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American Journal of
**PUBLIC
HEALTH**

A PUBLICATION OF
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AJPH

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AMERICAN PUBLIC HEALTH ASSOCIATION

COVER: December 14, 2021: Mike Stuart, the former district attorney in Charleston, the capital of West Virginia, always carries a pack of portrait photos of people who have died from drug overdoses. The COVID-19 pandemic has exacerbated the opioid crisis in the United States, with the number of drug deaths literally exploding.

Cover concept and selection by Aleisha Kropf. Photo by: Can Merrey/picture-alliance/dpa/AP Images. Printed with permission.

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Behavioral and Social Sciences Research: Addressing the US Opioid and Pain Crises



The US Department of Health and Human Services (HHS) declared the opioid crisis a public health emergency in 2017 (<https://bit.ly/3AGMf0a>) and developed the 5-Point Strategy to End the Opioid Crisis (<https://bit.ly/3o6sCck>). In response to and as part of those plans, the National Institutes of Health (NIH), a component of HHS, aimed to advance scientific breakthroughs for discovery of new and more effective approaches to prevent opioid misuse, treat opioid use disorders, and manage pain.

RESEARCH

As part of this effort, the NIH Office of Behavioral and Social Sciences Research (OBSSR), in collaboration with the National Institute on Drug Abuse (NIDA), the National Institute of Neurologic Disorders and Stroke (NINDS), the National Center for Complementary and Integrative Health (NCCIH) and the National Institute on Minority Health and Health Disparities (NIMHD) co-hosted a 2018 HEAL meeting, *Contributions of Social and Behavioral Research in Addressing the Opioid Crisis (CSBR-AOC)*, to identify key scientific information and research priorities that would inform strategies and interventions for the prevention and treatment of opioid use disorder and for pain management.

The panelists included people with lived experience related to the opioid and pain crises; an administrative law judge; a representative from a major city health department; people with expertise in rural communities, diverse populations, and mental health; practitioners in medical settings including the emergency department, primary care, and dentistry; and basic and clinical research scientists and economists. The combination of perspectives from the panelists identified the real-world implications of the scientific data and helped identify and prioritize the proposed research agenda related to social and behavioral factors of these crises. These panelists would not typically participate in the same activities, and this opportunity for exchange of perspectives led to the final recommendations of the meeting. Their input also helped contribute to the research priorities within the NIH Helping to End Addiction Long-term (HEAL) Initiative. The panel's final report identifies key issues, actionable

social and behavioral science priorities, and recommendations that have the potential to improve the response to the opioid crisis and alleviate the burden of pain (<https://bit.ly/3Gbj3Qb>).

STRATEGIC PLANNING

In follow-up to the March 2018 meeting, a strategic planning committee was created that included senior-level staff from 23 NIH institutes and centers. The participants were charged with identifying resources, additional goals, potential areas for further development, and other strategies to integrate the key recommendations from the March meeting into contributions to the broader NIH mission to combat the opioid and pain crises. These included NIH funding opportunities related to behavioral and social sciences and the opioid crisis; a workshop to inform measurement of pain that includes behavioral, social, and biological factors; and the integration of behavioral and social factors (such as stigma) into the NIH HEAL efforts (<https://bit.ly/3GnmPpL>).

AJPH SUPPLEMENT

A major priority of this committee was to continue to provide opportunities for integrating expertise and perspectives from a broad range of communities into NIH efforts related to the opioid and pain crises in the United States. Through multiple commentaries, this supplement issue of *AJPH* is designed to bring as many of those perspectives as possible to the interpretation and understanding of these research articles that focus on social and behavioral components to these two related crises. *AJPH*

Wendy B. Smith
Associate Director
Office of Behavioral and Social
Sciences Research
National Institutes of Health

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Opioid Analgesic Involvement in Drug Abuse Deaths in American Metropolitan Areas

Multiple urban areas have experienced a dramatic increase in both drug abuse deaths and the involvement of opioid analgesics in those deaths between 1997 and 2002. Methadone and oxycodone account for the majority of the increase in opioid-involved deaths. By 2002, opioid analgesics were involved in more deaths than either of the illicit drugs responsible for most urban drug abuse in the 1990s: heroin and cocaine. . . . The large contribution to mortality from oxycodone and methadone may be because of the long duration of action of methadone and OxyContin. Drug users may accidentally overdose by overlapping doses when the desired euphoric or analgesic effect is slow in coming. Abusers have learned to ingest and inject pulverized OxyContin pills, defeating the controlled-release mechanism and releasing dangerous amounts of the drug within a short time.

