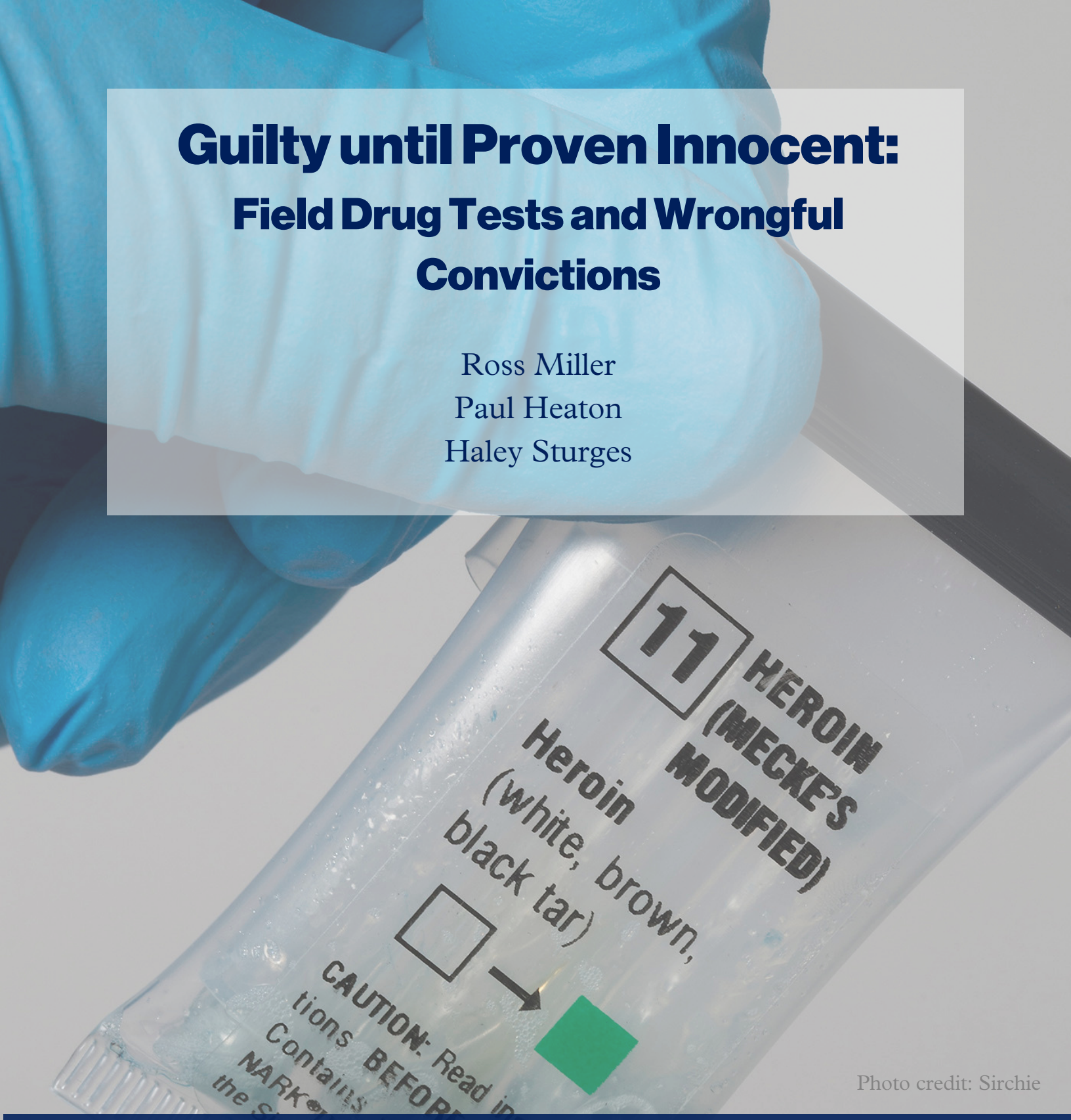
Guilty until Proven Innocent:

Field Drug Tests and Wrongful Convictions

Ross Miller
Paul Heaton
Haley Sturges



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Executive Summary

> This year 773,000 people will be arrested based on field drug tests with known accuracy problems.

Presumptive field tests for illicit substances have become an integral part of policing. Inexpensive and fast, these tests have become a tool of choice for law enforcement agencies. Unfortunately, they are notoriously imprecise and are known to produce "false positives," where innocuous legal substances (e.g., baking soda) provide the same result as an illegal substance (e.g., cocaine) and leading to frequent wrongful arrests and wrongful convictions.

Although originally developed as a preliminary-only testing method due to their unreliability, these tests have become de facto and inaccurate determinants of guilt or innocence in thousands of cases, causing considerable negative and undeserved consequences for thousands upon thousands of Americans.

In the modern U.S. criminal legal "system of pleas, not...of trials" (*Lafler v. Cooper*, 2012) where 95% of cases are resolved by plea bargain, the unreliability of these tests undermines public trust in the justice system and creates a liability risk for jurisdictions that rely on them.

This research report provides the first-ever comprehensive analysis of presumptive drug field test usage across law enforcement agencies in the United States. Utilizing a nationwide survey of agencies, the report offers national estimates on the frequency of test usage, finding that each year approximately **773,000 drug-related arrests** involve the use of presumptive tests. Using the survey data and national estimates of drug arrests, this report examines the impact of the tests on wrongful arrests, racial disparities in their use, and their subsequent impact on drug possession prosecutions and dispositions.

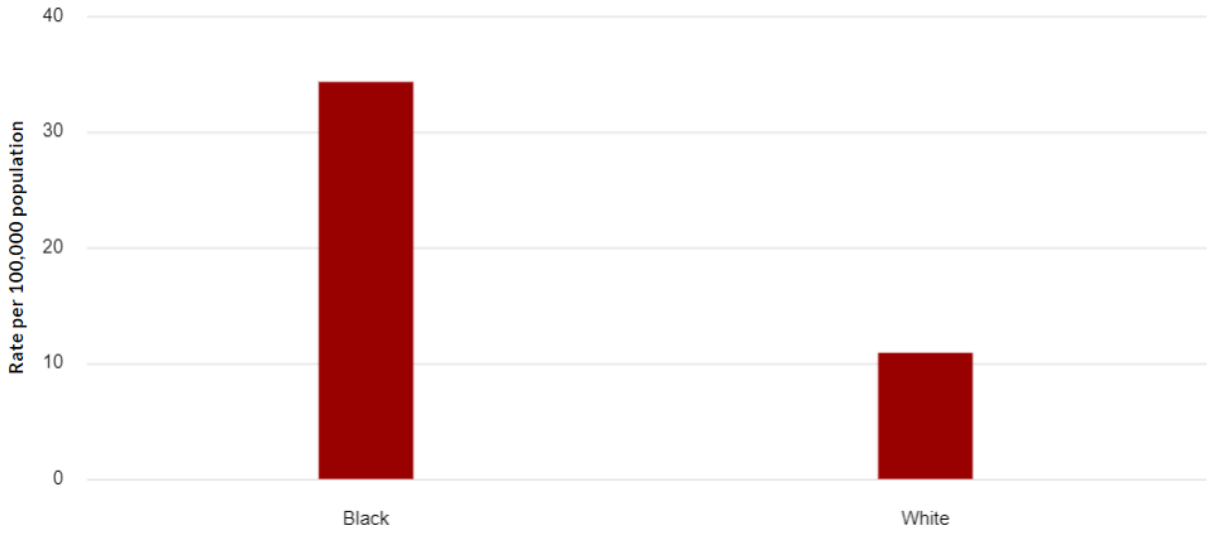
Although the true error rate of these tests remains unknown, estimates based on the imperfect data that are available suggest that around **30,000 arrests** each year involve people who do not possess illegal substances but who are nonetheless falsely implicated by color-based presumptive tests.

While factors like eyewitness misidentification, false confessions, or prosecutorial misconduct have been previously cited as leading causes of wrongful convictions, these new results support a bold claim: **The use of presumptive field tests in drug arrests is one of the largest, if not the largest, known contributing factor to wrongful arrests and convictions in the United States.**

Highlights of Findings

- There are over **1.5 million drug arrests** in the U.S. annually.
- Presumptive field tests are used in about half of these arrests.
- The true error rate of these tests remains unknown, but what data are available raise considerable cause for concern.
- Data from forensic labs on drug identification errors, although imperfect, suggest that approximately **30,000** people who do not possess controlled substances are arrested each year and falsely implicated by a presumptive color-based test.
- This equates to roughly **8x** the total number of known exonerations in the National Registry of Exonerations **in a single year.**
- In some contexts, false positive rates of 15% and as high as 38% have been observed.
- On a per capita basis, Black Americans experience these erroneous drug arrests at a rate 3x higher than White Americans

Per Capita Annual Arrests with Presumptive Tests and Drug Identification Errors



- The relative volume of drug cases in criminal cases overall, combined with the widespread reliance on error- prone field testing in arrests, indicate that this is a significant and unexplored vector for wrongful convictions.

Drug Arrests and Guilty Pleas

- Guilty pleas are the predominant form of case adjudication in the U.S.
- 95% of adjudications are by non-trial disposition.
- In our survey, 89% of prosecutors reported that guilty pleas are permitted without confirmatory testing (i.e., follow-up testing by a lab to verify that a □ eld test "positive" result accurately detected an illegal drug).
- 67% of drug labs in the U.S. report that they are not asked to review samples when there are plea agreements, and 24% do not receive samples for confirmatory testing when there are field test results available.
- Even when labs receive samples, 46% report that they will not conduct a confirmatory test if there has been a guilty plea, and 8% report that they will not retest if there has been a presumptive identification.

Potential Policy Reforms

- Conduct regular blind audits of cases involving presumptive testing to determine rates of false positives.
- Use more accurate presumptive tests that identify compounds by structural information (e.g. Raman spectroscopy) rather than simply by the presence of chemical groups.
- Limit or forbid the use of colorimetric presumptive field tests.
- Should field test kits continue to be used in simple drug possession cases, adopt a cite-and-release policy to avoid the coercive effect of detention and its impact on wrongful convictions.
- Require confirmatory testing whenever a guilty plea is accepted, with the right to withdraw the guilty plea following a no-controlled substance finding.

Introduction

Motivation

Colorimetric presumptive field drug test kits have been broadly utilized by law enforcement agencies across the United States for decades as a rapid, portable, and cost-effective method for detecting the presence of illicit substances at the scene of an investigation. These tests involve the use of chemical reagents that react with specific compounds found in drugs, causing a color change that indicates a positive result for the chemical groups associated with the substance in question.

While economical and seemingly efficient, these color-based chemical field tests have several limitations that raise concerns about their accuracy and reliability. These tests are known to produce false positives - indeed, the CEO of one of the main test kit manufacturers described such errors as the "nature of the beast" (Gutierrez, 2023). The chemical reagents used in these tests may react with a wide range of compounds, not just those found in illicit drugs, leading to false positive results. Additionally, environmental factors such as temperature and humidity can impact the efficacy of the reagents in the kit and thus affect the test results. In addition to these functional errors, the actual administration of the tests is highly sensitive to user error: the test kits must be stored, handled, and used correctly and the resulting color must be subjectively interpreted by police officers, who often lack standardized training and protocols to assist them.

Despite these limitations, field test kits continue to play a significant role in law enforcement and the criminal legal system. They are often used as a basis for arrests, searches, and the seizure of property. The presumptive results can also influence the decisions of police or prosecutors to pursue criminal charges, and, once a case is charged, they can be used by prosecutors as leverage in plea bargains. While the use of the tests continues, concerns about the accuracy and reliability of these tests, as well as the growing number of individuals whose lives have been affected by erroneous results, have led

to increased calls for reforms that would eliminate, or at minimum improve their use and administration.

Perhaps the most significant concern is that the true "false positive" rate of presumptive drug field tests remains unknown. This is partly because there are many variables that lead to inaccurate results:

- Variations in drug composition, user error, and environmental conditions can contribute to the erroneous identification of substances.
- The potential universe of substances that could trigger false positive results is virtually impossible to define, and thus an empirical "error rate" remains elusive.
- Test manufacturers rarely publicize what other compounds might trigger a false result, out of a concern that drug synthesizers might engineer ways around the tests

What is known, however, raises substantial concerns about the accuracy of tens of thousands of convictions linked to the use of these tests. As we will discuss later in this report, issues with false positives have surfaced in several jurisdictions, and audits of cases involving the tests discovered significant rates of wrongful arrests and wrongful convictions. The risk of relying on these tests, even in a preliminary process, is perhaps most aptly characterized by a phrase used by one court addressing the impact of discovered false positives from the tests: the police, corrections officers, and prosecutors who rely on these tests are simply "flying blind" (*Green v. Massachusetts Department of Correction et al.*, 2021).

Purpose and Scope of this Report

This research report aims to provide a comprehensive analysis of the use of presumptive drug field tests by law enforcement agencies across the United States and provide the first-ever national estimates of the impact of these unreliable tests on the estimated 1.5 million drug arrests made in the United States every year. It is motivated by the need to understand the scope and implications of the use of these tests in the context of drug-related arrests and prosecutions, particularly considering concerns about the potential impact of these tests on wrongful convictions. The primary objectives of the report are as follows:

1. To provide an account of the prevalence and distribution of presumptive drug field tests among law enforcement agencies across the nation.
2. To analyze the possible effect of these tests on drug arrests and prosecutions.
3. To estimate conservatively the rate at which the use of these tests contributes to wrongful convictions, due in part to the role of presumptive drug tests in plea bargaining and the lack of confirmatory forensic testing in most cases.

To achieve these objectives, we incorporate the results of our first-of-its-kind nationwide survey of law enforcement agencies on the use of presumptive field tests for drug detection. This survey provides insights on the use of these tests across the United States as well as on the scope and implications of drug field test usage in the context of drug- related arrests and prosecutions.

In addition to the data gathered from our nationwide survey, we employed Uniform Crime Reporting (UCR) Program data and the National Incident-Based Reporting System (NIBRS) data provided by the Department of Justice's Bureau of Justice Statistics (DOJ/BJS) to model drug arrest estimates for all states in the U.S. This data and analysis provide valuable information on drug arrests and offenses across the United States, offering a broader perspective on the prevalence and distribution of drug-related arrests. By integrating these data sources with our survey findings, we aim to provide a more comprehensive and accurate assessment of the potential effects of presumptive drug field tests on drug arrests and prosecutions and seek to contribute valuable insights and recommendations for policymakers, prosecutors, law enforcement agencies, and other stakeholders concerned with the administration of justice in the context of drug-related offenses.

The scope of this research report is limited to the United States, and its findings may not be generalizable to other countries or contexts. Nonetheless, the issues discussed may have broader implications for the use of presumptive drug field tests and the administration of criminal legal systems in other parts of the world. Furthermore, while this report focuses specifically on drug field tests, the challenges and concerns it raises may also apply to other forms of forensic evidence used in criminal investigations and prosecutions.

A Primer on Color-Based Presumptive Drug Tests

In many cases, a drug possession arrest starts at a traffic stop, when a police officer spots a substance in the stopped vehicle or on the person of someone in the vehicle. It might be an unidentified powder, liquid, or any number of other substances. To assist in determining whether a substance is an illicit drug, officers in many jurisdictions rely on the use of color-based chemical field tests which offer rapid results to officers on the scene. These tests are sometimes referred to as colorimetric tests.

Proponents of these tests see them as a convenient and seemingly straightforward way for officers to distinguish between legal and illegal substances. The instructions for use seem simple; officers place a sample of the substance into a small pouch containing chemicals that cause color-changing reactions, which are then compared by officers to reference colors provided by the tests' manufacturers. If the test turns a certain color the test can be considered positive for whatever substance that test was for, and the officer, relying on that result, has the probable cause of a crime necessary to make an arrest for the possession of illegal drugs. While rules across jurisdictions vary, in many jurisdictions across the U.S. the positive field test result is enough not just to make an arrest, but also to initiate criminal charges and even to secure a guilty plea. However, these tests are known to be inaccurate and do yield false positives. This report will explore the consequences that are associated with the widespread use of these tests.

Development and History

The origin of presumptive drug field tests can be traced back to the early 1970s, coinciding with the escalation of the war on drugs. Field (or roadside) drug tests were first invented in 1973 by a chemist at the newly founded Drug Enforcement Agency, created under the Nixon administration (Gabrielson, 2017). Some of the earliest test formulations used a compound called cobalt thiocyanate to detect the presence of cocaine in which a positive test result would create a blue

color. However, early versions of this test could bring back false positives when exposed to a number of legal substances. While a more complex test that uses multiple reagents was eventually developed, one-reagent tests are the commercial norm.

The number of reagents used and the possible drugs that can be detected have expanded; for example, Sirchie's NARK II product line includes 26 different reagents that can be used to presumptively test for the presence of different substances ranging from methamphetamine to THC, to bath salts (SWS Group, 2023). Use of the tests, which can be purchased by police departments for just a couple of dollars each, has become a widespread tool in making drug arrests.

