Savior or Enabler? The Impact of Naloxone Access on Opioid Mortality

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Abstract: The United States is experiencing an opioid epidemic. On average, more people die each day from opioid overdoses than from car accidents. Policymakers attempt to combat this crisis by increasing access to naloxone, an opioid overdose antidote. Since 2001, all 50 states and the District of Columbia have implemented a Naloxone Access Law, which broadens availability of naloxone to family, friends, and community members of opioid abusers. Some policymakers are in favor of widespread naloxone access, but others are skeptical of moral hazard, and claim it permits riskier drug abuse. This study exploits state-level variation in law implementation to analyze the effects of broadening the drug's access to naloxone on opioid-related deaths and on drug-related crimes. I also examine for the existence of a gender gap in impact. I find no evidence that increasing access to naloxone effectively reduces opioid-related mortality, and some evidence of moral hazard. I also find no differential impact between men and women.

1. INTRODUCTION

Opioid overdoses claimed more than 47,000 American lives in 2017 (NIDA, 2019), 10,000 more than car accidents. The frequency of opioid fatalities, which account for nearly 70 percent of all drug overdose deaths, continues to rise each year (CDC, 2018). About 130 people experience deadly opioid overdoses per day, and an estimated 1.7 million suffer from addiction (NIDA, 2019). The Centers for Disease Control (CDC) quantifies the economic burden of misuse of prescription opioids alone to be $78.5 billion per year (NIDA, 2019).

One way policymakers attempt to reduce mortality is to increase access to opioid antagonists, such as naloxone. People often obtain naloxone as a prepackaged nasal spray called Narcan (NIDA, 2018). Naloxone can reverse the lethal effects of an overdose, if administered properly. According to the CDC, it has reversed over 10,000 overdoses between 1996 and 2010 (Addiction Center, 2018). There is no abuse potential for naloxone, nor is it addictive or a controlled substance (CADPH, 2019). Though doctors may prescribe naloxone to patients at high risk of overdose in all 50 states, many opioid users do not have access to naloxone due to lack of primary care providers (Harper, 2018). Lawmakers have broadened access to the drug by allowing doctors to prescribe naloxone to a third party or to issue a standing order. Third-party laws allow someone who is not at risk but is likely to witness an overdose, to obtain naloxone from a pharmacy and administer to someone else as needed (SAMHSA, 2018). Common third parties are family members or close friends of an opioid user. Standing order laws allow anyone desiring naloxone to obtain it from a pharmacy (SAMHSA, 2018). Good Samaritan Laws decriminalizing possession of naloxone may often accompany these law packages (AMA, 2015). For example, California's Civil Code Section 1714.22, passed in 2014, issued a standing order and eliminated civil and criminal liability for naloxone possession (CADPH, 2019). All 50 states

and the District of Columbia have implemented either a third-party law or a standing order as of July 2017 to increase access to naloxone.

I will refer to third-party laws and standing orders together as Naloxone Access Laws (NALs). This paper explores state-level variation in the timing of ~~Naloxone Access Laws~~ NALs to investigate the impact of naloxone access on opioid mortality and on drug and narcotic related crimes.

Policymakers dispute whether the benefits of broadening naloxone access outweigh the costs. Several medical organizations and public figures publically support naloxone. The American Medical Association Task Force to Reduce Opioid Abuse emphasizes its support of broadening naloxone access as well as protecting those involved in an overdose from prosecution: "[We] encourage physicians to consider co-prescribing naloxone when it is clinically appropriate to do so" (AMA, 2015). In their report the AMA cites Rees et al. (2017) in claiming there is a 9 to 11 percent decrease in opioid-related death as a result of ~~Naloxone Access Laws~~ NALs. Surgeon General of the United States Jerome Adams also supports naloxone access. He asks prescription drug users, illicit drug users, health care specialists, and likely bystanders to obtain naloxone and learn how to administer it (US HHS, 2019). Others dispute the benefits. Maine governor Paul LePage believes the drug encourages riskier drug behaviors and stated it "merely extends [lives] until the next overdose" (Mattina, 2017). Despite his open criticism, Maine legislators passed a standing order law in 2015.