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Social and Behavioral Sciences: Response to the Opioid and Pain Crises in the United States

Robert D. Kerns, PhD

ABOUT THE AUTHOR

Robert D. Kerns is with the Departments of Psychiatry, Neurology, and Psychology, Yale School of Medicine, New Haven, CT. He is also a guest editor for this supplement issue.

Chronic pain is a prevalent, debilitating, and costly public health problem.¹ Recent estimates suggest that approximately 20% of all adult Americans report chronic pain (i.e., pain on most days) and approximately 8% report high impact chronic pain (i.e., pain that interferes with work and daily functioning on most days).² Unfortunately, despite evidence of the benefits of integrated, multimodal care that emphasizes nonopioid and nonpharmacological approaches for the management of chronic pain, it is more common for chronic pain to be managed by a single provider following a biomedical model of care and with limited education and training in pain management, resulting in opioid-centric treatment. This gap between evidence and practice has contributed to increases in opioid misuse, abuse, and addiction, as well as a precipitous increase in opioid-related overdose and deaths and all-cause mortality.³ The presence of chronic pain and associated pain-related interference with physical and emotional functioning and well-being is known to moderate and mediate transitions from use of prescription opioids to misuse and abuse, and transitions to illicit opioid use.⁴ In this context, the rapid increase in availability

and illicit use of particularly risky synthetic opioids such as heroin and fentanyl has resulted in a sustained public health crisis of opioid use and harms.³

A long-standing and growing body of evidence highlights the importance of multifactorial social and behavioral contributors to these public health problems. Widely acknowledged are social determinants of both chronic pain and opioid use disorder (OUD), as well as reliable relationships between social and behavioral or psychological factors and access to evidence-based care and accrued benefit of interventions for these conditions. Experts in the field have called for increased attention to psychosocial factors in national health policy, research, and practice initiatives to combat these public health crises.^{1,3}

In 2018, the National Institutes of Health (NIH) sponsored a workshop on these topics to identify and discuss social and behavioral considerations that could help frame research priorities to address the opioid and pain crises. This meeting included a diverse panel of researchers, academics, clinicians, people with pain and OUDs, and advocacy groups who presented and discussed behavioral and social scientific data and experiences.⁵ One of the

significant contributions of this panel was the impact of the diverse perspectives on its recommendations. The follow-up NIH activities are designed to continue the inclusion of perspectives of academic researchers as well as from multiple contributors with varied expertise and experiences.

Consistent with the objectives of this initiative, NIH partnered with the editors of *AJPH* to publish this special issue of the journal. This issue includes five core articles that focus on the social and behavioral science response to the United States pain and opioid crises, bringing the perspective of multiple disciplines and experiences. Editorials and perspective pieces complement these principal papers. Together, the objective is to encourage a deep consideration of key challenges and potential solutions for addressing these inter-related crises.

The first core article in this issue is authored by Meisel et al. (p. S45). Many have concluded that the management of pain in the emergency or urgent care settings in which there has historically been a reliance on opioid dispensing is the nexus for addressing the opioid crisis. A recent meta-analysis of the relevant literature highlights the need for patient-centered outcomes and novel approaches to reduce opioid prescribing in these settings.⁶ Meisel et al. report on a randomized controlled trial of three strategies for communicating risk of opioid therapy in the emergency department: a personalized probabilistic risk visual aid, a visual aid and video narrative, and general risk information. Despite evidence of the benefits of probabilistic risk communication and general narratives, there were no significant differences across the three conditions in opioid use or risk recall. Two editorials by Keefe (p. S9) and Altshuler (p. S12) offer

reflections on this study and conclude with calls for continued development and evaluation of risk communication approaches.

Sud et al. (p. S56) argue that commonly employed approaches for reducing opioid-related harms, including health professional education, clinical decision support systems, and state prescription drug monitoring programs, have clearly been insufficient given continued escalation in rates of opioid overdose and death. They draw upon a knowledge network framework of “wicked problems” to inform development and testing of novel multicomponent interventions that are more consistent with the complexity of these clinical problems, a population health perspective, and that are pragmatic. Doctor and Sullivan (p. S15) offer their reflections on this article and conclude with a call for addressing the social and behavioral context of chronic pain by expanding mental health care, community support and social services as alternatives to reliance on opioid therapy. Nicholson (p. S18) offers the perspective of an attorney and a patient advocate in her editorial. She calls for caution in interpreting and acting upon limited empirical evidence and encourages engagement of patients with a specific focus on their values in shared decision-making.

