facing the justice system:

- decentralization of the justice system
- consequences of new technologies and approaches
- enduring technology challenges
- staff retention and safety concerns
- resource constraints and performance measurement.

practices that can improve agencies' performance. To advance that mission, NIJ sponsored the Priority Criminal Justice Needs Initiative, a five-year cooperative effort designed to gather information from the criminal justice community on its challenges and needs.¹ The goals of the effort were to inform NIJ and others; identify gaps in available technology and practice through research and analysis; and produce approaches to disseminate the findings to research and development planners, practitioners, the private sector, and others to help foster innovation in the criminal justice system.

At the heart of the Initiative was a series of workshops and panels that brought together criminal justice practitioners from agencies across the country, technologists, civil-society representatives, and others to identify current problems, opportunities, and potential approaches to strengthen the justice system going forward. From May 2014 to November 2018, we held 24 workshops and panels.² During each event, we used structured brainstorming sessions to take advantage of the expertise of the group members, who

identified challenges and their potential solutions, along with opportunities to improve the functioning of the criminal justice system and the steps that would be needed to do so. These sessions resulted in long lists of needs relevant to each of the three main sectors of the criminal justice system. The results of each panel are documented in detailed reports associated with the individual workshops and can be accessed as a single database tool produced by the project team (see Hollywood et al., 2020).

However, while the different roles of law enforcement, the court system, and corrections agencies mean that each faces some unique demands and challenges, there are also common issues. Some of this commonality exists because the different parts of the justice system are wrestling with the same challenges. In addition, many of the problems, such as concerns about communications and data interoperability, affect multiple agencies and therefore require cross-sectoral initiatives for solutions to be possible. Efforts to address such challenges depend on innovations that apply across agency and sector boundaries.

In a world of resource constraints . . . solutions that can help multiple parts of the justice system could be opportunities to get more benefits for less cost.

PRIORITY CRIMINAL JUSTICE NEEDS INITIATIVE



PANELS AND WORKSHOPS

May 2014: Corrections Advisory Panel

July 2014: Law Enforcement Futures Advisory Panel

July 2014: Digital Evidence Workshop

September 2014: Future Internet Technologies/Web 3.0 Workshop

April 2015: Comprehensive School Safety Advisory Panel

May 2015: Courts Advisory Panel

May–June 2015: Assessing Effects of Technological Change on the Protection of Constitutional Rights Workshop

September 2015: Broadband Communications Workshop

May 2016: Reducing Mortality in Correctional Facilities Workshop

June 2016: Law Enforcement Advisory Panel

Mid 2016: Corrections Futures Interview Panel

February 2017: Potential Impact of Electronic Media Use on the Right to a Fair Trial Workshop

March 2017: Workforce Issues in Corrections Workshop

April 2017: Social Media and Network Analysis Tools Workshop

May 2017: Challenges with Digital Evidence Held in Remote Data Centers Workshop

June 2017: Serious Mental Illness and Corrections Workshop

July 2017: Video Analytics and Sensor Fusion for Law Enforcement Workshop

November 2017: Law Enforcement Workshop on Technology, Investigations, and the Dark Web

March 2018: Emerging Threats to Correctional Institution Security Workshop

March 2018: Prosecutors Advisory Panel

May 2018: Leveraging Technology to Enhance Community Supervision Workshop

August 2018: Law Enforcement Executive Panel

September 2018: Fighting the Opioid Crisis: Convening Police Leaders and Researchers to Learn Promising Practices and to Inform a Research Agenda

November 2018: Court Appearance Through Telepresence Advisory Panel

Such common needs are attractive as targets for federal investment (because successes would benefit a broader variety of organizations) and private-sector attention (because the market for new products or services would be larger and, therefore, potentially more attractive). Innovations that might be implemented broadly are advantageous in other ways. In a world of resource constraints—which was a common theme across the Initiative’s activities that examined both whole criminal justice sectors and specific policy issues or technologies—solutions that can help multiple parts of the justice system could be opportunities to get more benefits for less cost.

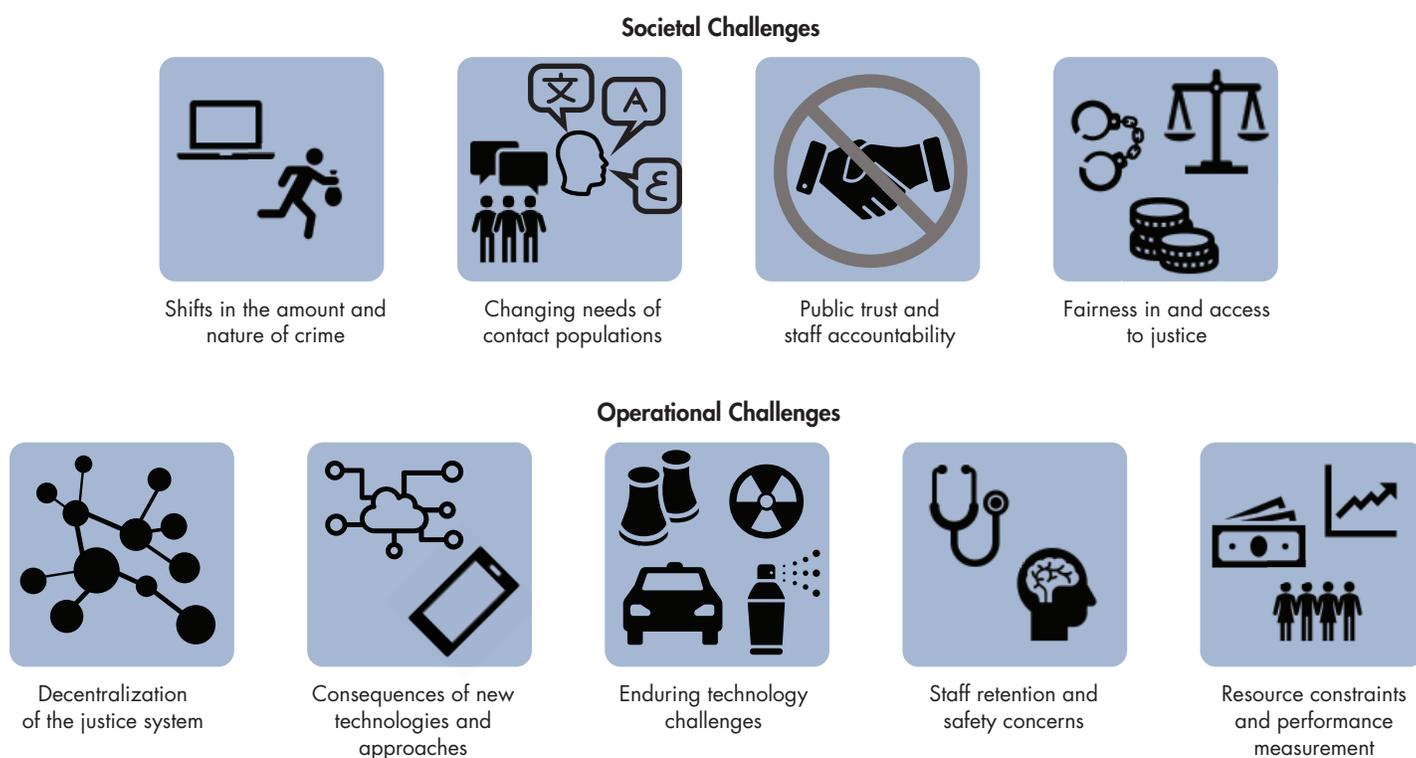
In this report, we focus on these common needs. Starting with the deep pool of feedback and input from the practitioner community collected across the five-year project, we abstracted insights about innovation needs for the justice system as a whole. In structuring this discussion, we divided the challenges and their potential solutions into two main classes (see Figure 1). The first class, comprising four specific areas, represents challenges coming from changes in society overall. Because criminal justice agencies operate within the larger society, such societal shifts cannot help but create tensions to which agencies must respond. The second class of challenges, comprising five areas, comes from inside the justice system

itself. These operational issues include organizational challenges created from the decentralization of the U.S. justice system and continuing shortfalls in performance measurement and agency management that create demands for both near-term innovation and longer-term change. The issues and problems in many of these areas of concern have been the focus of other research. To link the results of this effort to that broader foundation of scholarship, we provide examples of such studies throughout. In the remainder of this report, we examine these societal and operational challenges individually, drawing on the problems and potential innovative solutions identified by our workshop participants and panelists.

SOCIETAL CHALLENGES TO CRIMINAL JUSTICE FAIRNESS, EFFECTIVENESS, AND EFFICIENCY

As part of the infrastructure intended to manage societal problems and protect citizens from risks of crime and violence, justice agencies inevitably will be challenged by shifts in society. In recent years, shifts in criminal behavior have caused such tensions. However, the intersection of the justice system

Figure 1. Challenges for the U.S. Criminal Justice System



NOTE: Icons are from the Noun Project and Microsoft PowerPoint.

New digital crimes, from computer-mediated victimization to identity theft and cyberstalking, present problems for justice agencies that were designed to operate in the physical world rather than the digital world.

and other social challenges, including citizens with mental health or substance use concerns, has had broad-ranging effects. At the same time, tensions between the public and justice agencies have complicated the development and implementation of workable responses to these challenges. In this section, we discuss the problems and potential innovation options in each of these areas. In Table 1 at the end of this section, we provide examples of high-priority innovation needs underlying this discussion that came out of our panels and workshops over the five-year project.