Although the specific instructions for use vary between kit types and manufacturers, there are general guidelines that seem to be common. Test kit manufacturers typically include language in their instructions stating that the tests are presumptive in nature and need to be confirmed with laboratory testing. However, such instructions still require the awareness and participation of officers making arrests in the field and prosecutors advancing criminal charges based on the test results. Instructions also note that a reaction, for instance, a positive result, can be triggered by legal substances. Other instructions mention that proper storage of the tests (e.g., keeping them outside of extreme temperatures and away from UV light) is necessary to preserve their accuracy, or that the test should only be used on powders or solids and not liquids. Instructions can also include color charts and descriptions of what colors should appear for a negative versus a positive result.

Training for the tests varies across different police departments, with test manufacturers offering certification classes (Sirchie, 2023) or materials (Forensics Source, 2023) for jurisdictions to use so they can self-teach their departments. In many cases, there is no formal training class before officers can use the field test kits or any form of follow-up review of protocol compliance in the field. There are several ways in which errors can be introduced into the testing process, from improper evaluation of the color change to improper storage and use of the test itself. Any of these errors may have the effect of returning a "false negative" result (e.g., the test fails to change color despite the existence of an illegal substance) or a "false positive" result (e.g., the test changes color due to an interaction with a substance that is not illegal. While there are brands of tests that work with smartphones to handle the color identification process of the tests, this feature only impacts one dimension of user error related to subjective misidentification of colors signaling a positive result. Because actual false positive results—in which the chemical reaction takes place despite the absence of any drugs— can still occur, this does not solve the problem.

Other Drug Testing Technologies

To better understand how colorimetric field tests are situated in the larger universe of testing technologies, the guidance from the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) is helpful. The SWGDRUG recommendations offer guidelines aimed at supporting forensic analysts and managers in formulating analytical methods, protocols, and policies related to drug seizures (SWGDRUG, 2022). As of its August 2022 recommendations, drug testing methods are divided into three categories based on their level of selectivity:

- Category A methods are the most selective "gold standard" techniques, which identify substances based on analysis of their actual structure. This includes the well-known and widely used lab standard of mass spectrometry.
- Category B methods are less selective and include techniques that identify based on chemical or physical characteristics; this category includes gas chromatography, a component of the combined analytical method used in labs of "CG/Mass Spec" which employs both gas chromatography and mass spectrometry.

- Category C, which includes colorimetric field testing, contains the least selective techniques. These are the most general methods and include such non-specific methods as using the melting point of a substance for general classification.

Photo Credit: Dean Calma / IAEA

As illustrated in the SWGDRUG recommendations, more selective and accurate means of testing than colorimetric tests exist. While some of the technologies described require physically large systems that must be used in a laboratory setting, some can be implemented in portable devices (e.g., portable Raman spectrometers, which use a Category A method).

Portability comes at a price though, these portable devices do have higher front-end costs. Handheld Raman spectrometers, for example, can cost upwards of $20,000 dollars each, compared to just a couple dollars for a single field test. However, over the long term, upfront costs may be offset. In its Landscape Study of Field Portable Devices for Presumptive Drug Testing, the National Institute of Justice's Forensic Technology Center of Excellence found that "presumptive drug testing instruments and single-use, color-based tests have comparable costs over time, despite the large up-front price difference" (Forensic Technology Center of Excellence, 2018).

Admissibility in Court

Proponents of presumptive drug tests argue that any potential errors are harmless because these tests are not designed to be relied upon at trial. There is no nationally uniform legal standard regarding the admissibility of field drug test results in court, but some states do rely on them in various legal proceedings, including trials. In Georgia, colorimetric presumptive test evidence is admissible to prove a drug case at trial (*Fortune v. State*, 2010), confirmation by a lab is not required

(*Collins v. State*, 2006). Some states have specific rules regarding field drug test evidence; for example, Virginia permits officers to testify on marijuana field tests (Testimony Regarding Identification of Controlled Substances, 2021). The admissibility of these tests varies considerably among jurisdictions, but even where the admissibility is restricted the tests can still play a significant role in the legal process, especially in securing guilty pleas.

For more information on admissibility of presumptive tests, see Appendix I.

How Often Are Presumptive Drug Tests Used by Police?

The Field Test Use Frequency Survey

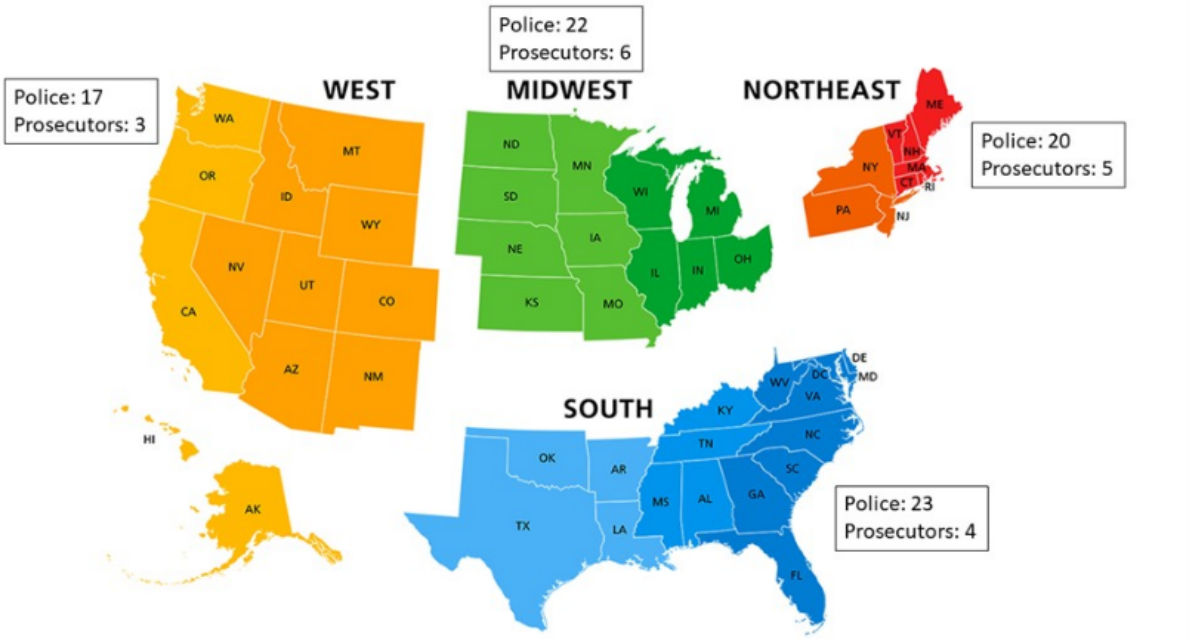
Our initial inquiry sought to learn the frequency with which presumptive tests are used by police in drug arrests. While some anecdotal accounts indicate that use is widespread, we could not find any empirical estimate in existing literature. To fill this gap, we devised and conducted a nationwide survey of police departments. Originally, our sample was created by identifying the two most populous cities or towns in each state and then identifying the law enforcement agency that served those places. We also included Washington DC and the DC Metro Police Department. Each agency was contacted by phone to determine an appropriate respondent who would have sufficient knowledge of drug arrest practices and procedures to supply information about the frequency of test use. The survey was then emailed to the identified contacts. Non-responses were followed up with phone calls. We expanded our sample to include the 10 most populous cities or towns in each state and their corresponding police departments. We ultimately collected responses from 93 agencies, 82 of which contained complete responses and were suitable for analysis. The agencies comprising these served a combined population of around 22,500,000 people.

We also surveyed prosecutor offices for the same locations. The response rate for prosecutors' offices was much lower, with only 18 offices completing the survey. The combined jurisdictions of these offices covered a population of around 6,8000,000 people. While not a sufficient sample for more detailed estimates, the information provided is very helpful in understanding prosecution policies regarding the tests.

Police Agency Results

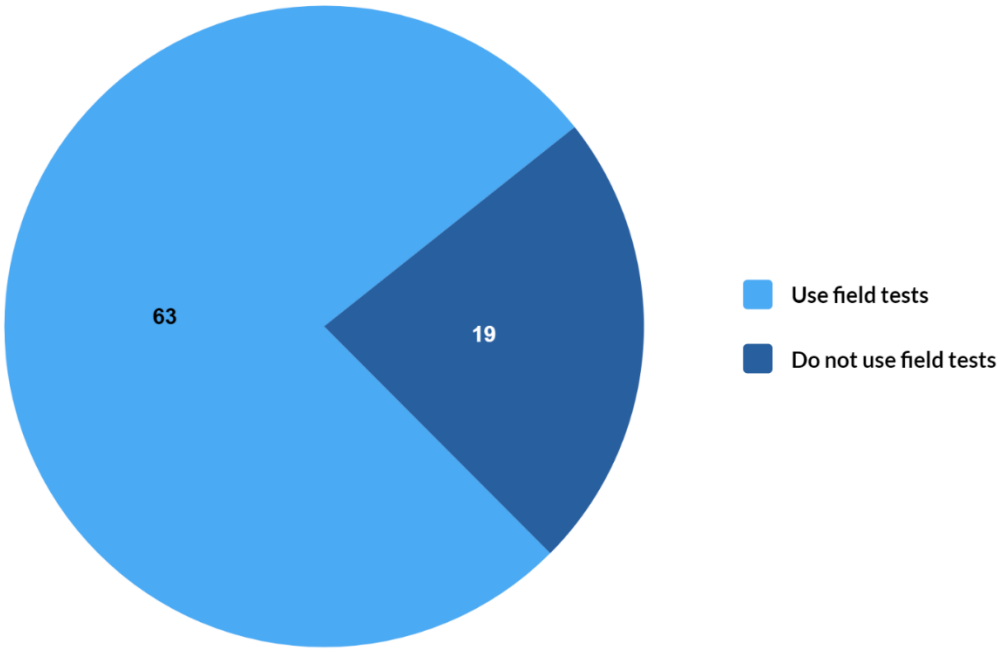
Our survey included responses from agencies in all regions of the US [Figure 4.A].

Figure 4.A: Geographic Distribution of Survey Responses



A total of 93 agencies responded to the survey; however, due to missing data, 82 responses comprised the final sample of police agencies. Responses came from police agencies in 38 states. Most respondents (76.8%) reported that that they currently use presumptive field tests in drug arrests, with 23.2% of agencies reporting no current use of field tests [Figure 4.B].

Figure 4.B: Use of Field Tests



Agencies that Do Not Use Field Tests

Of the 19 agencies reporting no current use of field tests, four (21.1%) indicated that their agency had not previously used any form of presumptive field testing. However, the remaining 78.9% (n = 15) indicated that their agencies had used field tests within the last five years. Twelve agencies recently stopped using the tests due to concerns about fentanyl exposure (i.e., a belief that physical contact with fentanyl is, by itself, dangerous for the officer), and two agencies reported that the tests were an unnecessary expense as suspects were arrested and charged regardless of the test outcome. The remaining agency stopped using field tests due to what it reported as "explosive" test reactions in the kits.

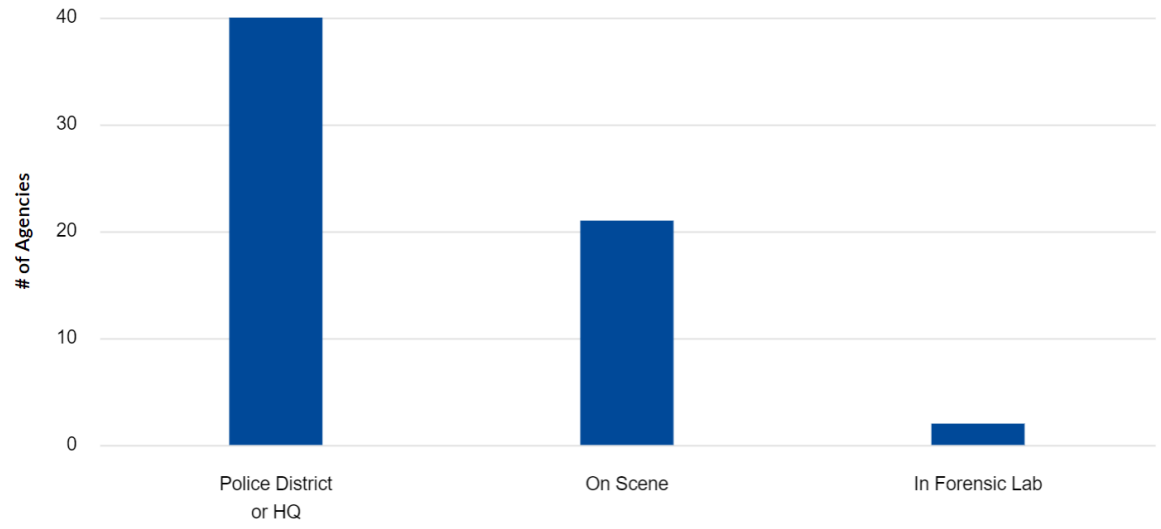
Agencies that Use Field Tests

When asked to identify when field tests are typically conducted by officers in their agency, most respondents indicated that field tests are conducted after a suspect is arrested/given a citation but before the initial charging (n = 38, 60.3%). 23.8% (n = 15) of field tests conducted by the

responding agencies occur before a suspect is arrested/given a citation, and the remaining 15.9% (n = 10) of field tests occur after the initial charging.

Most of these field tests are conducted in police districts/headquarters (n = 40, 63.5%) or on the scene (n = 21, 33.3%), with a small minority conducted in labs (n = 2, 3.2%), Figure 4.C.

Figure 4.C: Where Are Presumptive Field Tests Conducted?



56 agencies have written policies for conducting and/or documenting the use of presumptive field tests. Of these, 37 (68.5%) indicate that their agency's policy has been modified in the past five years.

Similarly, 56 agencies report that their officers receive training on the use of presumptive field tests, with most of the training conducted by their own department (n = 35, 62.5%). A small number of respondents (n = 5, 8.9%) indicated that training is provided by the field test vendor / manufacturer, and one respondent (1.8%) reported training on field tests by a state law enforcement agency. Just over one-fourth of participants (n = 15) indicated that they receive training on field tests from some other source.

Frequency of Field Test Usage

To determine the frequency of field test usage nationally, each respondent was asked to estimate the total percentage of drug arrests by their agency in which the presumptive tests were used. These responses were then averaged for the respective jurisdictions. First, an average was calculated for only those agencies which reported use of field tests. Then, an average was calculated for all agencies which responded to the survey. Responses from the agencies that reported no use of field tests were assigned a value of zero.

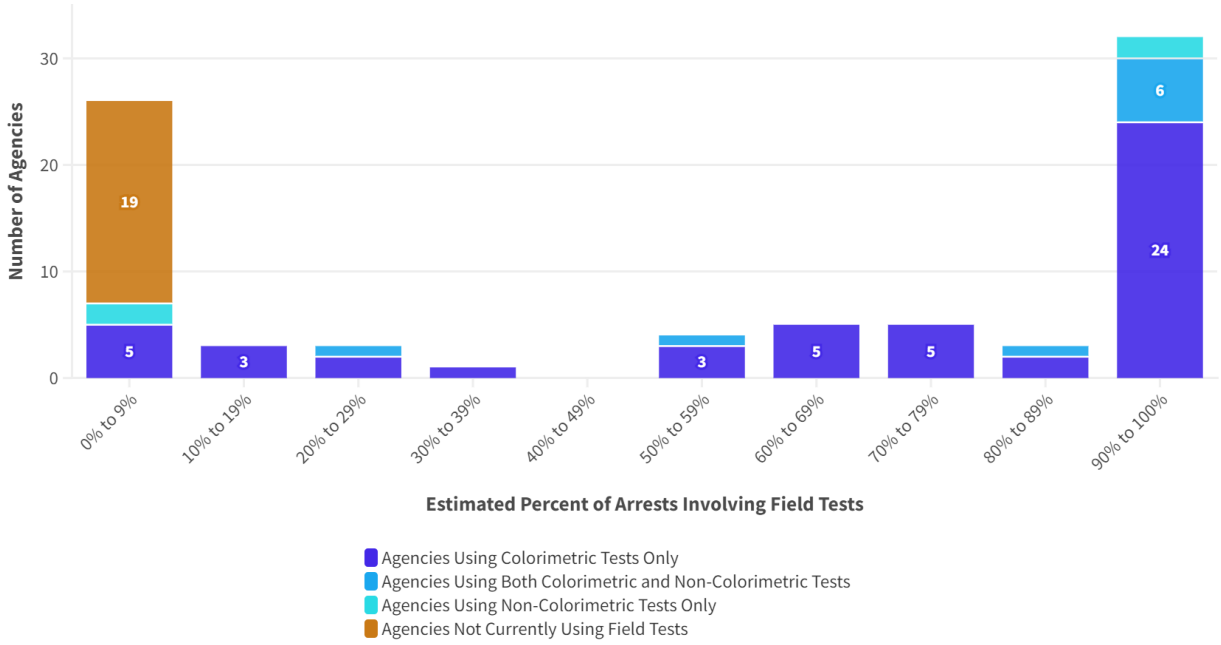
Of all agencies that use field tests, the estimated total percentage of drug arrests in which the presumptive tests were used ranged from 1% to 100%, with a **mean estimate of 69.8%.**

We also examined the estimated percentage for two subgroups: (1) the sample **without** agencies that exclusively use non-colorimetric tests (n = 59) and (2) the sample **without** agencies that exclusively use non-colorimetric tests or use both colorimetric and non-colorimetric tests (n = 50). When examining subgroup (1), the mean estimate of drug arrests in which presumptive tests are used is 71.0%. When examining subgroup (2), the mean estimate is 68.9%.

