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**Privacy Protections and Law Enforcement Use of Prescription Drug Monitoring
Databases**

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Prescription drug monitoring programs (PDMPs) are databases that can be used by healthcare professionals to identify problematic drug-seeking behavior. Law enforcement officers can also obtain PDMP information, raising significant privacy concerns. In this paper, I use regression analysis to explore the association between state PDMP protections and law enforcement information requests. I find that while requiring law enforcement to meet a specified standard of proof prior to accessing PDMP information is associated with fewer requests, other methods of regulating law enforcement access are not. These findings provide important and novel evidence about law enforcement behavior in response to privacy protections.

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As harms due to the misuse of opioids—a category of drugs including both prescription analgesics such as OxyContin and illicit narcotics such as heroin—have skyrocketed over the past two decades (Rudd et al., 2016), policymakers have struggled to respond. Forty-nine states have implemented prescription drug monitoring programs (PDMPs), which are “centralized database[s] . . . to which pharmacies report dispensed medications . . . [along with] date, prescriber, and patient” (Deyo et al., 2013, 603). These databases can be used to identify individuals with multiple overlapping opioid prescriptions from different physicians and pharmacies, a potential sign of nonmedical use. While they were originally intended as a mechanism for policing controlled substances, PDMPs have recently been hailed as part of the new “public health” approach to addressing the worsening opioid crisis (Haffajee, 2015, 1657).

While PDMPs have been embraced as a tool for preventing opioid misuse, they also raise significant privacy concerns. PDMPs contain hundreds of millions of prescription records, and they allow the user to track medical information for an individual over time and across providers. In many states, prescriptions that must be reported to PDMPs include drugs whose use allows inferences about a wide range of highly sensitive medical information, including treatment for mental illness and HIV status (Mejia, 2014). Furthermore, the majority of states allow law enforcement to access PDMP data without obtaining a warrant, instead relying on less stringent mechanisms to

protect the significant privacy interests at stake. While law enforcement officers have reported that PDMP information is useful for identifying potentially illegal activities and communicating with prescribers and pharmacists (Perez et al., 2017), allowing law enforcement access to sensitive medical information may threaten important privacy interests. In particular, without strong legal protections, there may be concerns about law enforcement accessing sensitive medical data arbitrarily, or using knowledge gleaned about medical conditions to inappropriately target people for investigation.

Variation in PDMP protections provides a rare opportunity to explore whether requiring a warrant or subpoena prior to pursuing evidence impacts law enforcement information seeking. Despite the doctrinal and normative importance of using justification standards such as the warrant requirement to regulate law enforcement surveillance, there is currently little empirical evidence on whether these standards change law enforcement behavior. Consequently, addressing these issues in the context of PDMP information will provide insights into law enforcement behavior that are useful for understanding the effectiveness of privacy protections more broadly.

In this paper, I explore variation in PDMP protections across states and analyze whether this variation is associated with the frequency of law enforcement requests to access PDMP information. I start with a general overview of our current understanding of law enforcement behavior in response to legal protections on information, focusing on the rational choice model that explicitly or implicitly underlies judicial assumptions about this behavior. I also justify the importance of considering whether and how law enforcement behavior changes in response to legal protections. I then describe state

PDMP programs and how access to the data generated by these programs has been regulated, emphasizing the importance of state statutory law. Next, I quantitatively analyze state administrative data describing the law enforcement requests for access to PDMP information across the country, as well as sub-state data from Utah. This analysis focuses on addressing two main questions. First, do law enforcement requests for access to PDMP data vary based on the legal protections afforded to that data under state statutes? Second, based on evidence from Utah, do the observed differences before and after the imposition of a warrant requirement vary based on agency or locality characteristics? I find that state laws requiring high standards of proof to obtain PDMP information are associated with lower rates of law enforcement requests for that information. Evidence from Utah suggests the imposition of a warrant requirement may have less of an impact on requests for information by narcotics-related agencies than by other types of agencies. I conclude by discussing the implications of my findings for the regulation of law enforcement access to information, arguing that these findings both support and complicate the application of rational choice theory to law enforcement surveillance decision-making.

I. Law Enforcement Behavioral Responses to Surveillance Regulation

The Fourth Amendment's protection of the right to be secure "against unreasonable searches and seizures" (U.S. Const. Amend. IV) is implemented through privacy interests. Under the test established by the Supreme Court in *Katz v United States* (1967), whenever the government engages in activities that violate an individual's

reasonable expectation of privacy, they are conducting a Fourth Amendment search and generally must first obtain a warrant based on probable cause. However, despite the doctrinal significance of the warrant requirement and the centrality of privacy in Fourth Amendment protections, very little is currently known about whether and how the warrant requirement changes law enforcement practices. In this section, I review the current research on law enforcement search behavior, demonstrating that common jurisprudential assumptions about this behavior are based on an application of rational choice theory that has not been empirically verified in the context of technological surveillance. I then argue that a clearer and empirically based understanding of how justification standards such as the warrant requirement change law enforcement behavior is necessary to ensure that the Fourth Amendment serves its intended role in ensuring individual privacy, regulating police conduct, and promoting judicial oversight.

A. Rational Choice Theory and Technological Surveillance

In crafting Fourth Amendment limitations on law enforcement use of technological surveillance, courts often assume that the frequency with which law enforcement uses surveillance depends heavily on its cost (legal or otherwise). In *United States v Jones* (2012), Justice Alito noted that location tracking was traditionally “difficult and costly and therefore rarely undertaken” (Jones, 2012, 965). The New Jersey Supreme Court has stated that cell phone location data can “function as a substitute for 24/7 surveillance without police having to confront the limits of their resources” (*State v Earls*, 2013, 642). These assumptions are predicated on a model of law enforcement

officers as rational consumers of technological surveillance, shifting their consumption in the face of shifting surveillance costs.

In making these assumptions, judges are explicitly or implicitly extending the rational choice theory of decision-making commonly used in the law and economics literature to law enforcement use of surveillance. Under rational choice theory, social-level phenomena are thought to be the result of many individual actors making choices that would maximize their utility within their circumstances (MacDonald, 2003). While discussions of rational choice theory frequently focus on easily quantified financial and time costs, there are also “thick” models of rational choice theory that allow for the impact of intangible values on decision making (Hechter & Kanazawa, 1997). When judges note that expensive forms of surveillance will only be used “during cases of unusual importance” (Jones, 2012, 963), they are implicitly assuming that the decision to use technological surveillance is in part a function of a cost-benefit analysis through which officers determine that the information they expect to obtain will be worth the time, expense, and hassle of conducting surveillance.

Under this model, legal requirements for obtaining surveillance can be seen as imposing a special type of cost relating to the resources necessary to develop evidence and complete administrative requirements. When a state decides to impose a warrant requirement on law enforcement access to information sources such as PDMPs, they increase the expense necessary to obtain that data. Consequently, courts can use legal standards as a corrective mechanism when new technologies reduce the cost of conducting surveillance, ensuring that the ability of the government to obtain information

remains stable relative to the individual's ability to conceal it (Kerr, 2011) and that law enforcement does not engage in patterns of surveillance that inconvenience large numbers of innocent people (Bambauer, 2014). For example, Bankston and Soltani (2013) argue that application of the Fourth Amendment to emerging forms of technological surveillance should depend on the change in the cost of obtaining information.

Although rational choice theory appears to underlie many arguments surrounding the application of Fourth Amendment protections to technological surveillance, there is currently little empirical evidence concerning whether—and under what circumstances—law enforcement use of surveillance changes in response to changes in legal requirements or cost. Minzner and Anderson (2013) used formal economic modeling to argue that the time and expense requirements impose greater restraint on law enforcement use of wiretaps than the warrant requirement. Slobogin (2011, 331) reviewed the empirical literature on whether requiring law enforcement to obtain a warrant improves the probability that a search will return relevant evidence, finding that “the best that can be said . . . is that if the government really wants particular evidence and the only way to obtain it legally is through a warrant process, it will devote the time and resources necessary to obtain one.” Ohm (2009, 1515) has argued that under some circumstances a requirement that law enforcement obtain a warrant may in practice not provide a stronger constraint than a requirement that law enforcement obtain a subpoena, as in certain types of investigations “the police almost always have probable cause whenever they have any suspicion at all.” To date, no studies have empirically investigated the application of

rational choice theory to law enforcement surveillance decision-making in the context of PDMPs.

B. Does It Matter Whether Warrants Change Law Enforcement Behavior?

However, efforts to verify the application of rational choice theory to law enforcement surveillance behavior raise the more fundamental question: does it matter whether warrants and other legal protections change officer behavior? The Fourth Amendment is fundamentally a source of procedural protections for individuals under government investigation; it is entirely possible (and perhaps even desirable) that these protections could be provided without impacting the frequency with which law enforcement uses surveillance. In this section, I argue that the legal and societal functions ascribed to the Fourth Amendment cannot be fulfilled unless the protections it provides change not only the process through which law enforcement uses surveillance but also the frequency with which surveillance is used.

On an individual level, Fourth Amendment rights not only provide specific procedural protections to persons under government investigation but also exist as a mechanism to ensure that surveillance practices align with societal expectations. The Supreme Court in *Carpenter v United States* (2018) found it persuasive that technologically enabled information collection contravened long-standing expectations about the potential scope and frequency of government surveillance, and the Court established a warrant requirement in part as a way to limit the pervasiveness of surveillance. If imposing a warrant requirement fails to change the frequency of

technological surveillance, then it cannot serve to effectively realign use with societal expectations.

On an organizational level, Fourth Amendment protections are a significant mechanism for regulating law enforcement conduct. Independent of its role in protecting privacy, “the central meaning of the Fourth Amendment is distrust of police power and discretion” (Maclin, 1993, 201). The Fourth Amendment is intended not only to ensure that surveillance use aligns with public expectations but also “to place obstacles in the way of a too permeating police surveillance” (*United States v Di Re* 1948, 595). A study of the impact of the warrant requirement on the frequency of law enforcement surveillance use can therefore be understood as an evaluation of the effectiveness of the Fourth Amendment in achieving these goals. This is especially critical as the rise of big data policing creates powerful surveillance tools that are currently untethered from traditional oversight mechanisms such as the Fourth Amendment (Brayne, 2017). If imposing a warrant requirement does not change law enforcement surveillance behavior, it is important to recognize this so that policymakers can pursue alternative oversight mechanisms.

On a governmental level, the Fourth Amendment serves an important role in ensuring that the judicial branch is empowered to serve as an effective check on executive branch actors (Huq, 2016). By mandating that law enforcement obtain permission from a neutral magistrate prior to conducting searches, the warrant requirement ensures that the judicial branch is regularly consulted on surveillance practices and given the opportunity to approve or disapprove. Law enforcement

substitution of surveillance mechanisms that require a warrant with those that do not require one raises both privacy concerns and broader concerns about the ability of the judicial branch to serve its constitutionally mandated oversight functions. Understanding how law enforcement officers change their use of surveillance in response to a warrant requirement will provide crucial information about the impact of nonregulated surveillance on judicial branch oversight of law enforcement.

Finally, understanding whether warrant requirements change the frequency of law enforcement surveillance is crucial given the manifest harms that pervasive surveillance can cause even absent accompanying criminal charges or a misalignment with societal expectations. By infringing upon privacy interests, pervasive surveillance undermines the dignity of those subject to it (Westin, 1967), discourages association and participation in political activities (Richards, 2012), and chills free expression and the use of communication tools (Sidhu, 2007). These concerns are particularly acute amongst members of minoritized populations and religions (Brunson & Miller, 2006), as well as those in marginalized positions such as sex workers (Wright, Heynen, & van der Meulen 2015). Similarly, law enforcement access to an individual’s PDMP data can lead to harms even if the individual is not subjected to criminal charges, as it allows for the exposure of sensitive medical data. As noted by one commentator, “surveillance harms vulnerable people . . . privacy empowers them” (Bedoya, 2020, 318).

