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Towards Increased Data Sharing and Standardization for Illicit Drug Analysis and Monitoring Workshop Report

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Abstract

Driven by the proliferation of synthetic opioids and novel psychoactive substances (NPS), the rapidly evolving illicit drug crisis requires a highly coordinated, multi-agency response. In accordance with the 2023 Testing, Rapid Analysis, and Narcotic Quality (TRANQ) Research Act, the National Institute of Standards and Technology (NIST) convened stakeholders from law enforcement, border interdiction, forensic science, and public health for a two-day workshop in June 2025. The workshop, titled "*Towards Increased Data Sharing and Standardization for Illicit Drug Analysis and Monitoring*" aimed to assess the current landscape of drug data and identify pathways to overcome systemic barriers to information sharing.

While diverse communities share the ultimate goal of mitigating drug-related harm, the workshop revealed that their efforts can be severely hindered by siloed data storage, inconsistent terminology, and significant administrative burdens. Despite these constraints, stakeholders universally envisioned an ideal system centered on real-time, nationally coordinated data dashboards that would allow agencies to shift from reactive mitigation to predictive prevention of emerging drug events.

To achieve this vision, this report outlines a consensus-driven roadmap. It details a phased approach to overcoming technical challenges and systemic obstacles through the development of unified data standards. Recognizing NIST's expertise in measurement science and standardization, the report concludes with possible NIST action items, including convening a multisector data consortium, developing a standardized drug ontology, and establishing technical frameworks for data interoperability and governance.

Keywords

Drug Surveillance; Data Sharing; Data Standardization; Interoperability; Illicit Drugs; Novel Psychoactive Substances (NPS).

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Acknowledgments

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Executive Summary

The street drug supply in the United States is evolving at an unprecedented rate. Effectively addressing this epidemic, now driven largely by synthetic opioids, novel psychoactive substances, and poly substance use, requires diverse communities to share accurate, real-time intelligence. In June 2025, the National Institute of Standards and Technology (NIST) hosted the "Towards Increased Data Sharing and Standardization for Illicit Drug Analysis and Monitoring" workshop. This workshop brought together representatives from multiple communities directly involved in responding to the drug epidemic, including border interdiction, law enforcement, public health, forensic science, and clinical. The core objective was to identify the constraints preventing effective data sharing across these disciplines and to develop a collaborative roadmap to overcome them.

At its core, "data" in the street drug space is highly contextual. A forensic chemist relies on raw instrumental output, a public health official relies on aggregated epidemiological trends, and law enforcement relies on actionable intelligence. Because data is collected differently to answer distinct, mission-critical questions, post-collection storage is frequently disorganized, decentralized, and inconsistent. Vital intelligence is currently locked in siloed Laboratory Information Management Systems (LIMS), restricted dashboards, or unstructured paper files, preventing a comprehensive national picture of the drug landscape.

To frame the problem, workshop participants categorized barriers as either *challenges* (technical problems requiring scientific solutions) or *obstacles* (systemic problems rooted in policy, law, or culture).

When discussing the most pressing barriers to sharing data, participants identified onerous legal and administrative procedures – specifically establishing Memoranda of Understanding (MOUs) and Data Use Agreements (DUAs) – as the greatest obstacle. Broadly, however, the constraints fell into five major themes:

- *Standardization:* A lack of common terminology, formatting, and centralized data repositories severely limits interoperability.
- *Resources:* High costs, limited technical expertise, and insufficient IT infrastructure prevent long-term data partnerships.
- *Policy:* Complex rules, restrictive security requirements, and slow legal approvals stall data exchange.
- *Misuse:* Fears over the misuse or compromise of sensitive or Personally Identifiable Information (PII), loss of data control, and downstream misinterpretation of data reduce transparency.
- *Quality:* Without rigorous quality assurance guardrails, the integrity of shared data may be questioned.

Despite the complexities of these constraints, stakeholders universally agreed on a vision for the future: real-time, multi-level data dashboards. To meet the needs of the rapidly evolving

landscape, communities need standardized platforms capable of displaying both macro-level national trends and granular, community-level insights.

To achieve this ideal, participants developed a proposed consensus roadmap centered on the creation of national standards:

- *Convene a Multisector Consortium:* Establish an active working group of technical experts, data generators, and end-users.
- *Conduct a Landscape Analysis:* Define the scope by auditing existing databases, access levels, and data ownership rules.
- *Develop National Consensus Standards:* Create uniform data formats, metadata standards, and unified terminology.
- *Implement and Scale:* Secure the necessary funding and technical expertise to deploy these standards across local, state, and federal systems.

The barriers to illicit drug data sharing are substantial, but they align directly with NIST's core mission of advancing measurement science and standardization. As a neutral, authoritative body, NIST could be uniquely positioned to lead or assist in executing the proposed roadmap. Specifically, there are four high-level action items that NIST could engage in:

- Formally establish and host a multi-community data consortium to drive continuous collaboration.
- Lead the development of a community-driven standardized drug ontology to ensure all communities use the same analytical metrics and naming conventions.
- Draft and publish an interoperability framework, including uniform application programming interface (API) standards and data entry fields, to connect disparate databases.
- Publish data governance best practices, providing standardized guidelines and templates for DUAs to significantly reduce the administrative burden of data exchange.

1. Introduction

The rapid evolution of the street drug supply, now driven by the proliferation of synthetic opioids, novel psychoactive substances (NPS), and polysubstance use presents unprecedented challenges to public health and safety. Combating this crisis requires a highly coordinated effort across diverse agencies. While each community has a unique mission, they are all ultimately driven by a shared need: utilizing accurate, real-time data to disrupt the drug supply, reduce demand, and/or mitigate harm.

To address these escalating challenges, the 2023 Testing, Rapid Analysis, and Narcotic Quality (TRANQ) Research Act [1] charged the National Institute of Standards and Technology (NIST) with advancing research and developing capabilities for the rapid identification of xylazine, synthetic opioids, and other novel psychoactive substances. Crucially, the Act directed NIST to collaborate with external communities to improve drug analysis and develop strategies and best practices for the safe handling, transportation, and analysis of these substances.