When including agencies that reported no use of field tests (assigned values of zero), the distribution of responses is bimodal in nature. As displayed below, most agencies estimated either 0% to 9% of arrests involving field tests or 90% to 100% of arrests involving field tests [Figure 4.D]. Given the focus of the present report on colorimetric field tests, we have indicated counts for agencies which: (1) exclusively utilize colorimetric tests, (2) utilize both colorimetric and non-colorimetric tests, (3) agencies which exclusively utilize non-colorimetric tests (e.g., TruNarc), and (4) agencies which do not currently use field tests.

Figure 4.D: Estimated % of Arrests Involving Field Tests

(including agencies who do not currently use field tests as 0%)



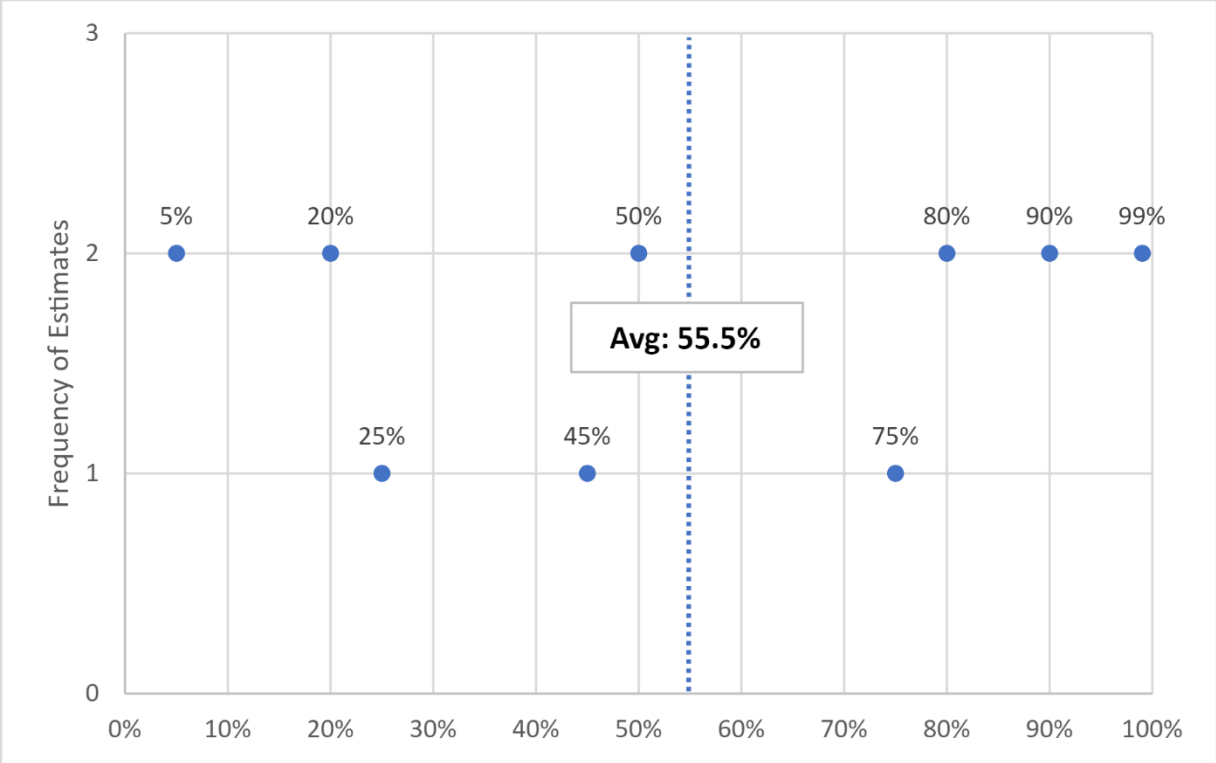
The mean estimated total percentage of drug arrests involving presumptive tests, including agencies that reported no use of field tests, is **53.6%**. Again, we examined the estimated percentage for two subgroups: (1) the sample **without** agencies which exclusively use non-colorimetric tests (n = 78) and (2) the sample **without** agencies which exclusively use non-colorimetric tests or use both colorimetric and non-colorimetric tests (n = 69).

When agencies that do not use field tests were included as zero values, the mean estimate of drug arrests in which presumptive tests are used for subgroup (1) is 53.7%. The mean estimate for subgroup (2) is 49.9%.

Prosecutor Office Results

Representatives from 18 offices in 15 states completed the survey. All but one office (94.4%) reported processing or charging drug cases in which presumptive field testing has been used to identify suspected drugs. Offices that process and charge cases that include field testing were asked to estimate the percentage of all drug-related arrests in their jurisdiction in which field tests are used. This estimate ranged from 5% to 99%, with an average of 55.5% [Figure 4.E].

Figure 4.E: Estimated Percent of Drug-Related Arrests that Involve Field Tests in Jurisdiction



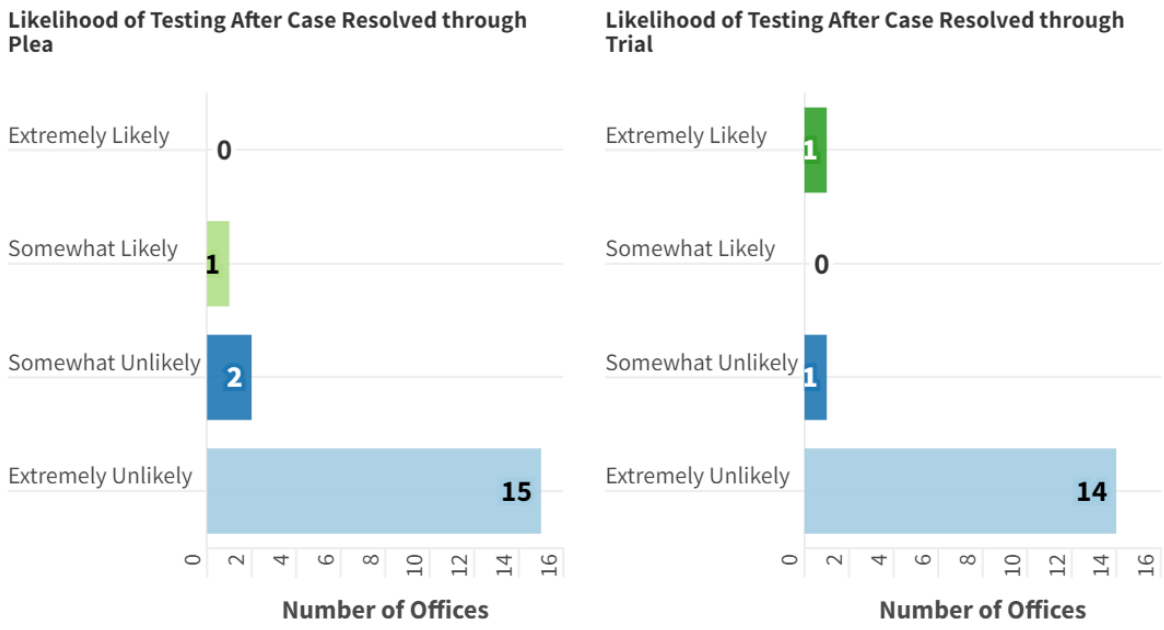
When the single office that does not process or charge drug cases in which field testing has been used was assigned a value of zero and included in this estimate, the average was reduced to 52.1%.

A minority of offices (n = 3, 16.7%) have a formal policy related to drug field tests. All of those offices reported that the policy is not in writing. One-third of surveyed offices (n = 6, 33.3%) make recommendations for pre-trial detention in simple drug possession cases that are not sales- or distribution-related. Of these, half report that they consider drug field tests when making recommendations, and half report that they do not.

88.9% of offices (n = 16) permit individuals to plead guilty prior to forensic lab drug testing in drug possession cases. Pertaining to trial, all offices require forensic confirmatory testing of suspected drugs prior to a case proceeding to trial.

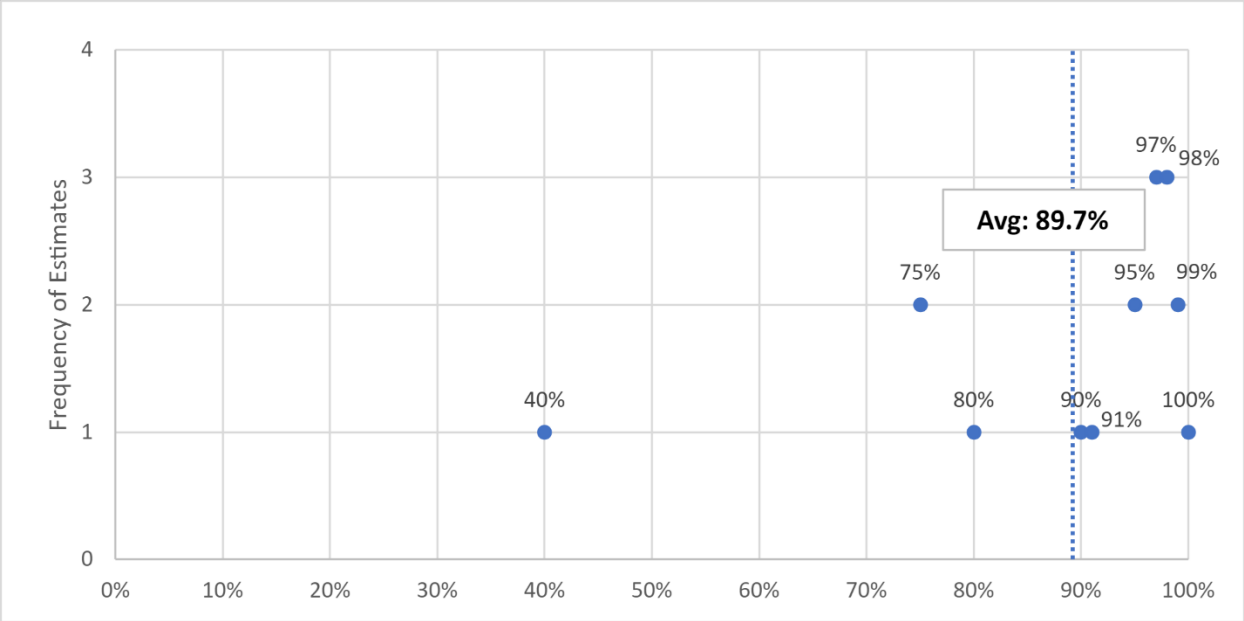
Respondents were asked to rate the likelihood that (1) seized drug evidence will be tested after a case is resolved by guilty plea and (2) seized drug evidence will be tested after a case is resolved by trial on a one-to-four scale (1: Extremely unlikely, 4: Extremely likely). On average, it would be unlikely for offices to test seized drug evidence after the case concludes for cases resolved by guilty plea (M = 1.2, SD = 0.6, Range: 1-3) as well as for cases resolved by trial (M = 1.4, SD = 1.0, Range: 1-4). The charts below display the distribution of responses to these questions [Figure 4.F].

Figure 4.F: Prosecutor Office Responses on Confirmation Testing



Office representatives also estimated the percentage of cases in which substances submitted to a forensic lab for confirmatory testing are forensically verified as the suspected drug type. This estimate ranged from 40% to 100%, with an average estimate of 89.7% [Figure 4.G].

Figure 4.G: Estimated Percent of Cases Where Substance is Forensically Verified as Suspected Drug Type by Lab



Note. Respondent who estimated a frequency of 40% stated: "About only 40% are the same substances, but more often than not they are other illegal substances."

One respondent indicated that they were aware of an instance in which a convicted/guilty plea defendant was exonerated after a discovery that the suspected drugs were not, in fact, the suspected substance.

How Often Do Presumptive Tests Contribute to Wrongful Convictions?

Our survey results indicate that colorimetric presumptive tests are used in roughly half of all drug arrests, with substantial variation across law enforcement agencies (LEAs). Given the concerns raised in some quarters about the accuracy of presumptive tests, a natural follow-on question is whether these tests wrongly inculpate people who do not in fact possess controlled substances, and, if so, how often this occurs.

To estimate the number of people impacted by inaccurate tests, we need data and methods that account for both the wide range of factual circumstances present in real-world drug arrests and the spectrum of probabilities that a presumptive testing method will yield a positive result inconsistent with confirmatory test results. Such estimation requires three ingredients:

1. Information about the fraction of drug arrests that involve the use of presumptive tests
2. Information about the number drug arrests that occur in that jurisdiction in a given time frame (e.g. in a year)
3. Information about the likelihood that substances suspected to be illicit drugs due to a positive presumptive test are not in fact drugs

The survey described above provides the first ingredient. To compute the number of drug arrests (#2), we conduct a statistical analysis of detailed jurisdiction-level administrative crime records from across the country. For #3, the precise data required do not currently exist, so we develop an approximation that draws upon existing published estimates and our own calculations based on data obtained through public record requests. We next describe these analyses.

How Many Drug Arrests and Presumptive Drug Tests Are There Each Year?

We rely on three main data sources to calculate the number of drug arrests nationally and by state. The National Incident-Based Reporting System (NIBRS) is an FBI-sponsored crime reporting program that collects data on individual crime incidents from participating law enforcement agencies. One key advantage of NIBRS relative to other data sources is that it contains granular data on each incident--e.g., the types of crimes alleged, the location and timing of the incident, the number and demographic characteristics of offenders and arrestees, and the types and amounts of property, weapons, drugs, and other materials involved. For this analysis, we used NIBRS datafiles archived in the University of Michigan's Inter-university Consortium for Political and Social Research (ICPSR), and averaged across the years 2010-2019.

While NIBS is a rich source of data about drug arrests, by the end of the sample period, only about half of all LEAs contributed data to NIBRS. We supplement that NIBRS data with data from the FBI's Uniform Crime Reporting (UCR) Summary Reporting Statistics (SRS) program, which covers a more agencies, but which reports only aggregate monthly counts of arrests across various crime categories, rather than incident microdata.

In addition to crime data, we use U.S. Census population estimates data that describe the demographic characteristics of the population served in each LEA locality (age, race, and sex).

For those agencies that participate in NIBRS, we used the annual average number of drug arrests recorded in NIBRS as their drug arrest total. For non-NIBRS agencies, we estimated the number of NIBRS drug arrests with regression models where the outcome was the average annual number of NIBRS drug arrests and the primary predictors were counts of UCR offenses and arrests and population and demographic variables. We estimated these relationships separately for different types of LEAs (large and small statewide departments; large and small local departments; large and small sheriff departments; and special agencies [e.g. university, transit, etc.]). For the minority of agencies without UCR data, we predicted the number of drug arrests based on the population and demographic variables.

NIBRS and the UCR contain limited information about the race of the arrestee. Given widespread concerns about racial disparities in wrongful prosecutions (Gross et al., 2022), we sought to also measure false tests separately by race, and below we present counts of arrests and numbers of people impacted by erroneous tests separately for White and Black defendants. To calculate these estimates, we modeled the percentage of all arrests that involved, respectively, White and Black defendants using generalized linear modeling with similar predictors as described above. We note that race data from official crime statistics have many limitations, including that standards for recording race/ethnicity vary substantially across jurisdictions, there are a very limited set of racial categories available in the data, and in many cases race information might be based on the judgment of law enforcement personnel rather than the individuals themselves.

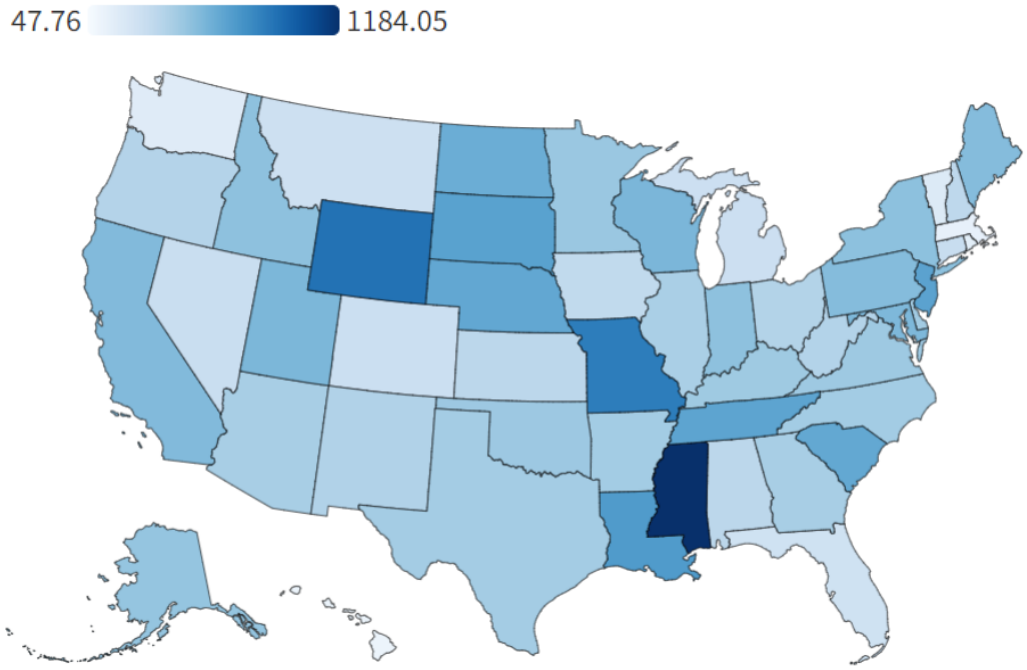
There are an estimated 1.55 million drug arrests in a typical year.