Pro et al. (p. S66) used national data from 2018 to identify client- and state-level variables that predicted reductions in drug use from program entry to discharge. Lower community-level distress was the strongest predictor of positive treatment response across all racial/ethnic groups. The authors encourage changes to state policies and redirection of resources to high-distress communities. An editorial by Hulseley (p. S21), a patient advocate and

founder of the Addiction Policy Forum, draws attention to long-standing and continuing racial disparities in access to and outcomes from addiction treatment programs. She reinforces the recommendations from Pro et al. highlighting the need for a comprehensive approach and an additional investment in resources to improve early access to evidence-based care, including medications for OUD, for Black individuals and members of distressed communities. In a complementary editorial, Friedman and Hansen (p. S30) note that although lower-income White communities were particularly vulnerable to harms associated with prescription opioids, by 2020, Black persons were much more likely to die of an opioid overdose than White persons. The authors characterize the opioid crisis as a “racial justice” issue and encourage explicit efforts to link opioid harm prevention strategies with the broader social justice movement and related initiatives in the United States. In a third editorial reflecting on the Pro et al. article, Cooper et al. (p. S24) focus on long-standing racial/ethnic and other disparities in health care that have been accentuated during the COVID-19 pandemic.

Dong et al. (p. S77) conducted secondary analyses of data from 9000 construction workers who completed the Medical Expenditures Panel Survey and report that approximately 10% endorse the use of prescription opioids annually, with higher rates of opioid therapy among those with work- and nonwork-related injuries and painful musculoskeletal conditions. The authors call for implementation of multipronged preventative interventions targeting the construction workplace. Colleagues from the Department of Veterans Affairs (VA), Atkins and Bohnert (p. S33), highlight the link among inadequate injury prevention

efforts in the workplace, limited access to high-quality pain management, and overreliance on long-term opioid therapy for the management of musculoskeletal pain, in particular. They draw attention to the VA’s comprehensive stepped care approach to pain management and related opioid safety initiatives as potential models for workplace and community interventions.

Finally, Merlin et al. (p. S36) raise concerns about the reliability and other limitations of cause of death (COD) data that are essential to derivation of estimates of rates of opioid overdose with implications for public health policy and related initiatives. Editorials provide important reflections on this article and draw attention to the multiple uses and implications of COD data. Ling, Deputy Director of the Centers for Medicare and Medicaid Services, et al., from the Centers for Disease Control and Prevention (p. S42), further address the complexity of COD coding and draw attention to resources to support physicians in improving the reliability of data capture. They emphasize opportunities to improve the quality of the measure, with a focus on behavioral health factors and social context. They suggest that such efforts may contribute to a comprehensive effort to promote quality of pain care and prevent opioid overdose and deaths. Latimore et al. (p. S39) suggest that limitations of surveillance approaches contribute to widely acknowledged racial disparities and structural racism in care for Black individuals. They call for increased resources to improve COD data, and to address bias and disparities in prevention of opioid-related harms.

Topics raised by these articles and commentaries include prevention, specifically in medical settings as well in

work environments; public policy implications from community factors and racial disparities; and some of the complexities related to data capture, in this case, COD data. These are a sample of some of the complex issues facing clinicians, researchers, public health professions, and people with lived experience of these crises, among others. This special issue is designed to catalyze efforts to focus on the biopsychosocial, behavioral, and social aspects of the interrelated challenges of the opioid and pain crises that the American public continues to face and that have only increased during the COVID-19 pandemic.⁷ **AJPH**

CORRESPONDENCE

Correspondence should be sent to Robert D. Kerns, PhD, Yale University, 300 George Street, Suite 501, New Haven, CT 06511 (e-mail: robert.kerns@yale.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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Managing Acute Pain With Opioids in the Emergency Department: A Teachable Moment?

Francis J. Keefe, PHD

ABOUT THE AUTHOR

Francis J. Keefe is with the Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Chapel Hill, NC.

 See also Meisel et al., p. S45.