Responding to these directives, NIST initiated a series of collaborative activities, bringing together representatives from communities working in drug detection, interdiction, monitoring, overdose prevention, and treatment:

- *February 2024*: NIST organized the first workshop, "*Analytical and Data Challenges Surrounding Drug Detection, Identification, and Monitoring*". Participants identified challenges across the entire lifecycle of a drug encounter—from sample collection and analysis to data interpretation, immediate action, and dissemination. The group discussed areas for advancement and how NIST's mission could be leveraged to support them [2].
- *June 2025*: Building on the foundational findings of 2024, NIST hosted two subsequent workshops with distinct operational emphases: one focused on safe handling protocols to mitigate exposure [3] and one on data standardization.

This report focuses on the latter June 2025 event, a two-day workshop titled "*Towards Increased Data Sharing and Standardization for Illicit Drug Analysis and Monitoring*". The goal of this workshop was twofold:

1. *Assess the Current Landscape:* Capture the current state of drug data and clearly identify the technical and systemic challenges preventing effective data sharing.
2. *Chart a Path forward:* Imagine how community missions could be advanced through increased data standardization and develop actionable, realistic steps to achieve this ideal.

Nearly every community working to address a component of the drug crisis generates data, and nearly all rely on data produced by others. Recognizing these commonalities and finding solutions for standardization will allow these diverse groups to leverage cross-disciplinary intelligence effectively.

A brief summary of the stakeholder communities represented at the workshop, their unique missions, and the key data they generate and consume during routine operations is presented in **Table 1**. The schedule of the workshop and a full list of workshop participants can be found in **Appendix A** and **Appendix B**, respectively.

Table 1. Summary of communities represented at the workshop.

Community	Drug-Related Mission	Key Data Generated	Key Data Used
Customs and Border Interdiction	Secure borders and prevent drugs and related substances from entering the country via illegal shipments.	Drug seizure statistics, arrest/enforcement statistics, and intelligence assessments.	Intelligence reports, drug seizure data, and financial/trade sector records.
Law Enforcement (local, state, and federal)	Enforce controlled substance laws by investigating, apprehending, and prosecuting individuals/organizations.	Case files, arrest records, seizure reports, field test data, and intelligence briefs.	Intelligence reports, drug seizure data, relevant personal/financial data, forensic analyses.
Public Health Departments and Overdose Prevention Programs (local and state)	Identify and address specific community needs through surveillance, harm reduction initiatives, and education/prevention programs.	Overdose surveillance reports, emergency department (ED) syndromic surveillance, program performance metrics, and community health assessments.	Emergency Medical Service (EMS) or ED data, fatal overdose data, hospital billing records, program data and community surveys.
Public Health Agencies (federal)	Coordinate national drug policy, manage national surveillance, fund innovative research, and foster international collaboration on global drug trends.	National surveillance reports, research publications, evidence-based guidelines, and funding data.	National survey data, treatment admissions, EMS/ED data, law enforcement data, and macro-trends.
Hospitals, Emergency Departments, and Emergency Medical Services	Provide medical care during and after an overdose or for withdrawal, provide connections to additional services, and refer patients to treatment for substance use disorders.	Local non-fatal overdose surveillance, naloxone administration data, rapid toxicology results, chief complaints, and linkage to treatment.	EMS/ED patient care records, hospital billing records, and law enforcement data.
Drug Analysis Laboratories (forensics and drug checking)	Identify, characterize, and quantify substances found in samples (seized evidence to support law enforcement investigations or submitted samples to support public health).	Physical descriptions, analytical instrument data, forensic reports, and drug profile data.	Case information, reference standards, field test data, instrument libraries, and monographs.
Toxicology Laboratoires (ante-mortem and post-mortem)	Detect, identify, and quantify illicit drugs/metabolites in	Analytical instrument data, qualitative/quantitative	Case information, external toxicology data, reference standards,

	biological samples to interpret human performance and post-mortem toxicology.	results, toxicology reports, and trends data.	instrument libraries, and monographs.
Coroner/Medical Examiner and Vital Records Offices	Investigate unattended deaths, deaths with suspicion of criminality, suicidal intent, significant trauma, or environmental exposure, and deaths in public locations to determine the cause and manner of death based on all circumstances. Record and report all birth and death statistics.	Fatal overdose and drug-related deaths, substances contributing to death, demographic and geographic characteristics of related decedents, leading cause of death, related trends.	Postmortem toxicology results, medicolegal investigation reports, death certificate literal text, hospital billing codes, provisional and official mortality datasets.

2. Data – What is it? Who generates it? Where is it? Why is it used?

At its core, "data" in this context is any information utilized by an agency or entity to advance their mission as it relates to street drugs. However, what is perceived as data is highly dependent on the operational context in which it is collected and interpreted. It can range from a raw spectrum on an instrument to intelligence that provides immediately actionable information.

For drug analysis and toxicology laboratories, data often refers to qualitative or quantitative measurements from analytical instruments. For the broader public health sector, data encompasses a wider range of inputs, such as overdose statistics, physical symptoms, and qualitative community reports. Law enforcement agencies leverage both raw data and interpreted products to generate the intelligence needed for immediate decision-making. The nuanced, highly contextual nature of this data is a primary barrier to seamless sharing across communities.

What is data?

The groundwork for the workshop was laid by identifying the varying definitions of data across the represented communities. Individuals from communities with aligned missions collaborated to map the data generated and consumed within their networks. Workshop participants identified characteristics of data, collection methods, analytical concepts, digital systems, and official documentation as vital information streams. Highlights of what each of the represented communities defined as data are provided below.

- *Laboratories:* Associated data primarily with analytical output, including qualitative seized drug identifications, quantitative drug purity measurements, toxicological findings, and method validation reports.
- *Law Enforcement and Interdiction:* Emphasized contextual information, such as visual features of seized drugs, packaging details, and the locations, times, and dates of encounters.
- *Public Health and Clinical Care:* Relied heavily on surveys, administrative patient data, health outcomes, patient demographics, clinical symptoms (self-reported and observed), and treatment efficacy.