The results of this analysis are shown in Figure 5.A below, which provides state level estimates of the number of annual drug arrests along with counts of arrests for White and Black defendants. Overall, based on data from 2010- 2019, we estimate that there are 1.55 million drug arrests in a typical year, with substantial variation from state to state in both the per capita rate of drug arrests and the share of all drug arrests that involve Black arrestees.

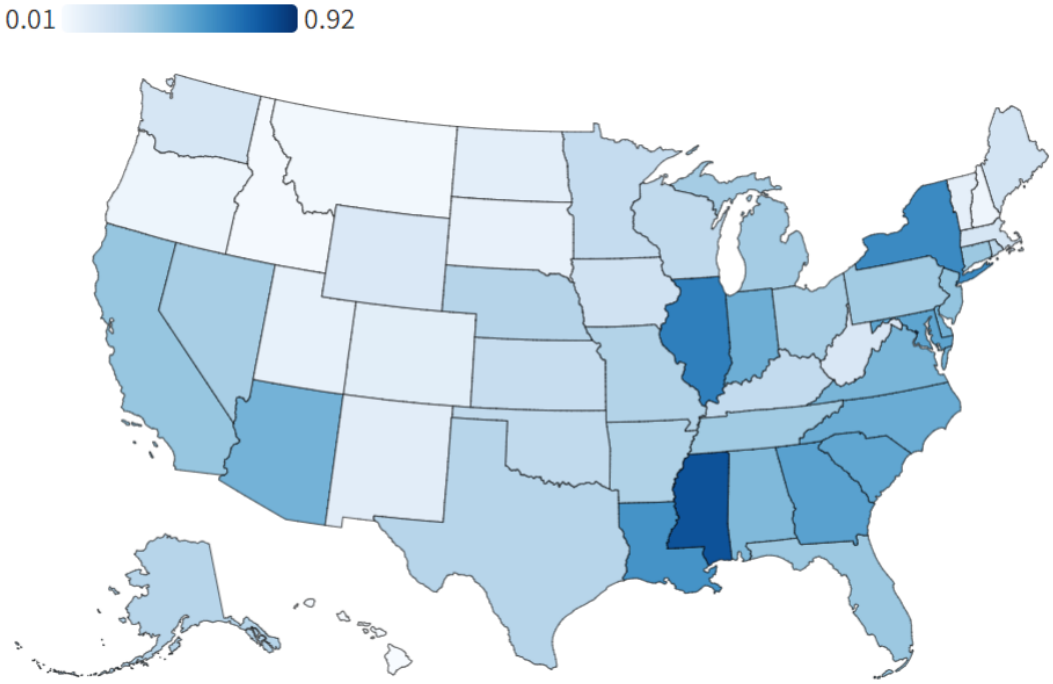
Nationally, nearly 600,000 arrests annually involve Black defendants, accounting for over 1/3 of all arrests, despite the fact that Black people constitute only about 12% of the U.S. adult population.

Figure 5.A: Estimated Annual Drug Arrests by State

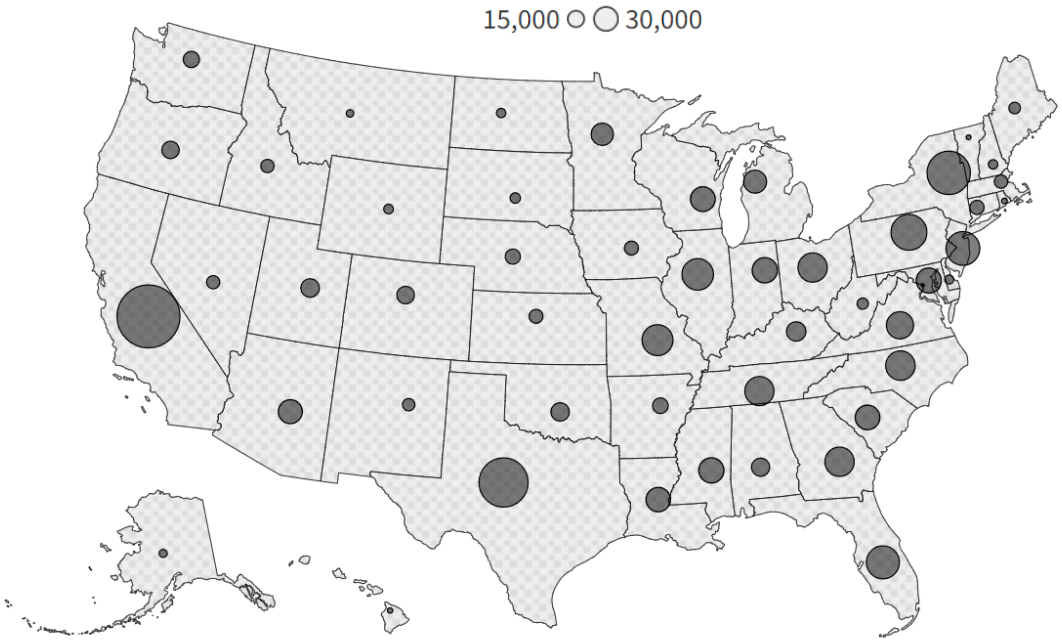
a. Per Capita Drug Arrests



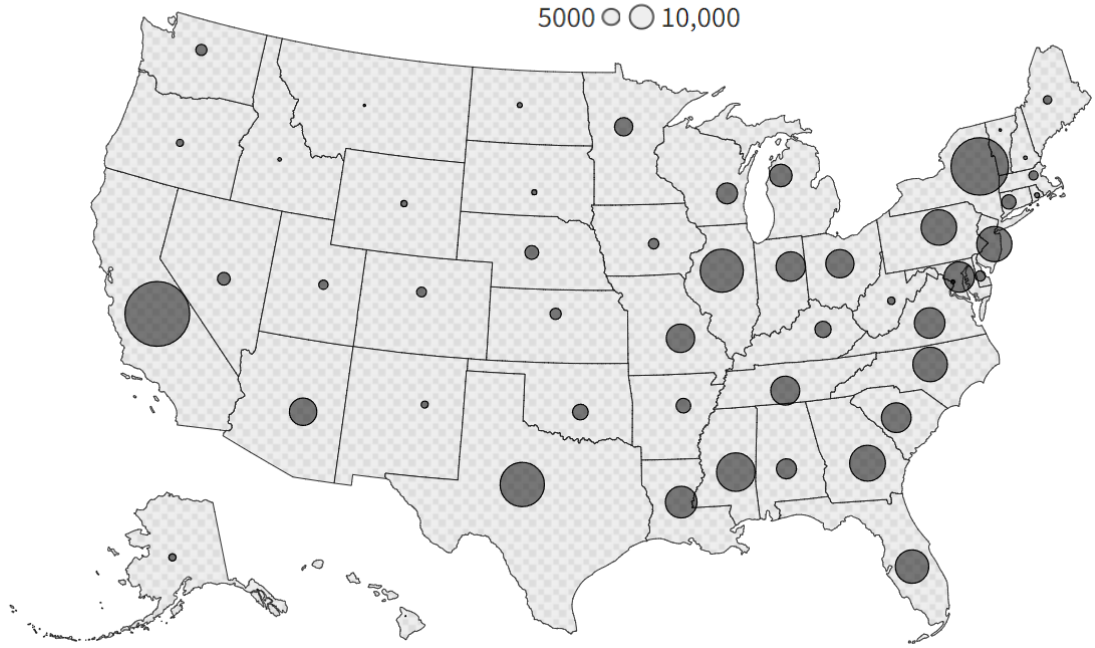
b. Black Share of Drug Arrests



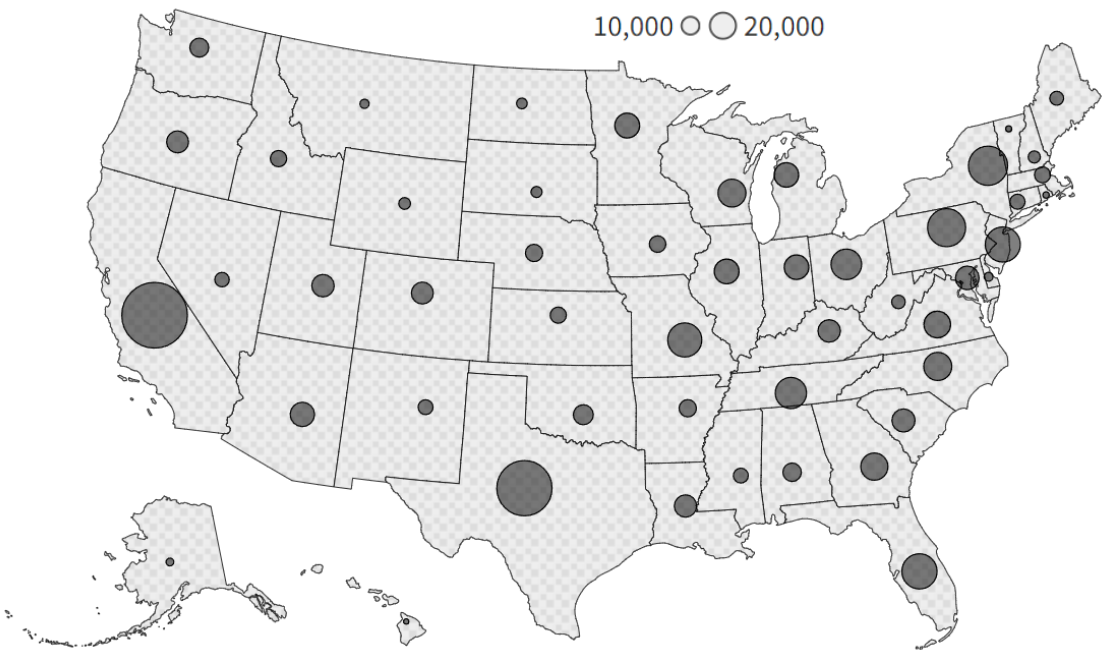
c. Drug Arrests (All Arrestees)



d. Drug Arrests (Black Arrestees)



e. Drug Arrests (White Arrestees)



There are an estimated 773,000 colorimetric field tests conducted each year.

To calculate the number of presumptive drug tests that occur each year that rely on the potentially flawed colorimetric testing methodology, we take the number of drug tests and multiply by the fraction of arrests that involve presumptive colorimetric tests. These fractions can be obtained from our survey data. After excluding tests where respondents indicate that they use potentially more reliable technologies such as TruNarc, we are left with 69 responses and an average testing rate in drug arrests of 49.9%. There is no indication that the testing rate is correlated with the size of the department, measured either based on total population served, overall number of arrests, or number of drug arrests. Thus, we can apply this number as a national average to the drug arrests estimates above. Doing so yields an estimated 773,000 colorimetric field tests conducted each year.

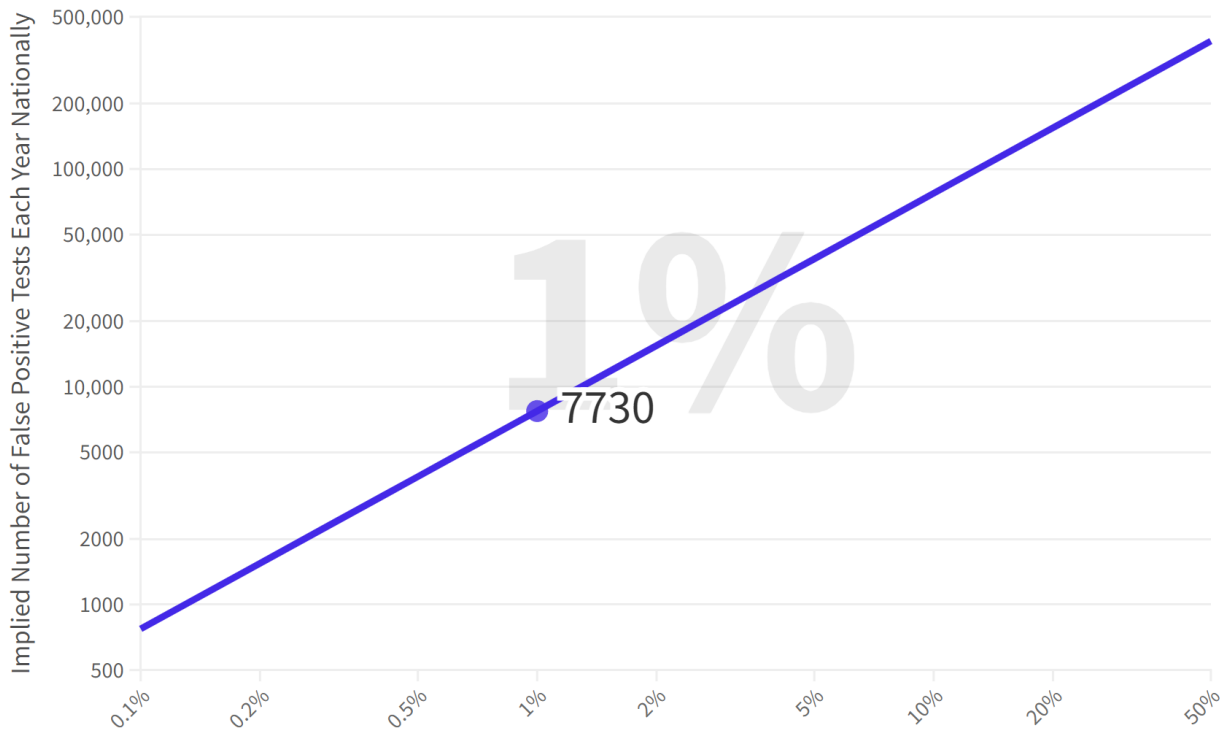
How Often Are Drugs Misidentified By Law Enforcement?

Unfortunately, there is no comprehensive source of data on error rates of presumptive drug tests, and there is limited published data on these tests. An error occurs when either a test fails to indicate the presence of a tested substance when that substance is in fact present (a "false negative"), or when a test indicates the presence of a substance when it is not in fact present (a "false positive"). Since our focus here is on wrongful convictions, we are more interested in the latter type of error, i.e., a false positive indicating someone has a controlled substance when they in fact do not, which typically leads to their arrest and a criminal charge.

The most scientifically valid way to establish true false positive rates in presumptive tests would be to randomly sample from arrests where there was a positive presumptive test, independently test the samples from those arrests for controlled substances using validated laboratory methods, and then calculate the false positive error rate based on those results. We could then simply multiply the false positive error rate by the number of tests conducted to estimate the number of innocent individuals falsely implicated by presumptive drug tests. For such a metric to apply nationally, the random testing would need to be broadly representative. However, such quality control testing does not routinely occur in practice, so false positive rates are unknown.

If we did know the true false positive rate, our estimates above furnish a means to calculate the number of people arrested for drug offenses who are falsely implicated by presumptive tests. The figure below plots the implied number of people wrongfully implicated by these tests for different levels of the true false positive rate. If the true false positive rate nationally were, for example, 1%, then this would imply that there are about 7,700 people each year who were not possessing drugs who were arrested and falsely implicated for drug possession by a presumptive colorimetric test.

Figure 5.B: Implied National Counts of False Arrests Involving Presumptive Colorimetric Tests as a Function of the False Positive Rate



Given that true false positive rates are unknown, are there any data that are available that might shed light on the scope of the problem? One intuitive way to approximate the "false positive" type of presumptive drug identification error would be to use field data and measure the rate at which samples with positive presumptive tests submitted to a lab are returned with a no controlled substance finding. This approach departs from the scientific ideal in that the set of presumptively tested samples actually submitted to the lab may be unrepresentative of the larger universe of arrests involving presumptive tests.

Even putting aside such concerns about representativeness, data availability would pose a challenge for such a calculation. Records on which arrests involved a presumptive drug test are maintained, if at all, by police, whereas records on confirmatory tests are maintained within crime labs. Typically, information from these data sources are not combined (and indeed, best scientific practice would be for crime labs to be blinded to other information police have about a case at the time of testing;

Kassin et al., 2013), making it difficult to know which lab- tested samples originally involved field tests.

