PRESCRIPTION AND ILLICIT OPIOID DEATHS AND THE PRESCRIPTION DRUG MONITORING PROGRAM IN FLORIDA

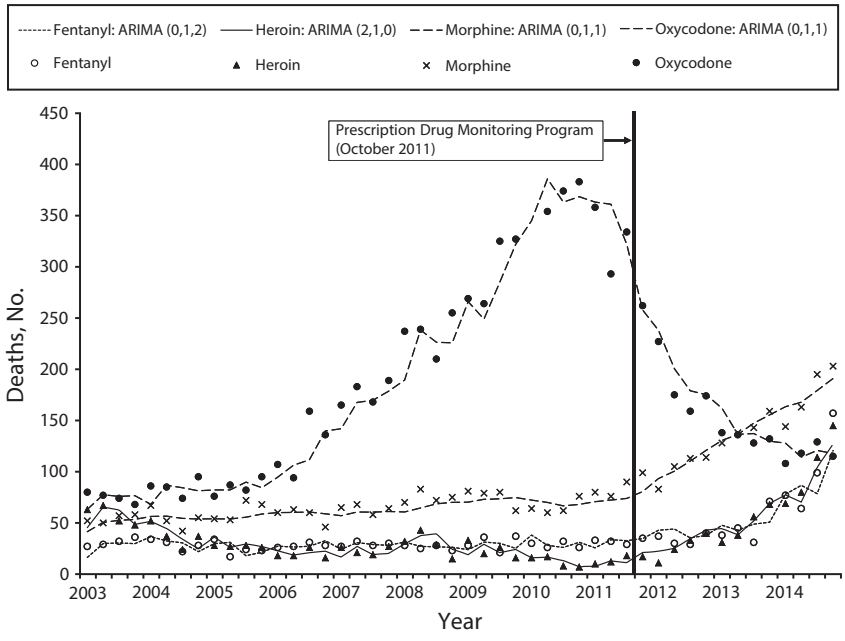
Kennedy-Hendricks et al. concluded that Florida state laws targeting "pill mills" were associated with a significant decline in prescription opioid overdose deaths and may have reduced heroin overdose deaths in the long-term.[1] These findings add to a growing body of evidence indicating that the opioid epidemic has changed significantly in Florida.[1–5] Undoubtedly, changes in policy and practice have shifted the opioid epidemic curve; however, scientific debate continues regarding *which* policy or enforcement contributed most to these changes. Additionally, the extent of unintended consequences—an increase in the demand for licit and illicit prescription opioid alternatives—remains unresolved.[6]

Our published research on this topic, using a quasi-experimental, time-series design, demonstrated that the prescription drug monitoring program (PDMP) in Florida reduced oxycodone-caused deaths by 25% immediately following implementation.[2] We concluded this after controlling for many of the same policies indicated by Kennedy-Hendricks et al.—US Drug Enforcement Administration operations, pill mill laws, and the reformulation of Oxycontin. Thus, the authors' assertion that "research has not shown [PDMPs] to be associated with lower mortality from opioid overdose" is incorrect.[1(p6)]

Our research provides evidence that heroin-caused deaths may have increased simultaneously.[2] For additional insight, we plotted quarterly counts of heroin, morphine, and fentanyl-caused deaths (and overlaid our previously studied oxycodone series). We also tested the change in monthly trend after Florida's PDMP implementation (Figure 1). Note that the observation period shown extends 1.5 to two years beyond the Kennedy-Hendricks et al.[1] and Delcher et al.[2] articles, respectively. We used unadjusted, best-fitting ARIMA models for this purpose, and deaths were plotted quarterly to improve readability. PDMP implementation was associated with a statistically significant increase in the trends for heroin, morphine and fentanyl-caused deaths ($P < .005$).

Three points are worth considering: (1) the magnitude of the heroin epidemic may be underestimated because, due to the rapid metabolism of heroin to morphine, many morphine deaths might be misclassified[7]; (2) in Florida, heroin and morphine deaths now exceed oxycodone-caused deaths; and (3) the increase in fentanyl-caused deaths (principally illicit) suggests that we should not focus solely on users' shift to heroin.

Visually, one could argue that rates began increasing in late 2010, an observation that



Note. The best-fitting Autoregressive Integrated Moving Average (ARIMA) parameters (p,d,q) for each drug series are shown and post-PDMP trends are significant ($P < .005$).

Source. Florida Department of Law Enforcement, Medical Examiners Commission.