Shifts in the Amount and Nature of Crime

Changes in criminal behavior have created challenges across the justice system. New digital crimes, from computer-mediated victimization to identity theft and cyberstalking, present problems for

justice agencies that were designed to operate in the physical world rather than the digital world.³ Collecting evidence related to digital crimes can require new types of police investigations, and varying levels of experience are required to handle digital evidence, complicating law enforcement's ability to triage evidence from the field. In spite of their desire to respond to the needs of citizens, most local law enforcement agencies have limited ability to respond to crimes where the perpetrators might be thousands of miles away and might have entered their jurisdiction only virtually. Cybercrimes also create challenges for court practitioners in both maintaining the expertise in technology needed to understand the nuances of such cases and developing ways to successfully present what can be highly technical cases to juries (Bossler and Holt, 2012; Gogolin and Jones, 2010; Grabosky, 2007, and references therein).

The effects of the internet, and of social media use in particular, are reverberating in both the court and corrections contexts. In the courtroom, social media has been used to intimidate witnesses and tamper with juries, with both real

and implied threats sometimes broadcast from the back of a courtroom while court is still in session (Browning, 2014; Davis, 2013). Officials in corrections facilities find it difficult to control inmates' connectivity to outside society because of the smuggling of contraband smart phones into prisons and because of the need to allow some access to the internet for inmate education, electronic communication with family, and reentry preparation (Grommon, 2018; Grommon, Carter, and Scheer, 2016). Probation and parole agencies also have difficulty monitoring offenders' computer use and social media behavior, even when monitoring is required as part of the conditions of supervision for such parolees as sex offenders (McKay, 2003; LaMagna and Berejka, 2009).

Cyber threats to criminal justice agencies' own information systems can affect the systems' ability to do anything at all. Such threats are pervasive; there have been cases of law enforcement information being hacked and released publicly, agencies' data taken hostage by ransomware, court records being threatened by persistent cyber vulnerabilities, and inmates in correctional institutions using facility systems to support disruption or escape.⁴

Another shift in the nature of crime involves the proliferation of recreational drugs and of ways for those drugs to penetrate the criminal justice system. In particular, corrections personnel need to be vigilant about the growing variety of drugs—from varied derivatives of synthetic marijuana to successive generations of stronger and stronger opioids—to keep the substances out of their facilities and monitor use as part of community supervision (Jones, Einstein, and Compton, 2018; Armenian et al., 2018). Although access to illegal substances and other contraband has long been facilitated through incoming mail and through smuggling by new inmates or misbehaving staff, the proliferation of such devices as hobbyist-level drones or unmanned aerial vehicles (UAVs) offers a new route for drugs and other contraband to come into facilities. The use of such devices is not yet commonplace.

Common Innovation Needs and Opportunities

Suggested innovations included the need for model policies and procedures that are specific to such new types of crime as “SWATing,” or calling the police from a falsified telephone number to trigger a law enforcement tactical response to another address. The law enforcement and corrections sectors in particular noted the need for better tools and training to improve the collection and handling of digital evidence, along with better approaches for triaging evidence collected in the field. Corrections officers emphasized that better approaches are needed to support community corrections personnel in being effective first responders to incidents involving offenders. They also cited the need for a low-cost field device that can extract data from cell phones and maintain the chain of custody of those cell phone data. Corrections personnel highlighted the value of a training curriculum—and funding to support training—on how to respond to a crime scene and preserve both physical and electronic forensics evidence. Law enforcement personnel emphasized the need for research on the challenges posed by encryption for responding to criminal behavior, including child abuse, terrorism, drug trafficking, and other crimes facilitated by technology. Court personnel noted the need for training to enable prosecutors, judges, and others to address such crimes in court.

Across all three sectors, the need for innovations to improve the justice system’s posture with respect to cyber threats was prominent. For the court system, the requirement to maintain the integrity of the court record led to suggestions to develop standards to protect the “virtual filing cabinets” that hold those records, consensus on which documents can be accessed anonymously, and discussions about appropriate uses of such tools as encryption. Representatives from the courts also called for standards to evaluate the security of third-party cloud storage providers. Law enforcement flagged the need for information resources to help assess risk and more-active “Red Team” efforts to test the ability of personnel to respond to cyberattacks.⁵ Community corrections officials flagged a need for guides and training materials for the probation and parole community on affordable and cost-effective means to deploy and use secure mobile computing technologies.



Changing Needs of Contact Populations

A consensus message across sectors in our research was that the roles and activities of agencies have grown more complex because of both mission creep and an increase in the number of

incidents in which justice agencies serve as first responders for an increasingly diverse population, some of whom are dealing with mental health or substance abuse issues. In many cases, the justice system has become the default mental health and substance abuse response system in the country. Police agencies often are first on the scene to provide mental health response, courts wrestle with the right approach for individuals whose offending might be driven by a treatable illness, and corrections agencies have become the nation’s de facto primary institutions for mental health care delivery (Al-Rousan et al., 2017). Similar points have been raised regarding the justice system’s ability to address individuals with substance abuse problems (Dodson, 2018). Specialty courts have been developed as an approach to address some of these challenges, although practitioners who participated in the Initiative expressed concern that the national justice system was not designed for this problem set and was producing adverse outcomes for all concerned—from police officers who are expected to respond to incidents without the tools they need to address them to imprisoned individuals without adequate treatment ending up on a treadmill of reoffending, leading to long-term incarceration (Wood, Miller, and Kaplan, 2018; Kaplan, Miller, and Wood, 2018, and references therein).

Another shift in society affecting criminal justice agencies involves the challenge of a highly multilingual society. In some urban environments, for instance, residents speak dozens of dif-

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ferent languages, creating translation and interpretation needs for a police officer making a traffic stop or responding to a call for service, for court officials seeking to ensure that all participants understand the proceedings, for institutional corrections officers monitoring inmate communications for security, and for community corrections personnel delivering services to diverse populations (Shah, Rahman, and Khashu, 2007; Davis and Isaacson, 2017; Martínez-Gómez, 2018).

Common Innovation Needs and Opportunities

Participants in the Initiative noted advances that have been made to address the mental health and substance abuse needs of contact populations (e.g., the Crisis Intervention Team model of response) and identified areas in which innovations are needed (Watson and Fulambarker, 2012, and references therein). All sectors emphasized the need for training to better prepare staff for these roles. Corrections personnel expressed interest in comprehensive video-based training to help staff address medication needs and other requirements for managing inmate and parolee mental health issues. Law enforcement participants were interested in training multiple skills together because the tendency to train skills in isolation leaves officers to determine how to integrate their knowledge and apply it simultaneously in the field (for example, training in the use of deadly force separate from efforts to teach officers de-escalation or interaction with individuals with mental health concerns). These personnel emphasized that research and measures also are

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needed to assess the effectiveness of different modes, methods, quality, and types of training integration.

Other areas for innovation focused on models for serving populations with mental health or substance abuse problems, including mobile mental health teams to serve individuals under correctional supervision in rural areas and alternative diversion options (e.g., mental health treatment) for institutional corrections to move individuals to providers who can best serve their needs. Courts focused on the need for better tools to sort cases and match them with the process that is most likely to produce an outcome efficiently and effectively (e.g., negotiation, trial, diversion, specialty court).

The needs of the multilingual populations served by criminal justice agencies were the source of a very specific technology requirement across the three sectors: technology for real-time language translation. Technologies for speech-to-speech translation exist but need to be improved significantly to meet justice practitioners' needs.



Public Trust and Staff Accountability

A lack of public trust can affect criminal justice agencies' ability to be successful by reducing the willingness of the public to work with them and decreasing the perceived legitimacy of their actions. As we were studying the challenges for U.S. criminal justice and identifying innovation opportunities that would be valuable to pursue, public trust and the legitimacy of public safety agencies in the eyes of the public became a major national issue. This project's first workshop was held in the same year as the shooting death of Michael Brown in Ferguson, Missouri, in August 2014, and subsequent deaths in the course of police-use-of-force incidents triggered protests and public scrutiny of law enforcement nationally. In some cases, the availability of recordings by bystanders brought what might have been local incidents to national attention. Driven by these concerns, the justice system as a whole—most dramatically, law enforcement and the courts—is wrestling with demands for increased transparency and the public release of data. Although it is certainly valuable for accountability and maintaining trust, striking the balance between individual privacy and the public's right to access government data remains difficult.

Damaged trust between public safety agencies and the citizens they are charged to protect has consequences for people's willingness to report crime or cooperate with police and, there-

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fore, for the viability of such strategies as community policing, which rely on collaborative approaches to solve problems (Slocum, 2018; Murphy, Madon, and Cherney, 2017). Participants in our panels also noted that the damaged legitimacy of the criminal justice system as an institution increases risks for officers and other practitioners.⁶ A public that does not trust police to be fair or that views police as illegitimate likely also will be less comfortable with justice agencies deploying technologies that might have the potential for misuse or abuse.

Although much of the national debate around legitimacy and trust has centered on law enforcement, similar issues were raised in discussions of challenges to courts and corrections. Over the past five years, such issues as the falsification of evidence by forensic labs, leading to false convictions, and the high-profile exoneration of individuals years after conviction, have raised questions about the effectiveness of courts as finders of fact (Jamieson and Hennessy, 2007; Muller and Schrage, 2014). In corrections, examples of staff misconduct—including collusion between staff and inmates, which leads to significant undermining of the institutions' security—prompted concerns about how such activity could be better detected and prevented and discussions about how the legitimacy of the sector could be strengthened (Center for the Advancement of Public Integrity, 2016).