Acute pain is one of the most common reasons patients come to the emergency department (ED). For patients and family members who come to the ED acute pain is a crisis. The expectation is that the pain will be evaluated and treated effectively, ideally with medications (such as opioids) that eliminate or substantially reduce pain. For health care providers in the ED, using opioids to manage common acute pain conditions (e.g., musculoskeletal pain) is challenging for several reasons. First, a patient presenting with an episode of acute musculoskeletal pain often has a long history of pain characterized by waxing and waning of pain symptoms. Although periodic flares in acute pain may trigger visits to the ED, one needs to keep the history and trajectory of pain symptoms when prescribing analgesics. Second, in some patients seen in the ED, particularly those given prescriptions for higher doses of opioids, a prescription for an opioid, meant to provide a short-term strategy for managing acute pain, may lead to long-term opioid use. Patients given prescriptions for higher doses of opioids at the time of their ED visit^{1,2} and those who have a history of

skeletal, back, or neck pain or were prescribed benzodiazepines³ are at greater risk for persistent opioid use. There is heightened recognition of the adverse effects and risks of long-term opioid use, and the risks of prescribing opioids for acute pain (e.g., opioids prescribed in the ED or after surgery). There is also growing interest in strategies for reducing these risks.

In this issue of *AJPH*, Meisel et al. (p. S45) explore a novel approach to managing acute pain episodes in two conditions that can cause chronic pain (musculoskeletal pain and kidney stones.) Their approach fits nicely with the notion that an ED visit for acute pain can serve as a potential “teachable moment” (i.e., a situation where one may be open to change and motivated to adopt health-related behaviors). Theory and research suggest that a teachable moment is most likely to occur when a health encounter affects one’s perception of risk, heightens emotional distress and anxiety, and affects their self-concept.⁴ All of these conditions are present in an ED visit for pain. As pointed out by Meisel et al., in the ED usual care for acute episodes of musculoskeletal or renal colic pain involves

providing generic written information about opioid risks but does not effectively engage patients in active discussions about the personal benefits and costs of short- and long-term opioid use. These usual care approaches clearly fail to capitalize on a potential teachable moment.

Meisel et al. tested two novel interventions for conveying information about opioids. The first, a visual Opioid Risk Tool, provided individualized, easy-to-read and understand information on the patient’s risk of opioid misuse and overall risk category. This tool is interesting, not only because it provides a more open and thorough communication about the potential benefits and harms of opioid analgesics, but also because it represents a more tailored approach to highlighting each patient’s individual opioid-related risks. The second intervention combined this visual tool with an opportunity to view brief (1–3 minutes) professionally made videotapes of real patients discussing their experiences using opioids for pain including problems related to opioid misuse. The rationale for these narratives is compelling. Stories of real-life experiences related to the management of pain with opioids can be highly salient and engaging. The stories may elicit an emotional response from patients because they may identify with and feel validated by the storytellers. Importantly, as Meisel et al. note, narratives may be particularly effective in influencing decision-making in patients with low education and health literacy, a group that is less likely to be responsive to generic written information typically provided to ED patients.

Both interventions tested by Meisel et al. fit nicely with a public health approach to the opioid crisis. Both are brief, standardized, and can be

integrated into a busy ED setting. Thus, both interventions have the potential to reach a large group of patients with pain seen in the ED who are at risk for opioid-related problems. These communication risk interventions also are notable in that they were developed and refined using extensive input from key stakeholders—both patients and providers.

Several questions arise when considering this study. First, are such brief approaches for communicating opioid risk effective? Meisel et al. found several short-term benefits. First, patients receiving both risk communication interventions appeared to be more aware of the risks of opioids in that 39% to 47% accurately recalled their risk category on the Opioid Risk Tool 14 days after their ED visit. Risk recall was better in both groups. Interestingly, patients in the group receiving both the visual tool and narrative were less likely to report a preference for opioids, greater satisfaction with treatment, and higher levels of shared decision-making. Longer-term benefits in terms of reducing self-reported opioid use (90 days after the ED visit), however, were not evident. Taken together, these findings indicate that novel brief communication interventions can affect patient perceptions of their opioid risks and of their treatment in the ED.