III. PDMP Programs

A. What are prescription drug monitoring programs?

State governments have used PDMPs to track prescriptions of potentially addictive medication since the 1930s. The first PDMP programs were intended primarily as a tool for narcotics enforcement (PDMP TTAC, 2018a), relied on labor-intensive use of triplicate forms to report prescriptions to state officials via postal mail (Deyo et al., 2013), and were often limited to collecting information only on Schedule II controlled substances (which have the highest potential for abuse). Although this limited the scope of information collected by early PDMPs, an individual state's PDMP may still have included millions of prescription records.¹

Opioid prescribing increased dramatically during the late 1990s due to a complex and interrelated set of factors, including an increase in the number of chronic pain patients (Dasgupta, Beletsky, & Ciccarone, 2018) and a shift towards incentivizing physicians to treat pain by using patient satisfaction surveys to gauge performance (Sinnenberg et al., 2017). Furthermore, there was a perception at the time that opioids had little risk of dependence (Mandell, 2016), which was fostered by efforts by Purdue Pharmaceuticals to market OxyContin for the treatment of low levels of pain, even though it was only FDA-approved to treat moderate pain (Chiarello, 2018). However, as opioids have a higher potential for dependence than initially recognized, patients who had begun using opioids pursuant to medical guidance sometimes found their prescriptions to be insufficient, and subsequently sought additional medication through other means. Increased medical opioid use changed perceptions of the dangerousness and social acceptability of opioids amongst nonmedical users (Inciardi, 2009), increasing the

prevalence of nonmedical use. A thriving illicit market for opioids developed (Rigg, 2012), and opioid dependence, treatment admissions, and associated deaths skyrocketed.

As policymakers sought a response to these harms, the number of states with PDMP laws expanded, aided by federal funding (Blumenschein et al., 2010). As is shown in Figure 1, both the establishment of operational PDMPs and the adoption of electronic PDMP programs have increased steadily. Since early PDMPs usually only collected information about Schedule II controlled substances, this limitation led to physicians prescribing unmonitored pain medication in place of the Schedule II controlled substances (Fishman, 2004). To avoid this substitution effect, it became more common for states to require pharmacists to report prescriptions of Schedule IV and V controlled substances as well. It is likely that hundreds of millions of prescription records are currently captured by PDMPs nationwide.²

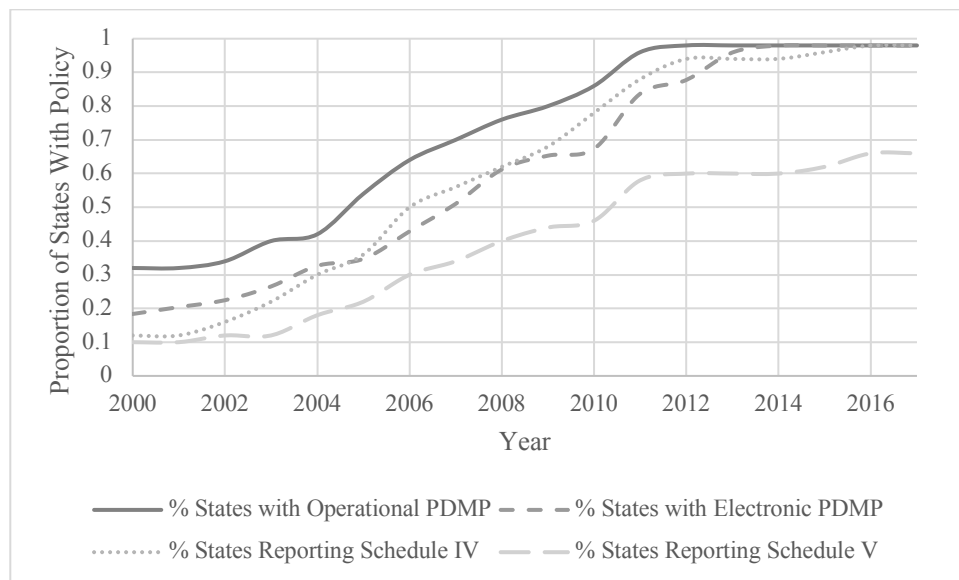


Figure 1. Changes in State PDMP Policies, 2000–2017³

Increasing the range of prescription drug information captured by PDMPs also increases the range of sensitive medical conditions implicated by this information. Testosterone, a Schedule III drug, is used to treat gender dysphoria; valium, a Schedule IV drug, is used to treat anxiety disorders; oxazepam, a Schedule IV drug, is used to treat withdrawal from alcohol (Mejia, 2014). However, it should not be assumed that PDMP programs that only capture information about Schedule II drugs do not implicate sensitive medical conditions. Schedule II drugs include Adderall, which is used to treat attention deficit hyperactivity disorder, and methadone, which is used to treat substance use disorder.

As the amount of information collected in PDMPs has grown, so too has the range of intended users of PDMPs. Modern PDMPs rely on secure, online databases that allow pharmacists to directly upload information about the prescriptions they fill and allow physicians and pharmacists to download reports on the patients they treat. Pharmacists are required to upload information about their patients soon after they dispense medication (Legal Science, 2018). States have also begun to require, rather than allow, physicians to check their patients' PDMP records when prescribing substances monitored by their PDMP (Haffajee, Jena, & Weiner, 2015). These databases can also be accessed by other government entities, including licensing boards and law enforcement. Furthermore, a majority of states have provisions in place allowing their PDMP data to be shared with programs from other states under some circumstances (PDMP TTAC, 2017). Much of this sharing takes place through PMP InterConnect, "an interstate data-

sharing ‘hub’” connecting PDMP databases that supports more than 175 million interstate data transactions per month (PMP InterConnect, 2019).

Given the increased reliance on PDMPs as a tool for addressing opioid misuse, there has been significant interest in their effectiveness. In total, the research suggests that PDMPs have a promising but uncertain effect on opioid-related public health outcomes (Davis, 2017). Early PDMPs—which collected limited information and required less participation from physicians—were generally observed to have a limited effect on opioid prescribing (Reifler et al., 2012) and opioid use behaviors (Worley, 2012), but little to no impact on overdose deaths (Paulozzi, Kilbourne, & Desai, 2011). Subsequent studies considering more rigorous PDMP laws found that imposing greater requirements on physicians had an observable impact on overdose deaths (Dowell et al., 2016, Pardo, 2017). However, even if PDMPs improve opioid-related outcomes, they may exacerbate other health harms as prescription opioid users turn to riskier drugs such as heroin (Yuanhong Lai et al., 2019, Fink et al., 2018). Commentators have also expressed concerns that PDMPs may discourage individuals from seeking treatment, due to fears that information provided to a physician might be reported to the state (Rivais & White, 2017).

Because they collect an enormous amount of highly sensitive medical information and provide that information to a variety of government and private actors, PDMPs raise significant privacy concerns—particularly when they are accessed by law enforcement officers. There have been several high-profile instances of questionable or unexpected use of PDMP data by law enforcement. After a Utah town realized that morphine was

going missing from their ambulances, law enforcement officers obtained PDMP records for almost 500 employees of the local fire department. These records revealed potentially concerning opioid use by two employees unrelated to the missing morphine; charges against both were dropped after more than a year of investigation (Silver Sweeney, 2015). In Tennessee, a police officer was fired after searching the PDMP for information without notifying his superior or first generating a case number as required by state law (*Brumley v City of Cleveland*, 2015). In Florida, attorneys for defendants accused of drug trafficking were provided with unredacted PDMP information for over 3,000 individuals (Kam, 2013; Unger, 2014).

Few studies have considered the role that law enforcement access to PDMP information may play in changing public health or safety outcomes. Law enforcement officers that use PDMP information generally describe it as helpful for investigating inappropriate use of prescription medication (Perez et al., 2017), and “useful in facilitating criminal investigations” (Paulozzi, Kilbourne, & Desai, 2011). Although rational choice theory suggests that increasing legal protections for PDMP information would decrease the frequency of law enforcement requests for that data, the extant literature does not appear to include an evaluation of the impact of privacy protections on law enforcement use of PDMP data.

B. Federal and State Constitutional Protections Have Not Been Widely Applied to PDMP Information

There is significant uncertainty about whether the Fourth Amendment governs law enforcement access to PDMP information. Although the Supreme Court held in *Whalen v Roe* (1977) that the collection of prescription information by a state PDMP was not “sufficient to constitute an invasion of any right or liberty protected by the Fourteenth Amendment,” they did not rule on the constitutionality of law enforcement access to PDMP information under the Fourth Amendment. Furthermore, the PDMP at issue was an early model that collected much less information than those in existence today. In his concurring opinion, Justice Brennan specifically refused to foreclose the possibility that innovations in PDMPs may “demonstrate the necessity of some curb on such technology” (*Whalen*, 1977, 607).

Under the *Katz* (1967) reasonable expectation of privacy test, it may appear that law enforcement access to PDMP information should be considered a search in the context of the Fourth Amendment. Courts have previously had “no difficulty concluding that protection of a right to privacy in a person’s prescription drug records, which contain intimate facts of a personal nature, is sufficiently similar to other areas already protected within the ambit of privacy” (*Douglas v Dobbs*, 2005, 1102). However, prescription drugs are tightly regulated by multiple government entities, and individuals have a lower expectation of privacy in highly regulated activities (*DEA v Utah Department of Commerce*, 2016). This analysis has been complicated by the long-established third-party doctrine, according to which individuals do not have a reasonable expectation of privacy with respect to information disclosed to others. However, the Supreme Court has recently held that the third-party doctrine does not apply to historical cell phone records because

there are strong privacy interests associated with those records, and the sharing of that information cannot be considered voluntary (*Carpenter*, 2018, 16–17)—arguments that can be made even more strongly in the context of PDMPs. Consequently, some scholars have argued that “PDMP protected health information is entitled to Fourth Amendment warrant protection” (Oliva, 2019, 2).

Several lower federal and state courts have considered the issue of whether the Fourth Amendment or state analogues protect PDMP information. In *Oregon Prescription Drug Monitoring Program v DEA* (2017), the Ninth Circuit held that Oregon’s warrant requirement for accessing PDMP information was preempted by the Controlled Substances Act (CSA), under which the DEA can obtain evidence to investigate narcotics crimes through an administrative subpoena, overruling a district court opinion that Fourth Amendment protections apply to PDMP information on standing grounds. In *State v Skinner* (2009), the Louisiana Supreme Court held that law enforcement could not search prescription records without a warrant. In contrast, the California Supreme Court recently held that law enforcement did not violate the state’s constitutional right to privacy by obtaining PDMP information without either a warrant or subpoena (*Lewis v Superior Court of Los Angeles*, 2017), although in this case PDMP records were used as evidence against a prescribing physician who forfeited any claims under the Fourth Amendment by failing to raise them at trial.

C. State Statutory Protections Are the Main Source of Protection for PDMP Information

Law enforcement access to PDMP information is primarily governed through statutory law. However, state statutes vary with respect to whether and how they allow law enforcement to access PDMP data. Figure 2 describes changes in key components of state laws over time. While the first three components—probable cause required, subpoena required, or ongoing investigation required—are designed to be mutually exclusive, the remainder of the categories may overlap.