Common Innovation Needs and Opportunities

Changes in public expectations of the justice system, particularly with respect to police and courts, led to several reported innovation needs. These needs included the development and dissemination of best practices on community relations and the adoption of public notification tools (including social media) and public education efforts to broaden understanding of the roles and functions of different parts of the justice system. To address the specific challenge of citizens involved in court proceedings who have limited legal or procedural knowledge (including individuals representing themselves), court personnel stressed the need to use electronic tools (such as video and

Microsoft PowerPoint) to educate them on the process. To ensure fairness, approaches to use these tools would need to reach both sides in a dispute and be carefully framed to not cross the line into providing legal advice.

Although increasing the dissemination of information is important to building and maintaining trust, law enforcement personnel emphasized the need to balance demands for transparency with legitimate safety and organizational concerns about release of information. Participants recommended a collaborative effort to leverage existing research to identify promising legal provisions and policies surrounding video footage and other law enforcement surveillance data. Clear guidelines were felt to be needed to distinguish between data that should be published to improve transparency and fight crime and data that, if released, could be readily exploited by criminals.

Participants in our panels also emphasized the need for staff training to improve relations with the public. Law enforcement personnel stressed the need to overcome the “us versus them” mentality between police departments and the community and noted that measures were needed to evaluate the success of activities to improve the relationship between law enforcement and the community.

Law enforcement personnel acknowledged that fortifying police stations or courts to improve security can affect relationships with the public. Changes in police tactics and equipment, characterized by some as “militarization,” similarly were discussed. Participants described the need for a better understanding of how the choice of technologies and criminal justice tactics can affect public trust. Standards and performance measures also are needed regarding effective security for different types of courts and locations within courts to minimize intrusiveness for court participants, staff, and the public.

To address issues of staff accountability, law enforcement and corrections personnel emphasized the need to provide better information to the public regarding the prevalence of misconduct and the ways in which it is addressed to establish context for high-profile individual incidents. At the same time,

In policing, one area of concern focused on the equity of policing strategies and the effect of implicit and other biases on justice agency actions.

agencies recognized the importance of doing a better job in ensuring staff accountability and reducing the likelihood of such situations occurring. Possible approaches included developing best practices for the use of analytic tools to create an audit trail and for the use of body cameras and Global Positioning System (GPS) tracking devices to monitor the behavior of law enforcement and corrections officers.



Fairness in and Access to Justice

Closely related to the issue of public trust is the challenge of the perceived fairness of the justice system—that is, whether the system is procedurally just and whether individuals of different

racess or from different socioeconomic strata are treated fairly (Khogali, Jones, and Penrod, 2018; Woolard, Harvell, and Graham, 2008). In considering both current challenges and the potential for innovation in criminal justice, our panel members identified maintaining and increasing fairness (both real and perceived) as an important goal. In policing, one area of concern focused on the equity of policing strategies and the effect of implicit and other biases on justice agency actions. This issue was raised in debates regarding police use of force and the disparate impacts on communities of such strategies as order-maintenance policing (Tyler, Jackson, and Mentovich, 2015). It also was mentioned in our discussion with respect to future technology-focused public safety strategies. For such analytic methods as predictive policing, concerns were raised about how algorithms might learn social bias when they are trained, for example, using historical arrest data (Simmons, 2018; Lee, 2018).

Issues of economic disparity in justice were flagged in several instances with respect to the courts system. The use of money bail was one example where individuals with greater access to resources would be affected differently; specifically, they would be able to get out of jail before trial rather than bearing the employment, family, and other consequences of having to remain in custody before their case was resolved

(Stevenson, 2018). That issue also was reflected in concerns about the routine use of plea bargaining to resolve cases: Individuals without the means to post bail might accept guilty pleas rather than exercise their rights to contest their case and have true access to the justice system.⁷ Resource constraints on public defenders' offices and for *pro se* litigants (i.e., individuals representing themselves) similarly raised concerns about fairness and whether the outcome of court processes would reflect the goals a just society relies on courts to pursue (Henschen, 2018; Yee, 2017; Joe, 2016).

In both the court and corrections contexts, participants posed the question of whether the trend for individuals convicted of crimes paying out of pocket for their involvement in the justice system—that is, a fee-for-justice model—was consistent with the goals society wanted to achieve. The clearest examples of this came from the corrections system in terms of costs for some services in correctional institutions (e.g., phone calls) and in community contexts (e.g., paying fees associated with supervision). Fees and fines also were described as having disparate impact, especially when the inability to pay results in other sanctions that can magnify their effect on poorer segments of the population (Martin et al., 2018; Lofstrom and Raphael, 2016; Latessa and Lovins, 2019; Link, 2019).

Common Innovation Needs and Opportunities

Law enforcement panelists noted that, while community policing is one of the most-frequently cited solutions for improving community relations and addressing fairness concerns, there is a great deal of variation, confusion, and misperception as to what community policing is. To address this issue, panelists called for best practices on community policing strategies and practices for agencies to work collectively, sharing resources to implement these strategies. Panelists also sought options for assessing law enforcement-initiated alternatives to traditional court proceedings, such as alternative dispute resolution, restorative justice, arbitration and mediation, and diversionary programs. Law enforcement also prioritized the need for research and measures to assess the effectiveness of different

Table 1. Examples of Top-Tier Innovation Needs Related to the Societal Challenges Identified by Initiative Panels

Issue/Challenge	Associated Need or Innovation
Shifts in the amount and nature of crime	<ul style="list-style-type: none"> • Assess training materials for investigating crimes involving digital evidence and make recommendations for improvements. • Develop options to triage digital evidence in the field to minimize the amount of data collected during investigations. • Define strategies and minimum standards for protecting the “virtual filing cabinets” that hold the court’s formal records, including requirements for different document types, consensus on what documents can be accessed anonymously, and appropriate use of such tools as encryption. • Implement stringent, already available web filtering software to address risks from inmate access to technology in corrections institutions.
Changing needs of contact populations	<ul style="list-style-type: none"> • Assess the adequacy of resources for mental health response and treatment at the regional or lower levels and the implications on law enforcement of the current situation. • Develop comprehensive video-based training for corrections staff on needs, medication, and other requirements to manage inmate mental health issues. • Assess the importance and effectiveness of additional de-escalation training for law enforcement officers. • Develop automated tools for transcribing inmate telephone calls, enabling rapid (and accurate) keyword analysis and other pattern recognition. • Develop affordable, portable, accurate, real-time, multilanguage speech-to-speech translators to support criminal justice functions.
Public trust and staff accountability	<ul style="list-style-type: none"> • Develop and disseminate best practices on sectoral policing and/or community relations. • Invite researchers and industry organizations (e.g., the International Association of Chiefs of Police) to produce materials that raise the level of public awareness and increase the amount of context that the public and politicians have access to on police misconduct. • Define standards and performance measures for effective security for different types of courts and locations within courts to minimize intrusiveness for court participants, staff, and the public. • Work with correctional staff and unions to reduce resistance to comprehensive searching of employees to address the smuggling of contraband into facilities.
Fairness in and access to justice	<ul style="list-style-type: none"> • Conduct research and develop measures to assess the effectiveness of different modes, methods, quality, and types of procedural justice training tools. • Assess community policing implementations to determine which ones are most successful. • Develop better tools to sort cases and match them with the process that is most likely to get to an outcome efficiently and effectively (e.g., negotiation, trial, diversion, specialty court), including collecting data to inform the assessment by all parties involved (e.g., judge, counsel, citizens). • Expand the appropriate use of diversion of inmates to outside service providers (e.g., mental health treatment) rather than incarceration. • Develop alternatives to incarceration, such as intensive monitoring, for parts of the offender population (e.g., individuals convicted of driving under the influence).

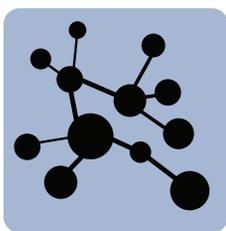
modes, methods, quality, and types of training tools related to procedural justice.

Court personnel highlighted the need to collect data through electronic court information systems that would yield better metrics and measures so that courts can hold themselves accountable for their performance and the ways in which that performance affects different segments of the population. Other major themes among court priorities included developing ways

to better support *pro se* litigants and public defender systems to help address the concern that access to justice is limited by an individual’s ability to pay for it. There were similar priorities among corrections agencies to develop new policies for the outsourcing of corrections functions to the private sector to limit business incentives that would undermine the goals of fairness and justice.

OPERATIONAL CHALLENGES IN INDIVIDUAL AGENCIES AND THE JUSTICE SYSTEM OVERALL

Justice agencies face a variety of operational challenges arising from the overall structure of the U.S. justice system, including specific technical and personnel problems. In this section, we discuss the problems and potential innovation options in each of these areas. As in the previous section, we present examples of high-priority needs that came out of our panel and workshop discussions in Table 2. These needs cut across different categories of common agency operational concerns.