Second, who is most likely to benefit from such brief interventions? Interestingly, Meisel et al. found that among those patients at highest risk for opioid misuse, accuracy of recall (a key primary outcome) was higher among those receiving the visual tool plus narratives than the visual tool alone. Learning at the time of an ED visit that one is at higher risk may heighten the salience and impact of viewing patient narratives and enhance recall of risk

status. It should be noted, however, that patients at particularly high risk for opioid misuse were excluded from this study (e.g., those under the influence of illicit drugs or alcohol, deemed to be drug seeking, or taking opioids in the 30 days prior to their visit). Thus, the results may not generalize to the group of patients that are particularly challenging to ED health care providers (i.e., those at very high risk for problems with opioid treatments).

A disappointing aspect of this study is that the communication risk interventions had no effect on reports of opioid use 14 and 90 days after the ED visit. A major reason for the appeal of brief interventions is their potential to change key health behaviors (e.g., daily opioid use for pain). Changing the recall of risk perceptions and perceptions of care may represent a first step in the behavior change process—a step that both raises patient awareness and helps them contemplate the benefits of adopting a health behavior (i.e., appropriate use of opioids to manage an acute pain episode). However, in patients with pain conditions that are likely to be chronic, improved strategies for conveying information about opioid-related risks may not be sufficient to achieve the ultimate goal of reducing the harms of long-term opioid use. What strategies could be used to supplement such strategies? Patients with persistent pain who are at risk for problems with opioids also appear to benefit from mindfulness-based interventions.⁵ In addition, there is evidence that a more consensual patient-centered approach to voluntary opioid tapering that provides patients with control over the pace and timing of their opioid dose can reduce opioid intake without leading to increased pain.⁶ Finally, there is growing interest

in brief motivational interviewing techniques to enhance the motivation and commitment of patients with chronic pain to reduce their intake of opioids, although evidence for their effectiveness is inconclusive.^{7,8}

Is there a risk that communication tools such as those developed by Meisel et al. could be misused (e.g., to deny certain patients access to opioid treatments)? Research has shown that Black and Hispanic patients are less likely to receive opioids for management of their pain in the ED and less likely to be given a prescription for opioids during their ED visit.^{9,10} Meisel et al. make a point that their communication tools were developed and outcomes chosen with input from patients with diverse backgrounds and, thus, reflected their preferences. The population they studied also was diverse (38% Black, > 10% Hispanic). Nevertheless, their study failed to examine whether patients randomized to receive either one of their communication tools showed any racial or ethnic differences on measures such as opioids given in the ED or self-reported opioid use at follow-up. Future research is needed to examine the impact of such communication tools on racial and ethnic disparities in opioid treatments for pain.

In summary, it is increasingly clear that the ED is at the nexus of the opioid and pain crises. The study by Meisel et al. is important in reminding us that a visit for treatment of acute pain can provide an important opportunity for addressing these dual crises. One hopes that this study has a heuristic effect on the field stimulating even more research that capitalizes on the ED as a teachable moment for patients at risk for problems related to chronic pain and long-term opioid use. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Francis Joseph Keefe, PhD, Duke University School of Medicine, Psychiatry and Behavioral Sciences, 2420 Sedgefield Drive, Chapel Hill, NC 27514 (e-mail: keefe003@mc.duke.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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Narratives Are Useful Strategies for Overcoming Challenges in Risk Communication

Rachel D. Altshuler, PhD

ABOUT THE AUTHOR

Rachel D. Altshuler is with the Division of Cancer Prevention, National Cancer Institute, National Institutes of Health, Bethesda, MD.

Note. These opinions expressed by the author are their own and should not be interpreted as representing the viewpoint of the US Department of Health and Human Services, the National Institutes of Health, or the National Cancer Institute.

 See also Meisel et al., p. S45.

The opioid overdose epidemic is an ongoing public health crisis in the United States, initially fueled, in part, by prescription opioid use for pain management. The Centers for Disease Control and Prevention reported more than 14,000 deaths caused by overdoses involving prescription opioids in 2019, making up more than 28% of all opioid overdose deaths.¹ Prescription opioids are still commonly used, either alone or in combination with other pain management drugs, for the treatment of acute pain. The current standard for communicating risk is not always effective at impacting an individual's decision-making regarding prescribed opioid use, raising the need to evaluate additional communication strategies.