Across all communities, aggregate data – such as emerging drug trends, geographical and temporal mapping, mortality rates, and seizure statistics – was universally valued. **Figure 1** provides an overview of all the types of data identified by participants.

Figure 1. Conceptual word cloud of the types of data as identified by workshop participants. Larger words indicate a data type that was brought up more frequently.

Who generates data?

Workshop participants identified a broad spectrum of organizations, agencies, and individuals as the generators of the previously defined qualitative, quantitative, contextual, and aggregate data.

While conventional data producers (law enforcement agencies, forensic laboratories, public health departments, and hospitals) were prominently featured, participants notably emphasized the critical role of non-conventional sources. These include people who use drugs, local community members, social media platforms, and community-facing overdose prevention services. **Figure 2** provides an overview of the data generators identified by participants.

Figure 2. Conceptual word cloud of data producers as identified by workshop participants.

Where is data stored?

A significant constraint identified during the workshop is that post-collection data storage is frequently disorganized, decentralized, and inconsistent. Much of the data generated remains inaccessible due to siloed storage practices.

- *Formal Locations:* Structured databases such as the National Forensic Laboratory Information System (NFLIS) [4] and the State Unintentional Drug Overdose Reporting Systems (SUDORS) [5], internal Laboratory Information Management Systems (LIMS), and agency-specific or public-facing dashboards.

- *Informal Locations:* Paper files, physical laboratory notebooks, and unnetworked digital files like localized spreadsheets and unlinked datasets.

Without standardized documentation or networked access, valuable data is often underutilized or misunderstood, remaining isolated with the individual or small group that originally collected it. **Figure 3** provides an overview of the data storage locations identified by participants.

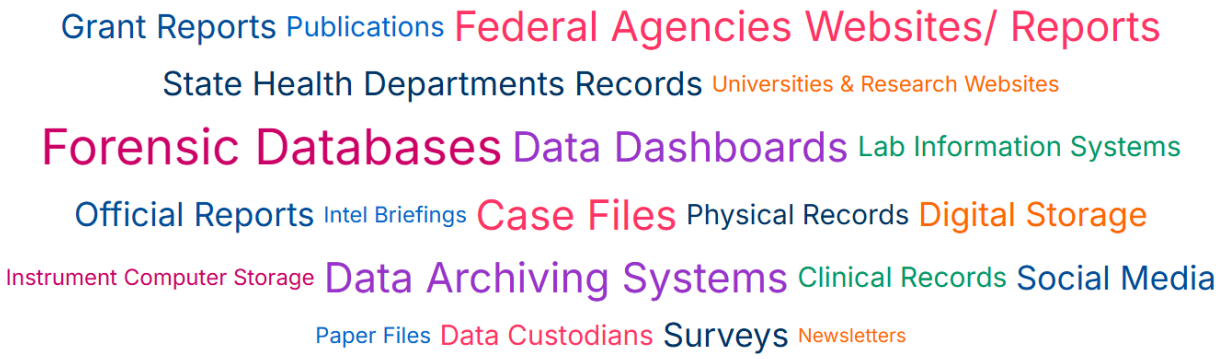

Figure 3. Conceptual word cloud of data storage locations as identified by workshop participants.

Why is data used?

Data answers mission-critical questions that directly inform on-the-ground actions and policy decisions. A central goal of the workshop was not only understanding *what* data is stored, but how it is applied. Participants critically evaluated their data streams to identify the core questions driving their operations. **Table 2** outlines some key questions different communities use data to answer and what action is taken based on the data.

Table 2. Key data questions and actions for represented stakeholder communities.

Community	Primary Data Sources	Key Question(s) Asked	Resulting Actions
Customs and Border Interdiction	Intelligence, seizure info, chemical profiling.	Where are drugs originating? How are they concealed? What mixtures are present?	Direct interdiction efforts, draft policies, modify testing procedures.
Law Enforcement (local, state, and federal)	Intelligence reports, seizure data, personal data.	Where are the active hotspots? Who is involved in distribution? What poses the greatest community risk?	Initiate investigations, make targeted arrests, inform policymakers on resource needs.
Public Health Departments and Harm Reduction Organizations (local and state)	Mortality data, EMS reports, electronic health records, hospital billing records.	Who is at risk? What preventative steps can reduce the risk of harm?	Track local and regional trends, educate the public, inform intervention programs, make local policy recommendations.
Public Health Agencies (federal)	Aggregated local data, wastewater data, publicly funded data sources.	What are the national geographic trends? What are the potencies of street drugs?	Direct national health policies, fund intervention studies, provide public data access.

Hospitals and Emergency Departments	Patient symptoms, hospital records, drug checking data.	What drugs are contributing to overdoses? What interventions reduce harm?	Provide appropriate treatment, advise public health on community resource allocation.
Drug Analysis Laboratories (forensics and drug checking)	Analytical results, NFLIS data, clandestine lab data.	What is the chemical composition? What new syntheses are used? What are the purity trends?	Inform law enforcement or public health partners, inform scheduling, request equipment/resource allocation.
Toxicology Laboratoires (ante-mortem and post-mortem)	Analytical data, death investigation reports	What caused the overdose? What new substances are appearing? How has prevalence changed?	Generate analytical reports, assist in drug scheduling, alert public officials.
Coroner/Medical Examiner and Vital Records Offices	Post-mortem toxicology reports, death certificates, hospital billing codes.	Who is dying from drug overdose and what substances are most prevalently involved?	Provide timely provisional mortality data, and official confirmed data to guide public health and public safety response.

3. Roadblocks to Data Sharing

Despite shared overarching goals and overlapping data sources, communities face a variety of constraints to effective data sharing. A thorough understanding of these limitations is a necessary first step toward developing viable solutions.

To frame this discussion, constraints can be broadly categorized as either challenges or obstacles:

- A *challenge* is a technical problem requiring specialized skills to solve. The solution lies in developing new scientific tools, analytical methods, and community expertise.
- An *obstacle* is a systemic problem rooted in policy, law, or culture. The solution requires changes to regulations, legal agreements, or organizational mindsets.