Decentralization of the Justice System

Some challenges throughout the criminal justice system are related to the operating characteristics of the system itself. Chief among these characteristics is the system's decentralization. Police departments are, by definition, local, and the number of officers at

the nation's more than 18,000 law enforcement agencies ranges from fewer than a handful to tens of thousands. Court system organization also differs by state, with state courts having different levels of centralized management. Furthermore, the federal court system coexists with the systems at all other levels. Corrections systems also take various forms, with the added complexity brought on by the inclusion of private corrections services; for-profit firms both manage corrections institutions and provide probation and parole services (Bureau of Justice Statistics, undated).

Decentralization has significant consequences for criminal justice innovation. This atomization can be a boon to innova-

Information sharing and contractual mechanisms were recommended as options for making pricing more transparent across agencies.

tion at the local level because smaller agencies, according to one of our practitioner participants, “can turn like speedboats compared to the battleships of the much larger institutions.” But it also can be a serious barrier because resources in smaller agencies—not only money but also people and expertise—can be seriously constrained. Decentralization also means that innovation in criminal justice in the United States only emerges from the sum of individual innovations across thousands of wholly independent actors, meaning that broad-based change will come slowly unless forces or incentives push change forward.

Decentralization also fragments the market for products and services to meet criminal justice needs. Instead of police, courts, and corrections officials coming to the private sector as one very large customer, individual agencies look for solutions to local problems one by one. This shifts power in the market to the technology providers, leading to concerns about whether available products truly meet agencies' requirements, how much these products will cost, and whether contractual terms might lock agencies into single-provider platforms or mean that agencies lose control of data collected or stored on their behalf. The atomization of the market also can create logistical challenges for technology providers as individual agencies ask for products customized to their local circumstances.

Common Innovation Needs and Opportunities

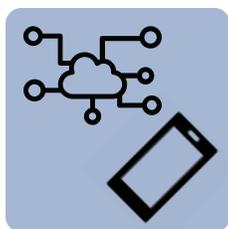
Several of the potential solutions suggested focused on redefining how agencies interact with the private sector—in essence, recommending banding together to do procurement as a group rather than individually. Innovation needs include the development of purchasing consortia to get commodity-level products (e.g., standard computers, uniforms) more cheaply and efficiently and search for tools that organizations in different parts of the justice system could use to learn about best practices for acquisition and purchasing. Information sharing and contractual mechanisms were recommended as options for making pricing more transparent across agencies. Corrections personnel noted a need for new contracting vehicles and for state-approved and nationally approved item lists. These lists would allow for bulk purchasing of key equipment at lower cost and would permit some reciprocity on approved lists across states.

Participants across sectors also identified a variety of approaches for addressing the differing information technology (IT) priorities of the public and private sectors. As would be expected, the majority of proposed solutions for this issue focused on procurement policies and contractual requirements,

Practitioners across all sectors of the justice system complained that their agencies are drowning in a flood of data.

which could be potentially augmented by changes in federal grant policies to prohibit the use of grant funds for systems with the potential to create lock-in (i.e., situations in which the use of proprietary standards or data structures in IT makes it difficult or impossible for an agency to change to a different company if employees are dissatisfied).

Other suggestions spoke to the problem that products often do not meet the needs of specific police departments, courts, or corrections agencies. Proposed ways to address this issue covered almost the full variety of possibilities: developing systems in house, building partnerships with providers or incentivizing firms to create products for smaller agencies, adjusting agency procurement policies, developing guidance for agencies, and reengineering organizational processes.



Consequences of New Technologies and Approaches

New technologies and tactics—including those designed to assist in criminal justice activities—can pose significant challenges for criminal justice agencies.

Practitioners across all sectors of the justice system complained that their agencies are drowning in a flood of data. Law enforcement investigations frequently are complicated by the need to sift through gigabytes of data that could be relevant or extraneous to the particular investigation (Caviglione, Wendzel, and Mazurczyk, 2017). The burden of data overload is then carried over to the court system because prosecution requires the transfer of evidence and sharing in discovery, creating logistics and storage challenges that grow over time. For corrections officials, the ability to capture inmate communications digitally can overwhelm the capacity of agencies to listen and analyze them for potential security threats, criminal activity, or other safety concerns. Use of social media data in community-based supervision raises similar concerns (American Probation and Parole Association, 2019).

Some technological solutions—such as the use of body-worn cameras on police officers—have contributed to the data

challenge. Each camera on an officer produces its own stream of video data, increasing demand for data storage and management (Smykla et al., 2016). Deletion of camera footage as quickly as possible is one response to these storage demands, but questions have been raised as to whether doing so forgoes the potential value of the footage for better understanding systemic issues (Fan, 2018).

The need for cross-agency information sharing also has increased. Many crimes cross jurisdictional boundaries, requiring communication and coordination among relevant agencies that might be next to one another, across the country, among different levels of government, or even international. Even within single geographic jurisdictions, the justice system requires information sharing to work effectively. For example, there is a need for data to be shared between police and the crime lab and then with prosecutors and defense attorneys in discovery. There also might be a need to share data about individuals in the corrections system between institutions and probation officers or among community health and service providers.

Data quality concerns were raised in many parts of the justice system. Staff from multiple organizations taking on diverse roles can result in databases with errors or out-of-date data. The consequences of these errors are magnified when data are shared regionally or even nationwide in response to continued demands for transparency (Logan and Ferguson, 2016).

The need to integrate new technologies into existing agency practice creates training challenges as well. Building staff knowledge of new tools—whether they are new analytical tools for mining insights from crime data or advanced offender-tracking systems in the probation sector—requires teaching staff how to use them to best effect. Organizations with limited training time and budgets might face a nontrivial barrier to innovation (Custers and Vergouw, 2015; Cinar, Trott, and Sims, 2018). Agencies also are challenged by the consequences of individual officers bringing their own technologies to work and the potentially serious consequences of data being recorded on personal phones or posted to the web in the course of the officers' professional duties (Collins, 2012; Collom, 2012).

Agencies described the need for analysis tools that are capable of assessing the implications of changes in the criminal justice system, such as changes to staffing (e.g., 100 more police officers) and changes to data-exchange systems.

Common Innovation Needs and Opportunities

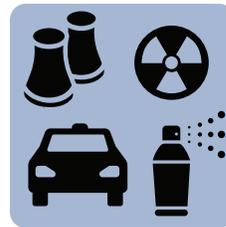
Across police, courts, and corrections, our participants identified a need for foresight and broad situational awareness research to help agencies understand the innovation landscape. These needs focused on monitoring technology trends and developments to help agencies be more proactive with respect to innovation rather than simply responding to change after the fact. In some cases, panelists identified needs related to specific technologies, such as autonomous vehicles or UAVs. More often, they argued that there was a need for broader efforts to support the practitioner community overall and to help prioritize among the many new technologies and research results that are available and assess what is known about their performance.

Other opportunities were more general, including the need to design IT tools to ensure that criminal justice decisionmakers have the right data at the right time to make good decisions. Among the types of tools mentioned were mobile devices that securely deliver inmate information and body-worn computers to improve the effectiveness and efficiency of community corrections. Agencies also highlighted the need for procedural and technical approaches to improve the accuracy of criminal justice data (particularly when many separate agencies are involved), automated data transfers to facilitate the sharing of discovery materials within courts and between law enforcement and courts, and automated analytics to help sift through the mountains of data and rapidly identify trends.

Agencies described the need for analysis tools that are capable of assessing the implications of changes in the criminal justice system, such as changes to staffing (e.g., 100 more police officers) and changes to data-exchange systems. Such analyses could help inform cross-agency decisions to upgrade and help agencies better assess the risks of new innovations before adoption.⁸

In addition, the practitioners who were part of our study also identified a variety of very practical tools and approaches

to make criminal justice agencies better at using innovations. These approaches included customized training resources to help reduce barriers to innovation in agencies that were leery of change, materials to market technology and its value, trainings on the practical requirements of managing innovation projects, and resources to improve the technical skills of staff to facilitate the adoption of new methods and tools.



Enduring Technology Challenges

Although much of the focus of our discussions during the project looked forward, it is important to note that there are several criminal justice technology challenges that have existed unsolved for

many years. Although such problems were not often described as high priority, both law enforcement and corrections practitioners cited continued issues with body armor, other protective equipment, and vehicles. They also noted the need for more-effective, more-predictable, and less lethal weapons to give officers more options short of resorting to deadly force (Stephenson, 2015).

In addition, across all three sectors of the justice system, concerns were raised about emergency preparedness and incident management. These concerns focused especially on communications interoperability among different agencies, the ability to notify the public in emergency situations, and preparedness or continuity of operations planning for justice agencies themselves (National Center for State Courts, 2019; Robbins, 2008). Law enforcement raised issues about responding to incidents more frequently, while court managers were concerned with safeguarding court functioning and records through natural or other disasters. Corrections agencies faced the dual challenges of planning for incidents that might affect prisons or jails directly and reconstituting community correc-

tions operations in a locally disruptive event that might affect both staff and supervisees.

Common Innovation Needs and Opportunities

Solutions to enduring issues raised largely by corrections and law enforcement panelists (although they are potentially relevant to court security officers also) focused on the need for lighter-weight and more-comfortable body armor and other protections for ballistic and stab threats, lower-cost protective gloves for needlestick and other threats, gloves that can keep officers' hands warm while allowing for the effective use of weapons, and other load-bearing clothing and gear that reduce injuries and allow for greater freedom of movement. Other innovation opportunities focused on eliminating barriers to the adoption of protective equipment, including leveraging the research and capability of other federal agencies, such as the U.S. Department of Defense.