> One potential data source for error rates might seem to be manufacturer validation studies. However, such studies are likely not appropriate for our purposes. Validation studies are used by manufacturers to measure the technical characteristics of their tests in an effort to ensure that their tests yield accurate results to within an acceptable range of error. Such tests are generally conducted in controlled laboratory conditions by highly experienced test operators on substances of known composition and purity. Such conditions are very different from those used in the field, where officers who may have limited training are deploying tests on unknown substances.
>
> Additionally, inferences drawn from publicly available results from validation studies may also suffer from publication bias if manufacturers only publicize results that tend to help their marketing efforts.

There are examples of such tests that have been performed in specific jurisdictions, but their utility for constructing a national estimate is questionable due to concerns about generalizability. For example, in one instance that garnered media attention (e.g., Savage, 2019), the Savannah Police Department examined 42 police cases where presumptive tests were used. That audit revealed that a "positive" presumptive result occurred in 39 of the cases and a negative result occurred in 3. Of the 39 positive field test results, 6 were negative for controlled substances when tested by the forensic lab. This yields a "false positive rate" of 15.4% (6/39).

However, the utility of such data points for producing national estimates is questionable. In Savannah and many other single-jurisdiction audits, available documentation provides no clear indication how the samples were selected, meaning that law enforcement may have picked cases where there were particular concerns about test procedures (which might lead to an overestimate relative to the true error rate) or cases involving atypical substances. Moreover, since test procedures and substances seized can vary appreciably across communities, making broad extrapolations based on a small number of samples from single jurisdictions is likely problematic.

We can, however, obtain more broad-based data for one metric likely related to the false positive rate, which is the share of all forensic drug lab submissions thought to contain drugs that are returned as having no controlled substances, which we will refer to as the "drug identification error rate." This drug identification error rate reflects the basic situation we are trying to capture, which is when the police believe someone has a controlled substance (it is presumed to be drugs) but in fact the substance in question is not illegal. This metric can also be calculated from data available within a crime lab, so it is potentially more feasible to compute for a broad range of jurisdictions, an important consideration for developing a national estimate. Of course, a key drawback of this metric is that it is not specific to presumptive drug tests, but instead captures all test activity, whether or not the initial arrest involved a presumptive test.

Relative to the ideal measure of a true false positive rate for presumptive tests, the drug identification error rate is likely overinclusive in some ways and underinclusive in others. Only a subset of submissions made by police to drug labs for testing involve situations where a presumptive test has already been performed. If presumptive tests contain some useful diagnostic information--i.e., there is a higher probability that a substance is in fact illicit when it has tested positive with a presumptive test as compared to when no testing has been done at all--then the drug identification error rate might be upward biased relative to the true false positive rate. On the other hand, the lab never receives many samples tested by police for a variety of reasons, including cases pleading out or being dropped, backlogs, and misplaced samples. In other words, the set of samples seen by the lab is a selected, non-random sample of the true universe of cases of interest. If the selection process tends toward filtering out bad cases where evidence is weak--as one might hope it would--then through that channel the drug identification rate might be downward biased relative to the true false positive rate.

We sought the best available evidence on drug identification error rates by canvasing high-quality published studies and reports for information about error rates. We also compiled data obtained through public records requests that could be used to calculating the drug identification error rate. In total, we were able to obtain 7 independent estimates of the drug identification error rate as detailed in Table 5.1.

Table 5.1: Estimates of Drug Identification Error Rates

Data Source	Share of Submissions with No Controlled
Bechky (2021)	5.0%
Authors' calculations from Florida Department of Law Enforcement Forensic Laboratory 2021 drug testing data	5.3%
Authors' calculations from Massachusetts State Police Crime Lab 2021 drug testing data	3.2%
Authors' calculations from Texas Department of Public Safety 2021 drug testing data	2.3%
Authors' calculations from California Department of Justice Bureau of Forensic Services 2021 drug testing data	2.4%
Authors' calculations from Virginia Department of Forensic Science 2021 drug testing data	6.6%
Authors' calculations from Wyoming Attorney General's Office 2021 drug testing data	1.3%
Overall Average	3.7%

Although in one sense these data are limited in that they derive from only a few states, our states were geographically dispersed and they represent 32% of the total U.S. population; moreover, the drug identification error rate given above is derived from data covering over 190,000 individual submissions. To our knowledge this is the most comprehensive accounting ever assembled of misidentification rates for drug seizures conducted in a criminal adjudication context in the United States.

Manufacturers or other advocates of presumptive field drug tests might suggest that this implies that the colorimetric presumptive tests have an "error rate" or "false positive rate" of 3.7%. This would not be an accurate characterization of what we estimate here. We are attempting to use what data are

available to better understand the potential national impact of the tests as measured by people affected; we are not estimating the true false positive rate of the tests. As explained above, the true false positive rate that applies nationally is unknown, and false positive rates in any given setting can vary widely depending on the specific contexts in which the tests are used, as evidenced by the fact that false positive rates as high as 38% have been observed in particular settings.

Applying the drug identification error rate estimated above to our other data suggests that large numbers of people are adversely affected by inaccurate colorimetric tests. The 3.7% drug identification error rate equates to an estimated 28,800 arrests each year involving a person not possessing a controlled substance who was falsely implicated by a presumptive drug test. In other words, the enormous number of drug arrests and tests that occur annually, coupled with the lack of meaningful post-arrest review (discussed further below), means that tens of thousands of innocent people are wrongfully arrested and wrongfully convicted of drug possession charges each year due to erroneous presumptive drug tests.

Available data indicate that tens of thousands of people not possessing a controlled substance are falsely implicated by presumptive drug tests each year.

To put this number in context, the National Registry of Exonerations, the leading data source on exonerations in the United States, has records of 3,388 confirmed exonerations that have been identified across the United States for all crimes dating back to 1998. Our analysis based on the drug identification error rate indicates that more than eight times that number of people are being wrongfully convicted of drug possession **each year** through the use of presumptive colorimetric field drug tests without a subsequent confirmatory test.

The burden of these wrongful arrests is not borne evenly across the population. Given their overrepresentation among drug arrestees, it is no surprise that the per capita rate of erroneous drug

arrests involving presumptive tests is 3x higher for Black Americans than it is for White Americans (Figure 5.C).

Figure 5.C: Per Capita Annual Arrests with Presumptive Tests and Drug Identification Errors

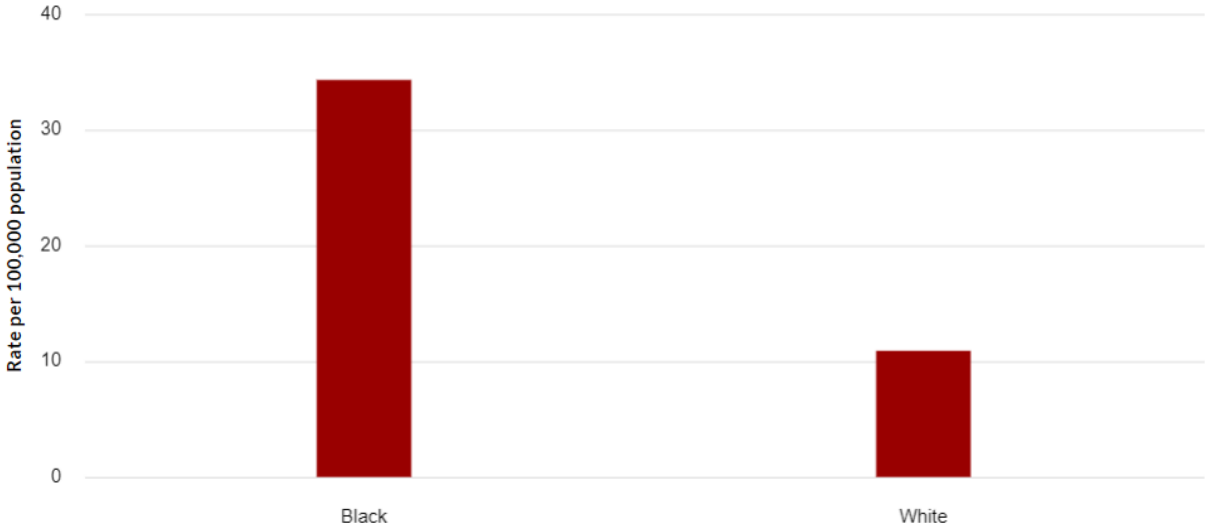
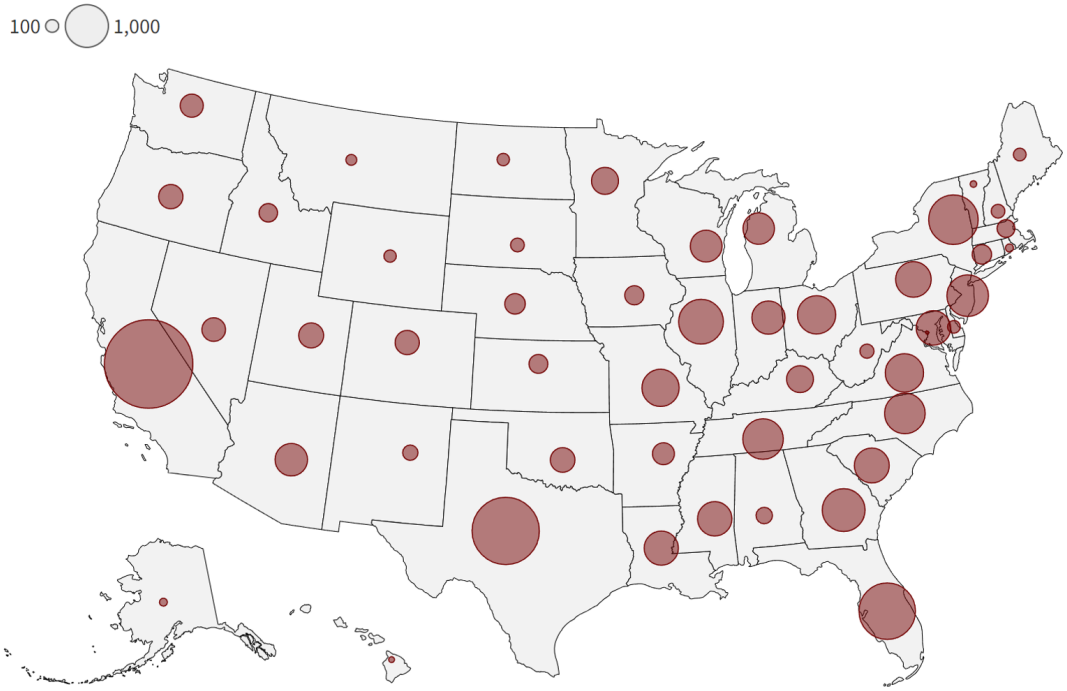


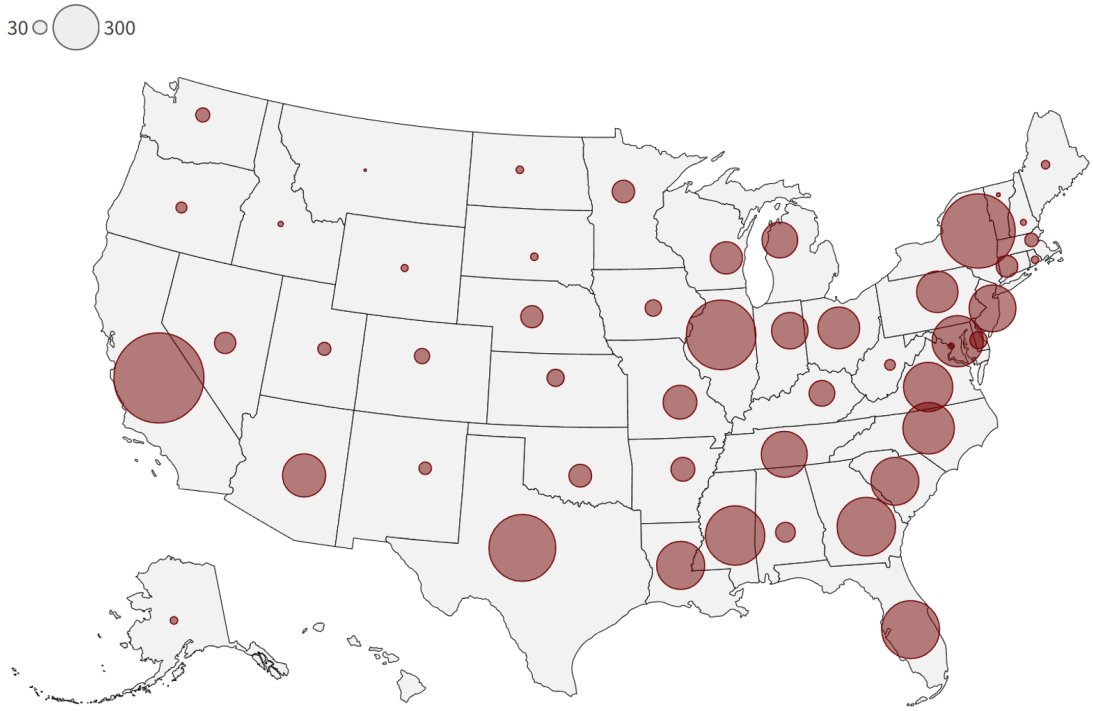
Figure 5.D below shows the estimated distribution of erroneous drug arrests by state, again based on the drug identification error rate described above. California leads the nation with an estimated 4,000+ arrests each year involving individuals not carrying controlled substances who are falsely implicated by presumptive tests. In most states, hundreds or even thousands of innocent people each year are falsely implicated by these tests.

Figure 5.D: Estimated Annual Arrests with Presumptive Tests and Drug Identification Errors by State

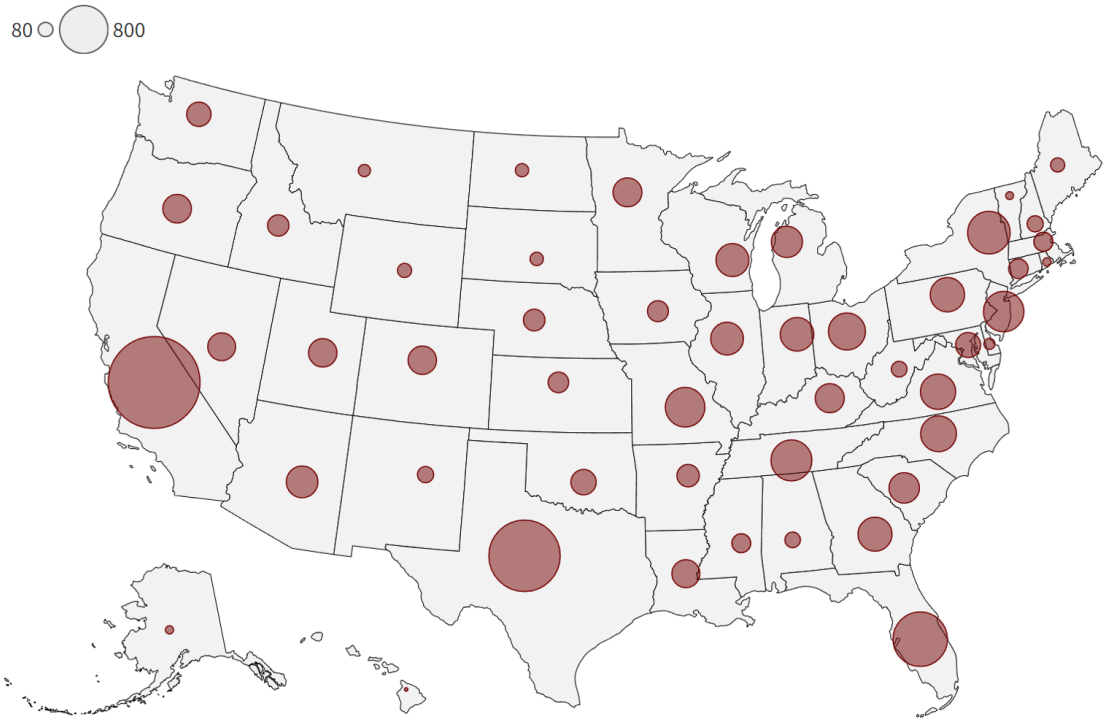
a. All arrestees



b. Black arrestees



c. White arrestees



Accounting for Uncertainty

The process of extrapolating from available data on arrest patterns, testing rates, and drug identification error rates involves uncertainty both due to sampling and due to the various statistical and other data assumptions required to produce these estimates. To characterize the sampling uncertainty of our estimates, we employed a bootstrapping process that involved the following steps:

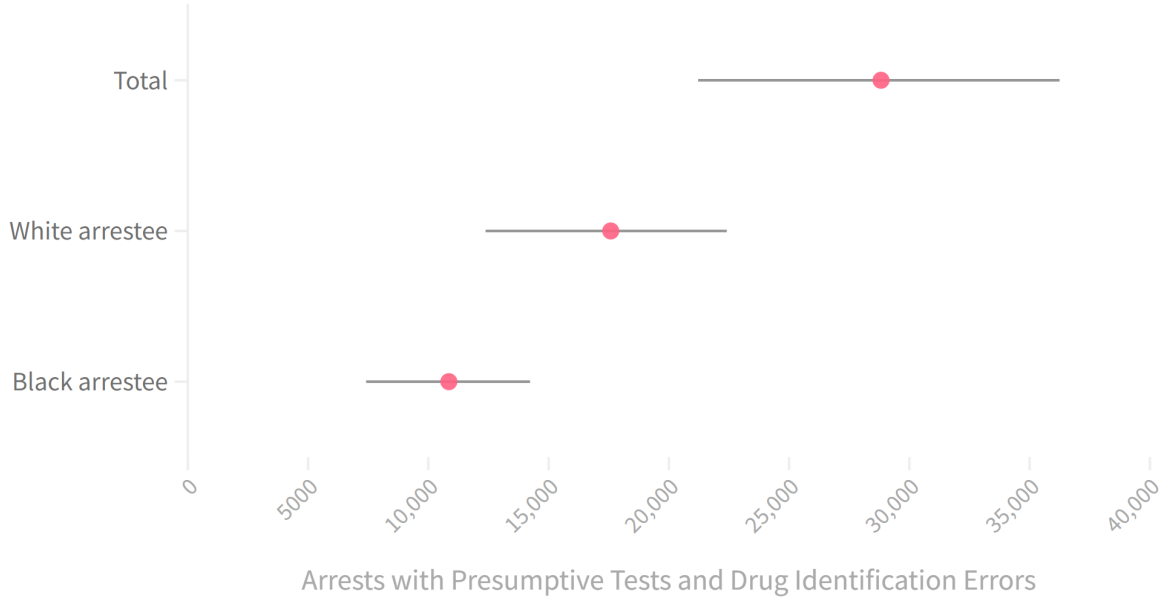
1. Construct the truncated (at zero) normal distribution that best fits the 7 data points for drug identification error rates described above.
2. Randomly select from among the 17,659 law enforcement agencies in our sample with replacement.
3. For each law enforcement agency, assign a bootstrapped testing rate by randomly drawing from one of the 69 survey responses we received.
4. For each jurisdiction, assign a bootstrapped drug identification error rate by randomly drawing from the distribution computed in Step 1.

