



Do medical marijuana laws reduce addictions and deaths related to pain killers?☆



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ABSTRACT

Recent work finds that medical marijuana laws reduce the daily doses filled for opioid analgesics among Medicare Part-D and Medicaid enrollees, as well as population-wide opioid overdose deaths. We replicate the result for opioid overdose deaths and explore the potential mechanism. The key feature of a medical marijuana law that facilitates a reduction in overdose death rates is a relatively liberal allowance for dispensaries. As states have become more stringent in their regulation of dispensaries, the protective value generally has fallen. These findings suggest that broader access to medical marijuana facilitates substitution of marijuana for powerful and addictive opioids.

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1. Introduction

Drug overdose deaths have increased dramatically over the past 15 years, increasing by 137% between 2000 and 2014 (Rudd et al., 2016), and are now the leading cause of death from injuries in the United States, exceeding deaths from suicide, gunshots and motor vehicle accidents (Murphy et al., 2013). Overdose deaths are also a prime contributor to the recent rise in mortality among middle-aged non-Hispanic white Americans (Case and Deaton 2015; Case and Deaton 2017). In 2015, 22,598 deaths were caused by an overdose of a prescription opioid, representing over 40% of all drug overdose deaths, and exceeding overdose deaths from heroin and cocaine combined.¹ Over the same period, the distribution of opioid analgesics (commonly referred to as “pain medications”) quadrupled, demonstrating a parallel rise between the medical distribution of opioid analgesics and its misuse nationally (CDC,

2011). More recently, the misuse of heroin and synthetic opioids has increased, with overdose deaths involving heroin more than quadrupling between 2010 and 2015 (Hedegaard et al., 2017). The problem has reached such severe proportions that the Department of Health and Human Services and Centers for Disease Control have deemed it an epidemic.

Providing some modest hope in an otherwise bleak landscape, recent work finds that state medical marijuana laws, which allow marijuana use for medicinal purposes, reduce prescription pain medication fills in Medicare Part-D (Bradford and Bradford, 2016), prescriptions for nausea, pain, depression and seizures among Medicaid enrollees (Bradford and Bradford, 2017), hospitalizations related to opioid analgesics (Shi, 2017), the prevalence of narcotics detected among fatally injured drivers (Kim et al., 2016) as well as national age-adjusted opioid overdose death rates (Bachhuber et al., 2014). The implication from these studies is that medical marijuana laws enable individuals to substitute marijuana for opiates, particularly opioid analgesics.² Consistent with this idea, medical

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¹ <https://www.drugabuse.gov/sites/default/files/overdose.data.1999-2015.xls> (last accessed July 31, 2017).

² For the purposes of the work we present in this paper, we are adopting the medical definitions of “opiate” and “opioid”, using “opiate” to refer to the broad class of narcotics that include both natural opiates derived from the opium plant, such as heroin, as well as semi-synthetic and synthetic opioids frequently produced by prescription drug companies (e.g., hydrocodone, oxycodone, and even fentanyl). The term “opioid” is used to refer to synthetic narcotics that have opiate-like properties typically patented as a prescription drug, but are not derived from opium. However, there are some naturally derived prescription drugs as well, including morphine and codeine so, consistent with the CDC, we will use the term “opioid analgesics”

marijuana recommendations are often sought for severe or chronic pain (Bowles, 2012; Nunberg et al., 2011) and several reviews find the drug is effective medicine for the treatment of chronic pain (Borgelt et al., 2013; Lynch and Cambell, 2011; Leung, 2011; Martin-Sanchez et al., 2009).³ More generally, there is interest in pain management substitutes for opioid analgesics given their associated risks, and significant policy interest in the ramifications of improving access to such substitutes. Missing from most of the prior literature, however, is a clear articulation of the mechanism through which patients substitute towards marijuana.⁴ In particular, given the considerable heterogeneity in medical marijuana laws (Klieger et al., Forthcoming; Williams et al., 2016; Pacula et al., 2015), it is important to discern the specific features of medical marijuana laws that have contributed to this relationship. Without understanding the mechanisms, efforts to replicate any benefits (or, likewise, avoid any harms) may prove unsuccessful.

In this paper, we present a detailed analysis of the impact of medical marijuana laws on opiate related harm with a specific focus on not just whether a state has a law in effect but also whether that law provides an allowance for retail marijuana sales to qualified patients through dispensaries. Dispensary allowances are associated with greater access to and use of marijuana (Pacula et al., 2015; Pacula et al., 2010; Choi, 2014; Chu, 2014; Freisthler and Gruenewald, 2014) as well as the availability of more potent marijuana (Sevigny et al., 2014). If marijuana is an effective alternative to prescription opioids, then states that provide greater legal access to it should have been more likely to stem the rise of harm caused by opiates overall.