Other options focused on addressing issues related to incident management, emergency preparedness, and continuity of operations planning. One approach suggested by agencies was to develop and implement governance structures to address the competing communications priorities of different agencies and sustain interoperability over time. Another suggestion was to deploy patch trucks for radio networks that can filter, translate, and disseminate signals that different agencies can understand. Participants described the need for better tools to alert the public about incidents, including through social media. One such suggestion was to link corrections facilities to the federal wireless emergency alert system to provide alerts on corrections-related events. Other identified needs focused on greater adoption of tools for coordinating across agencies, including the National Incident Management System, and the improvement of policy and training tools for increasing cross-agency preparedness collaboration (Federal Emergency Management Agency, 2020).

Finally, several top-tier needs related to continuity of operations after a disaster. This issue was most prominent for the court system, where there were top-priority needs related to exercises and drills, maintaining the technological systems on which the courts depend, and agreements in which states or adjacent counties collaborate to back up each other's operations. Law enforcement and corrections needs focused on planning for organizational preparedness and recovery after disasters.



Staff Retention and Safety Concerns

Agencies across the justice system described difficulties in recruiting and retaining staff, particularly individuals with key expertise in information technology or other specialties (Ware-

ham, Smith, and Lambert, 2015; U.S. Courts, 2015; National Center for State Courts, 2017; Stinchcomb, McCampbell, and Leip, 2009). Although participants during the workshops sometimes argued that raising standards for recruitment—for example, requiring post-high school education for public safety officers—would be valuable in making the justice system more effective, they also pointed out that recruitment difficulties led to pressure to reduce or eliminate requirements to broaden the pool of potential recruits. Many personnel concerns are related to money, because tight budgets constrain salaries paid to current staff, can limit hiring to replace attrition, and reduce hiring success if wages in other fields outcompete those in public safety. However, personnel concerns are not just about dollars and cents. Participants raised concerns about how criminal justice careers are perceived, especially in terms of prestige, safety, and stress (Sundt, 2009; Yim and Schafer, 2009).

Regarding safety, although the risk to police or corrections officers from violent altercations with suspects might be the most familiar risk of this sort, officers also are injured and killed in vehicle crashes or as a result of other hazards encountered in the course of carrying out their daily tasks. Criminal justice practitioners and officials have been targeted because of

Agencies across the justice system described difficulties in recruiting and retaining staff, particularly individuals with key expertise in information technology or other specialties.

their public safety roles. Concern also persists about the possibility for first responders to be exposed to risks as a result of new, highly potent drugs, such as fentanyl, and in large-scale disasters or terrorist incidents (Mumford, Taylor, and Kubu, 2015).

The stress and mental demands of justice system roles are a major staff safety concern. Practitioners in law enforcement and corrections in particular emphasized the mental health hazards of the job, with participants citing associated health consequences for officers, suicide rates, and overall reduction in life expectancy (Stanley, Hom, and Joiner, 2016; Ferdik and Smith, 2017). Officers can be directly affected by the demands of the job, but also can experience secondary trauma as a result of witnessing the victimization and death of colleagues and from responding to the needs of crime victims.

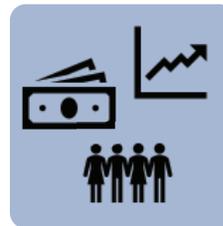
Common Innovation Needs and Opportunities

Although the types of staff that individual justice agencies employ can differ, there were common needs related to staff recruitment and retention across the three sectors. These included the need for better marketing tools, approaches for assessing potential staff at hiring, and incentives to retain staff who might leave public service for better-compensated private roles.

High-priority needs identified to protect staff included the development of new training to better prepare staff to address risks to their safety, particularly regarding use of force and weapons. Other options focused on improving equipment to better protect criminal justice staff, including making changes to personal equipment and disseminating effective practices for selecting and carrying gear. Participants also described the need for novel tools to allow officers to avoid or respond to threats,

such as a handheld mobile device that can detect weapons from a safe distance.

Across all three sectors, practitioners identified options for responding to the targeting of officers and criminal justice leaders, along with expanded efforts to protect the dissemination of personal information that could be used to do so. Law enforcement and corrections personnel emphasized the need to better address the mental health effects of working in criminal justice through training and programming for stress management, workforce management approaches to reduce stress on staff, and efforts to respond to staff mental health issues.



Resource Constraints and Performance Measurement

Across the criminal justice system, participants cited resource shortages as an enduring challenge. Even before the tightening of resources in the past few years, there were concerns about capacity

in the justice system, particularly about insufficient numbers of police officers, heavy caseloads in court systems and public defender agencies, overcrowding in correctional institutions, and heavy caseloads for parole and probation officers supervising individuals after release (Yang, 2016; Galvin, 2017; Oppel and Patel, 2019). Although resource shortages can be a driver of innovation—because new technology or practice might make it possible to do more with less—it also is an impediment because being stretched to address immediate needs can make it difficult to make longer-term investments in improving performance.

In responding to resource constraints, practitioners noted a fundamental need for performance and efficiency measurement, both to quantify the effects of resourcing and, more

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broadly, to assess how effectively the justice system is performing its varied societal roles. In policing, clearance rates (i.e., the percentage of crimes for which an arrest is made) for many types of crime are less than 50 percent: for violent crime, average clearance rates are approximately 46 percent, and for property crime, the percentage of reported crimes that are cleared is lower (Federal Bureau of Investigation, 2017). And clearance rates reflect only reported crime, meaning that the percentage of the total societal crime burden cleared by police is lower still. Participants also expressed concerns about rates of criminal

recidivism. Most criminal justice offenders are released back into their communities at some point, and the rate at which they fall back into crime calls into question the capability of current efforts to promote behavioral change and address crime risk over the longer term.

Being able to connect outcomes to resources, staff, training, and capability is critical. It is a management cliché that what gets measured gets done. However, the ability to measure not only outcomes but also the relationship between those outcomes and inputs is key to effective management. Across mul-

Table 2. Examples of Top-Tier Innovation Needs Related to the Operational Challenges Identified by Initiative Panels

Issue/Challenge	Associated Need or Innovation
Decentralization of the justice system	<ul style="list-style-type: none"> • Create governance structures that limit the level of autonomy that elected judges can have in customizing technological systems for their individual courtrooms to reduce the chance that, by attempting to simultaneously meet the needs of multiple stakeholders, the resulting products will not work well and threaten data quality and system viability.
Consequences of new technologies and approaches	<ul style="list-style-type: none"> • Develop tools that help judges effectively use available information to inform bail decisions, helping to maintain consistency across courts while limiting the potential for information overload. • Examine ways to better present assessments of what is known about new technologies and practices and what the “most promising” options are to decisionmakers. • Continue federal efforts to research and evaluate correctional programs that work and can be broadly implemented to help agencies invest limited budgets for innovation. • Develop automated data analysis tools to rapidly identify trends in internal data systems (without the lag involved in many centralized analytic processes) using improved CompStat methods for corrections. • Identify and publicize specific use cases for UAVs (e.g., barricaded subjects, crime scene investigations) that have high utility and no privacy concerns in order to respond to concern about their use in law enforcement. • Produce and disseminate affordable tools that provide for querying multiple federal, state, and local databases about people, places, and things. Perform analytics on the results. • Define consensus formats and standards for digital data to be admissible in court to resolve challenges of digital evidence in multiple, incompatible data formats.
Enduring technology challenges	<ul style="list-style-type: none"> • Design court information systems with backup capabilities and prioritize technology support to focus on restoring critical systems when they go down. Develop, exercise, and implement response plans to address technology failures. • Develop guidebooks and training materials on how to plan for and recover from a natural disaster from the community corrections perspective. • Hold more interagency exercises to build relationships between agencies and bolster preparedness for large-scale incidents, where success depends on using common resources effectively. • Address shortfalls in the ability to notify individuals in the court building during emergencies by adopting available commercial alerting tools. • Explore cases in which states or adjacent counties collaborate to back up each other’s court operations during natural disasters or other events.
Staff retention and safety concerns	<ul style="list-style-type: none"> • Research and disseminate effective practices for selecting and carrying gear, reflecting concerns for officer health, mission flexibility, and citizens’ perceptions of appearance, including informing the public about why gear is carried in certain ways. • Develop a handheld mobile device that can scan for materials in weapons (e.g., guns, knives) from a safe distance to protect community corrections officers. • Assess the adequacy of resources for mental health response and treatment at the regional or lower levels, along with the implications of the current situation on law enforcement.

Table 2—Continued

Issue/Challenge	Associated Need or Innovation
Resource constraints and performance measurement	<ul style="list-style-type: none"> • Implement a true justice reinvestment model to provide agencies with access to a pool of funds to draw on to pay the start-up costs for new evidence-based practices or programs. • Adopt court system business process reengineering in a formalized way, including tools for process documentation and reengineering, and match processes to the goals the courts are trying to achieve. • Assign increased and more-targeted resources to address changes in the population of offenders under community supervision (e.g., resources addressing more-frequent violations as more dangerous, higher-risk offenders into community monitoring to reduce institution overcrowding). • Study the risks and benefits of public safety dispatch center consolidation as a cost-saving approach. • Update corrections training materials and software so that they are current, more realistic, visual, and more interactive to better maintain staff interest and engagement. • Develop best practices for integrating and using existing internal and community data for evaluating law enforcement operational success. • Collect data through electronic court information systems for better metrics and measures so that courts can hold themselves accountable for their performance and the way that performance affects different segments of the population.

tiple sectors, practitioners raised the possibility that technology might compensate for staff limitations or resource constraints. However, without the ability to measure what is done and what is accomplished, it is impossible to assess whether that strategy is good or bad.