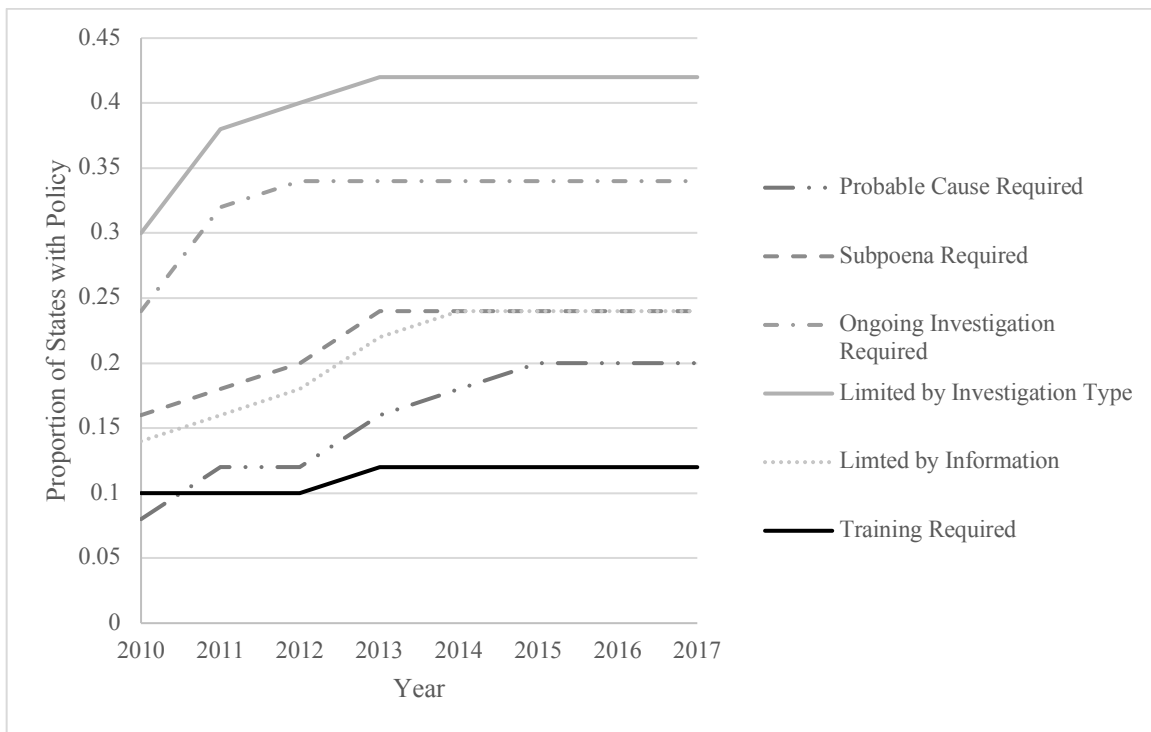


Figure 2. State Laws Regarding Law Enforcement Access to PDMP Data, 2010-2017⁴

1. Type of legal showing required⁵

States vary in terms of the minimum standard that law enforcement officers must meet before they are allowed to access PDMP data, and whether that proof must be evaluated by an impartial magistrate. Some states stipulate that law enforcement can

obtain PDMP data “under a search warrant, subpoena, or order issued by a court establishing probable cause” (Alaska Stat. 2016 §17.30.200(d)(5)). Other states allow law enforcement access to PDMP data upon issuance of a subpoena, without explicitly requiring probable cause (CO Rev. Stat. 2016 § 12-42.5-404(3)(e)).

Rather than mandating that law enforcement demonstrate probable cause or obtain a subpoena, some states instead require that law enforcement show that their request is related to an active criminal investigation (Ariz. Rev. Stat. 2017 §36-2604(D)(4)). This requirement is sometimes coupled with the requirement that the investigation be related to identified persons. (Wash. Rev. Code 2018 § 70.225.050(3)(d)) State statutes may also specify how law enforcement officers can demonstrate that their request is related to a criminal investigation, usually by providing the appropriate case number (Ark. Code 2017 § 20-7-604(i)); Ohio Admin. Code 2017 § 4729-37-08). Other states do not set forth explicit standards that law enforcement must meet prior to accessing PDMP information, or leave this determination up to the discretion of PDMP officials (Texas Health & Safety Code 2018 § 481.076(a)(3)).

2. Access to PDMP based on investigator type or training

In determining the process by which law enforcement can obtain access to PDMP data, some states distinguish requests by officers with specialized expertise in narcotics investigations or training in accessing PDMP materials from other requests. Under these legislative schemes, officers with specialized expertise or training are allowed easier or exclusive access to PDMP information. For example, Illinois allows local law

enforcement officers who are “approved by the Department to receive information of the type requested for the purpose of investigations involving controlled substances” to receive PDMP information, although some state investigators can obtain access if they are engaged in a narcotics-related investigation (720 Ill. Comp. Stat. 2017 § 570/138(d)). States may also elect to limit access to PDMP data based on the employer of the officer seeking information. For example, Alaska does not allow PDMP information to be shared with the federal government (Alaska Stat. 2017 § 17.30.200(d)).

3. Access to PDMP based on investigation type

In regulating access to PDMP data, some states have elected to provide easier or exclusive access to PDMP data during narcotics investigations. For example, Mississippi requires the State Board of Pharmacy to supply “local, state and federal law enforcement officials engaged in the administration, investigation or enforcement of the laws governing illicit drug use” with PDMP data upon request (Miss. Code Ann. 2017 § 73-21-127(e)).

4. Limiting information received from PDMPs

Even after an officer has met the requirements to access PDMP information, state statutes may limit the amount of information they can receive. Delaware and Wisconsin require law enforcement to be granted access to the minimum amount of information necessary to fulfill the officer’s request; Delaware further requires that identifying information only be provided if nonidentifying information is insufficient (Wisc. Admin.

Code CSB 2017 §44.11(10)); Del. Code Ann. tit. 16 2017 § 4798(2)(d)). Other states require that the information requested be “related to a specific patient or a specific individual or entity under investigation” (W. Va. Code R. 2017 § 60A-9-5(a)).

In addition to limiting the information that law enforcement can receive from PDMPs, states could elect to provide additional protection to certain types of PDMP information. For example, Pennsylvania allows law enforcement officers access to PDMP information related to Schedule II controlled substances without a court order, but it requires a court order prior to releasing information about other controlled substances (35 Pa. Stat. 2017 § 872.9(b)). As Schedule II controlled substances pose a higher risk of abuse than other scheduled drugs, allowing law enforcement easier access to information about Schedule II controlled substances suggests an effort to manage tradeoffs between privacy and public health.

5. Proactive reporting based on PDMP information

While most states allow law enforcement to request access to PDMP information, a much smaller number of states allow or require PDMP officials to bring information to the attention of law enforcement under certain circumstances. For example, New York PDMP officials may provide law enforcement agencies with “relevant information about the suspected criminal activity, including controlled substances prescribed or dispensed” when they have reason to believe that criminal diversion of prescription medications is occurring (New York Pub. Health Law 2017 § 80.107(k)).

6. Transparency and reporting of law enforcement access to PDMP information

In addition to prospectively regulating how law enforcement can access PDMP information, some states have created mechanisms to provide retroactive oversight of law enforcement use of PDMP information through reporting or other transparency mechanisms. These mechanisms may place a reporting onus on the law enforcement officers who access PDMP information (Ark. Code 2017 § 20-7-604(j)(1)) or on the PDMP itself (Tenn. Code Ann. 2012 § 53-10-306(j)).

IV. Relationship between legal protections and law enforcement use of PDMP data

Variation in the regulation of law enforcement access to PDMP data presents an opportunity to empirically verify whether rational choice theory can be used to understand how privacy protections shape law enforcement behavior. In this section, I explore this issue by addressing two questions. First, do law enforcement requests for access to PDMP data vary across states with different legal protections for that data? Second, based on evidence from Utah, do the observed differences before and after the imposition of a warrant requirement vary based on agency or locality characteristics?

A. Data and Methods

1. State-level analysis

I obtained data on law enforcement requests for access to PDMP information from administrative reports, requests and interviews with PDMP officials, and

information published by investigative reporters who comprehensively reviewed law enforcement use of PDMP programs (Greenblatt & Hill, 2016).⁶ Sources for administrative reports are provided in Appendix A. When obtaining data directly from PDMP officials, I began with the point of contact provided on the state PDMP’s website, and then asked to speak with someone knowledgeable about law enforcement requests for PDMP information. When data was obtained directly from PDMP officials, they were asked to consult their agency’s records, rather than provide an estimate. As data availability varied, I focused on obtaining the most widely reported metric: the number of law enforcement requests for information.⁷

Data were aggregated up to the state-year level. As these data were collected in early 2018, a number of states had not yet reported their 2017 data, leading to a notable reduction in the number of observations from 2016 to 2017. When I could only obtain data for part of a year, I estimated the yearly number of requests if at least three months of data were available.⁸ This process resulted in 169 observations covering 2010–2017. Figures 3a and 3b describe data coverage by year and state.

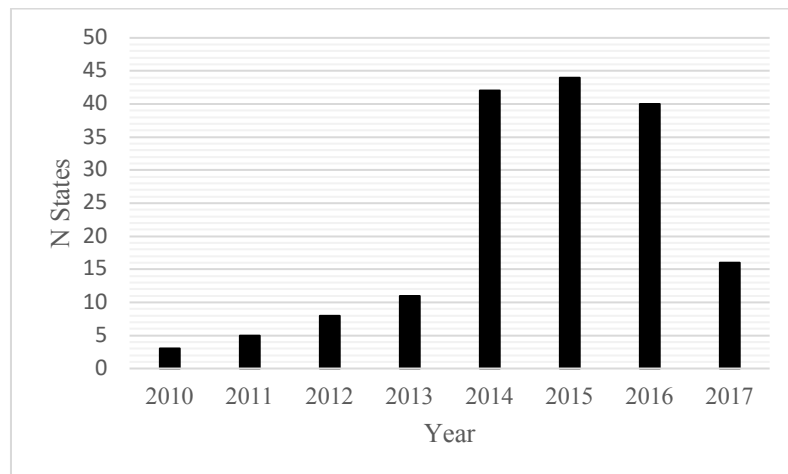


Figure 3a. Data Coverage by Year

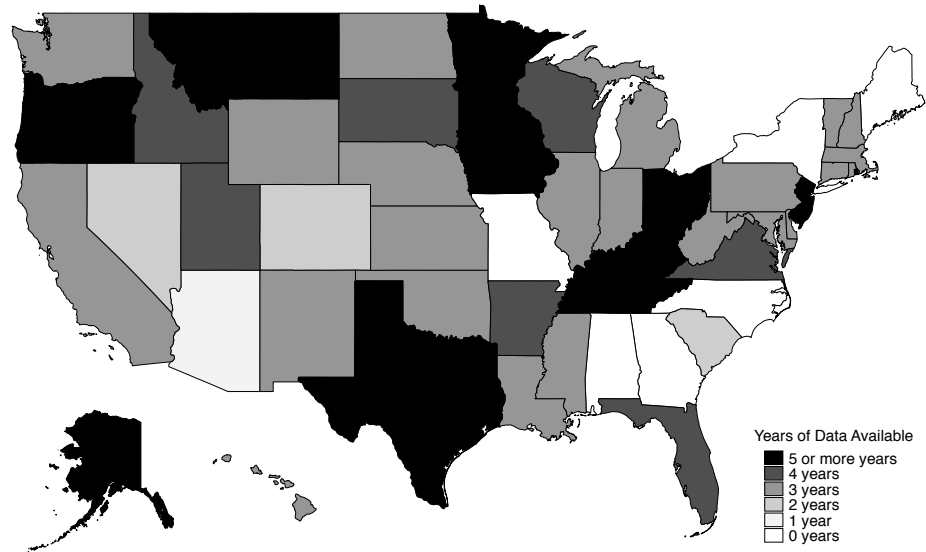


Figure 3b. Data Coverage by State

Yearly counts of law enforcement requests for PDMP information were then used to calculate the rate of requests per 100,000 people, as summarized in Table 1.