Increasing naloxone access has theoretically ambiguous consequences on opioid overdoses, because it lowers the risk associated with opioid use. Providing naloxone to illicit drug users may prolong their habit, fail to encourage treatment, and enable riskier behaviors. Doleac and Mukherjee (2018) find naloxone causes moral hazard of increasing risky drug use as

a result of decreasing the likelihood of death. Their analysis shows an increase in Emergency Room visits and an increase in opioid mortality in the Midwest and South. Others argue that people will seek drug treatment after a near-death experience, and naloxone provides abusers with a second chance (Rees et al., 2017). One argument is that not all opioid overdoses are a result of illicit use; some patients taking legally prescribed opioids accidentally overdose (SAMHSA, 2016). Rees et al. (2017) find a significant, 9 to 11 percent decrease in opioid mortality as a result of ~~Naloxone Access Laws~~; they claim naloxone saves lives and is an effective tool to fight the opioid epidemic.

This study seeks to clarify previous researchers' conflicting results by using publically available data, fact-checking dates of access laws for accuracy, and performing robustness checks to ensure confidence in findings. I find no evidence that increased access to naloxone decreases opioid-related mortality, and find statistically weak evidence that it increases mortality, evidence of moral hazard. I also estimate the impact of ~~Naloxone Access Laws~~ on mortality by gender, to see if increased access differs in impact between women and men. Women on average use smaller amounts of heroin, and suffer from addiction for a shorter period of time than the average man (NIDH, 2018). I find slightly stronger evidence of moral hazard for men than for women, but not much difference overall. Finally, I estimate the impact of ~~Naloxone Access Laws~~ on drug and narcotic related crimes, as classified by the Federal Bureau of Intelligence (FBI). My estimates are imprecise but do not provide evidence that ~~Naloxone Access Laws~~ lower crime.

2. BACKGROUND

Opioids are a class of powerful drugs that include the illegal substance heroin, a wide variety of prescription painkillers such as oxycodone, hydrocodone, codeine, morphine, and fentanyl (NIDH, 2019). Fentanyl is a synthetic opioid that can mix with heroin to increase potency (ASAM, 2016). Fentanyl-laced heroin is 80 to 100 times more powerful than morphine (US DEA, n.d.) and sometimes too potent for antagonists to combat.

2.1 Opioid epidemic history

The opioid epidemic began about thirty years ago. The CDC defines three "shocks" or significant events in the epidemic's history (CDC, 2018). The first event began in the 1990s when doctors began more freely writing opioid painkiller prescriptions. From 1991 to 2009, the number of opioid prescriptions increased by 300 percent in the United States (Lyapustina and Alexander, 2015). Possible causes for this massive increase are the increased marketing and availability of OxyContin and the general cultural movement to "treat untreated pain" (Poison Control, 2018). People began to abuse prescriptions and recreationally use opioids during this time. In 2002 alone, 2.7 million people became recreational opioid users (NCBI, 2017). The second shock occurred in 2010 as a result of the abuse-deterrent reformulation of OxyContin. Abuse-deterrent OxyContin cannot be crushed or dissolved. As a result, many prescription misusers began to use heroin, an inexpensive and powerful substitute. The number of heroin deaths since 2010 has more than quadrupled (Evans et al. 2018, Alpert et al. 2017). The third event began in 2013, when fatal overdoses increased due to the lacing of heroin with Fentanyl and other synthetics. Fentanyl-related deaths more than doubled between 2015 and 2016 (Katz, 2017).

2.2 Other policies combatting the epidemic

Policymakers, along with medical researchers and developers, attempt to mitigate the opioid epidemic in several ways. One was reformulating OxyContin to prevent its misuse. Evans et al. (2018) and Alpert et al. (2017) find this reformulation effectively reduces prescription opioid misuse, with the unintended consequence of substitution to heroin.