To assess these issues, we focus on two broad measures of opioid related harm: treatment admissions for addiction to pain relievers (1999–2012) and state-level overdose deaths from opioid medications (1999–2013). Because of the recent rise in heroin use, particularly in response to a 2010 reformulation of OxyContin (Alpert et al., forthcoming), we also consider treatment admissions and overdose deaths for a combined category of heroin and prescription opioids (which together will be referred to as “opiates”). We further examine how state policies influence the distribution of (2000–2013) and self-reported misuse of prescription opioid medication (2002–2012), so as to better understand whether medical use of marijuana impacted the legal distribution of opioid analgesics as a possible mechanism for our findings.

To begin, we replicate the estimates of Bachhuber et al. (2014), demonstrating a significant decline in opioid overdose death rates in states that adopted medical marijuana laws between 1999 and 2010. We show that these estimates are driven disproportionately by states that allowed for and had a legal channel for retail marijuana sales to qualified patients. We find a similar pattern of results for treatment admissions. We then show that extending the study period through 2012/2013 – a period when states began opening more tightly regulated medical marijuana retail systems – weakens the overall medical marijuana law results and, to a lesser extent,

when referring to these prescription drugs. When referring to findings from other research, however, we maintain the language used in that original work (or used by the CDC/NIDA to describe the overall “opioid epidemic”).

³ As medical marijuana is a Schedule I drug on the federal Controlled Substance Act, it cannot be prescribed by a licensed physician (as that would put the physician at risk of losing his license). Thus, state laws instead require “recommendations” by physicians, which can either be a verbal or written statement by a physician stating that it is their professional opinion that marijuana may be of medical benefit to the patient.

⁴ Kim et al. (2016) analyzes only laws that allow for medical marijuana access through one’s own or collective cultivation or through dispensaries but does not distinguish across these types of access channels. Shi (2017) tests for differential effects of dispensary operations (though not necessarily legal) on hospitalizations. Both papers use only a subset of states – 27 in Shi (2017) and 18 in Kim et al. (2016) – limiting the generalizability of the findings.

even the dispensary law provisions. We discuss in the paper why we think this occurs and what these findings tell us about possible mechanisms.

We find little evidence that states with medical marijuana laws experience reductions in the volume of legally distributed opioids, as captured by the Drug Enforcement Agency’s Automation of Reports and Consolidated Orders System (ARCOS). This finding is irrespective of whether the state allows legal access to medical marijuana dispensaries. If anything, states that adopt medical marijuana laws during our sample experience a relative increase in the legal distribution of prescription opioids. This result suggests that our findings are not driven by a decrease in the legal supply of opioids.

Finally, we analyze self-reported nonmedical use of pain relievers as reported in the National Survey on Drug Use and Health (NSDUH). We find only weak evidence that access to medical marijuana dispensaries reduce nonmedical use of pain relievers. Given the limits of this question – which asks only about nonmedical use of pain relievers, rather than, for example either any or regular use of prescription opioids – and the small size of the NSDUH, we caution against over-interpreting this result.

These results combined – reductions in opioid overdose death rates and treatment admissions with no decrease in the legal distribution of prescription opioids or in their “nonmedical use” – suggest that medical marijuana dispensaries reduced some of the harms associated with the misuse of opioids. The effect of medical marijuana policies on opioid related harm diminishes over time, particularly after 2010, which might be due to the regulatory tightening of medical marijuana dispensaries, the major marijuana policy feature behind the reduced harm in the earlier period. It is not driven solely by a shift in use to heroin, as our results with respect to active and legal dispensaries remain when we include heroin in our mortality measure and treatment admissions.

The rest of this paper is organized as follows. In Section 2, we describe the data sources and study measures. Section 3 includes a discussion of our empirical strategy. The results are presented in Section 4. Section 5 concludes.

2. Data and measures

Following the literature studying opioid-related harms, we use four different measures of opioid use and misuse to study the relationship between medical marijuana laws and potential harm from opioids: opioid-related mortality, opioid-related treatment admissions, the legal distribution of opioids to states from the producers of these medications, and self-reported nonmedical pain reliever use. For each outcome, we have data for all states and Washington D.C.

We construct opioid-related deaths using the National Vital Statistics System (NVSS), a census of deaths in the United States. Opioid-related deaths are the key driver of prescription drug overdoses for over a decade (Jones et al., 2013). We code deaths as related to prescription opioids using the ICD-10 external cause of injury codes (X40–X44, X60–64, X85, or Y10–Y14) and drug identification codes (T40.2–T40.4). We follow the codes used by the CDC to categorize deaths of any intent (unintentional, suicide, homicide or undetermined).⁵ Given the rise in heroin-related mortality during our time period, we will also study deaths involving any opiate, including heroin (identification code T40.1). We limit our mortality analysis to 1999–2013 because prior to 1999, the NVSS used ICD-9 codes to identify cause of death and opioid-related deaths are difficult to link across ICD coding systems. We used the restricted

⁵ See <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6226a3.htm>.

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