FIGURE 1—Modeled (Line) and Observed (Dot) Quarterly Counts of Heroin-, Morphine-, Fentanyl- and Oxycodone-Caused Deaths Before and After Implementation of Florida's Prescription Drug Monitoring Program

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Kennedy-Hendricks et al. (2015) change-point analysis supports. Our approach tests a specific intervention at a specific point in time (October 2011) using four specific drug series, providing compelling evidence that PDMPs are affecting mortality. The scientific debate aside, Florida and the nation are clearly faced with a new and challenging course for the opioid epidemic. AJPH

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C. Delcher conceptualized the letter and led the writing. Y. Wang completed the analyses. A. C. Wagenaar, B. A. Goldberger, R. L. Cook and M. M. Maldonado-Molina critically reviewed and revised the letter.

REFERENCES

1. Kennedy-Hendricks A, Richey M, McGinty EE, Stuart EA, Barry CL, Webster DW. Opioid overdose deaths and Florida's crackdown on pill mills. *Am J Public Health*. 2016;106(2):291–297.

2. Delcher C, Wagenaar AC, Goldberger BA, Cook RL, Maldonado-Molina MM. Abrupt decline in oxycodone-caused mortality after implementation of Florida's prescription drug monitoring program. *Drug Alcohol Depend*. 2015;150:63–68.

3. Rutkow L, Chang H-Y, Daubresse M, Webster DW, Stuart EA, Alexander GC. Effect of Florida's prescription drug monitoring program and pill mill laws on opioid prescribing and use. *JAMA Intern Med*. 2015;175(10):1642–1649.

4. Johnson H, Paulozzi L, Porucznik C, Mack K, Herter B; Hal Johnson Consulting and Division of Disease Control and Health Promotion, Florida Department of Health. Decline in drug overdose deaths after state policy changes—Florida, 2010–2012. *MMWR Morb Mortal Wkly Rep*. 2014;63(26):569–574.

5. Surratt HL, O'Grady C, Kurtz SP, et al. Reductions in prescription opioid diversion following recent legislative interventions in Florida. *Pharmacoepidemiol Drug Saf*. 2014;23(3):314–320.

6. Compton WM, Jones CM, Baldwin GT. Relationship between nonmedical prescription-opioid use and heroin use. *N Engl J Med*. 2016;374(2):154–163.

7. Hedegaard H, Chen L-H, Warner M. Drug-poisoning deaths involving heroin: United States, 2000-2013. *NCHS Data Brief*. 2015;190:1–8.

KENNEDY-HENDRICKS ET AL. RESPOND

Measuring the unique impacts of particular components of Florida's multifaceted response to the prescription opioid overdose epidemic is complicated by the implementation of these interventions in close temporal proximity. In a previous study,[1] Delcher et al. found significant declines in oxycodone-caused overdose mortality associated with Florida's implementation of a prescription drug monitoring program (PDMP). In our study, we used a flexible modeling approach to discern significant changes in trends in Florida's prescription opioid overdose mortality rates and to distinguish these aberrations from changes in trends in a comparison state. Our models did not identify any change in these trends corresponding with the time that Florida implemented its PDMP. Rather, we found that the only point at which Florida's trends shifted—and dramatically so—was in early 2010 when pain clinics had to register with the state and law enforcement arrested a number of individuals running the state's largest pill mills. This was the beginning of a long, steep decline in opioid overdose mortality that continued through a period in which the state enacted two laws curtailing and then eliminating pain clinic and physician dispensing of opioids, conducted additional law enforcement operations targeting pill mills, and implemented the PDMP.

Although the study by Delcher et al. suggests that the Florida PDMP reduced oxycodone-caused overdose mortality rates,[1] there is limited national evidence that PDMPs, as implemented to-date, are associated with reductions in prescription opioid overdoses.[3] State PDMP laws vary substantially, which complicates national studies' ability to assess their effectiveness as a standardized policy intervention.[4] The protective effect of Florida's PDMP estimated in the study by Delcher et al. also may be partly attributable to interventions directed at pill mills in the months prior to and soon after the PDMP was implemented.

Delcher et al. also raise concerns about potential unintended consequences of these policies. However, analyses with no comparison group that attribute increases in heroin overdose mortality to prescription opioid policies should be interpreted with caution. Heroin overdose deaths are rising nationally.[5] A recent review of the relationship between nonmedical prescription opioid use and heroin use found little evidence to-date that implementation of prescription opioid policies has led directly to increases in heroin use although the authors note that the literature on this relationship remains sparse.[6] It is clear that more research is imperative to determining the effectiveness of various policy interventions and to understanding the interconnections between these policies and heroin use. AJPH

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