Using this framework, workshop participants identified the constraints affecting their ability to share data outside their immediate agencies or communities (a full list of raw responses is available in **Appendix C**). Participants then voted on the most pressing issues. As shown in **Figure 4**, the most significant obstacle to data sharing is the onerous administrative procedure involved in establishing Memoranda of Understanding (MOUs) and Data Use Agreements (DUAs) between parties. Other highly ranked constraints included the lack of a centralized data repository, disparate data formats limiting interoperability, a lack of data exchange standards, and the high cost of maintaining databases.

Figure 4. Top constraints to data sharing as voted by workshop participants.

Constraints to Addressing Outstanding Operational Questions

Participants were asked to consider the critical questions that remain unanswered due to these data limitations. Across all communities, the inability to access and integrate real-time data was cited as a major handicap, preventing agencies from getting ahead of emerging drug trends.

When communities cannot seamlessly access and assess cross-disciplinary data, they struggle to answer three critical, outstanding questions:

1. What are the key trends and emerging substances regarding both drug use and availability?
2. What are the current drug trafficking patterns?
3. Is our isolated data on the drug landscape consistent with the data being generated by other communities?

The first two questions drive the need for better data collection and innovative presentation methods. The third question is the primary driver for cross-community collaboration and the catalyst for this workshop.

Five Major Themes of Data Sharing Constraints

When analyzing the top constraints preventing communities from answering these critical questions, five major themes emerged. The specific challenges and obstacles within each theme are detailed in **Table 3** below.

Table 3. Major themes of data sharing constraints.

Theme	Core Issue	Specific Constraints Identified
Standardization	Lack of common terminology, metrics, and centralized ownership severely limits interoperability.	• No centralized data repository or lead collation entity. • Lack of data exchange or formatting standards. • Inconsistent drug categorization and constituent naming. • Lack of analytical/instrumental standards. • Incompatible software formats. • Need for platforms capable of ingesting diverse data streams.
Resources	Budgetary and personnel limitations prevent the implementation of long-term data partnerships.	• High cost and necessary expertise to maintain databases. • Difficulty demonstrating a clear cost-benefit ratio for data sharing. • Deficits in funding, staff, IT resources, and time.
Policy	Administrative burdens and legal frameworks create formidable systemic obstacles.	• Onerous procedures for establishing data sharing agreements (MOUs). • Restrictive IT policies and security requirements. • Delays caused by internal legal departments regarding Data Use Agreements (DUAs) and publication requests. • Complexities in establishing intellectual property and data ownership.

Misuse	Privacy concerns, potential for misinterpretation, and fear of lost control impede transparency.	• Fear of downstream data misuse or misinterpretation. • Difficulties protecting Personally Identifiable Information (PII) and confidentiality. • Risk of sensitive intelligence falling into the wrong hands. • Fear of negative optics or unintended endorsements. • Ensuring the physical safety of personnel generating/holding data.
Quality	Without rigorous quality assurance guardrails, data integrity is questioned.	• Loss of critical data subtleties and nuances upon sharing. • Misaligned incentives (e.g., withholding data until academic publication). • General mistrust regarding the quality of external data. • Inconsistencies in the initial data collection process.

4. Overcoming the Data Sharing Roadblocks

It is abundantly clear that a wealth of data is already being collected, ranging from large-scale multi-agency initiatives to localized community efforts. However, individual agencies would be vastly more effective at preventing or responding to the next drug event if they could seamlessly access cross-disciplinary data and develop innovative strategies to fill existing intelligence gaps.

To pivot from identifying constraints to building solutions, participants were asked to envision a "constraint-free" data system that standardizes and shares data while strictly honoring privacy and legal integrity.

The Vision: Real-Time, Multi-Level Dashboards

Despite the freedom to design any system, all communities independently converged on a single ideal solution: real-time data dashboards.

This focus on real-time surveillance directly addresses a primary unanswered operational question identified in Section 3; what is the true, current prevalence of a substance. When participants envisioned their ideal constraint-free system, they pictured dashboards capable of displaying real-time national data that could also be zoomed in to provide granular, community-level insights. To overcome the time-lag traditionally required for data vetting, participants proposed implementing pre-defined, standardized data entry fields that require inputs to meet specific criteria before automatically populating the dashboard.

The Current Data Landscape vs. The Ideal

This vision is unsurprising given that many of the most successful existing data initiatives utilize dashboard formats (a summary of current data sources discussed at the workshop is available in **Appendix D**).

Current drug surveillance systems provide critical data through unique lenses—ranging from laboratory analysis of seized drugs and clinical toxicology to emergency response and epidemiological surveys. Systems like Overdose Detection Mapping Application Program (ODMAP) [6] and the National EMS Information System (NEMSIS) Drug Overdose Surveillance Dashboard [7] offer near real-time capabilities to restricted communities, allowing for rapid public health responses. While valuable, neither source provides a comprehensive picture. Many other databases lack national coverage, largely due to local resource constraints, while others are highly specific but lack granular contextual information. Crucially, most suffer from significant time-lags due to manual data vetting and non-standardized intake.

The Consensus Roadmap

Inspired by ongoing efforts and their constraint-free vision, participants engaged in a collective problem-solving activity (framework available in **Appendix E**). Small groups tackled specific, high-priority constraints: three groups focused on standardization (lack of centralized data, differing software formats, and lack of exchange standards), one group addressed the fear of data misuse, and another tackled the cost of maintaining databases.

Across all groups and challenges, a universal roadmap emerged. The primary proposed intervention was the development of national consensus standards and best practice guides, championed by a neutral, authoritative body.