5. For this new sample, re-calculate the total number of drug arrests and erroneous drug arrests by employing the same methodology and statistical models used above for the baseline, but on this newly constructed sample.
6. Repeat steps 2-5 for 1,000 iterations

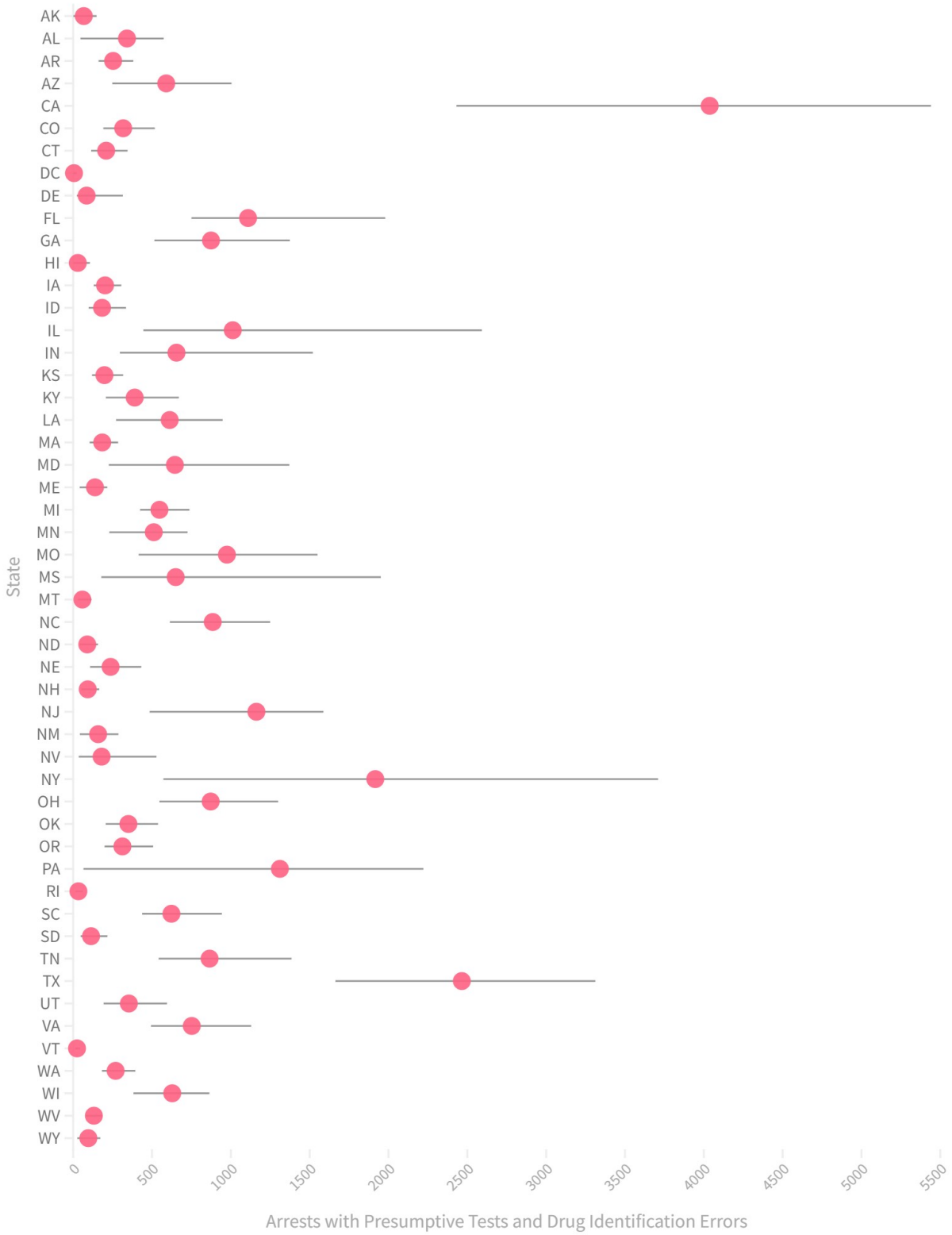
In Figure 5.E below, we construct the 95% confidence interval using 2.5th and 97.5th percentile values from this resulting collection of 1,000 estimates. This approach improves upon conventional standard errors because it explicitly takes into account fact that we are combining information from multiple distinct sources, each of which has some degree of sampling uncertainty.

Figure 5.E: Confidence Intervals for Estimates of Number of Arrests with Presumptive Tests and Drug Identification Errors

a. National Estimates



b. State Estimates

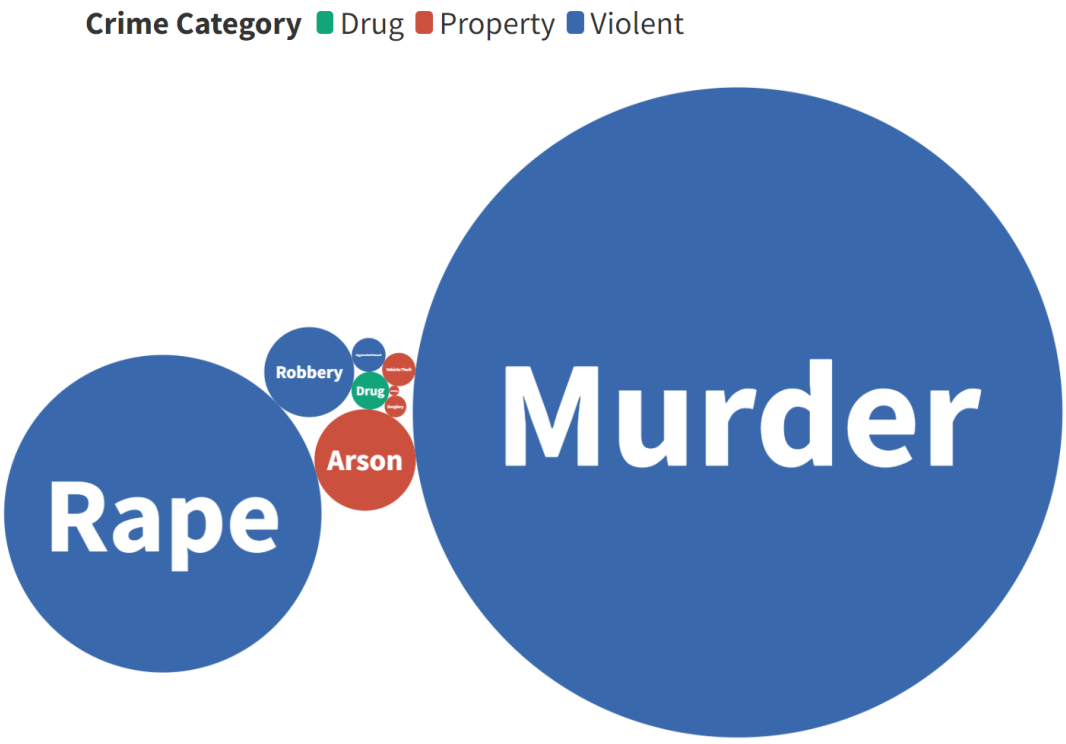


The precision of these estimates varies across states for a several reasons, but one important contributor is the underlying quality of data on crime and arrests. Nonetheless, even taking into account the considerable sampling uncertainty from the various data sources used for these estimates, we can state with a high degree of confidence that there are tens of thousands of drug arrests involving misleading colorimetric field tests each year.

Are These Numbers Big or Small?

These estimates fundamentally change our understanding of the frequency of wrongful convictions across different categories of crime. To illustrate, Figure 5.F below shows the relative contribution of different categories of crime to known wrongful convictions. We constructed the figure by counting up the number of exonerations in the National Registry of Exonerations (2023) for each of the seven FBI index crime categories, adjusting to an annual rate, and then calculating the expected number of exonerations per 100,000 arrests by denominating by 2019 FBI arrest counts (Criminal Justice Information Services Division, 2019).

Figure 5.F: Annual Wrongful Convictions Per 100,000 Arrests (NRE only)



The figure makes apparent that the landscape of known exonerations is heavily skewed towards violent crime in general, and murder in particular. This overrepresentation of murder and other serious crimes in known exonerations is a well-documented phenomenon (Brooks, 2023), and occurs for a variety of reasons, including greater availability of DNA in cases of violence, a more thorough appellate process for more serious cases, and lengthier review times for cases involving

The "Shiny Object" of DNA

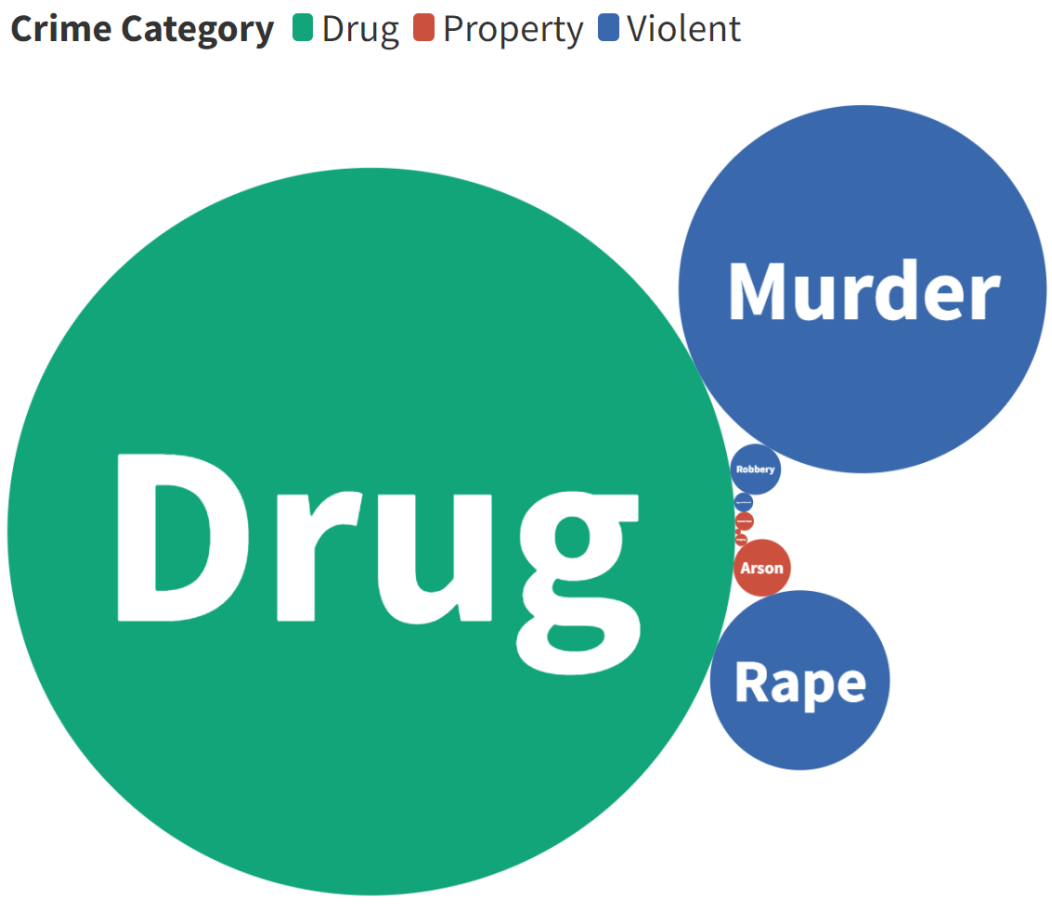
When asked to imagine an exoneration, many average people visualize a DNA analysis proving that an accused person didn't commit a crime. People often associate DNA evidence with exonerations because the cases garner a lot of media attention and the science behind DNA identification is well accepted. However, only 17% (581/3,383) of known exonerations involve DNA as a factor, which is actually a large fraction given how rare DNA evidence actually is.

Whereas in the usual case highly dispositive evidence determining guilt or innocence usually isn't available, ironically, this is not true of drug offenses, which nearly always involve material that can be tested with forensic methods, like mass spectrometry, that have the same "gold standard" acceptance in the scientific community as modern DNA analysis.

longer sentences. Compared to violent and property crimes, exonerations for drug crimes are relatively uncommon, occurring at a rate about 1/300th as frequent as murder exonerations.

The figure below revises Figure 5.F to take into account what we have discovered from this study of identification errors and presumptive drug tests. To construct the figure, we have assumed that only 90% of the arrests involving erroneous field drug tests estimated above result in an actual conviction.[1]

Figure 5.G: Annual Wrongful Convictions Per 100,000 Arrests (NRE plus our estimates)



[1] The basic pattern shown in the figure--that drug cases represent a much larger source of wrongful convictions than previously recognized once one takes into account false positive presumptive tests--is not particularly sensitive to this assumption.

As is apparent from the figure, once we take into account wrongful convictions that likely arise due to erroneous field tests, we see that drug offenses represent an enormous source of wrongful convictions in the U.S. Indeed, these data, although surely imperfect, suggest there may be more wrongful convictions for drug offenses than for all other crimes combined.

Systemic Implications of Presumptive Tests

The drug cases discussed in this report were not concluded when an arrest was made. One argument advanced by proponents of field tests is that because they are preliminary, they are generally not relied upon for trial and therefore errors, when they occur, can be corrected later. This perspective presupposes two facts that are not supported by our observations: first, that trials occur commonly as a check on imperfect evidence, and second, that confirmatory tests are conducted and used in those trials. A voluminous literature on plea bargaining refutes the former and our survey casts strong doubt on the latter assumption.

In a 2011 study, researchers found that LEAs in all ten sites surveyed employed presumptive field tests as an integral part of their standard operating procedures (Strom et al., 2011). For these agencies, field tests were not minor or discretionary tools; rather, they served critical criminal legal functions including obtaining and justifying search warrants, establishing probable cause necessary for arrests, and providing preliminary evidence regarding the legality of a seized substance. In all but one jurisdiction, field test results were sufficient for prosecutors to initiate plea negotiations or to present evidence to grand juries, events that shape the trajectory of criminal proceedings from the onset.