Table 1. Summary statistics, tabulated for type of restriction on law enforcement access

		<i>Law Enforcement PDMP Request Rate</i>
<i>Overall</i>		70.48 (113.21)
<i>Showing Required</i>	Probable Cause	8.74 (10.91)
	Subpoena	48.50 (57.84)
	Ongoing Investigation	72.33 (85.23)
	No Requirement	141.45 (116.80)
<i>Limited by Investigation Type</i>	Yes	83.77 (142.58)
	No	59.88 (81.98)
<i>Limited Information</i>	Yes	74.09 (95.10)
	No	69.01 (120.16)
<i>Training Required</i>	Yes	176.67 (137.13)
	No	53.75 (99.63)
	Years	2010-2017
	N	169
This table presents the mean and standard deviation (in parentheses) for law enforcement requests for PDMP information. Rates are calculated per 100,000 people.		

Data on state laws regarding law enforcement use of PDMP data were obtained by reviewing state statutes, and have previously been described in Figure 2 and discussed

in Section III.C. These data were collected by obtaining current and previous versions of each state's statutory code and locating provisions related to law enforcement access to PDMP data. A preliminary review was used to develop a specific set of coding criteria for each relevant legal dimension;⁹ these criteria were then systematically applied to each statute to develop the relevant variables. The variables describing the statutes in each state-year reflect the laws in effect in that state on January 1st of that year. To the greatest extent possible, these data were then checked against the Prescription Drug Abuse Policy System's (PDAPS's) data describing law enforcement access to PDMP data (Legal Science, 2018).

As stronger PDMP programs may collect more information and consequently be more useful to law enforcement, variables were included to account for whether the state required prescribing physicians to access PDMP databases and whether the state's PDMP captured prescriptions for schedule III, IV, and V substances. Additionally, state-level data on pain management clinic laws, naloxone access laws, and Good Samaritan laws were obtained from PDAPS. Pain management clinic laws restrict specialist medical practices aimed at treating pain, often by providing extensive prescriptions for opioid painkillers (Popovici et al., 2018). Naloxone access laws are meant to increase the availability of naloxone, a life-saving opioid antagonist that reverses opioid overdose (Davis & Carr, 2017). Good Samaritan laws provide legal protections to individuals who seek medical attention for someone experiencing an overdose (Evans et al., 2016) As prior research has shown that state laws allowing medical marijuana dispensaries may reduce opioid-related harms (Powell, Pacula, & Jacobson, 2018), I also included a

variable describing whether a medical marijuana dispensary law was in effect. State adoption of Medicaid expansion was accounted for through data obtained from Meinhofer and Witman (2018) and the Commonwealth Fund (2018).

A robust set of controls were used to account for other state characteristics that could impact law enforcement requests for access to PDMP data. Yearly data on state-level opioid prescription rates were obtained from the Centers for Disease Control (CDC) (Centers for Disease Control, 2017), and opioid-related death rates were obtained from the CDC Wide-Ranging OnLine Data for Epidemiologic Research (WONDER) multiple cause of death database (Centers for Disease Control, 2018b); data on heroin/cocaine possession and sales arrests were obtained from the Federal Bureau of Investigation's Uniform Crime Reports (Kaplan, 2018).¹⁰ Data on law enforcement employees were obtained through the Uniform Crime Reports (Department of Justice, 2018). State demographic data were obtained from bridged-race population estimates produced by the US Census Bureau and the National Center for Health Statistics (Centers for Disease Control, 2018a). Economic control data were obtained from the US Census Bureau's Small Area Income and Poverty Estimates Program and the Bureau of Labor Statistics. Summary statistics for control variables can be found in Appendix B.

These data were then analyzed using a Poisson regression to estimate the relationship between the rate of law enforcement requests for access to PDMP data and a set of variables describing the available legal protections for PDMP data. The specific model used is described in equation 1, where P denotes a vector of policy variables and X

denotes a vector of control variables, including year fixed effects. Standard errors were clustered on the state level.

$$\ln(\text{PDMP request rate}) = \alpha + \beta P + \gamma X \quad (1)$$

2. Sub-state Analysis

While this analysis allows for exploration of the impact of law enforcement access to PDMP data on the state level, it may also obscure important sub-state variation. To address this concern, I explored how different agencies in Utah responded to the passage of SB 119, a statute changing the requirements for accessing Utah's PDMP by mandating that law enforcement obtain a warrant prior to accessing PDMP data. The Utah Office of the Legislative Auditor General was commissioned to report on law enforcement use of the Controlled Substances Database (CSD) both immediately before and after Utah passed SB 119 (Office of the Legislative Auditor General, 2015). As part of this report, the Legislative Auditor General released agency-level data on the number of times law enforcement sought information from the CSD during an 18-month period surrounding the passage of SB 119. While this information is only available over a very limited time period,¹¹ it can be used to explore how requiring a warrant to obtain PDMP information may have had a differential impact on different types of agencies.

B. Relationship between law enforcement use of PDMP data and applicable legal protections

1. Main Results

As summarized in Table 3, there appears to be a correlation between the standard of proof that law enforcement must meet prior to accessing PDMP data and the rate of law enforcement requests for these data. Moreover, the magnitude of this correlation falls into an expected pattern when the impact of various standards of proof are considered: more burdensome requirements have a greater impact on law enforcement requests for access to PDMP data. State policies requiring that law enforcement demonstrate probable cause prior to obtaining PDMP data had the greatest impact on PDMP usage. If all other factors are held constant, the log of the PDMP access request rate is 2.81 requests per 100,000 people lower in states that require probable cause for obtaining PDMP information than in states that place no requirements on law enforcement requests for PDMP information. This corresponds to a PDMP access request rate in states that require probable cause that is about 6% of the rate in states that do not require probable cause.

A similar phenomenon can be seen when law enforcement is required to obtain a subpoena or to demonstrate a connection to an ongoing investigation prior to requesting access to PDMP information, although the apparent effect size is smaller. With all else held constant, states that require law enforcement to obtain a subpoena prior to requesting access to PDMP information are expected to have a PDMP access request rate that is about 34% of that for states that place no requirements on law enforcement requests for access to PDMP information. Similarly, holding all else constant, states that require law enforcement to demonstrate a connection to an existing case are expected to have a

PDMP access request rate that is about 40% of that for states that place no requirements on law enforcement requests for access to PDMP information.

Table 3. Relationship between regulation of law enforcement access to PDMPs and law enforcement requests for access to PDMPs

		(I) PDMP Request Rate	(II) PDMP Request Rate	(III) PDMP Request Rate
Requirements for Obtaining PDMP Information	Probable Cause Required	-2.45*** (0.704)	-3.13*** (0.822)	-2.81*** (0.571)
	Subpoena Required		-1.31*** (0.327)	-1.07** (0.353)
	Ongoing Investigation		-0.816*** (0.229)	-0.895*** (0.246)
Other Restrictions on Law Enforcement Access	Limited by Investigation Type			-0.334 (0.398)
	Limited Information			0.281 (0.375)
	Training Required			1.00* (0.390)
Control Variables	Opioid Use Controls	X	X	X
	Opioid-Related Policies	X	X	X
	Law Enforcement Resources	X	X	X
	Demographic Controls	X	X	X
	Economic Controls	X	X	X
	Year Fixed Effects	X	X	X

This table presents the results of a series of Poisson regressions, with law enforcement request rate for PDMP data as the outcome variable. Standard errors were clustered at the state level. *** denotes statistical significance at the 0.005 level; ** denotes statistical significance at the 0.01 level; * denotes statistical significance at the 0.05 level.

However, other regulatory mechanisms did not appear to be correlated with a reduction in law enforcement requests for access to PDMP data. No statistically significant relationship was observed between the rate of law enforcement PDMP access requests and state policies limiting PDMP access by investigation type or limiting the information that can be obtained from PDMPs. Interestingly, requiring law enforcement to undergo training prior to requesting access to PDMP information appears to be correlated with an increase in PDMP usage. This suggests that law enforcement officers who receive PDMP training may increase their requests for access to PDMP information, either because the training teaches them new ways to use PDMP information or because law enforcement officers feel the need to request more PDMP information to justify the time spent undergoing training.

2. Robustness and Sensitivity Tests

I tested the robustness of these results in several ways. First, the analysis used partial-year data to impute a full-year value for information requests when full-year data were unavailable. As there is not sufficient month- or quarter-level data on law enforcement requests for PDMP information to explore seasonal variation within a given year, this approach may fail to account for seasonal trends. To address these concerns, I

repeated my analyses after dropping any imputed data. The results of this analysis, which are reported in Appendix B, were very similar to my main analysis in terms of both magnitude and significance.

Second, the data used in this analysis were derived from several sources, including both official reports and an investigative journalism publication. This combination of sources could create concerns that data across sources are not equivalent, and therefore should not be used concurrently. To address these concerns, I repeated my analysis using only information obtained from official state reports or through communication with a PDMP official. The results of this analysis, which were again very similar to my main analysis in terms of both magnitude and significance, are reported in Appendix B.

Third, as requests for PDMP data may be driven by law enforcement manpower and resources within the state, I repeated my analysis with the number of PDMP information requests per law enforcement employee as the dependent variable. As is reported in Appendix C, these results follow a similar pattern to my main analysis: a probable cause requirement is associated with a large and statistically significant reduction in the rate of law enforcement requests for PDMP information, while a subpoena requirement and a requirement that PDMP requests be connected to an ongoing investigation are each associated with smaller but still statistically significant reductions in the PDMP request rate. Requiring law enforcement to undergo training prior to requesting PDMP information is associated with a statistically significant increase in the rate of law enforcement requests for PDMP information.

Finally, to ensure that my results were not being driven by data from any particular state, I dropped each state one at a time and recalculated my results. My results were largely unchanged by this state-wise deletion process: the coefficients on the three legal process variables remain similar in magnitude and statistically significant at at least the 0.05 level. Figure 4 shows the coefficients and standard errors for the probable cause requirement, subpoena requirement, and ongoing investigation requirement as each state is dropped.