Participants outlined the following practical roadmap to achieve this:

- *Phase 1*: Convene a multi-community consortium consisting of an active, collaborative group of diverse data generators, technical experts, and end-users from across all relevant communities.
- *Phase 2*: Define the scope of the problem by conducting a comprehensive landscape analysis of existing databases, terms of data ownership, and current access levels.
- *Phase 3:* Develop consensus standards to provide a foundation to data standardization. Proposed standards include:
    - Application Programming Interface (API) standards for system interoperability.
    - Uniform data formats, data entry fields, and metadata standards.
    - Standardized terminology and data governance protocols.
    - Standardized templates for Data Use Agreements (DUAs) and Cooperative Research and Development Agreements (CRADAs).
- *Phase 4:* Implement and scale the core resources – funding, technical expertise, and sustained leadership – to deploy these standards across local, state, and federal databases.

5. Key Takeaways

The workshop discussions and collective problem-solving exercises yielded several critical conclusions regarding the current state and potential future potential of drug data sharing:

- *Abundant Data is Limited by Silos:* A breadth of valuable drug surveillance data is actively collected across communities. However, its operational impact is severely restricted by systemic constraints, primarily a lack of data standardization, administrative burdens (such as MOUs/DUAs), and resource deficits.
- *Real-Time Data is the Ultimate Goal:* Stakeholders universally envision a system capable of providing granular, real-time data. This shift is necessary to enable agencies across the nation to share and access localized, real-time data in support of program and policy initiatives aimed at reducing harm from illicit drug overdose.
- *National Coordination is Essential:* Achieving this ideal system cannot be done through isolated, community-specific patches. It requires a unified, collaborative, and nationally coordinated effort that finds creative ways to bypass current legal and technical barriers.
- *Current Successes Provide a Blueprint:* A review of ongoing large-scale data resources and early warning systems provides significant insight into best practices and proves that a more interconnected system is possible.
- *The Path Forward Relies on Consensus Standards:* The constraints currently facing data sharing are not insurmountable. The fundamental barrier of data interoperability can be directly resolved through a national effort to develop consensus standards, uniform API protocols, and unified data governance frameworks.

6. Potential NIST Action Items

The constraints identified during the workshop—specifically the lack of data interoperability, standardized nomenclature, and unified data governance—are substantial, but they align directly with the mission and capabilities of NIST. As a neutral agency with a proven track record of developing consensus standards and technical frameworks, NIST is uniquely positioned to lead or assist in developing a national response to these challenges.

Based on the workshop discussions and the proposed roadmap, the following actionable items (**Table 4**) could be championed by NIST in collaboration with the wider stakeholder community.

Table 4. Summary of potential NIST action items.

Action Item	Description	Constraints Addressed
Convene a Multi-Community Data Consortium	Formally establish and host a working group comprised of technical experts, data generators, and end-users from law enforcement, forensic science, and public health to drive continuous collaboration.	• Siloed communication • Limited cross-community engagement
Develop a Standardized Drug Ontology	Lead the creation of a universal lexicon for illicit drug data. This includes standardizing constituent naming conventions, drug categorizations, and analytical metrics to ensure all communities are speaking the same data language.	• Lack of data exchange standards • Inconsistent nomenclature
Draft an Interoperability Framework	Develop and publish consensus standards for Application Programming Interfaces (APIs), unified data entry fields, and uniform data formats. This framework would serve as the technical blueprint for connecting disparate, localized databases.	• Differing software formats • Inability to ingest multiple data streams
Publish Data Governance Best Practices	Create standardized guidelines and templates for Data Use Agreements (DUAs), metadata standards, and privacy protection protocols. While NIST does not dictate legal policy, a standardized technical framework for governance can significantly reduce the administrative burden of sharing data.	• Onerous MOU/DUA procedures • Fear of data misuse • Inconsistent data quality

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Appendix A. Workshop Agenda

Day 1-Wednesday, June 11th, 2025	
Defining Data and Its Challenges	
9:00 – 9:15	Why Are We Here? *Ed Sisco, NIST*
9:15 – 10:15	Breakout Session 1: What is Data / What Data Exists *Led by David Newton, NIST*
10:40 – 11:05	Introductions
11:05 – 12:15	Existing Databases Lightning Round *Erin Artigiani, University of Maryland* *MeLisa Creamer, National Institutes of Health* *Rachel Culbreth, American College of Medical Toxicology* *Steve Passik, Millennium Health* *Kate Durst, Tennessee Dept. of Health* *Brent Kluttz, Washington-Baltimore HIDTA* *Alex Krotulski, Center for Forensic Science Research and Education* *Jason Williams, University of Washington* *Kaitlyn Brown, America's Poison Centers* *Eric Wisniewski, Drug Enforcement Administration*
1:30 – 2:00	Data Sharing Success 1 *Kevin Nicholes, NEMSIS*
2:00 – 3:00	Breakout Session 2: What Are We Doing with Data? *Led by Caitlin Berry, NIST*
3:20 – 4:50	Breakout Session 3: Data Sharing and Its Challenges *Led by Monica Joshi, NIST / West Chester University of PA*
4:50 – 5:00	Daily Wrap Up and Housekeeping *Monica Joshi, NIST / West Chester University of PA*
Day 2-Thursday, June 12th, 2025	
Imagining the Future of Data	
9:00 – 9:20	Remarks by Craig Burkhardt (NIST Director)
9:20 – 9:40	Data Sharing Success 2 *Terra Dassau, U.S. Customs and Border Protection*
9:40 – 10:25	Breakout Session 4a: If Data Sharing Had No Limits *Led by Ed Sisco, NIST*
10:50 – 12:15	Breakout Session 4b: If Data Sharing Had No Limits
1:30 – 2:30	Breakout Session 4c: If Data Sharing Had No Limits
2:30 – 3:00	Data Sharing Success 3 *MeLisa Creamer, National Institutes of Health*
3:20 – 4:40	Breakout Session 5: Mapping a Path Forward *Led by Caitlin Berry, NIST*
4:40 – 5:00	Wrap Up and Next Steps *Ed Sisco, NIST*

