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Behavioral Responses to Supply-Side Drug Policy during the Opioid Epidemic

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In the last 20 years, the use of prescription opioids has grown dramatically in the United States. Since 1999, the number of opioid prescriptions increased by 300 percent, surpassing 255 million prescriptions in 2012 (81.3 prescriptions per 100 people) before declining to 153 million prescriptions by 2019 (46.7 per 100 people). Opioids may be an effective analgesic for acute pain, but they are also associated with high risks of addiction and overdose. Death rates from opioid poisoning tripled between 2000 and 2014, contributing to a stunning reversal in 1999 of the long-running decline in midlife mortality. The increase in overdose deaths was initially driven by prescription opioid poisonings, but the more recent surge in deaths has been attributed to illicit opioids such as heroin and fentanyl.

In efforts to abate the opioid epidemic, federal, state, and local governments have implemented an array of policies aimed at curbing harms related to prescription opioid misuse. These policies typically follow one of three lines of attack: prevention of opioid misuse, treatment of opioid use disorder, and reducing drug availability. While prevention and treatment are demand-side interventions, reducing drug availability targets the opioid supply. Throughout the epidemic, policymakers have relied heavily on supply-side interventions. Half of all federal drug control funding ($17 billion) for fiscal year 2020 was assigned to supply reduction, 44 percent was allocated to treatment ($15 billion), and only 6 percent to prevention ($2 billion). Although supply-side interventions dominate drug policy, evidence of their effectiveness is mixed.

At the state level, prescription drug monitoring programs (PDMPs) are the primary tool used to control the supply of prescription opioids. These programs record patients'

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prescription histories, with the purpose of facilitating detection of suspicious fill patterns, "doctor shopping," or other behaviors indicative of prescription drug misuse. By raising awareness among physicians of the risks of opioid prescribing, and facilitating detection of inappropriate prescribing, PDMPs are intended to discourage excess or high-risk opioid prescribing, thereby limiting exposure of consumers to opioids and preventing addiction. But, in creating access barriers, PDMPs may inadvertently increase the likelihood that individuals who are already addicted to prescription opioids switch to illicit opioids—primarily heroin and fentanyl traded on the black market. This is known as the "balloon effect": when the government closes a source of drug supply, individuals dependent on these substances resort to other sources instead of reducing their drug use. Indeed, deaths from heroin and synthetic opioids have surged to record numbers nationwide, increasing sevenfold since 2012 and now surpassing deaths from firearms and car crashes combined.

We conduct a comprehensive investigation of the direct and indirect effects of PDMPs. Our research design leverages the staggered implementation of electronic PDMPs across states between 1993–2018. We have assembled a comprehensive set of large administrative and survey data not used in previous studies to examine the effects of prescription drug regulation across a broad range of outcomes and actors, revealing the chain of events that unfolds after an opioid supply disruption limits access to prescription drugs.

We first test whether PDMPs are effective at limiting the proliferation of prescription opioids. Using the nation's largest database of commercial insurance claims, Blue Cross Blue Shield (BCBS) Axis, we find that electronic PDMPs reduce the overall number of opioid prescriptions by 14 percent and the number of people receiving opioid analgesics by 13 percent. We corroborate this finding in data from the Drug Enforcement Administration, which track shipments of oxycodone and hydrocodone (the two most prescribed opioid analgesics) from manufacturers to dispensers. These data confirm that PDMPs reduce the volume of dispensing by both pharmacies and practitioners.

We then focus on the behavioral responses of prescribers across a diverse set of patients. Our analysis reveals that providers respond entirely by reducing the number of prescriptions they issue but not their daily dosage or duration. While physicians limit opioid prescriptions across a diverse set of patients, first-time prescriptions to opioid-naive patients are reduced the most. However, most of the reduction arises from limiting prescriptions to long-term opioid users—a smaller set of users that nevertheless accounts for most prescription volume. This prescriber response cuts off patients with a history of chronic opioid use—and therefore a higher risk of opioid dependence—from a steady supply of legal prescription drugs.

Patients respond by seeking other sources of opioids. Using BCBS Axis and the National Survey on Drug Use and Health, we document an increase in the number of prescriptions obtained from out-of-state prescribers. At the same time, patients are also more likely to rely on diverted prescription drugs or other illicit drugs, primarily heroin: the number of individuals who report using heroin increased by 9 percent. We then compute bounds for the rate of substitution between prescription opioids and heroin. Our estimates suggest that for every six prescription drug users who lose legal access to opioids after PDMP introduction, one person initiates heroin consumption.

We then investigate whether these PDMP-induced reductions in prescribing translate into health improvements. Our results suggest that aggregate mortality estimates hide meaningful and opposing health effects arising from changes in the consumption patterns of people who are dependent on opioids. Although mortality due to semi-synthetic prescription opioids decreases, aggregate mortality remains unaffected by PDMPs. This is because mortality due to heroin and fully synthetic opioids (e.g., fentanyl) increases sharply, by about 14 percent, reflecting the substitution toward illicit drugs. The increase in heroin and fentanyl mortality fully offsets the decrease in mortality due to prescription opioids. Our results suggest that although prescription drug mortality is reduced permanently, heroin mortality spikes sharply following the introduction of a PDMP and remains at an elevated level.

Having established the existence and magnitude of substitution effects for mortality, we focus on hospitalizations as a nonterminal health outcome and assess the costs imposed on the health care system. Using the National Inpatient Sample, we find that hospitalizations due to prescription opioid poisoning decrease, while those caused by heroin poisoning increase. As in the case of mortality, overall opioid hospitalizations remain stable. Although average

effects are similar to those for mortality, the time pattern of hospitalization effects differs. In the years following PDMP introduction, hospitalizations for prescription opioid poisonings steadily decreased, while heroin poisonings steadily increased. This suggests that, as heroin consumption spreads, harm-reduction practices become more established and the risk of fatal overdose decreases, while hospitalization becomes more likely.

These changes in the composition of hospital cases are costly: the total hospital costs associated with opioid poisonings increase by 3 percent. Most of the additional costs are borne by commercial insurers and not by Medicaid or Medicare. Excess hospitalizations occur mostly among middle-aged individuals, white individuals, and commercially insured individuals. While both men and women are affected, incidence among men is higher compared with women.

NOTE

This research brief is based on Simone Balestra et al., "Behavioral Responses to Supply-Side Drug Policy during the Opioid Epidemic," NBER Working Paper no. 29596, December 2021.