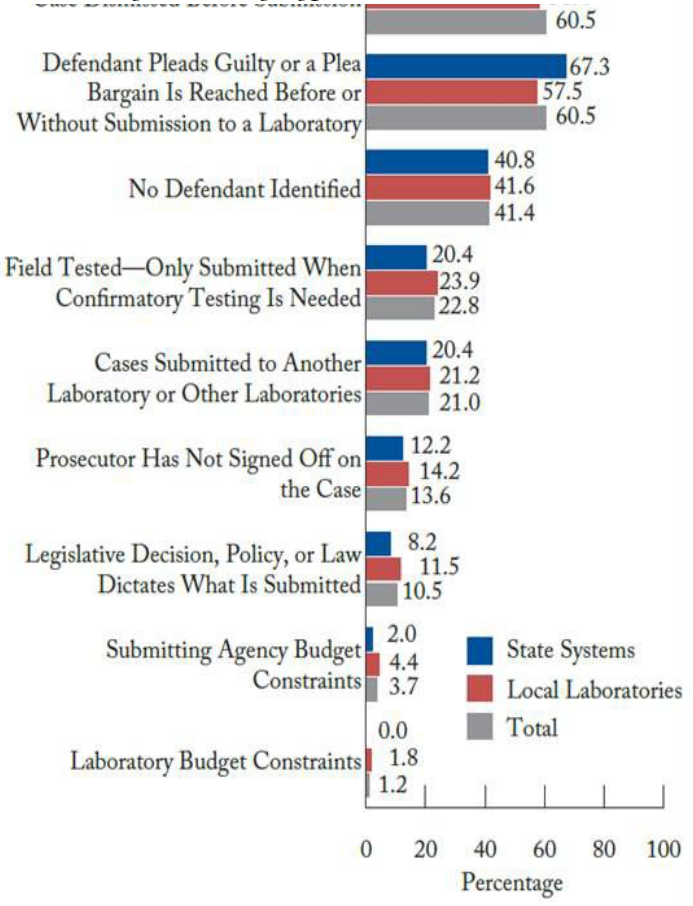
Across all ten sites, prosecutors saw drug field testing as a potent tool— especially during the initial phases of a case. In six jurisdictions, prosecutors described how field tests furnished leverage in plea negotiations. For example, in one jurisdiction arrests involving less than three grams of a drug were termed "expedited felon[ies]." In these cases, a positive field drug test was used to coerce a lesser misdemeanor possession charge, and if the misdemeanor offer was rejected, the prosecutor would then file the case as a felony. Notably, the suspect substance was sent for confirmatory testing only after these offers were rejected. While all surveyed prosecutors indicated that presumptive tests were not used at trial, the study notes that they were used in misdemeanor marijuana trials.

In 89% of jurisdictions, guilty pleas were permitted in drug cases without confirmatory testing.

Our survey, which collected complete responses from 18 prosecutor offices across the country, yielded results consistent with the 2011 study. In all but two of the 18 jurisdictions (89%), guilty pleas were permitted in drug cases without confirmatory testing. Our survey responses confirm that drug cases resolving in pleas were unlikely to get confirmatory testing--15 jurisdictions (83%) reported that testing after pleas was extremely unlikely and two (11%) reported that it was somewhat unlikely. Only one jurisdiction (6%) reported that it was somewhat likely.

Figure 2 from NFLIS-Drug Survey of Crime Laboratory Drug Chemistry Sections Report[1]

Reasons That Cases Were Not Submitted to the Laboratory, Overall and by Laboratory Type



Another source of data which assists in understanding this issue is the National Forensic Laboratory Information System (NFLIS), a program run by the Drug Enforcement Administration's (DEA) Diversion Control Division, which collects and analyzes data on drug identification from federal, state, and local forensic laboratories. According to the most recent NFLIS-Drug Survey of Crime Laboratory Drug Chemistry Sections Report[1], of the 146 surveyed laboratories, 67.3% identified a defendant's plea agreement as one reason cases were not submitted for testing and 23.9% cited prior field tests (NFLIS, 2019).

Once submitted to the lab, presumptive tests and guilty pleas still play a significant role in whether confirmatory forensic testing occurs. 46% of labs report that they do not test when there has been a guilty plea and 8% report they do not test because of a presumptive identification (NFLIS, 2019). The NFLIS data confirm the infrequency of comprehensive laboratory analyses, particularly following pleas. This lack of confirmatory testing amplifies the risk of erroneous convictions in drug-related cases.

Data from the National Registry of Exonerations also underscore the significant role that guilty pleas play in the prosecution of innocent people charged with drug offenses. For exonerations involving drug-related crimes, only 19% (n = 117) of cases ever went to trial, while 81% (n = 484) were resolved through guilty pleas (Figure 6.A). For the 2,754 nondrug cases, this ratio is very different: 86% of these cases had trials while only 12% (n = 333) of these cases involved a guilty plea. The high share of guilty pleas in drug exoneration cases demonstrates that the conventional court trial—a mechanism designed for the forensic scrutiny of evidence and arguments—was circumvented in a vast majority of these cases. It also underscores the considerable social and legal pressures defendants face to plea out, as all of these individuals opted for plea deals despite being innocent.

Figure 3 from NFLIS-Drug Survey of Crime Laboratory Drug Chemistry Sections Report[1]

Reasons That Submitted Cases Were Not Analyzed, Overall and by Laboratory Type

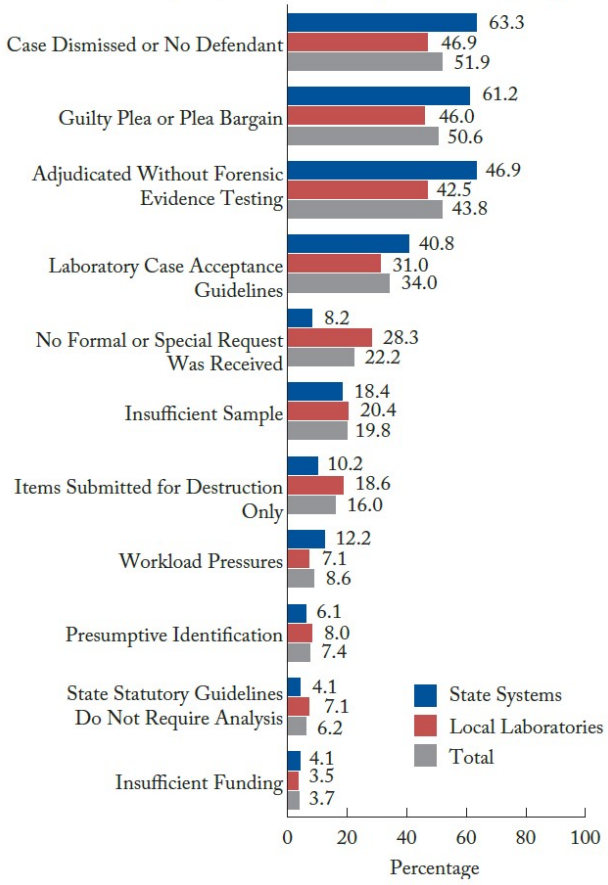
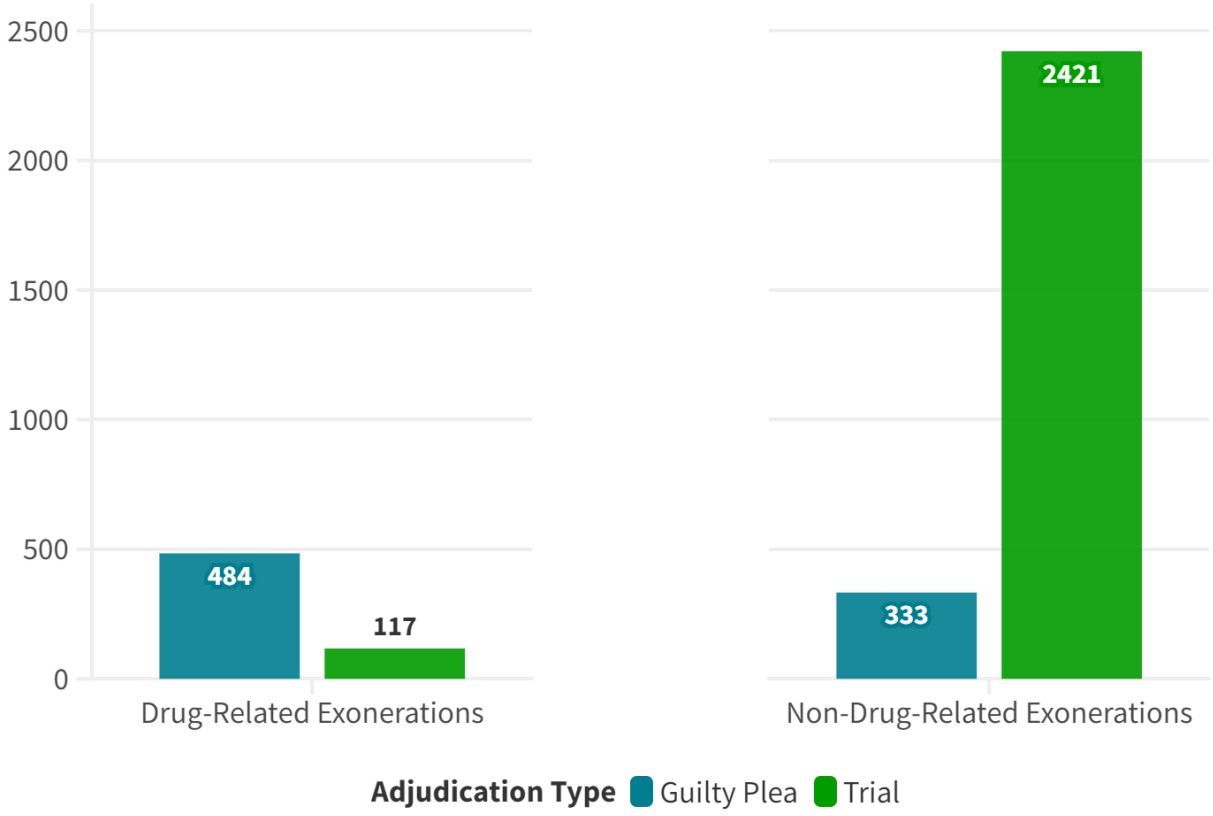


Figure 6.A: Guilty Plea Rates for Drug and Non-Drug Cases in the National Registry of Exonerations



Note: Authors' calculations from the National Registry of Exonerations as of 9/26/2023

Taken as a whole, these data refute the notion that inaccurate results from presumptive testing will be cured by confirmatory testing. Once a case begins with a presumptive finding of an illegal substance and is not otherwise withdrawn or dismissed, it is most likely headed to a negotiated plea, a process that is highly coercive for the accused. Research has demonstrated that people charged with crimes, both the factually culpable and the innocent, are coerced to plead guilty for many reasons; for instance, to obtain a plea "discount" in the shadow of a trial or to avoid a penalty for seeking a trial; for expediency; or even just acquiescence to a process that feels out of their control (Redlich et al., 2017).

Concern about the ubiquity of plea bargains has motivated some comprehensive examination. In its 2023 report, the American Bar Association (ABA) Plea Bargain Task Force found that the prevalence of plea bargaining in the criminal legal system introduces a range of problematic incentives that undermine the pursuit of justice (Johnson, 2023). Courts and prosecutors are often driven by metrics like case disposition rates, prioritizing speed over justice and diverting attention away from fully examining the merits of each case. A variety of data, including our survey, demonstrate how field tests can serve to reinforce these problematic practices.

[1] U.S. Drug Enforcement Administration, Diversion Control Division. (2019). NFLIS-Drug 2019 Survey of Crime Laboratory Drug Chemistry Sections Report. Springfield, VA: U.S. Drug Enforcement Administration.

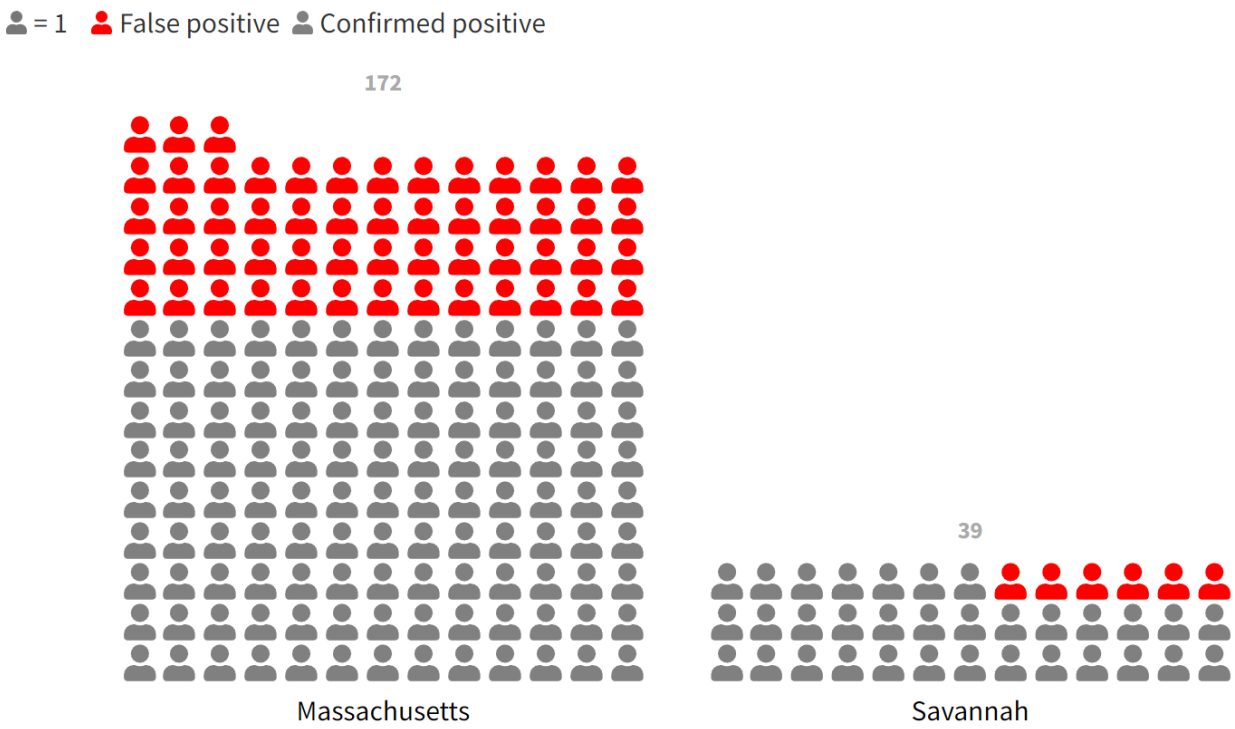
Real-World Errors from Presumptive Field Tests

Real-world experiences demonstrate that the problem of wrongful convictions from false positives in field drug tests is not limited to a particular region or jurisdiction. Audits of presumptive testing and forensic confirmation tests are seemingly rare, and publicly accessible data about them is rarer still. However, in the few instances where that data has surfaced, it raises genuine concerns about the occurrence of false positives in colorimetric presumptive testing.

Savannah, Georgia

In 2018 the Savannah Police Department audited 42 drug arrests involving presumptive tests (Savage, 2019). That audit revealed a false positive rate of 15.4% (6 out of 39 positive field test submissions tested negative for drugs when tested by the lab, 3 of the 42 were false negatives).

Figure 6.A: Patterns of False Positive Presumptive Tests in Two Jurisdictions



Massachusetts Department of Correction

In the course of litigation resulting from the use of presumptive tests in the Massachusetts state prison system, evidence of an even more shocking error rate emerged. In that litigation, the discovery provided by the Department of Correction showed that over a 21-month period, 55 items that initially tested positive with presumptive field tests for synthetic cannabinoids were negative for those substances when forensically tested by the lab, equating to a 32% false positive rate. In its order granting a preliminary injunction, the court noted that for one year the DOC itself had internally documented a 38% false positive rate (*Green v. Massachusetts Department of Correction et al.*, 2021). The court's assessment of the NARK II Test was unequivocal and scathing, highlighting the test's "highly unreliable" nature and that such a rate of error is "only marginally better than a coin-flip" and significantly worse than what the DOC itself deemed acceptable.

Harris County, Texas

In the first major investigative report on this topic, Ryan Gabrielson and Topher Sanders of ProPublica published "Busted," a detailed account of the catastrophic impact of false positive test results in Harris County, Texas. The article chronicles the events that led to the discovery of 212 people who had been convicted of drug offenses, but the forensic lab had later determined the substances in those cases to be "N.C.S." – not controlled substances (Gabrielson & Sanders, 2016). Every one of the 212 had pleaded guilty and 93% were sentenced to jail or prison. Even more surprising was that these factually innocent people pleaded guilty in an average of only four days after their arrest, in contrast to 22 days for people who actually possessed drugs.

Las Vegas, Nevada

In 2014 in a research report for the Department of Justice, the Las Vegas Metropolitan Police Department reported that in reviewing four years of data it discovered that 71% of all chemical field-tested cocaine errors were false positives (Fedchak, 2014). The report described false positives as known risks of using presumptive tests, and that because the "forensic laboratory only sees a small portion of these field results, the true percentage of errors due to false positives is unknown."

Georgia, Statewide

Following the Savannah audit, local reporters in Atlanta investigated field testing statewide in Georgia for 2017 (Travis, 2018). They discovered 145 instances of false positive tests in that year for substances that were later found negative by confirmatory testing. These results included 11 false positives for heroin, 24 for ecstasy, 40 for cocaine, and 64 for methamphetamines.

Jacksonville, Florida

In September 2023, the Jacksonville Sheriff's Office (JSO) instructed officers to stop using the widely used Scott colorimetric test after internal testing discovered that common over-the- counter medications like Benadryl could yield false positives (Schindler & McKeiver, 2023). When Scott Company CEO Ian Scott was asked about the false positives produced by his company's kits he said that this incident was not the first time they've had false positives and that this is the "nature of the beast" (Gutierrez, 2023).