Common Innovation Needs and Opportunities

Although many participants argued that the justice system requires more resources or different funding streams and that leaders should better advocate for those needs, a wide variety of cross-sector needs focused on how justice agencies could save resources and do more with less. Such needs included options for making justice system infrastructure (e.g., buildings and physical facilities) more efficient or optimizing the ways in which infrastructure is used as a means to cut costs.

Other areas of major focus for reducing resource demands were business process reengineering to seek efficiencies or focus resources on tasks of greatest need, staffing models that would allow tasks to be completed with less expensive personnel, new delivery models that are less resource intensive, less expensive ways to train existing staff, and such new technologies as telepresence (i.e., technology to simulate physical presence). However, participants identified the need to verify that new technologies actually are saving resources. When new systems are put in place, resource constraints can mean that their successes are difficult to sustain without changes in procurement and management approaches.

Although it is useful in responding to broader concerns about performance assessment, measurement is required for

effective innovation as well; to get better, organizations need to be able to define and measure what “better performance” means, which would allow them to choose what to focus on and determine whether improvement efforts are successful.

CONCLUSION: SETTING THE INNOVATION AGENDA FOR THE U.S. CRIMINAL JUSTICE SYSTEM

Over five years of discussions involving hundreds of criminal justice practitioners, technical experts, civil-society advocates, and many others, participants identified a wide variety of needs related to solving key challenges in the criminal justice system or to capitalizing on opportunities presented by new technologies or societal changes to better achieve justice goals. The picture that emerges from the full data set developed through the Initiative’s efforts reveals a national law enforcement, courts, and corrections system that is facing many difficult challenges.

In many cases, the individual justice sectors had unique issues and roles and, therefore, had quite different innovation needs and priorities. Predictably, institutional corrections agencies had especially significant concerns and offered many potential solutions regarding the management of facilities and large numbers of individuals under supervision. Conversely, a much larger percentage of court priorities for innovation focused on information management and use, given the many demands for data sharing and use in court processes, during appeals, and in maintenance of the court records. Challenges also dif-

ferred across jurisdictions and geography: Problems and viable solutions can be quite different for agencies that are responsible for geographically dispersed and sparsely populated rural areas than for those that are responsible for densely populated urban jurisdictions.

However, as we have explored in this report, there are also common challenges across agencies. Looking across the different categories of problems and solutions that emerged from our workshops and practitioner panels, there were technology, policy, and practice innovations in common across law enforcement, courts, and corrections. These common needs and solutions were not always the top priorities in all of the sectors, but the breadth of their applicability would multiply the potential value of addressing them.

While some proposed solutions relied on technologies or emerging approaches (e.g., much broader application of biometrics or advances in protective technologies), many drew on tools that are already on the shelf. The majority of these solutions fell into the near-to-middle-term time frame, or over a three-to-five-year time frame at most. Among these needs, there were significant examples of potential low-hanging fruit, or changes that could be made using existing technology and business practices that possibly could improve performance in the relatively near term.

Although the inputs from our large group of workshop participants over the course of the project provided a broad foundation for considering how innovation could improve the effectiveness, fairness, and efficiency of the justice system, an important caveat is that other practitioners with different visions of what the future holds might have identified other priorities. Some of the needs identified during the course of the effort explicitly acknowledged the importance of continued assessment, “futuring,” and an ongoing search for innovation opportunities.⁹ Furthermore, echoing the goals of the Initiative itself, multiple participant panel members called not only for efforts to meet today’s challenges, but also for a greater focus on innovation and change management in justice agencies. By being prepared and positioned to change and learn, justice agencies will be ready to address not just the challenges we know about today but also the challenges that have not yet made themselves known.

Notes

¹ The Initiative was a multiorganization endeavor involving the RAND Corporation, the Police Executive Research Forum, RTI International, and the University of Denver. The Initiative was supported by NIJ Cooperative Agreement 2013-MU-CX-K003 from October 2013 to December 2019.

² In this report, we draw on the full set of issues raised during all of the events held over the course of the Initiative from 2013 to 2018. We draw most heavily on the reports of the sectorwide 2014 Corrections Advisory Panel, 2015 Courts Advisory Panel, and 2016 Law Enforcement Advisory Panel (Jackson et al., 2015; Jackson et al., 2016; and Hollywood et al., 2017, respectively).

³ See Maimon and Louderback, 2019, for a review of what they term “cyber-dependent crime.”

⁴ Example incidents of attacks on U.S. police departments are discussed in Francescani, 2016, and Quinn, 2018.

⁵ *Red-teaming* refers to efforts wherein trusted individuals probe for vulnerabilities and even attempt to attack a computer system to test security and identify ways to strengthen protection.

⁶ See Maguire, Nix, and Campbell, 2017, for an analysis of law enforcement fatality data examining—although not observing—increased risk of law enforcement fatalities.

⁷ For a review, see Cummings and Rhode, 2017. Also see the special issue on access to justice research in the *South Carolina Law Review*, 2016, which examines a wide variety of access to justice issues and initiatives.

⁸ Criminal justice coordinating councils are one potential model for upgrade.

⁹ The full reports from each of the workshops noted in the text box at the beginning of this report can be downloaded from the Initiative page on the RAND website (RAND Corporation, undated).

References

- Al-Rousan, Tala, Linda Rubenstein, Bruce Sieleni, Harbans Deol, and Robert B. Wallace, "Inside the Nation's Largest Mental Health Institution: A Prevalence Study in a State Prison System," *BMC Public Health*, Vol. 17, No. 1, 2017, pp. 342–351.
- American Probation and Parole Association, *The Use of Social Media as a Supervision Tool*, Lombard, Ill., April 24, 2019.
- Armenian, Patil, Kathy T. Vo, Jill Barr-Walker, and Kara L. Lynch, "Fentanyl, Fentanyl Analogs and Novel Synthetic Opioids: A Comprehensive Review," *Neuropharmacology*, Vol. 134, Part A, May 15, 2018, pp. 121–132.
- Bossler, Adam M., and Thomas J. Holt, "Patrol Officers' Perceived Role in Responding to Cybercrime," *Policing: An International Journal*, Vol. 35, No. 1, 2012, pp. 165–181.
- Browning, John, "#Snitches Get Stitches: Witness Intimidation in the Age of Facebook and Twitter," *Pace Law Review*, Vol. 35, No. 1, 2014, pp. 192–214.
- Bureau of Justice Statistics, "The Justice System," webpage, undated. As of February 21, 2020: <https://www.bjs.gov/content/justsys.cfm>
- Caviglione, Luca, Steffen Wendzel, and Wojciech Mazurczyk, "The Future of Digital Forensics: Challenges and the Road Ahead," *IEEE Security and Privacy Magazine*, Vol. 15, No. 6, 2017, pp. 12–17.
- Center for the Advancement of Public Integrity, *Prison Corruption: The Problem and Some Potential Solutions*, New York: Columbia Law School, September 2016.
- Cinar, Emre, Paul Trott, and Christopher Sims, "A Systematic Review of Barriers to Public Sector Innovation Process," *Public Management Review*, Vol. 21, No. 1, 2018, pp. 1–27.
- Collins, Hinton, "New Tech Brings New Issues to Public Safety Agencies," *Government Technology*, July 23, 2012. As of February 22, 2020: <https://www.govtech.com/public-safety/New-Tech-Brings-New-Issues-to-Public-Safety-Agencies.html>
- Collom, Lindsey, "When Police Officers Use Social Media, Their Departments See Risks," *Arizona Republic*, April 17, 2012.
- Cummings, Scott, and Deborah Rhode, "Access to Justice: Looking Back, Thinking Ahead," *Georgetown Journal of Legal Ethics*, Vol. 30, 2017, pp. 485–500.
- Custers, Bart, and Bas Vergouw, "Promising Policing Technologies: Experiences, Obstacles and Police Needs Regarding Law Enforcement Technologies," *Computer Law & Security Review*, Vol. 31, No. 4, August 2015, pp. 518–526.
- Davis, Kevin, "Witness Harassment Has Gone Digital, and the Justice System Is Playing Catch-Up," *ABA Journal*, August 1, 2013.
- Davis, Lynn W., and Scott A. Isaacson, "Ensuring Equal Access to Justice for Limited English Proficiency Individuals," *The Judges' Journal*, Vol. 56, No. 3, 2017, pp. 21–26.
- Dodson, Kimberly D., *Routledge Handbook on Offenders with Special Needs*, New York: Routledge, 2018.
- Fan, Mary D., "Body Cameras, Big Data, and Police Accountability," *Law and Social Inquiry*, Vol. 43, No. 4, Fall 2018, pp. 1236–1256.
- Federal Bureau of Investigation, "Crime in the United States 2017: Clearances," webpage, 2017. As of February 21, 2020: <https://ucr.fbi.gov/crime-in-the-u.s/2017/crime-in-the-u.s.-2017/topic-pages/clearances>
- Federal Emergency Management Agency, "National Incident Management System," webpage, January 16, 2020. As of February 21, 2020: <https://www.fema.gov/national-incident-management-system>
- Ferdik, Frank Valentino, and Hayden P. Smith, *Correctional Officer Safety and Wellness Literature Synthesis*, Washington, D.C.: National Institute of Justice, NCJ 250484, July 2017.
- Francescani, Chris, "Ransomware Hackers Blackmail U.S. Police Departments," CNBC, April 26, 2016. As of February 21, 2020: <https://www.cnbc.com/2016/04/26/ransomware-hackers-blackmail-us-police-departments.html>
- Galvin, Gaby, "Underfunded, Overcrowded State Prisons Struggle with Reform," *U.S. News and World Report*, July 26, 2017.
- Gogolin, Greg, and James Jones, "Law Enforcement's Ability to Deal with Digital Crime and the Implications for Business," *Journal of Digital Forensic Practice*, Vol. 19, No. 2, 2010, pp. 109–117.
- Grabosky, Peter, "Requirements of Prosecution Services to Deal with Cyber Crime," *Crime, Law, and Social Change*, Vol. 47, 2007, pp. 201–223.
- Grommon, Eric, "Managed Access Technology to Combat Contraband Cell Phones in Prison: Findings from a Process Evaluation," *Evaluation and Program Planning*, Vol. 66, February 2018, pp. 39–47.
- Grommon, Eric, Jeremy G. Carter, and Charles Scheer, "Contraband Cell Phone Usage Patterns: An Exploratory Examination of Captured Transmission Data," *Justice Research and Policy*, Vol. 17, No. 2, 2016, pp. 100–122.
- Henschen, Beth, "Judging in a Mismatch: The Ethical Challenges of Pro Se Litigation," *Public Integrity*, Vol. 20, No. 1, 2018, pp. 34–46.
- Hollywood, John S., Brian A. Jackson, Annie Brothers, Mark Barrett, Dulani Woods, and Michael J. D. Vermeer, *A Database of Criminal Justice Needs for Innovation: Requirements for Developers and Funders—User Guide*, Santa Monica, Calif.: RAND Corporation, TL-352-NIJ, 2020. As of March 11, 2020: <https://www.rand.org/pubs/tools/TL352.html>