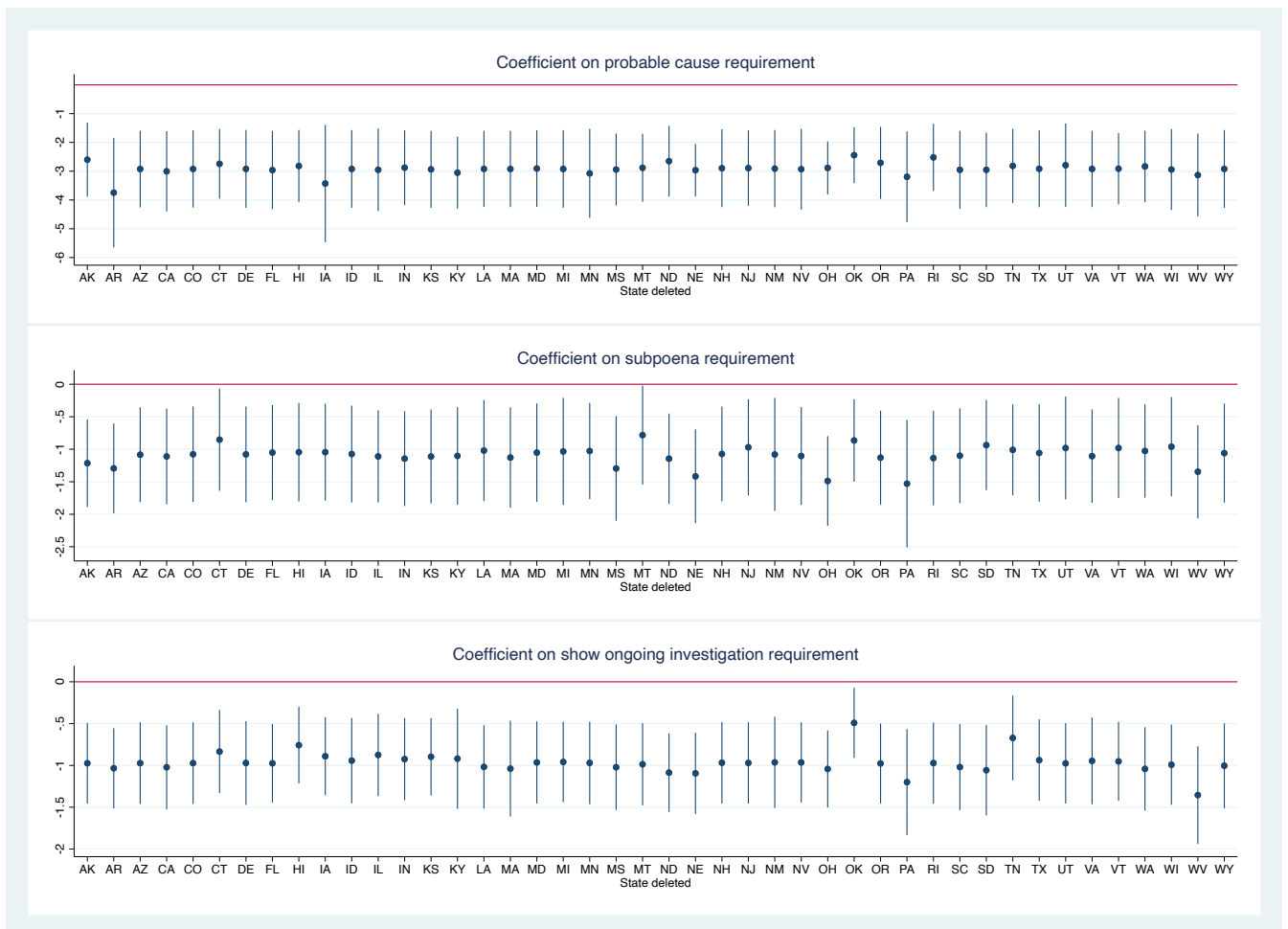


Figure 4. Sensitivity to deletion of data by state

On the whole, this analysis suggests that requiring law enforcement to meet a specified standard of proof prior to obtaining PDMP information is associated with fewer law enforcement requests for access to PDMP information. No negative relationship is observed between the PDMP access request rate and other mechanisms for regulating law enforcement access (such as limiting the use of PDMP data to narcotics-related cases). However, requiring law enforcement to undergo training appears to be associated with an increase in law enforcement requests for access to PDMP information.

3. Limitations

There are several significant limitations to this analysis. First, this analysis only demonstrates a correlation between policies regulating law enforcement access to PDMP information and law enforcement requests for access to that information, and cannot be used to support causal inference. On the basis of the available data, it is not possible to distinguish between state law enforcement requests for PDMP information and federal law enforcement requests for PDMP information. This is particularly troubling given that some courts have ruled that state statutory protections for PDMP information are preempted under federal law.¹² However, as most narcotics-related crimes are prosecuted on the state level, it is likely that requests for PDMP information by federal law enforcement make up a minority of requests. Furthermore, to the extent that differences in legal requirements for federal and state law enforcement effectively lead to mismeasurement of the variables related to the requirements for obtaining PDMP

information, we would expect this mismeasurement to bias the estimated relationship between legal protections and the PDMP information request rate towards zero.

Additionally, as the available data only describe the rate of law enforcement requests for PDMP information, policies regulating law enforcement access could change investigations in a variety of important ways that cannot be observed from these data. For example, even if limiting the information that law enforcement can obtain from PDMP databases does not affect the frequency with which law enforcement requests access to this information, it may nevertheless make investigations that use PDMP information more expensive than they would be if PDMP information were provided without restrictions. Consequently, this analysis does not suggest that requiring law enforcement to meet a specified standard of proof prior to requesting access to PDMP information is the only form of regulation that has any impact on law enforcement investigations that use PDMP information. Relatedly, the available data do not provide any information on what types of information law enforcement officers seek from PDMP databases (e.g., whether they are seeking information about patients or prescribers). An alternative explanation for variation in law enforcement requests for PDMP information across jurisdictions could be that law enforcement officers in states with larger number of PDMP information requests are more likely to seek information about patients rather than providers, leading to a higher number of requests.

This analysis also does not provide any insights into how information sought from PDMP databases is used after it is obtained, or how broadly it is shared once it has been obtained by law enforcement. Variation in requests for PDMP information across states

could be partially explained by differences in how law enforcement officers share information amongst themselves, perhaps through inter-agency task forces. In addition, this does not reveal any information gleaned from PDMP databases and reported to law enforcement through other channels, such as proactive reporting by PDMP administrators, or data mining to discover potential criminal activity. Finally, as this analysis utilizes state-year data, it may obscure variation in the effects of regulating law enforcement requests for access to PDMP information across different localities or different types of agencies. This limitation is partially addressed in the next section, which uses evidence from a policy change in Utah.

C. Sub-state variation in the relationship between law enforcement use of PDMP data and applicable legal protections: Evidence from Utah

It is generally impossible to observe within-state variation in law enforcement requests for PDMP information, as states do not report information on which agencies or which types of agencies make PDMP information requests. One exception is a 2015 report published by the Office of the Legislative Auditor General in Utah, which provides information on which agencies made PDMP requests during a one-year period prior to the passage of a law requiring law enforcement to obtain a warrant prior to requesting PDMP information, as well as which agencies made requests in the six-month period following passage of the law. These data provide only a brief glimpse of agency-level PDMP requests; however, as this is the only instance in which sub-state data on law enforcement PDMP requests is available before and after a policy change, this section

presents an exploratory, descriptive agency-level analysis of changes in law enforcement PDMP requests after implementation of a warrant requirement.

Utah’s PDMP—commonly referred to as the Utah Controlled Substances Database (CSD) program—initially became operational in 1996 (PDMP TTAC, 2018c). At that time, the contents of the database were easily accessible to law enforcement. Under the 2014 version of the Utah Code, CSD information was available to “federal, state, and local law enforcement authorities, and state and local prosecutors, engaged as a specific duty of their employment in enforcing laws” related to controlled substances or Medicaid abuse (Utah Code 2016 § 37f-3-301). However, several high-profile incidents involving the expansive use of CSD information by law enforcement raised significant concerns about whether these data should be provided with additional privacy protections (Schwartzapfel, 2017). As the Utah Office of the Legislative Auditor General later described the situation, while “an associate attorney general stated that law enforcement did not illegally access the CSD . . . in one case, the way that information was used was illegal and in the other case, though not illegal, the way it was used caused great hardship for one individual” (Office of the Legislative Auditor General, 2015).

Consequently, the Utah Legislature passed SB 119 in 2015. The statute required law enforcement to obtain a search warrant prior to accessing identifiable information contained within the CSD. As shown in Figure 5, the law enforcement PDMP access request rate dropped from over 280 yearly requests/100,000 people to approximately 10 yearly requests/100,000 people after the implementation of SB 119. This change appears to be unique to Utah; a comparison group constructed from all other states that require

law enforcement to obtain probable cause prior to requesting PDMP information does not show a similar drop during this time period.¹³

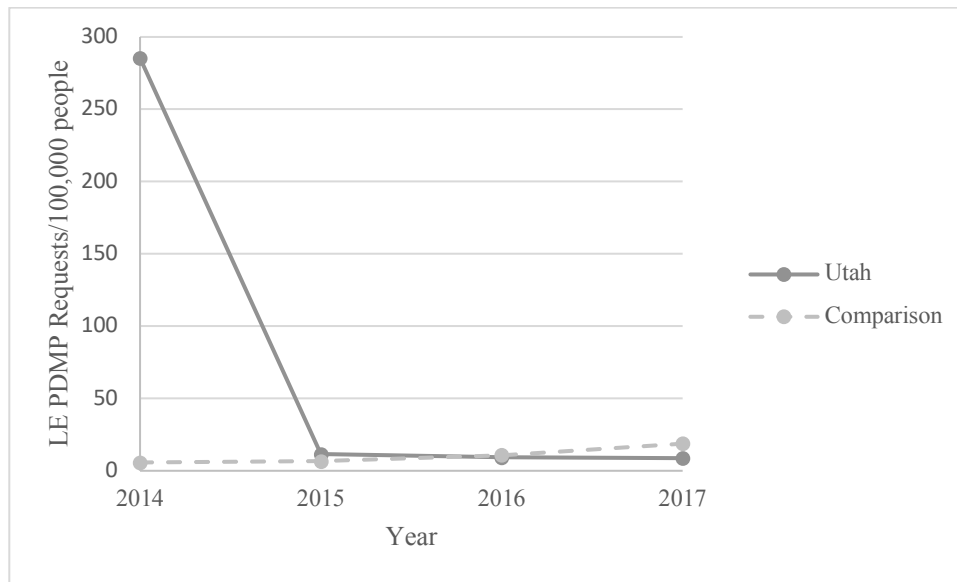


Figure 5. Law enforcement requests for PDMP information, before and after the passage of Utah SB 119

Furthermore, data released in a report by the Utah Office of the Legislative Auditor General make it possible to explore within-state variation in how law enforcement requests for PDMP information changed after the passage of SB 119 (Office of the Legislative Auditor General, 2015). After the passage of SB 119, most agencies dramatically reduced their number of requests¹⁴ for access to CSD information. The observed percent difference¹⁵ is similar for federal, state, and local agencies: there was a 100% reduction in access requests made by federal agencies, a 99% reduction in access requests made by state agencies, and a 94% reduction in access requests made by local agencies. However, as can be seen in Figure 6, differences in changes in information

requests after SB 119 can be observed if agencies are categorized based on their primary function. While the number of PDMP information requests made by probation agencies, investigative agencies, and district attorney’s offices dropped to an average of less than one request per agency (a greater than 95% percent difference), agencies that focus on investigating and enforcing narcotics crimes dropped from an average of 12.07 requests per agency to 5.85 requests per agency after the implementation of SB 119. It appears that requiring a warrant prior to obtaining information from Utah’s CSD is associated with a smaller reduction in the number of access requests made by narcotics agencies compared with other type of agencies.