> "[A] JSO narcotics detective identified that multiple over-the-counter substances, affirmatively known not to be Cocaine, were indicating false positives for the narcotic using the Scott Company Presumptive Field-Testing Kits for Cocaine."
>
> - Jacksonville Sheriff's Office

The examples below demonstrate the individual impacts and harms produced by erroneous presumptive drug tests.

Dasha Fincher

Dasha Fincher was pulled over for an alleged window tint violation in Monroe County, Georgia. **Deputies searched the car and found a bag filled with a "blue crystal-like substance."**

Fincher told deputies it was cotton candy; however, the substance tested positive for methamphetamine. Fincher was charged with trafficking and possession with intent to distribute and held on a $1 million bond. **Unable to afford bond, Fincher remained in jail.**

After nearly three months, lab tests showed that there were no illicit substances present in the sample.

Source: Atlanta Journal-Constitution

Cody Gregg

Cody Gregg was stopped for a traffic violation while riding his bike through Oklahoma city. **During the stop, officers confiscated a plastic bag of white powder. Presumptive field testing indicated that the powder tested positive for cocaine, and Gregg was booked into the Oklahoma County Jail for trafficking 45.91 grams of cocaine.**

Gregg, who was homeless at the time of the incident, spent weeks in jail, unable to afford his $50,000 cash bail. **Gregg was eager to be released and believed a guilty plea offered a path forward.** He pled guilty to the drug trafficking charges - and received a 15-year sentence.

Two months later, confirmatory lab testing results came back negative for the presence of any controlled substance.

Gregg would later tell the judge that this was powdered milk he received from a food pantry.

Sources: USA Today, NBC News, The Oklahoman

Skye Collins

Skye Collins was arrested in Houston, Texas after police found a chunky white substance in her possession. **This substance tested positive for cocaine.**

Collins pled guilty to possession and was sentenced to three years of probation.

However, **the substance was lab tested one week after Collins's plea and did not contain any illicit substances.**

Collins is one of 212 individuals in Harris County who were convicted of drug offenses and plead guilty--but the "drugs" used to convict them were later determined to contain no controlled substances.

Sources: National Registry of Exonerations, NBC News

Dartavius Barnes

Dartavius Barnes was pulled over by police in Springfield, Illinois on April 6, 2020, for alleged traffic violations. Officers detained Barnes, placing him in the back of a cruiser, and asked if they would find any substances while searching his car. Barnes admitted to possessing marijuana, which was found by officers.

However, when a small gold container was spotted in the vehicle, officers decided to use a presumptive field test on the substance inside to test it for methamphetamines and ecstasy.

Barnes was confused when officers told him that they found another substance in the vehicle, other than marijuana, that tested positive for methamphetamines. When officers showed Barnes the container, he became upset, pleading with officers to leave the container alone.

The container was actually a small urn containing the ashes of his two-year-old daughter, Ta'Naja, who had died the year prior.

Sources: BBC, Fox 13 MemphisSources: National Registry of Exonerations, NBC News

Kena'z Edwards

Kena'z Edwards was pulled over by officers in Jacksonville, Florida for a broken tail light. **The officers searched his car and found a bottle of lidocaine, which they tested using a presumptive drug test. The results came back positive for cocaine.**

Edwards was given a trafficking charge that carried a minimum of three years in prison.

Because the District Attorney's office in Jacksonville only tests substances in a lab once a trial date is set, Edwards spent over three months in jail--unable to afford his $178,000 bond-- despite eventual lab results that proved the substance was not in fact an illicit drug.

Source: The Florida Times-Union

Clarice Doku & Simon Cofie

Clarice Doku and Simon Cofie were driving home in Doraville, Georgia, when police pulled over their car after spotting a plastic license plate cover.

The officer claimed to smell marijuana, and searched the car.

A plastic bag with white tablets was found in the glove compartment. A field test indicated the substance was positive for ecstasy.

The married couple were trying to conceive, and **Doku was taking a common folic acid vitamin she purchased at Wal-Mart. To remember to take the vitamins, she placed a few in a plastic bag that she carried with her.**

The positive test was enough to land the couple in jail for two weeks while they awaited release on a signature bond. The couple emerged from the ordeal to find that Doku had lost her job. Cofie had missed his swearing-in ceremony for US citizenship. **Five months later, the lab results came back negative**. Though the charges were dropped officially, Doku said she remained unable to find full-time work long after the incident. **The felony charges still appear on a background check over a year later.**

Source: Fox 5 Atlanta

Shai Werts

On July 31, Shai Werts, the star quarterback of Georgia Southern, was pulled over for speeding by sheriff's deputies in Saluda County, South Carolina. Werts was removed from his car and handcuffed while the deputies searched his car. No contraband was discovered, but Deputy Charles Browder was determined to find something incriminating. When he shined his flashlight across the hood of the car, he saw white streaks.

He scraped some of the residue and tested it with a presumptive test kit. The kit turned color and Browder exclaimed to his partner "it turned pink man, that's cocaine ain't it?"

Werts told the deputies that the streaks were bird poop, but with the positive test result, they arrested Werts and charged him with drug possession.

As a result of the arrest, Werts was suspended from the football team, but he fortunately had the means to hire an attorney. While test results in that area typically took up to six months, the results from the material taken off his car came back in 8 days – no illegal substance was present.

Source: Greenville News

William McIntire, Charles Batts, & Wanda Moore

After receiving tips that heroin was being sold at a home in Wilmington, North Carolina, **police seized 13 pounds of a white powdery substance which tested positive for fentanyl on a field test.**

This was heavily reported on as the largest fentanyl seizure in North Carolina, worth $2 million, until **lab results confirmed the police had seized 13 pounds of sugar**.

Suspects were held on multi-million dollar bonds until the test results were released.

Source: Newsweek

Sadly, our analysis demonstrates that these are not isolated incidents, but in fact occur thousands upon thousands of times each year.

Conclusions

Our survey shows that hundreds of thousands of drug arrests each year start with a presumptive colorimetric test known to be prone to false positive results. Although these tests were never meant to be dispositive, in the modern system of pleas they often serve as the only evidence in drug arrest cases of the presence of drugs. Once someone is arrested and a presumptive test result is interpreted as positive, their life course is altered. They enter the criminal legal system and are subject to the coercive nature of that process.

Most drug possession cases do not go to trial. Instead, those charged with drug offenses choose to enter a guilty plea. Many who plead guilty are the intended targets of the system, as the substances and the circumstances in which they possessed them were in fact illegal. However, innocent people who did not possess illegal drugs also find themselves in the system simply because of a false positive result returned by a test kit not intended or designed to be conclusive. Many innocent individuals decide the safest option is to take a plea deal and accept probation or a much lighter sentence. In other cases, defendants may not be able to pay cash bail and run the risk to their livelihood, housing, or children that would come with being detained up until trial. Sadly, even though forensic technology exists to accurately determine whether the substances in these cases are actually drugs, for the vast majority of cases it is exceedingly unlikely that this confirmation process will ever occur.

Instead, the cases for these innocent people will proceed through a pre-trial process that most likely will result in a guilty plea. While they may be life-altering for the person who accepts those consequences, they will almost certainly remain completely unnoticed by the rest of the world.

Ultimate justice for the victims of wrongful convictions is rare in general, and in cases involving guilty pleas is rarer still.

Policy Solutions

A number of policy solutions that are reasonably easy to implement could reduce or even eliminate wrongful convictions from inaccurate presumptive drug tests. These include:

- Conduct regular blind audits of cases involving presumptive testing to determine rates of false positives

One problem highlighted by our analysis is the paucity of high-quality scientific evidence regarding the accuracy of these tests as implemented in the field. One solution would be to establish accuracy rates by conducting blind audits of cases where presumptive tests have been used. To be maximally informative, the audits should include a representative samples of cases where field tests are employed regardless of the ultimate disposition of the case.

Blind testing would allow for calculation of error rates that are specific to the particular tests, training, and contextual factors present in a given jurisdiction, and would provide law enforcement and the public with better information about the accuracy (or lack thereof) of their current approach to testing.

- Use more accurate presumptive tests that identify compounds by structural information (e.g. Raman spectroscopy) rather than simply by the presence of chemical groups.

Presumptive testing technologies more accurate than colorimetric tests do exist (Forensic Technology Center of Excellence, 2018), and employing them in place of presumptive tests could reduce errors. It should be noted that this approach does not completely address the problem of wrongful arrests or prosecutions from erroneous presumptive tests, as since all tests have a nonzero error rate. However, the use of more reliable technologies could enable law enforcement to achieve some of the objectives they seek to accomplish with colorimetric tests, but in a more reliable manner. Moreover, use of more reliable tests need not increase overall expense for drug testing.

- Limit or forbid the use of colorimetric presumptive field tests.

Given their potential for producing wrongful convictions, one option is to simply stop using colorimetric tests, or limit their use to narrow situations, such as those where a confirmatory test will be conducted with certainty. A number of LEAs that we surveyed indicated that they do not use colorimetric tests at all or have recently abandoned these tests, demonstrating that such test are not in fact an integral requirement for law enforcement. Additionally, some jurisdictions, such as

Oregon, have decriminalized various substances, which, of course, eliminates the need to perform presumptive tests in many situations.

As jurisdictions consider whether to limit or abandon presumptive tests, an important consideration is what the alternative will be without colorimetric tests. If colorimetric tests are replaced by non-scientific arrest criteria such as the subjective judgement of officers, eliminating colorimetric tests might actually increase errors. However, if the alternative is to not prosecute cases absent clear indicia of guilt from a lab-based analysis, limiting or abandoning these tests can reduce wrongful convictions.

- Should field test kits continue to be used in simple drug possession cases, adopt a cite-and-release policy to avoid the coercive effect of detention and its impact on wrongful convictions.

Regardless of the method used to establish grounds for initial charges in simple possession drug cases (e.g., a presumptive test or observations by an officer), a policy of citation and release should be implemented. The coercive effects of pre-trial detention on defendant decision- making and case outcomes are well known: detention significantly increases the likelihood that innocent people will plead guilty to crimes they did not commit (Heaton, 2020).

- Require confirmatory testing whenever a guilty plea is accepted, with the right to withdraw the guilty plea following a no-controlled substance finding.

Sometimes all involved in a criminal case desire a quick resolution, including the defendant. One potential barrier to expanding confirmatory testing is potential delay in the resolution of cases, which might harm all parties, including defendants. Conditional pleas offer one way to address this concern. A conditional plea system would allow a defendant to enter a guilty plea in a drug case that is conditioned on the outcome of mandatory confirmatory testing of the suspected substance. If the confirmatory test does not detect the presence of controlled substances or disputes the findings of the initial test, the defendant would have an unequivocal right to withdraw their guilty plea. To effectuate such a scheme in a way that does not contribute to the ongoing problem of inherently coercive plea bargaining, it would be important that 1) all pleas would be conditional; conditional pleas cannot be "special" plea offers that become their own bargaining chips, and 2) all suspected

drugs must be tested with an effective tracking and notification system; defendants would not have the option to "waive" testing for additional consideration.

There are surely other reasonable responses to the problem of presumptive drug testing and wrongful convictions, and jurisdictions need not choose only one.

The effects of colorimetric presumptive tests are truly alarming, but every jurisdiction has options to eliminate or reduce these effects. If the shared goal of jurisdictions that continue to use colorimetric tests is to provide fair criminal justice, the only intolerable choice is to do nothing. Failing to address the known inadequacies of colorimetric presumptive tests in the criminal legal system does not signify neutrality or acquiescence to a status quo; it is a choice to perpetuate error and systemic inequities. At stake are not just the lives of innocent people harmed by presumptive drug testing, but justice more broadly. Jurisdictions that fail to act are willfully turning away from the notions of accuracy, fairness, and due process upon which the criminal system should be built.

Appendix I – Admissibility of Field Tests in Court

There are different burdens of proof that must be met across different stages of a criminal case or investigation. Generally, the Fourth Amendment requires that to perform a search or seizure, including searching a car or performing a presumptive drug test of an individual's belongings, a police officer must first establish probable cause that the individual has committed a crime. Additionally, a positive result from the presumptive drug test may provide probable cause to make an arrest and for an individual to be initially charged with drug possession.

In the United States, whether in state or federal court, in order to obtain a criminal conviction, the government must prove the defendant committed the crime beyond a reasonable doubt. In determining whether that standard is met, there are evidentiary rules in both state and federal courts that govern the admissibility of different types of evidence. In federal courts, rules on admitting expert testimony (such as testimony that seeks to explain the result of a drug test) are governed by Federal Rule of Evidence Rule 702, which provides guidance to federal judges on when to admit evidence (Testimony by Experts, 1975). Admittance of expert testimony is further guided by the Supreme Court Case *Daubert v. Merrell Dow Pharmaceuticals* (1993) which provides factors to judges in deciding whether scientific methodology is valid so that expert testimony may be admitted. Parties seeking to exclude evidence in a *Daubert* jurisdiction can make what is called a *Daubert* motion. After this motion a judge should then consider factors about the testimony including whether the methodology or technique has been tested, is subject to peer review, has a known or potential error rate, whether there are standards controlling the operation of the technique, and whether that technique is widely accepted. Although *Daubert* was a civil case, numerous jurisdictions have applied it to the criminal context as well. This standard is relevant to drug tests given their technical nature and the need for expert witnesses to explain the tests and their results to judges and juries.

There is no uniform standard across the U.S. that governs the admissibility of field test results, although generally, they are not permissible or used at the trial stage for drug possession cases. Defendants in some cases in federal court have received mixed results when challenging prosecutors' attempts to use presumptive drug tests as evidence at trial. In *United States v. Perez*, a defendant challenged the admission of the results of a NARK II positive test for marijuana but failed after a magistrate judge ruled that despite being presumptive in value the tests are based on

"good grounds" and admissible under Rule 702 and *Daubert* (*United States v. Perez*, 2012). While all federal courts are beholden to *Daubert* and Rule 702, there are few published cases that challenge the admission of presumptive drug tests as evidence at trial because there are so few relevant drug cases that proceed to trial and because the greater likelihood of confirmatory laboratory testing in the small sample of cases that actually make it to trial might mean that there is rarely need in those cases for prosecutors to attempt to introduce presumptive drug test results as evidence.

At the state court level, the wide variety of state laws and evidence rules leads to a lack of uniformity among states on the admissibility of field drug test results. However, most states use one of two standards in determining whether expert testimony is admissible: the *Daubert* test described above or the *Frye* rule (with some state-specific variations). The *Frye* rule, established in the 1923 case, *Frye v. United States*, held that scientific information was generally admissible as evidence if the technology in question was "generally accepted" by experts in the relevant scientific field (*Frye v. United States*, 1923). Most states have abandoned the use of the *Frye* rule in favor of the *Daubert* test, in part because it may not be suitable for all types of scientific evidence and because factors other than just acceptance within the field might be beneficial. States that use the *Frye* standard or some variation of it include New York (*People v. Wakefield*, 2022), Pennsylvania (*Commonwealth v. Jones*, 2020), and Washington (*State v. Arndt*, 2019), among others. New Jersey joined the majority of states adopting the Daubert standard for criminal cases in 2023 (*State v. Olenowski*, 2023).

While states typically have broad standards for the admission of expert testimony at trial, some states also have statutory carveouts or provisions that specifically allow the admission of presumptive drug tests as evidence at trial. For example, Virginia allows law enforcement officers to testify on the results of an approved field test for marijuana at both the pretrial and trial stages (Testimony Regarding Identification of Controlled Substances, 2021).

Other courts seem to depart from both *Daubert* and relevant rules of evidence. In *Fortune v. State* (2010), the Georgia Court of Appeals ruled that chemical field testing was admissible because the tests had reached a "scientific state of verifiable certainty" even in the absence of expert testimony and therefore needed no expert to testify as to their accuracy. The court further found that the field test results were sufficient to support a conviction for selling or possessing cocaine (*Fortune v. State*, 2010). In *Collins v. State* (2006), the Georgia court went even further, specifically holding that

confirmatory testing is not required for trial. However, courts in Indiana (*Doolin v. State*, 2012) and New Mexico (*State v. Morales*, 2002; *State v. Tollardo*, 2012) have required that testimony on the results of a field test requires the state to establish a scientific foundation as to the test's reliability. Even though many jurisdictions do not allow for the use of the tests at trial, many jurisdictions accept their use in securing a guilty plea.

The admission as evidence at trial of field drug tests that lack a confirmatory laboratory test of the sample creates substantial opportunity for wrongful convictions. If the admissibility does not require expert testimony, it is possible that field drug tests with substantial false positive rates would be admitted without the opportunity for cross-examination of an expert on what those false positive rates are, thereby depriving the jury or court of the ability to properly assess the probative value of the test. Even if expert testimony is required, using the field test without a confirmatory analysis from an accredited lab allows the presumptive test to be the sole scientific evidence of drug possession – a proposition that is completely contrary to the purpose the tests are actually designed for and is the very use that the disclaimers on the tests themselves warn against.

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