Appendix B. Workshop Participants

Leonardo Angelone **National Institute on Drug Abuse (NIH)**	Erin Artigiani **CESAR, University of Maryland**	Cailin Berry **NIST**	Jason Bienert **Johns Hopkins Bloomberg School of Public Health**
Kaitlyn Brown **America's Poison Centers**	Thinh Bui **NIST**	Megan Chambers **National Institute of Justice**	Ronald Clouse **NFLIS (DEA)**
MeLisa Creamer **National Institute of Drug Abuse**	Rachel Culberth **American College of Medical Toxicology**	Nicole D'Anna **New York City Office of Chief Medical Examiner**	Terra Dassau **U.S. Customs and Border Protection**
Shaun Doyle **North Central HIDTA**	Kate Durst **Tennessee Dept. Of Health**	Matt Fallico **New Yok State Dept. Of Health**	Matt Gamette **Idaho State Police Forensic Services**
Kelsey Granger **Association of Public Health Laboratories**	Grecia Gratacos **U.S. Customs and Border Protection**	Dave Holbrook **NIST**	Krystina Johnson-O'Leary **America's Poison Centers**
Monica Joshi **NIST**	Anthony Kearsley **NIST**	Brent Klutz **Washington/ Baltimore HIDTA**	Dan Kostov **National Institute on Drug Abuse (NIH)**
Alex Krotulski **Center for Forensic Science Research and Education**	Lance Kvetko **Drug Enforcement Administration**	Bobby Lawlor **New England HIDTA**	Dennis Leber **NIST**
Beth Lavach **ELS and Associates**	Tytus Mak **NIST**	David Marshall **The MITRE Corp.**	Mick McCormick **Office of National Drug Control Policy**
Marcela Najarro **NIST**	David Newton **NIST**	Tam Nguyen **National Institute on Drug Abuse (NIH)**	Kevin Nicholes **NEMSIS Technical Assistance Center**
Emily Packard Dawson **NASEM**	Laura Parker **U.S. Dept. of Homeland Security**	Steve Passik **Millenium Health**	Ben Place **NIST**
Elizabeth Robinson **NIST**	Kristin Schneider **Johns Hopkins Bloomberg School of Public Health**	Frances Scott **National Institute of Justice**	Sarah Shuda **NIST**
Edward Sisco **NIST**	Frances Stites **The Mitre Corp**.	Catherine Tomko **Johns Hopkins Bloomberg School of Public Health**	Zach Trautt **NIST**
Paul Wax **American College of Medical Toxicology**	Jason Williams **University of Washington**	Agnes Winokur **Drug Enforcement Administration**	Eric Wisniewski **Drug Enforcement Administration**

Nae Won **Johns Hopkins Bloomberg School of Public Health**	Annie Yarberry **NIST**		

Appendix C. Data Sharing Challenges and Obstacles Noted by Represented Communities

Note: The listed challenges were generated by workshop participants within the designated communities (i.e., those within federal public health agencies identified challenges around data sharing within their own community) and are not listed in any particular order.

1) **Customs and Border Interdiction and Law Enforcement**
   - Comparability of results can be limited by lack of standards and tools
   - Difficult communication and translation of data can limit usefulness of data
   - Usability of data takes energy/ work/money and effort
   - Lack of balance between timeliness and quality can hurt usefulness or responsiveness
   - Lack of centralized or unified leadership, to get things done there needs to be leadership to push forward
   - Different formats or software limit interoperability
   - Raw data transfer – too big to email
   - Sensitive or classified information sharing can result in limited or non-useful data
   - Lack of willingness to share data
   - IT policies can limit ability to easily share data (firewall permissions)
   - Limitations or control of data use can limit data sharing including retention policies
   - Lack of data ownership
   - Need for more personnel resources

2) **Public Health Departments and Harm Reduction Organizations**
   - DUA developments
   - Lack of resources to produce data
   - Resources on how to accurately interpret the data
   - Resources on proper messaging
   - Paywalls for data access
   - Lack of staff to analyze data
   - Timeliness of data
   - Privacy concerns
   - Territorial, competitive data owners
   - Expensive data systems
   - Data literacy by our consumers
   - Conflicting dimensions of accountability
   - Privacy and confidentiality concerns

- Lack of consistency in the data collection process
- Conflicting goals of partners in the fray
- Ethical issues with IRB or regulatory limits
- Discrepancies between state law, federal law, and HIPPA
- Criminalization renders all data collection and sharing inherently dangerous for community mentors

3) Public Health Agencies (federal)

- Data coming in faster and in larger quantities than can be aggregated to be shared
- Bureaucratic red tape
- Financial barriers
- Data access fees
- Lack of funding, staff, data/IT expertise
- IT infrastructure
- Incentives that keep data private for research/publication
- Ethics, specifically which data to share with whom
- Administrators may have ulterior motives, may not want to share full data if it could be misconstrued
- Trust in the data
- Lack of data on true chemicals
- Determining composition of unknowns
- Different variable names
- Data stored inefficiently
- Instrument data to epidemiological data, how do we make this pipeline efficient?
- What data exists? Is there some way we can centralize storage? Where do I go as a central resource to learn about what data is available?
- IT security requirements between federal agencies prohibit collaboration and shared platforms

4) Hospitals and Emergency Departments

- Ways to harmonize data
- Lack of contextual information
- Money, time, and expertise
- Confidentiality
- Data protection policy / perspective
- Data transfer agreements
- Common data elements

- Privacy concerns with more granular data
- Concerns about law enforcement seizure
- Conflicts of interest
- Funding interest
- Competition
- Possible negative perception

5) Drug Analysis Laboratories

- Standardization of data
- Fear of inaccurate representation
- Unused data
- Misrepresentation or lack of guardrails
- Understanding how to use the data / data interpretation
- Constantly live / updated data
- APIs
- Data exchange standards
- Compatibility of databases
- No database or compiling data manually
- File sizes
- Time and resources to compile the data or do data entry
- Protecting rights and privacy
- Sensitive recipes for synthesizing drugs
- Officer safety
- Deidentifying PII
- Loss of how data will be used or represent the entity / make the entity look bad that provides the data
- Political issues data could cause
- Potential public perception of endorsement from data sharing
- Lack of interest Intellectual property
- Scared to share
- Bureaucracy
- Authorization
- Legal agreements required or making MOU agreements
- Agency policy