Prescription Drug Monitoring Programs mandate prescribers to report all opioid prescriptions to an online database. These programs prevent patients from receiving multiple prescriptions from different doctors, referred to as "doctor shopping". Pain Management Clinic Laws crack down on "pill mills," clinics that traditionally prescribed patients with heavy doses and quantities of opioids with little regulation. "Pill mills" were formerly common in Florida until the Pill Mill Bill of 2011, which forced many of them to close (National Institute of Justice, 2018). Studies find both Prescription Drug Monitoring Programs and Pain Management Clinic Laws reduce the number of prescription opioids on the market (e.g. Mallatt, 2018; Buchmueller and Carey, 2017; Kilby, 2015). Doctor Shopping Laws make obtaining multiple prescriptions of the same drug illegal, but little evidence supports effectiveness of this law (Deiana and Giua, 2018). Reducing market quantity of prescription drugs cannot be effective without access to rehabilitation (SAMHSA, 2016).

Good Samaritan Laws sometimes accompany ~~Naloxone Access Laws~~ NALs in policy packages, as noted in the California 2014 law example (see page 2). Good Samaritan Laws provide bystanders immunity from criminal charges if they seek emergency services for a drug overdose. Evidence of the effectiveness of Good Samaritan Laws as standalone policies is inconclusive (Rees et al., 2017; Deiana and Giua, 2018).

2.3 Government-issued Initiative

Awareness of the opioid crisis is widespread. President Trump declared a National Public Health Emergency on October 26, 2017 (The White House, 2017). The President's Initiative to Stop Opioid Abuse includes $6 billion in funding over a two-year period to increase education and awareness about opioids, increase border security to prevent the flow of drugs across the border, and further opioid treatment opportunities. States and local communities will also receive more than $1 billion in grants to improve education, treatment, and health centers (The White House, 2018). These efforts are recent and ongoing; though providing funds for improved treatment may relieve the present dearth of treatment facilities in some areas, the persistent effects of these efforts are unclear.

3. RELATED LITERATURE

Two of the most salient papers on this topic present conflicting results. Rees et al. (2017) estimates the effects of Naloxone Access Laws and Good Samaritan Laws enacted between 2001 and 2014 on opioid deaths. They use a Poisson model to examine data on the state-year level, and find a 9 to 11 percent reduction in opioid-related deaths resulting from ~~Naloxone Access Laws.~~ NALs During their study period, twenty-seven states and the District of Columbia adopted ~~Naloxone Access Laws~~ NALs. In contrast, the range of my data encapsulates legislature from all fifty states (and DC).

Doleac and Mukherjee (2018) theorize naloxone enables people to engage in riskier behaviors, because it decreases the likelihood of fatal overdose. Using a difference-in-difference fixed effects model, they estimate the impact of broadening naloxone access on opioid deaths, opioid-related theft, and emergency room visits. They find geographically heterogeneous effects

but no net effect on mortality. They also estimate an increase in arrests, and a significant increase in emergency room visits. Opioid mortality is subject to geographic heterogeneity, which they suspect stems from differences in healthcare availability and the prevalence of fentanyl lacing. For example, they find a 14 percent increase in mortality in the Midwest, a decrease in the west, an insignificant increase in the south, and inconclusive effects in the northeast. Their geographically heterogeneous effects are robust to excluding influential states such as California, New York, and Florida. Their mortality data is on the county-month level, spans the years 2010-2015, and comes from the CDC restricted access database. Though their data spans a short time frame, it captures policy variation in 41 states, as most states adopt ~~Naloxone Access Laws~~ during this time.

A potential explanation for Doleac and Mukherjee and Rees et al.'s conflicting results is some differences in coding ~~Naloxone Access Law~~ dates and different data timespans. The policy dates used in Rees et al.'s study come from the Prescription Drug Abuse Policy System (PDAPS), whereas Doleac and Mukherjee compile policy dates for naloxone access from other sources ~~for accuracy~~ such as Davis and Carr (2015), a legal analysis of all legislation relating to naloxone to pinpoint specific timing of increased access. Policy dates differ for fourteen states, including California, Colorado, Connecticut, Delaware, Illinois, Kentucky, Louisiana, Maine, Maryland, New York, Pennsylvania, Rhode Island, Virginia, and Washington. My research on timing of ~~Naloxone Access Laws~~ concludes that all but two of Doleac and Mukherjee's dates are more accurate than those used in Rees et al. (2017). Some of the dates used in PDAPS represent decriminalization of possession, rather than adoption of a third-party law or standing order. See Appendix Table 1 for a comprehensive comparison of ~~Naloxone Access Law~~ dates and my reconciliation of discrepancies. Doleac and Mukherjee also claim to use higher frequency data