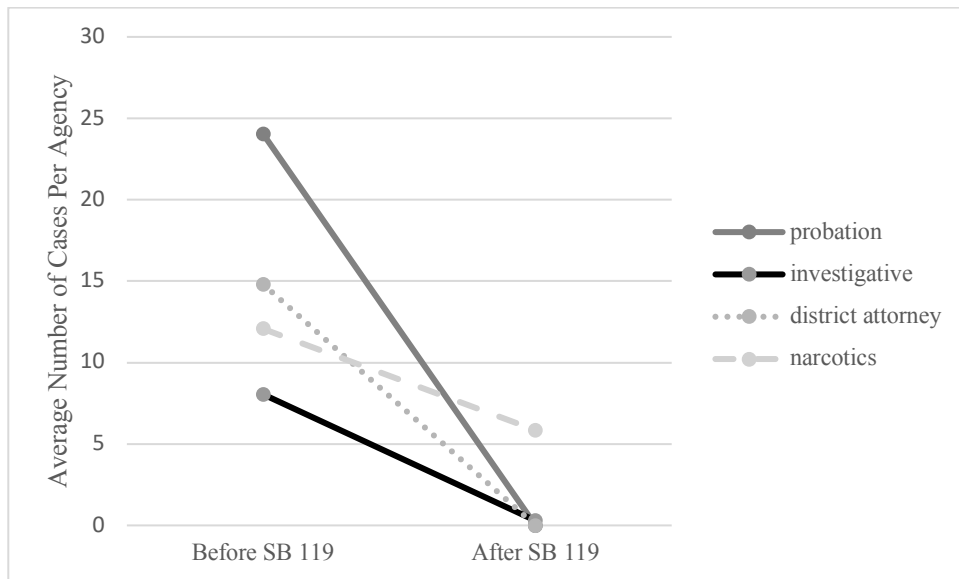


Figure 6. Changes in PDMP Information Requests After SB 119, by Agency Type

To explore whether geographic differences can be observed, access requests made by local agencies were aggregated to the county level,¹⁶ and the percent difference of the

number of requests made before and after SB 119 was calculated for each county. Figure 7 shows a county-level map of Utah, in which counties are shaded more darkly if there was a greater observed percent difference in the number of CSD access requests made, and more lightly if there was a smaller observed percent difference.¹⁷

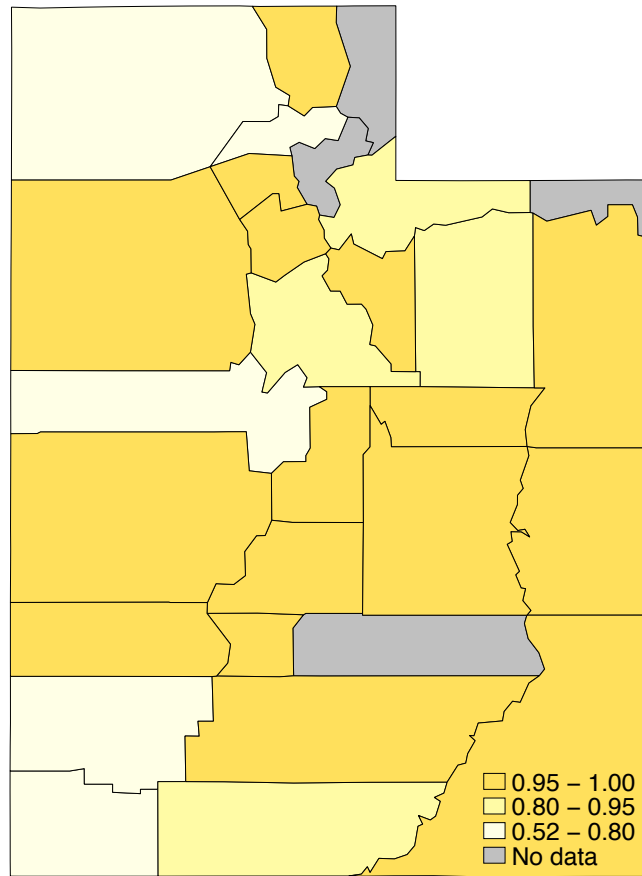


Figure 7. Geographic Distribution of Percent Reduction in CSD Request in Utah

No trends are apparent from this analysis. The three most populous counties in Utah—Salt Lake County, Utah County, and Davis County—all showed a similarly high percent difference in the number of CSD requests made before and after SB 119. On the other hand, the next most populous county—Weber County—was the least affected by the passage of SB 119. The smallest counties for which data are available—Piute County,

Garfield County, and Kane County—all also appear to have a high percent difference in CSD requests. Consequently, the size of the county does not appear to be related to the observed change in the number of CSD access requests following passage of SB 119. However, more data are needed in order to understand why there does not appear to be a relationship between the size of a locality and the impact of requiring a warrant to obtain access to CSD information, and whether the size of the locality could also have an impact on law enforcement behavior that is not observable from relatively few observations over a short period of time.

While the information provided by the Legislative Auditor General’s report allows for suggestive exploratory analyses, the robustness of these analyses should not be overstated. These data represent the experience of one state over a very short period of time, and they may not be indicative of how agencies in other states would respond or what variation might be apparent over a longer period of time. This analysis also cannot account for the potential for interagency cooperation across county lines, which is a common occurrence in narcotics investigations.

Additionally, given that the policies governing access to Utah’s CSD have changed since 2015, the differences between CSD usage by different agencies may have also changed since release of the Legislative Auditor General’s report. In particular, after the Utah District Court ruled that the Controlled Substances Act preempts Utah’s requirement that law enforcement obtain a warrant prior to accessing information from the CSA (*DEA v Utah Department of Commerce*, 2016), the state agreed in August 2017 to release information to the DEA without a warrant (Whitehurst, 2017). Allowing

federal law enforcement officers to access PDMP data more easily than state law enforcement officers may create incentives for cooperation between state and federal agents, and may therefore change the frequency with which state officials request PDMP information.

V. Discussion and Conclusions

A. Lessons for Regulating Law Enforcement Behavior

On the whole, these findings both support and complicate the application of rational choice theory to law enforcement responses to surveillance regulation. In the context of PDMP data, law enforcement requests for access to information are substantially less frequent when costs are imposed by requiring law enforcement to first demonstrate probable cause or obtain a subpoena. However, imposing costs on law enforcement information access requests may not have a uniform impact on all types of agencies, and not all types of costs are associated with an observable change in law enforcement behavior. This variation suggests that more research is needed in order to facilitate a thicker understanding of how law enforcement officers weigh the costs and benefits of undertaking surveillance. In this section, I discuss each of these points in depth.

First, the frequency of law enforcement requests for access to PDMP information is highly sensitive to the presence of certain costs associated with obtaining that information, conforming with the theory that law enforcement officers act as rational

actors when seeking information. In states where law enforcement can access PDMP information on request, the costs of obtaining this information is negligible: law enforcement officers are required to fill out a short form or make a request through an online portal, and they can expect that these requests will generally be approved within minutes or hours. Consequently, as observed in my analysis, a rational law enforcement officer would frequently be willing to seek PDMP information, even where they only expect it to have minimal benefit in a particular investigation.

In states where law enforcement is required to demonstrate probable cause or obtain a subpoena when requesting access to PDMP information, the costs of obtaining information are high in comparison, due to both the added evidentiary requirement and the extra administrative burden. Correspondingly, law enforcement would have to foresee a greater expected benefit before they would be willing to seek PDMP information, and we would expect rational law enforcement officers to seek PDMP information less often. According to prior research, law enforcement officers who use PDMPs do describe the information they obtain as useful for identifying instances of obtaining prescriptions from multiple providers, with one officer explaining that prescription records ““tell a story which cannot be denied especially after follow-up with the Doctors and Pharmacies”” (Perez et al. 2017). These benefits may justify the costs required to obtain PDMP information under some circumstances.

However, even if increased standards for obtaining PDMP data are associated with fewer law enforcement requests, it does not necessarily follow that the difference is always meaningful from a policy perspective. Although a requirement that law

enforcement obtain a subpoena is theoretically and doctrinally distinct from a requirement that law enforcement demonstrate that their request is related to an ongoing investigation, the frequency of PDMP access requests associated with both policies is substantially similar in magnitude. This may suggest that a subpoena requirement imposes few additional costs on law enforcement compared with requiring a demonstration that the request is related to an ongoing investigation. Additionally, the fact that policies intended to establish different barriers to law enforcement use of technological surveillance provoke similar levels of behavioral responses from law enforcement also complicates application of rational choice theory to law enforcement use of surveillance, and suggests that a thicker description of law enforcement's understanding of the costs and benefits of using surveillance (and complying with regulation) may be necessary to draw a more detailed behavioral model.

Second, preliminary evidence suggests that, under some circumstances, certain types of agencies are more sensitive to changes in cost than others. After the passage of SB 119, narcotics-oriented agencies in Utah showed a smaller reduction in their PDMP access request rate than other types of agencies. Although the exact mechanism may be unclear, this finding suggests that the specialized expertise concentrated in narcotics agencies may partially insulate them from the effects of enacting additional protections for PDMP information. It may be less costly for narcotics agencies to comply with a probable cause requirement, as they are better able to obtain the evidence necessary to demonstrate probable cause. Additionally, narcotics agencies may have higher funding or staffing levels, leaving them better able to respond to the imposition of procedural

barriers. Conversely, narcotics agencies may derive more benefit from obtaining PDMP information, as it can be particularly probative of the crimes they investigate.

Regardless of why it occurs, variation across agency types poses a significant challenge to the application of rational choice theory to surveillance decision-making and regulation of law enforcement information use. It suggests the need for a thicker description of law enforcement surveillance decision-making that accounts for contextual and agency-level factors. Additionally, if the goal of regulating law enforcement access to information is at least in part to manage the frequency with which law enforcement obtains that information, then what type of agency should we consider when deciding whether such regulations are necessary or successful? Crafting regulations around specialized agencies that are less sensitive to the changes in cost created by new policies can unduly hamper the ability of nonspecialized agencies to obtain information; regulations crafted around nonspecialized agencies may pose only a weak constraint on use of information by specialized agencies. This is a difficult calculus to perform, and will depend on the specific type of information in question.

Third, this analysis complicates the application of rational choice theory to law enforcement surveillance decision-making by suggesting that not all mechanisms for imposing regulatory costs are associated with changes in the rate of law enforcement information requests¹⁸ and that, in some cases, mechanisms intended to create regulatory costs may be associated with higher request rates. Requiring law enforcement to demonstrate probable cause or obtain a subpoena prior to gaining access to PDMP information was associated with decreased requests for access to that information; to a

lesser extent, requiring law enforcement to connect their request to a particular case was also associated with a lower number of PDMP access requests. However, regulatory mechanisms that do not mandate that law enforcement meet a particular standard every time they request information did not have a similar effect. Policies that restrict the amount of information provided and limit the use of PDMP information to narcotics investigations were not associated with a lower rate of PDMP access requests by law enforcement. Furthermore, requiring law enforcement to undergo training prior to requesting PDMP information was actually associated with a higher number of requests for PDMP information. While perhaps unexpected, this might be due to training increasing the salience of PDMP information, increasing awareness of PDMP information and law enforcement's ability to access it, increasing incentives to use PDMP information (if law enforcement officers feel motivated to use PDMP information to justify their training), or increasing the benefits associated with using PDMP information (if training helps law enforcement officers to use PDMP information more effectively).

The different impacts of legal and nonlegal regulatory mechanisms on law enforcement behavior may be partially explained by the different types of costs imposed by these mechanisms. Some expenses related to obtaining information operate as fixed costs, not varying with the amount of information obtained, while other expenses may operate as variable costs, increasing as the amount of information obtained increases. In this framework, legal mechanisms impose variable costs that must be paid each time PDMP information is requested, while the other regulatory mechanisms impose fixed

costs. Consequently, although legislators can employ a variety of mechanisms to limit law enforcement access to PDMP data, they should consider the potential efficacy and unintended consequences of the mechanisms they choose.