6) Toxicology Laboratories

- Lack of standardization of data / database
- Lack of fidelity of data / explanation
- Interoperability
- Privacy
- Identifiable data
- Who owns what data?
- Delays in DUAs approval and data publication requests imposed by internal IT or legal
- Need to maintain boundaries around competing projects using similar data when a particular topic is hot
- Business competition – hesitant to share certain data that reveal trade secrets to competitors
- Philosophical differences – data owners may not agree with methods of data users
- Ongoing maintenance of databases
- Who is paying?
- Data science skills are not universal across participants and partners
- Incompatible and missing data
- IT challenges
- The technology used to share data (in and out) requires expensive skills to build and maintain
- Insufficient staffing
- Third-party relationships complicate sharing (LIMS vendors)

Appendix D. Data Sources Discussed in Workshop

EDDS: Emergency Department Drug Surveillance

- **Organization**: Center for Substance Use, Addiction and Health Research at the University of Maryland
- **Access**: Four public facing dashboards available for external use that monitor trends in drug usage for visits to various hospitals.
- **Link**: https://cesar.umd.edu/landing/EDDS
- **Description**: Two primary data sources are used in EDDS: (1) medical health data extracted from Electronic Health Records, and (2) analysis of urine samples taken from a subset of patients.
- **Geographic coverage**: EDDS contains data from 50 hospitals across 16 states.
- **Size**: Approximately 1 million health records, and 1,000 urine samples
- **Limitations and challenges:** Resources and funding for continued maintenance and development.

NDEWS: National Drug Early Warning System

- **Organization**: University of Florida, New York University, and Florida Atlantic University; funded by the National Institute on Drug Abuse
- **Access**: (1) NDEWS offers a weekly briefing which disseminates findings in recent trends in illicit drugs. (2) Some data is available via collaboration with NDEWS. (3) Some data is proprietary and can't be shared outside of the NDEWS team, such as secondary data from Reddit or Biospatial, INC (see below).
- **Link**: https://ndews.org/
- **Description**: Multiple data sources, including:
  - Early warning network: qualitative data from community health sites, sentinel sites, scientific advisors, etc.
  - Rapid street reporting: intercept survey data across the US
  - Web monitoring: approximately 80 drug-oriented subreddits
  - Biospatial, INC: 911 EMS dispatch data
  - Wastewater: Weekly analysis of wastewater data from 6 locations within the US.
  - Other: secondary data sources, such as data from the NIST Rapid Drug Analysis and Research program, the High-Intensity Drug Trafficking Areas, and NIFLIS.
- **Geographic coverage**: Varies by dataset.
- **Size**: Varies by dataset.
- **Limitations and challenges**: Different variables are collected for different sources, so merging data to understand full picture is not straightforward. One common

misconception is that the data are not intended to be prevalence data but are meant to serve as indicators for changes in US drug usage patterns.

ToxIC: Toxicology Investigators Consortium

- **Organization**: American College of Medical Toxicology
- **Access**: Federal and industry partners can access ToxIC data through data use agreements.
- **Link**: https://acmt.net/toxic/
- **Description**: Multiple data sources (core registry, opioid sub registry, Fentalog, DOTS, and RENDOR) consisting of medical toxicology data from emergency departments, EMS, blood/urine tests, etc. Each data source has a particular target population (e.g., ED patients) and particular inclusion criteria (e.g., opioid overdose). Most data sources are academic medical centers.
- **Geographic coverage**: Data collected from 69 sites and 100 hospitals; exact locations not specified.
- **Limitations and challenges**: Patient data enters the system within one month of collection, and laboratory data is entered within three to four months from date of service. No confirmatory testing is done beyond what was reported by the healthcare professionals.

Millennium Health Urine Drug Testing Database

- **Organization**: Millennium Health
- **Access**: Millenium Health staff; external collaborations and contractors via data usage agreements.
- **Link**: https://www.millenniumhealth.com/services/urine-drug-testing/
- **Description**: Near real-time results of liquid chromatography tandem mass spectrometry urine drug tests deemed medically necessary from clinical facilities, such as substance abuse treatment centers, primary care, and behavioral health settings. Test results include presence and quantity of over 150 potential analytes.
- **Geographic Coverage:** Data received from all 50 states (with some states represented more heavily)
- **Limitations and challenges:** Difficulty to keep drug panels current to keep up with illicit substance landscape. Some types of data, such as overdose mortality, tend to have more lag than the urine test data results.

Tennessee Department of Health Database

- **Organization**: Tennessee Department of Health, local syringe service programs (SSPs) and NIST RaDAR program.
- **Access**: Health Department staff (management), SSP staff (data entry/results access), and Lab staff (submitting results) via a REDCap system.
- **Description**: Combines sample collection surveys from SSP sites with chemical analysis results from NIST RaDAR program. R scripts are used to automate notifications for new compounds, create visualizations, and generate monthly reports.
- **Geographic coverage**: Participating SSP sites within Tennessee.
- **Limitations and challenges**: The database is not interoperable with other sources to maintain participant anonymity. Challenges include the need for clearer data interpretation for SSP staff and concerns that public health data could further stigmatize participating communities.

HIDTA Case Explorer

- **Organization**: Washington/Baltimore High Intensity Drug Trafficking Area (HIDTA).
- **Access**: Restricted to law enforcement; requires an agency case number for inquiry and role-based permissions to view details.
- **Link:** https://hidta.org/resources/case-explorer/
- **Description**: Nationwide event and case subject deconfliction system. Serves as a pointer index and case management tool for entities including persons, locations, drugs, and weapons.
- **Geographic coverage**: Nationwide.
- **Size**: Contains records for over 2.7 million locations, 1.8 million persons, 655,000 drugs, among other types of entries.

ODMAP: Overdose Detection Mapping Application Program

- **Organization**: Washington/Baltimore HIDTA.
- **Access**: Available to federal, state, local, and tribal law enforcement, public health personnel, and licensed first responders via a Participation Agreement.
- **Link:** https://www.odmap.org/
- **Description**: Mobile-friendly software tool that provides real-time geographic data on suspected fatal and non-fatal overdoses to support public health and safety interventions.
- **Geographic coverage**: 50 states, Washington DC, and Puerto Rico, with 19 states having statewide implementation.