(on the county-month level) than Rees et al., allowing them to capture variation to the month-year, rather than to the year. The short time frame of Doleac and Mukherjee's data may limit their ability to ensure that pre-trends do not obfuscate the results. Furthermore, they limit their analysis to urban areas; excluding rural areas that also suffer from the epidemic might be problematic.

Multiple studies determine the mortality effects of anti-overdose programs at the community level. Massachusetts implemented an Overdose Education and Naloxone Distribution (OEND) program in 19 different communities between 2004 and 2006. Walley et al. (2013) estimated a significant reduction in opioid death rates for those communities with OEND programs, compared to similar areas without the program. Doe-Simkins et al. (2014) also studied the program and found evidence that first responders trained to administer naloxone behave similarly during an overdose to laypersons. Not sure what this means — are laypersons just as good as professionals in administering naxolone?

Good Samaritan Laws may also accompany ~~Naloxone Access Laws~~ NALs in a legislative package. Deiana and Giua (2018) find that Good Samaritan Laws decrease substance-related mortality. As theoretically expected, they also decrease narcotic-related crimes; providing bystanders immunity from criminal charges should reduce the number of drug related crimes. This study also estimates the effects of other opioid-targeted laws on mortality, including ~~Naloxone Access Laws~~ NALs, Prescription Drug Monitoring Programs, Pain Management Clinics Laws, and Doctor Shopping Laws. They find insignificant evidence of an effect of ~~Naloxone Access Laws~~ NALs on mortality and crime, but both estimates are positive.

Prescription Drug Monitoring Programs intend to reduce the over-supply of prescription opioids that was common in the 1990s, ~~to prevent opioid overdose deaths~~. Multiple studies confirm that this type of law does reduce the number of opioid prescriptions, with heterogeneous

effects depending on the law's severity (Mallatt, 2018; Buchmueller and Carey, 2017). This finding is theoretically sensible because reducing supply is the law's direct target to indirectly negate opioid overdoses. Limiting the availability of prescription opioids may, however, trigger prescription misusers to use heroin instead. Studies also find evidence that heroin-related deaths increase as a result of Prescription Drug Monitoring Programs adoption (Mallatt, 2018; Kilby, 2015).

Pharmacies reformulated the prescription opioid OxyContin in 2010, so that it cannot be crushed or dissolved for abuse. This shock to the opioid market also caused prescription opioid abusers to switch to using heroin. Multiple studies confirm this suspicion (Alpert et al. 2017, Evans et al. 2018), by finding both a decrease in prescription opioid-related deaths and an increase in heroin-related deaths. Pain Management Clinic Laws and Doctor Shopping Laws are other policies that target the opioid market, and have been estimated to reduce prescription opioid deaths (Popovici et al., 2018).

Some studies consider whether people are aware of ~~Naloxone Access Laws~~ NALs, to ensure they do proxy increased access. Doleac and Mukherjee (2018) use Google trends data to support their first-stage assumption that after ~~legislature~~ NALs are passed, people are more aware and searching for naloxone. Conversely, in Washington State, very few policemen knew much about ~~Naloxone Access Laws~~ NALs shortly after their passing, suggesting poor implementation (Banta-Green et al., 2013). Of police survey respondents, 64 percent had attended an overdose incident in the past year, but only 1 percent had arrested the abuser or bystanders (preceding the Good Samaritan Law). More officers were opposed to the ~~Naloxone Access Law~~ NAL than in support of it. Understanding law enforcement's attitudes and habits is important because fear of police

involvement is a main reason why bystanders fail to call for emergency services during an overdose (Drug Policy Alliance, n.d.).