While these findings speak most directly to the implications of regulating law enforcement access to PDMP information, they also speak more broadly to the empirical verification of the application of rational choice theory to surveillance decision-making. Similar results may be expected in situations in which additional legal costs are imposed on information-seeking activities with a low cost to law enforcement, such as requesting information from commercial entities. However, even where information-seeking activities are low cost, they may not be equally low cost for all types of law enforcement agencies (Boustead, 2018), which may lead to similar variation in changes in law enforcement information requests after higher legal costs are imposed on information seeking. Finally, these results may not be generalizable to situations in which law enforcement faces high practical costs in seeking information, such as the use of wiretaps (Minzner & Anderson, 2013).

B. Implications for Privacy, Regulation of Law Enforcement, and Separation of Powers

Despite the fact that legal protections such as warrants are fundamentally a procedural protection, whether they change the scope of law enforcement surveillance use has important implications for privacy, the effectiveness of limitations on law enforcement investigations, and the ability of the judicial branch to provide an effective

check on law enforcement actors. In the remainder of this section, I discuss the implications of my findings for each of these considerations.

Courts have repeatedly extended Fourth Amendment protections in order to align law enforcement surveillance practices with societal expectations about what information can and should remain private. This function is especially important in the case of PDMPs, given the sensitivity and presumed confidentiality of the medical information at stake. The findings of this paper suggest that extending legal protections to PDMP information may be associated with a reduction in the frequency of information use, and thus may be an effective way of preventing widespread use by law enforcement of sensitive medical information. However, additional research is needed to investigate whether this relationship is causal, and whether it holds for other forms of technological surveillance. Additionally, as policymakers consider expanding PDMP usage into new arenas, they may want to consider consulting with a broad range of stakeholders in order to avoid introducing new discrepancies between information use and societal expectations. An advisory council that includes individuals whose PDMP information may make them uniquely vulnerable in different ways—including those with substance use disorders—could help policymakers weigh the advantages and disadvantages of different uses of PDMP data, and avoid unintended consequences.

Fourth Amendment protections are also a critical mechanism for regulating law enforcement surveillance. This study provides novel evidence of the effectiveness of this mechanism by finding that, in the context of PDMPs, legal protections are associated with lower levels of law enforcement use of surveillance. However, these findings also

suggest that legal protections are a blunter tool than judicial policymakers might assume. Given the frequency and intensity of debates over whether subpoenas or warrants should be required prior to the use of various forms of technological surveillance, it is particularly troubling that probable cause and subpoena requirements are both associated with similar levels of law enforcement requests for PDMP information. This suggests that much of this debate may in fact focus on a distinction without a difference, at least from the perspective of law enforcement behavior. Furthermore, preliminary evidence suggesting that some agencies may be more sensitive to changes in legal costs than others seriously undermines reliance on the judicial branch to regulate technological surveillance, as judges rarely establish separate legal requirements for different types of agencies. Further legislative intervention in this area may be needed.

Finally, Fourth Amendment protections promote judicial oversight of executive branch actors by requiring consultation with an impartial magistrate prior to engaging in certain forms of surveillance. This research paints a complicated picture of the association between legal protections for information and law enforcement use of surveillance, raising questions about for whom and under what circumstances legal protections afford the judicial branch oversight opportunities. In particular, if the impact of legal protections varies across agency types, it may be that expanding legal protections skews the types of agencies that continue to use a given form of surveillance and are therefore exposed to judicial oversight. However, this raises questions about the substitution of regulated forms of surveillance with unregulated ones by agencies that decrease or discontinue their use of technological surveillance in response to legal

protections. It also highlights the need for broader oversight mechanisms targeting law enforcement use of technological surveillance.

NOTES

¹ For example, based on the Court’s description in *Whalen* it would appear that New York’s PDMP held approximately 6 million prescription records at any given time: 100,000 prescriptions were reported per month, and records were destroyed after five years (*Whalen v Roe*, 492 U.S. at 593-4).

² The Prescription Drug Monitoring Program Training and Technical Assistance Center (PDMP TTAC) at Brandeis University conducted a survey of all state PDMPs in 2011–2013, including data on the number of prescription records collected for certain years in certain states. The yearly number of prescription records collected varies from state to state depending on population and other factors; the yearly count ranges from just over 500,000 in Alaska to over 45 million in California (PDMP TTAC 2018b). Given that most states appear to report yearly numbers in at least the low millions and data are kept for multiple years, hundreds of millions of prescription records would appear to be a conservative estimate.

³ This chart was created using data on state PDMP policies compiled by the Prescription Drug Abuse Policy System (Legal Science 2018)

⁴ The process through which the data used to make this graph were collected is described above in Section IV.A.1.

⁵ Note that this section only describes variation in the legal showing that law enforcement must make prior to obtaining PDMP information, not the specific process that they use to obtain the information. In particular, I exclude any discussion of the workflow through which law enforcement may obtain access to PDMP information once they have met the requisite legal standard, such as whether they must rely on PDMP officials to provide them with the information or whether they are able to access it directly on their own.

⁶ To view the data available from this report, mouse over the symbol next to the state name in the table labeled “Warrantless Searches: The Norm, Not the Exception.”

⁷ I was only able to obtain data on the number of law enforcement requests for information made in each state, not the specific mechanism through which the requests were made (e.g., whether law enforcement officers in a state that did not require a warrant to request PDMP information nevertheless obtained a warrant prior to making an information request).

⁸ This estimation was done by dividing the total observed in the partial year by the number of months of data available (thus obtaining a monthly average), then multiplying by 12.

⁹ For purposes of this analysis, I included as independent variables those aspects of state statutes that had been adopted widely enough to support analysis and could be expected to have an effect on law enforcement requests for PDMP information.

¹⁰ As 2017 data are not yet available, 2017 values were linearly extrapolated from prior state trends. Additionally, as linear extrapolation may not accurately predict future values, given the volatility of opioid-related arrests in the midst of an opioid crisis, I reran my results (1) excluding these arrest controls and (2) limiting the time period to pre-2017, when arrest data are available. In both sets of analyses, the results were largely unchanged from my main analysis.

¹¹ As data are available for a one-year period prior to the passage of the law and a six-month period after the passage of the law, I divided the pre-law observations in half so that they correspond to a six-month time period.

¹² See discussion in Section III.B.

¹³ In Figure 5, the comparison group comprises data from Alaska, Arkansas, Iowa, Minnesota, New Hampshire, Oregon, and Rhode Island.

¹⁴ Number of requests are determined by the number of cases searched prior to the implementation of SB 119 and the number of warrants issued after the implementation of SB 119. To the extent that law enforcement may have to seek multiple warrants per case in the post-implementation period, these metrics may not be fully identical. However, this discrepancy would suggest that the large observed percent decrease in PDMP information requests after SB 119 is, if anything, an underestimation of the effect of the statute.

¹⁵ The percent difference describes the change in the number of requests made, normalized by the number of requests made in the pre-law period. A percent difference of 50% corresponds to an agency making half as many requests in the post-law period as they did in the pre-law period; a percent reduction of 100% corresponds to an agency making no requests in the post-law period.

¹⁶ Requests that could not be attributed to a single county—such as requests made by federal and state agencies—were omitted for the purposes of this analysis. In addition to federal and state agencies, there was one local-level reporting agency (the Cache/Riche Drug Task Force) that could not be attributed to a single county and was therefore omitted.

¹⁷ Counties are shaded in grey if no data are available on their use of CSD data during this time period.

¹⁸ It is important to note, however, that mechanisms for imposing regulatory costs that are not associated with changes in the rate at which PDMP information is requested may still be associated with other changes in law enforcement behavior that are not observable from this data.

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Utah SB 119 (2015)
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W. Va. Code R. §60A-9-5(a) (2017)
Wisc. Admin. Code CSB §44.11(10) (2017)

Appendix A: Sources of PDMP Data

<i>State</i>	<i>Source</i>
Alaska	<p>Alaska Board of Pharmacy, <i>Alaska Prescription Drug Monitoring Program Report to the 30th Alaska State Legislature (2017)</i>, https://www.commerce.alaska.gov/web/portals/5/pub/PHA_PDMP_2016_LegislativeReport.pdf.</p> <p>Alaska Board of Pharmacy, <i>Alaska Prescription Drug Monitoring Program Report to the 30th Alaska State Legislature (2018)</i>, https://www.commerce.alaska.gov/web/portals/5/pub/PHA_PDMP_2017_LegislativeReport.pdf.</p>
Arkansas	<p>Arkansas Prescription Monitoring Program, <i>FY 2016 Third Quarter Report</i>, http://www.arkansaspmp.com/files/2016/ARPMP_Quarterly_Report.pdf</p> <p>Arkansas Prescription Monitoring Program, <i>FY 2017 Fourth Quarter Report</i>, http://www.arkansaspmp.com/files/2017/Official_PMP_Dashboard_4th_Quarter_2017.pdf</p>
Connecticut	<p>Connecticut Department of Consumer Protection, <i>Prescription Drug Monitoring Program: Snap Shot of Legal Controlled Substance Prescription Usage Throughout Connecticut</i>, https://portal.ct.gov/-/media/DCP/drug_control/PMP/Statistics/2016-CPMRS-Statistics.pdf?la=en</p> <p>Connecticut Department of Consumer Protection, <i>Prescription Drug Monitoring Program: Snap Shot of Legal Controlled Substance Prescription Usage Throughout Connecticut</i>, https://portal.ct.gov/-/media/DCP/drug_control/PMP/Statistics/2017-stats_FINAL_updated_09-2018.pdf?la=en</p>
Florida	<p>Florida Health, <i>2013–2014 Prescription Drug Monitoring Program Annual Report</i>, http://www.floridahealth.gov/statistics-and-data/e-force/news-reports/2014-pdmp-annual-report-final.pdf</p>

	<p>Florida Health, <i>2014–2015 Prescription Drug Monitoring Program Annual Report</i>, http://www.floridahealth.gov/statistics-and-data/e-force/news-reports/_documents/2015-pdmp-annual-report.pdf</p> <p>Florida Health, <i>2015–2016 Prescription Drug Monitoring Program Annual Report</i>, http://www.floridahealth.gov/statistics-and-data/e-force/_documents/2016PDMPAnnualReport.pdf</p> <p>Florida Health, <i>2016–2017 Prescription Drug Monitoring Program Annual Report</i>, http://www.floridahealth.gov/statistics-and-data/e-force/funding/2017pdmpannualreport.pdf</p>
Idaho	Data obtained through communication with official
Iowa	<p>Iowa Board of Pharmacy, <i>Letter of Andrew Funk, Director, to Governor Terry E. Branstad and Members of the 86th General Assembly</i>, https://pharmacy.iowa.gov/sites/default/files/documents/2016/01/pmp_annual_report.pdf</p> <p>Iowa Board of Pharmacy, <i>Iowa Prescription Monitoring Program 2017 Annual Report</i>, https://pharmacy.iowa.gov/sites/default/files/documents/2018/01/pmp_annual_report_2017_final.pdf</p>
Kentucky	<p>Kentucky Cabinet for Health and Family Services, <i>Kentucky All Schedule Prescription Electronic Reporting Quarterly Trend Report 4th Quarter 2013</i>, https://web.archive.org/web/20170102110325/http://www.chfs.ky.gov/NR/rdonlyres/38DA2EB9-6E02-4AA9-946C-E748EBAEEC48/0/KASPERQuarterlyTrendReportQ42013.pdf</p> <p>Kentucky Cabinet for Health and Family Services, <i>Kentucky All Schedule Prescription Electronic Reporting Quarterly Trend Report 4th Quarter 2014</i>, https://web.archive.org/web/20170702042911/http://www.chfs.ky.gov/NR/rdonlyres/4A5D62A9-D4A8-40E5-89B8-6C6B3E29A312/0/KASPERQuarterlyTrendReportQ42014.pdf</p> <p>Kentucky Cabinet for Health and Family Services, <i>Kentucky All Schedule Prescription Electronic Reporting Quarterly Trend Report 4th Quarter 2015</i>, https://web.archive.org/web/20170702042840/http://www.chfs.ky.gov</p>