- **Size**: Over 1.1 million suspected overdoses entered.

Center for Forensic Science Research and Education, NPS Discovery

- **Organization**: Center for Forensic Science Research and Education.
- **Access**: "Open access" website for the public; spreadsheets and detailed data are available by request.
- **Link**: https://npsdiscovery.org
- **Description**: Early warning system for NPS that provides information on novel drugs from clinical, forensic, and drug material specimens. Also provides trend reports, public alerts, and new drug monographs.
- **Geographic coverage**: National perspective, though results are limited by which samples are submitted.
- **Size**: The scope of analysis covers more than 1,200 drugs.
- **Limitations and challenges**: Perspectives limited by geographic submission areas; drugs detected are not always the definitive cause of death or intoxication. Standardizing drug nomenclature remains a significant hurdle for data sharing.

University of Washington Death Certificate Data

- **Organization**: University of Washington Addictions, Drug and Alcohol Institute.
- **Access**: Accessed via a DUA that strictly prohibits linking with other data sources.
- **Link**: https://adai.washington.edu/WAdata/emerging_deaths.htm
- **Description**: Individual death certificate data containing ICD-coded cause of death fields and literal text fields for specific drug mentions.
- **Geographic coverage**: Washington State.
- **Size**: Updated quarterly.
- **Limitations and challenges**: Long lag times for drug death data. ICD codes can be limiting (e.g., distinguishing between different synthetic opioids like carfentanil).

NFLIS-Drug: National Forensic Laboratory Information System

- **Organization**: Drug Enforcement Administration.
- **Access**: Public access is provided through semi-annual and annual reports for prior calendar years; more detailed monthly data is available to participants and select partners.
- **Link**: https://nflis.deadiversion.usdoj.gov
- **Description**: A system that aggregates chemical data from analyzed drug items submitted by law enforcement to federal, state, and local forensic laboratories.

- **Geographic coverage**: Nationwide.
- **Size**: Over 1.1 million drug items reported in 2024.
- **Limitations and challenges**: Data represents only seizures needed for prosecution and does not include full amounts or all substances present in a sample. Absence of data in the system does not necessarily mean the drug is absent from the community.

University of Washington Community Drug Checking Network

- **Organization**: University of Washington Addictions, Drug and Alcohol Institute.
- **Access**: Population-level data is accessible via a website using interactive charts.
- **Link**: https://adai.washington.edu/WAdata/drugchecking/
- **Description**: Community members submit samples for on-site testing Fourier transform infrared spectroscopy; results are later merged with confirmatory lab testing.
- **Geographic coverage**: Washington State.
- **Size**: Confirmatory results typically have a two-week lag.
- **Limitations and challenges**: Not a random sample of the drug supply. Challenges include complex drug categorization (analogues vs. precursors) and cross-contamination.

NPDS: National Poison Data System

- **Organization**: America's Poison Centers.
- **Access**: Through data licensing agreements.
- **Description**: Near real-time clinical case data from all US Poison Centers, with records auto-uploading approximately every six minutes.
- **Geographic coverage**: Nationwide.
- **Limitations and challenges**: Underreports fatalities that occur outside of a hospital. Substance coding is based on clinical reporting rather than biological testing results.

NEMSIS: National Emergency Medical Services Information System

- **Organization**: Funded/administered by National Highway Traffic Safety Administration; operated by the University of Utah.
- **Access**: Standardized data sharing with local, state, and national organizations.
- **Link**: https://nemsis.org
- **Description**: National database that provides standardized EMS documentation and data collection practices. Tracks EMS activations, patient vitals, and treatments (e.g., naloxone administration).
- **Geographic coverage**: All 50 states, Washington DC, and three territories.
- **Size**: Collected over 60 million EMS activation records in 2024.

- **Limitations and challenges**: Data timeliness depends on when local agencies transmit records to the national level.

NIDA Wastewater Monitoring

- **Organization**: University of Florida, funded by the National Institute on Drug Abuse (NIDA).
- **Access**: Results disseminated via NDEWS through both public and password-protected dashboards.
- **Description**: Analysis of community drug patterns by detecting parent drugs and metabolites in wastewater to distinguish between drugs consumed versus those merely flushed.
- **Geographic coverage**: Currently covers six U.S. cities.
- **Size**: Over 25,000 data points collected as of late 2024.
- **Limitations and challenges**: Cannot distinguish between prescribed and illicit forms of the same drug (e.g., fentanyl) on its own. Cities often require a review of information before it is shared, even in deidentified formats.

Appendix E. Template for Mapping the Next Steps

For each of the identified constraints, the following five questions were asked:

1. What kind of intervention would help most (e.g., a new standard, a best practice guide, a working group, a pilot project)?
2. What is the very *first* practical step we could take (e.g., convene a small meeting, draft an outline, research existing examples)?
3. At what level should this be addressed (e.g., within an organization, state-wide, national standard)?
4. Who might be logical leads or champions?
5. What initial resources might be needed?

Appendix F. List of Symbols, Abbreviations, and Acronyms

CRADA

Cooperative Research and Development Agreement

DUA

Data Use Agreement

ED

Emergency Department

EDDS

Emergency Department Drug Surveillance

EMS

Emergency Medical Services

HIDTA

High-Intensity Drug Trafficking Areas

MOU

Memorandum of Understanding

NDEWS

National Drug Early Warning System

NEMSIS

National EMS Information System

NFLIS

National Forensic Laboratory Information System

NIDA

National Institute on Drug Abuse

NIST

National Institute of Standards and Technology

NPDS

National Poison Data System

NPS

Novel Psychoactive Substance

ODMAP

Overdose Detection Mapping Application Program

SSP

Syringe Service Program

SUDORS

State Unintentional Drug Overdose Reporting System

ToxIC

Toxicology Investigators Consortium