- Hollywood, John S., Dulani Woods, Sean E. Goodison, Andrew Lauland, Lisa Wagner, Thomas J. Wilson, and Brian A. Jackson, *Fostering Innovation in U.S. Law Enforcement: Identifying High-Priority Technology and Other Needs for Improving Law Enforcement Operations and Outcomes*, Santa Monica, Calif.: RAND Corporation, RR-1814-NIJ, 2017. As of February 21, 2020: https://www.rand.org/pubs/research_reports/RR1814.html
- Jackson, Brian A., Duren Banks, John S. Hollywood, Dulani Woods, Amanda Royal, Patrick W. Woodson, and Nicole J. Johnson, *Fostering Innovation in the U.S. Court System: Identifying High-Priority Technology and Other Needs for Improving Court Operations and Outcomes*, Santa Monica, Calif.: RAND Corporation, RR-1255-NIJ, 2016. As of February 21, 2020: http://www.rand.org/pubs/research_reports/RR1255.html
- Jackson, Brian A., Joe Russo, John S. Hollywood, Dulani Woods, Richard Silbergliitt, George B. Drake, John S. Shaffer, Mikhail Zaydman, and Brian G. Chow, *Fostering Innovation in Community and Institutional Corrections: Identifying High-Priority Technology and Other Needs for the U.S. Corrections Sector*, Santa Monica, Calif.: RAND Corporation, RR-820-NIJ, 2015. As of February 21, 2020: https://www.rand.org/pubs/research_reports/RR820.html
- Jamieson, Kathleen Hall, and Michael Hennessy, “Public Understanding of and Support for the Courts: Survey Results,” *Georgetown Law Journal*, Vol. 95, No. 4, 2007, pp. 899–902.
- Joe, Irene Oritseweyinmi, “Systematizing Public Defender Rationing,” *Denver Law Review*, Vol. 93, No. 2, 2016, pp. 389–429.
- Jones, Christopher M., Emily B. Einstein, and Wilson M. Compton, “Changes in Synthetic Opioid Involvement in Drug Overdose Deaths in the United States, 2010–2016,” *JAMA*, Vol. 319, No. 17, 2018, pp. 1819–1821.
- Kaplan, Tatyana, Monica K. Miller, and Emily F. Wood, “Looking Backward, Looking Forward: How the Evolution of Specialty Courts Can Inform the Courts of Tomorrow,” *Court Review*, Vol. 54, 2018, pp. 14–24.
- Khogali, Mawia, Kristyn Jones, and Steve Penrod, “Fairness for All? Public Perceptions of Plea Bargaining,” *Applied Psychology in Criminal Justice*, Vol. 14, No. 2, 2018, pp. 136–153.
- LaMagna, Richard C., and Marc Berejka, “Remote Computer Monitoring: Managing Sex Offenders’ Access to the Internet,” *Journal of Offender Monitoring*, 2009, pp. 11–24.
- Latessa, Edward J., and Lori Brusman Lovins, “Privatization of Community Corrections,” *Criminology and Public Policy*, Vol. 18, No. 3, May 2019, pp. 323–341.
- Lee, Min Kyung, “Understanding Perception of Algorithmic Decisions: Fairness, Trust, and Emotion in Response to Algorithmic Management,” *Big Data and Society*, 2018, pp. 1–16.
- Link, Nathan W., “Criminal Justice Debt During the Prisoner Reintegration Process: Who Has It and How Much?” *Criminal Justice and Behavior*, Vol. 46, No. 1, 2019, pp. 154–172.
- Lofstrom, Magnus, and Steven Raphael, “Crime, the Criminal Justice System, and Socioeconomic Inequality,” *Journal of Economic Perspectives*, Vol. 30, No. 2, Spring 2016, pp. 103–126.
- Logan, Wayne A., and Andrew Guthrie Ferguson, “Policing Criminal Justice Data,” *Minnesota Law Review*, Vol. 101, 2016, pp. 541–616.
- Maguire, Edward R., Justin Nix, and Bradley A. Campbell, “A War on Cops? The Effects of Ferguson on the Number of U.S. Police Officers Murdered in the Line of Duty,” *Justice Quarterly*, Vol. 34, No. 5, 2017, pp. 739–758.
- Maimon, David, and Eric R. Louderback, “Cyber-Dependent Crimes: An Interdisciplinary Review,” *Annual Review of Criminology*, Vol. 2, 2019, pp. 191–216.
- Martin, Karin D., Bryan L. Sykes, Sarah Shannon, Frank Edwards, and Alexis Harris, “Monetary Sanctions: Legal Financial Obligations in U.S. Systems of Justice,” *Annual Review of Criminology*, Vol. 1, 2018, pp. 471–495.
- Martínez-Gómez, Aída, “Language, Translation and Interpreting Policies in Prisons: Protecting the Rights of Speakers of Non-Official Languages,” *International Journal of the Sociology of Language*, Vol. 2018, No. 251, 2018, pp. 151–172.
- McKay, B. W., “Guardrails on the Information Superhighway: Supervising Computer Use of the Adjudicated Sex Offender,” *West Virginia Law Review*, Vol. 106, No. 1, 2003, pp. 203–244.
- Muller, Christopher, and Daniel Schrage, “Mass Imprisonment and Trust in the Law,” *Annals of the American Academy of Political and Social Science*, Vol. 651, No. 1, 2014, pp. 139–158.
- Mumford, Elizabeth A., Bruce G. Taylor, and Bruce Kubu, “Law Enforcement Officer Safety and Wellness,” *Police Quarterly*, Vol. 18, No. 2, 2015, pp. 111–133.
- Murphy, Kristina, Natasha S. Madon, and Adrian Cherney, “Promoting Muslims’ Cooperation with Police in Counter-Terrorism: The Interaction Between Procedural Justice, Police Legitimacy and Law Legitimacy,” *Policing: An International Journal*, Vol. 40, No. 3, 2017, pp. 544–559.
- National Center for State Courts, “HR Management: Resource Guide,” webpage, October 13, 2017. As of February 21, 2020: <https://www.ncsc.org/Topics/Human-Resources/HR-Management/Resource-Guide.aspx>
- National Center for State Courts, “Emergency Preparedness/ Disaster Recovery: Resource Guides,” webpage, April 5, 2019. As of February 21, 2020: <https://www.ncsc.org/emergencyprep>