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Louisiana	Data obtained through communication with official
Maryland	<p>State of Maryland Department of Health and Mental Hygiene, <i>2015 Report of the Analysis of the Advisory Board on Prescription Drug Monitoring on the Impact of the Prescription Drug Monitoring Program</i>, https://bha.health.maryland.gov/pdmp/Documents/BHA%20Prescription%20Drug%20Monitoring%20ProgramFinal%20Signed120815OGA1655.pdf</p> <p>State of Maryland Department of Health and Mental Hygiene, <i>2016 Report of the Analysis of the Advisory Board on Prescription Drug Monitoring on the Impact of the Prescription Drug Monitoring Program</i>, https://bha.health.maryland.gov/Documents/HG%2021-2A-05%20-%20BHA%20-%20PDMPFinal%20SignedBHA_01-24-17OGA1767%20(2).pdf</p>
Minnesota	<p>Minnesota Board of Pharmacy, <i>Minnesota Prescription Monitoring Program 2016 Annual Report</i>, http://pmp.pharmacy.state.mn.us/assets/files/2017%20Files/2016_Annual_Report.pdf</p>
Montana	Data obtained through communication with official
New Jersey	Data obtained through communication with official

Ohio	Data obtained through communication with official
Oregon	<p>Oregon Health Authority, <i>Annual Report to the Advisory Commission</i>, http://www.orpdmp.com/orpdmpfiles/PDF_Files/Reports/PDMP_AC_AnnualReport_2011.pdf</p> <p>Oregon Health Authority, <i>Prescription Drug Monitoring Monthly Report (January 2012-December 2013)</i>, available at http://www.orpdmp.com/archived-reports.html</p> <p>Oregon Health Authority Public Health Division, <i>Oregon Prescription Drug Monitoring Program 2014 Annual Report to the PDMP Advisory Commission</i>, http://www.orpdmp.com/orpdmpfiles/PDF_Files/Reports/2014_PDMP-AC_Annual_Report_02_05_15.pdf</p> <p>Oregon Health Authority Public Health Division, <i>2015 Annual Report to the Prescription Drug Monitoring Program Advisory Commission</i>, https://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFE_LIVING/PDMP/Documents/PDMP_AC_AnnualReport_2015.pdf</p> <p>Oregon Health Authority Public Health Division, <i>Prescription Drug Monitoring Program Advisory Commission Annual Report</i>, http://www.orpdmp.com/orpdmpfiles/PDF_Files/Reports/PDMP_AC_AnnualReport_2016.pdf</p> <p>Oregon Health Authority Public Health Division, <i>2017 Annual Report to the Advisory Commission</i>, https://www.oregon.gov/oha/PH/PREVENTIONWELLNESS/SAFE_LIVING/PDMP/Documents/PDMP_AC_AnnualReport_2017.pdf</p>
South Dakota	<p>South Dakota Prescription Drug Monitoring Program, <i>SD PDMP Statistical Information December 2017</i>, https://web.archive.org/web/20180220223416/http://doh.sd.gov/boards/pharmacy/assets/MonthlyStats.pdf</p>
Tennessee	<p>Tennessee Department of Health Controlled Substance Monitoring Database Committee, <i>2016 Report to the 109th Tennessee General Assembly</i>, https://www.tn.gov/content/dam/tn/health/healthprofboards/csmd/C_SMD_AnnualReport_2016.pdf</p>

	<p>Tennessee Department of Health Controlled Substance Monitoring Database Committee, <i>2017 Report to the 110th Tennessee General Assembly</i>, https://www.tn.gov/content/dam/tn/health/healthprofboards/csmd/2017_Comprehensive_CSMD_Annual_Report.pdf</p> <p>Tennessee Department of Health Controlled Substance Monitoring Database Committee, <i>2018 Report to the 110th Tennessee General Assembly</i>, https://www.tn.gov/content/dam/tn/health/healthprofboards/csmd/2018%20Concise%20CSMD%20Annual%20Report.pdf</p>
Texas	Data obtained through communication with official
Utah	Data obtained through communication with official
Virginia	<p>Virginia Department of Public Health, <i>Virginia Prescription Monitoring Program Statistics through Year End 2013</i>, https://web.archive.org/web/20180218032727/https://www.dhp.virginia.gov/dhp_programs/pmp/docs/ProgramStats/2013PMPStatsFinal.pdf</p> <p>Virginia Department of Public Health, <i>Virginia Prescription Monitoring Program Statistics through Year End 2014</i>, https://web.archive.org/web/20180218032725/https://www.dhp.virginia.gov/dhp_programs/pmp/docs/ProgramStats/2014PMPStatsFinal.pdf.</p> <p>Virginia Department of Public Health, <i>Virginia Prescription Monitoring Program Statistics through Year End 2015</i>, https://web.archive.org/web/20190418035831/https://www.dhp.virginia.gov/dhp_programs/pmp/docs/ProgramStats/2015PMPStatsFinal.pdf</p>
Wisconsin	<p>Wisconsin ePDMP, <i>PDMP Utilization</i>, https://pdmp.wi.gov/statistics/pdmp-utilization</p>

Appendix B: Summary Statistics of Control Variables

Table B1. Summary Statistics of Control Variables

<i>Category</i>	<i>Control</i>	<i>Overall</i>	<i>Probable Cause Required</i>	<i>Subpoena Required</i>	<i>Ongoing Investigation Required</i>
Opioid use controls	Opioid prescription rate	77.09 (21.85)	73.64 (18.79)	75.78 (17.03)	78.99 (25.66)
	Opioid death rate	12.06 (7.71)	11.24 (7.63)	13.50 (8.08)	11.34 (6.37)
	Heroin/cocaine possession arrest rate	53.47 (44.14)	39.71 (26.16)	70.13 (48.87)	47.28 (37.37)
	Heroin/cocaine sales arrest rate	22.91 (22.60)	12.60 (10.54)	29.22 (26.04)	24.39 (26.15)
Opioid-related policies	Physicians required to access PDMP	0.21 (0.41)	0.05 (0.22)	0.19 (0.40)	0.24 (0.43)
	PDMP includes schedule III, IV, V	0.86 (0.33)	0.82 (0.38)	0.94 (0.23)	0.93 (0.24)
	Pain management clinic laws	0.23 (0.42)	0 (0)	0.33 (0.47)	0.33 (0.47)
	Naloxone access laws	0.60 (0.49)	0.56 (0.50)	0.58 (0.50)	0.54 (0.50)
	Good Samaritan laws	0.48 (0.50)	0.48 (0.50)	0.50 (0.50)	0.41 (0.49)
	Medicaid expansion	0.51 (0.50)	0.61 (0.49)	0.58 (0.50)	0.41 (0.49)
	Medical marijuana dispensaries allowed	0.27 (0.44)	0.28 (0.45)	0.33 (0.47)	0.22 (0.42)
Law enforcement resources	Law enforcement employees per 100,000 population	273.70 (72.02)	257.33 (47.63)	294.05 (93.99)	286.48 (71.61)
Demographic characteristics	Proportion urban population	0.73 (0.13)	0.71 (0.14)	0.72 (0.13)	0.74 (0.12)
	Proportion White	0.72 (0.15)	0.79 (0.08)	0.71 (0.13)	0.69 (0.17)
	Proportion Black	0.09 (0.08)	0.05 (0.04)	0.13 (0.09)	0.09 (0.07)

	Proportion Hispanic	0.10 (0.10)	0.08 (0.03)	0.09 (0.07)	0.13 (0.12)
	Proportion female	0.50 (0.008)	0.50 (0.01)	0.50 (0.006)	0.50 (0.008)
	Proportion aged 20–29	0.13 (0.008)	0.14 (0.01)	0.13 (0.005)	0.14 (0.008)
	Proportion aged 30–39	0.12 (0.007)	0.13 (0.009)	0.12 (0.007)	0.12 (0.005)
	Proportion aged 40–49	0.12 (0.008)	0.12 (0.006)	0.12 (0.009)	0.12 (0.009)
	Proportion aged 50–59	0.20 (0.006)	0.20 (0.009)	0.20 (0.004)	0.20 (0.004)
	Unemployment rate	5.35 (1.59)	5.28 (1.68)	5.79 (1.64)	5.24 (1.65)
Economic characteristics	Poverty rate	13.96 (3.07)	12.65 (2.87)	13.81 (2.80)	14.72 (2.96)
	Median income (in thousands)	56.05 (9.75)	58.59 (9.42)	57.00 (11.14)	54.18 (8.88)

Appendix C: Results of Sensitivity Analyses

Table C1. Relationship between regulation of law enforcement access to PDMPs and law enforcement requests for access to PDMPs; restricting analysis by data type

		<i>Omitting any imputed data</i>	<i>Using only data from official reports</i>
Requirements for obtaining PDMP information	Probable cause required	-3.01*** (0.577)	-3.35*** (0.322)
	Subpoena required	-1.62*** (0.362)	-2.26*** (0.388)
	Ongoing investigation	-1.28*** (0.271)	-0.464 (0.469)
Other restrictions on law enforcement access	Limited by investigation type	-0.277 (0.361)	-0.719 (0.472)
	Limited information	0.221 (0.256)	-0.566* (0.243)
	Training required	0.918* (0.384)	1.83*** (0.481)
Control variables	Opioid use controls	X	X
	Opioid-related policies	X	X
	Law enforcement resources	X	X
	Demographic controls	X	X
	Economic controls	X	X
	Year fixed effects	X	X

This table presents the results of a series of Poisson regressions, with law enforcement request rate for PDMP data as the outcome variable. Standard errors were clustered at the state level. *** denotes statistical significance at the 0.005 level; ** denotes statistical significance at the 0.01 level; * denotes statistical significance at the 0.05 level.

Table C2. Relationship between regulation of law enforcement access to PDMPs and law enforcement requests for access to PDMPs, using number of PDMP requests per law enforcement employee as the dependent variable

		PDMP requests per law enforcement employee
Requirements for obtaining PDMP information	Probable cause required	-2.760*** (0.580)
	Subpoena required	-1.467*** (0.380)
	Ongoing investigation	-1.224*** (0.295)
Other restrictions on law enforcement access	Limited by investigation type	-0.764 (0.442)
	Limited information	0.052 (0.444)
	Training required	1.475** (0.546)
Control variables	Opioid use controls	X
	Opioid-related policies	X
	Demographic controls	X
	Economic controls	X
	Year fixed effects	X
<p>This table presents the results of a series of Poisson regressions, with law enforcement requests for PDMP data per law enforcement employee as the outcome variable. Standard errors were clustered at the state level. *** denotes statistical significance at the 0.005 level; ** denotes statistical significance at the 0.01 level; * denotes statistical significance at the 0.05 level.</p>		