- Oppel, Richard A., Jr., and Jugal K. Patel, "One Lawyer, 194 Felony Cases, and No Time," *New York Times*, January 31, 2019.
- Quinn, Christian, "The Emerging Cyberthreat: Cybersecurity for Law Enforcement," *Police Chief Magazine*, December 12, 2018. As of February 21, 2020:
<http://www.policechiefmagazine.org/the-emerging-cyberthreat-cybersecurity>
- RAND Corporation, "Priority Criminal Justice Needs Initiative," webpage, undated. As of February 1, 2020:
<https://www.rand.org/well-being/justice-policy/projects/priority-criminal-justice-needs.html>
- Robbins, Ira P., "Lessons from Hurricane Katrina: Prison Emergency Preparedness as a Constitutional Imperative," *University of Michigan Journal of Law Reform*, Vol. 42, 2008, pp. 1–69.
- Shah, Susan, Insha Rahman, and Anita Khashu, *Overcoming Language Barriers: Solutions for Law Enforcement*, New York: Vera Institute of Justice, 2007.
- Simmons, Ric, "Big Data and Procedural Justice: Legitimizing Algorithms in the Criminal Justice System," *Ohio State Journal of Criminal Law*, Vol. 15, No. 2, 2018, pp. 573–581.
- Slocum, Lee Ann, "The Effect of Prior Police Contact on Victimization Reporting: Results from the Police–Public Contact and National Crime Victimization Surveys," *Journal of Quantitative Criminology*, Vol. 34, No. 2, June 2018, pp. 535–589.
- Smykla, John Ortiz, Matthew S. Crow, Vaughn J. Crichlow, and Jamie A. Snyder, "Police Body-Worn Cameras: Perceptions of Law Enforcement Leadership," *American Journal of Criminal Justice*, Vol. 41, No. 3, 2016, pp. 424–443.
- South Carolina Law Review*, Vol. 67, No. 2, Winter 2016.
- Stanley, Ian H., Melanie A. Hom, and Thomas E. Joiner, "A Systematic Review of Suicidal Thoughts and Behaviors Among Police Officers, Firefighters, EMTs, and Paramedics," *Clinical Psychology Review*, Vol. 44, 2016, pp. 25–44.
- Stephenson, Charles, "Less Lethal Technologies for Law Enforcement," Bureau of Justice Statistics Smart Policing briefing, August 26, 2015. As of February 21, 2020:
http://www.strategiesforpolicinginnovation.com/sites/default/files/webinar_slides/Less%20Lethal%20Webinar%20FINAL.pdf
- Stinchcomb, Jeanne B., Susan W. McCampbell, and Leslie Leip, *The Future is Now: Recruiting, Retaining, and Developing the 21st Century Jail Workforce*, Naples, Fla.: Center for Innovative Public Policies, March 2009.
- Sundt, Jody L., "Good Job or Dirty Work? Public Perceptions of Correctional Employment," *Federal Probation*, Vol. 73, No. 3, 2009, pp. 40–45.
- Tyler, Tom R., Jonathan Jackson, and Avital Mentovich, "The Consequences of Being an Object of Suspicion: Potential Pitfalls of Proactive Police Contact," *Journal of Empirical Legal Studies*, Vol. 12, No. 4, 2015, pp. 602–636.
- U.S. Courts, "Issue 3: The Judiciary Workforce of the Future," in *Strategic Plan for Federal Judiciary*, Washington, D.C., 2015, pp. 9–10.
- Wareham, Jennifer, Brad W. Smith, and Eric G. Lambert, "Rates and Patterns of Law Enforcement Turnover: A Research Note," *Criminal Justice Policy Review*, Vol. 26, No. 4, 2015, pp. 345–370.
- Watson, Amy C., and Anjali J. Fulambarker, "The Crisis Intervention Team Model of Police Response to Mental Health Crises: A Primer for Mental Health Practitioners," *Best Practices in Mental Health*, Vol. 8, No. 2, 2012, pp. 71–79.
- Wood, Emily F., Monica K. Miller, and Tatyana Kaplan, "Specialty Courts: Time for a Thorough Assessment," *Mississippi College Law Review*, Vol. 36, No. 3, 2018, pp. 332–349.
- Woolard, Jennifer L., Samantha Harvell, and Sandra Graham, "Anticipatory Injustice Among Adolescents: Age and Racial/Ethnic Differences in Perceived Unfairness of the Justice System," *Behavioral Sciences and the Law*, Vol. 26, No. 2, 2008, pp. 207–226.
- Yang, Crystal S., "Resource Constraints and the Criminal Justice System: Evidence from Judicial Vacancies," *American Economic Journal*, Vol. 8, No. 4, November 2016, pp. 289–332.
- Yee, Davis G., "The Professional Responsibility of Fair Play When Dealing with a Pro Se Adversary," *South Carolina Law Review*, Vol. 69, 2017, pp. 377–411.
- Yim, Youngyol, and Bryan D. Schafer, "Police and Their Perceived Image: How Community Influence Officers' Job Satisfaction," *Police Practice and Research*, Vol. 10, No. 1, 2009, pp. 17–29.

Acknowledgments

A project that has spanned five years and tens of separate activities could not have been carried out successfully without the efforts of many individuals.

From NIJ, Steve Schuetz shepherded this project from the beginning, and his efforts to shape the agenda and contributions to ensuring that its products were relevant and useful were invaluable to the Initiative's success. Other NIJ staff who made important contributions to specific sectors' efforts or technical areas included William Ford, Marie Garcia, Jack Harne, Joe Heaps, Joel Hunt, Martin Novak, Chris Rigano, Howard Spivak, Chris Tillery, and Linda Truitt. We also are grateful for the support of NIJ directors David Muhlhausen and Nancy Rodriguez over the course of the effort.

From the four organizational partners who carried out the Initiative, a much broader group of research staff were involved over the five-year effort than are listed as authors on this report. To fully acknowledge the contributions of this group of researchers, specialists, and other staff, we provide a comprehensive listing here:

- **RAND Corporation:** Julienne Ackerman, Adwoa Amofa, Sandra Ascencio, Catherine H. Augustine, Babitha Balan, Rebecca Balebako, Dionne Barnes-Proby, Mark Kevin Barrett, Melissa Bauman, Patricia Bedrosian, Debra Belluomini, Samantha Bennett, Arwen Bicknell, Julia Brackup, Annie Brothers, Maria A. Buenaventura, Meagan Cahill, Samantha Cherney, Brian G. Chow, Matthew Clews, Sarah Cressy, Sherban Drulea, Diane Bronowicz Egelhoff, Christopher A. Eusebi, Sara-Laure Faraji, Lee Floyd, Gina Frost, Dara Gold, Sean Grant, Amanda Hagerman-Thompson, Owen Hall, Stacey Rennea Haughton, Monica Hertzman, Stephanie Brooks Holliday, Allison Kerns, Stephan Kistler, Eric Landree, Eileen LaRusso, Jesse Lastunen, Andrew Lauland, Kristin Leuschner, Jocelyn Lofstrom, Mauri Jun Matsuda, Heather McCracken, Rosa Meza, Paul Ng, Cordaye Ogletree, Rachel Ostrow, Bryce Pardo, Catherine Plummer, Laura Poole, Carter Price, Rajeev Ramchand, Adrian Salas, Jessica Saunders, Heather Schwartz, Richard Silbergliitt, Lauren Skrabala, Blair Smith, Karlyn Stanley, Paul S. Steinberg, Quinton G. Stroud, Zoltan B. Szalay, James Torr, Joshua L. Traub, Lisa Wagner, Dori Walker, Francisco G. Walter, Michael Watson, Gabriel Weinberger, Mikhail Zaydman, and Michelle D. Ziegler
- **Police Executive Research Forum:** Nathan Ballard, Jeremy D. Barnum, Elizabeth K. Berger, Robert C. Davis (now at the Police Foundation), Adam R. Kemerer, Bruce E. Kubu, and Thomas J. Wilson
- **RTI International:** Justin C. Dawson, Camille Gourdet, Nicole J. Johnson, Brandy Lawrence, Daniel S. Lawrence, Michael G. Planty, Amanda Royal, Amanda Witwer, and Patrick W. Woodson
- **University of Denver:** George B. Drake and John S. Shaffer.

We also acknowledge the contributions of the former management and staff of Bearded Studio, Inc., led by Matthew Griffin. They were key partners on a web-focused experimental effort during the project.

We also would like to acknowledge Meagan E. Cahill of RAND and Michael D. White of Arizona State University, who provided very helpful reviews of this report.

Our most heartfelt thanks go to the large number of criminal justice practitioners, technical experts, staff from relevant sector or civil-society organizations, and other specialists who took part in the workshops and panels held during the course of this project. Nearly 550 individuals gave generously of their time and expertise, without which this effort would not have been possible.

The RAND Justice Policy Program

RAND Social and Economic Well-Being is a division of the RAND Corporation that seeks to actively improve the health and social and economic well-being of populations and communities throughout the world. This research was conducted in the Justice Policy Program within RAND Social and Economic Well-Being. The program focuses on such topics as access to justice, policing, corrections, drug policy, and court system reform, as well as other policy concerns pertaining to public safety and criminal and civil justice. For more information, email justicepolicy@rand.org.

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About This Report

On behalf of the U.S. Department of Justice, National Institute of Justice (NIJ), the RAND Corporation, in partnership with the Police Executive Research Forum, RTI International, and the University of Denver, is carrying out a research effort to assess and prioritize technology and related needs across the criminal justice community. This initiative is a component of NIJ's National Law Enforcement and Corrections Technology Center (NLECTC) System and is intended to support innovation within the criminal justice enterprise. For more information about the NLECTC Priority Criminal Justice Needs Initiative, see www.rand.org/well-being/justice-policy/projects/priority-criminal-justice-needs.

This report is one product of that effort. It presents the overarching challenges to the U.S. criminal justice system identified by expert workshops throughout the course of the Priority Criminal Justice Needs Initiative. This report and the results it presents should be of interest to practitioners in law enforcement agencies, court systems and corrections organizations at the state and local levels, research and operational criminal justice agencies at the federal level, private-sector technology providers, and policymakers active in the criminal justice field.

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This publication was made possible by Award Number 2013-MU-CX-K003, awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice. The opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect those of the Department of Justice.

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