In "A Multicentered Randomized Controlled Trial Comparing the Effectiveness of Pain Treatment Communication Tools in Emergency Department Patients with Back Pain or Kidney Stone Pain," Meisel et al. (p. S45) sought to evaluate effective means of communicating benefits and risks of

opioid use for managing acute kidney stone or back pain in an emergency department. Participants were presented with either a personalized probabilistic risk tool (PRT), the PRT plus video narratives of real patients, or standard written instructions on analgesics. The study found that patients presented with the narrative and PRT had a lower preference for opioids than patients receiving written instructions. However, communication type did not affect patterns in opioid use up to 90 days after the emergency department visit. Patients rated as high risk in the group receiving narratives and PRTs were more likely to recall their individual risks. Furthermore, the narrative group reported higher initial satisfaction with their treatment and higher scores on the American Pain Society questionnaire asking about participation in decision-making regarding pain treatment. Together, these findings demonstrate that communication strategies involving narratives have the potential to be effective tools in a patient's

decision-making regarding pain management.

OVERCOMING CHALLENGES IN RISK COMMUNICATION

Several findings from this study stood out and are further discussed here. First, narratives are a useful strategy for overcoming challenges in risk communication. Second, patients presented with narratives reported increased scores in one measure of shared decision-making, which may have implications for their healing process and future experiences with decisions regarding health care. Finally, a greater understanding of risk using narratives may not change patients' patterns of opioid use and is worth further exploration.

Effective communication on the risks and benefits of treatments is vital for decision-making in clinical settings; yet, it remains a challenge. Narratives are known to be powerful communication tools³ and represent a useful strategy for risk communication. The narratives used in this study ranged from individual experiences with opioid use after surgery and individuals' decision-making processes regarding opioid use to the experiences of grieving parents after the death of a child because of an opioid overdose. Matching a real person to the benefits and risks associated with opioid use may help humanize the experience and add an element of emotion that is not obtained from a fact sheet. In addition, video narratives may appeal to different learning styles and reach people with low literacy, as noted in the study. Expanding the narratives to include a large variety of experiences, backgrounds,

and languages that match those of the participants has been shown to be particularly persuasive^{2,3} and may have a greater impact on recall and understanding of the risks associated with opioid use.

Effective communication through narratives may be particularly useful by improving the patient experience in a clinical setting through increased participation in medical decision-making. The use of PRTs demonstrated that risks change depending on background and circumstances and can be influenced by factors not necessarily known to the provider, such as trauma and family history. Clear communication between providers and patients regarding patients' health allows both parties to understand the factors that play into the patients' risks and decide the best treatment plan. Shared decision-making between patients and providers can also impact their adherence to prescribed treatments.⁴ The benefits of shared decision-making may extend beyond treatment adherence and result in increased trust in clinicians regarding future health decisions.⁵ It is important to note that although there was an increase in decision-making scores on the American Pain Society questionnaire, no statistically significant differences were found between groups in an additional measure of shared decision-making (collaboRATE).

Although the use of narratives resulted in a decrease in opioid preference, they had no effect on opioid use over time. If the goal of narrative use and PRTs is to decrease long-term opioid use, a single presentation of the narratives and PRTs may not be effective. Communication on the risks and decisions in pain management at time

points beyond the initial visit to the emergency department may have an impact on patients' using opioids for prolonged periods of time. A second question is whether the use of multiple pain management pharmacotherapies plays into outcomes such as patient satisfaction and long-term opioid use. The study noted that the patients were treated with nonsteroidal anti-inflammatory drugs (NSAIDs) alone, opioids alone, NSAIDs and opioids, or no pain medication. It would be interesting to determine if there were differences in risk recall, opioid use, and patient satisfaction between the opioid-alone and the opioid and NSAIDs group.

NARRATIVES AND CANCER

Expanding the use of narratives across pain conditions to facilitate shared decision-making may prove useful in cancer-related pain. The experiences of a patient with cancer with pain vary, depending on factors such as disease stage and treatment; thus, practices in prescribing opioids to these patients should also differ. Opioids may be beneficial for acute pain related to surgery or cancer progression; however, patients may be weaned off of opioids if the treatment is successful. In addition, opioids are not recommended for patients with chemotherapy-induced peripheral neuropathy.⁶ A greater understanding of the risks associated with opioid use through narratives that match the conditions seen in patients with cancer could help these patients understand when opioid use is appropriate and work with their providers to assess the best strategies to manage their pain. There is also a risk of

underprescribing opioids for patients experiencing pain during end-stage cancer. Research has shown that opioid prescriptions from 2007 to 2017 among patients with cancer within 1 month of hospice care or death decreased; yet, pain-related emergency visits increased, suggesting that the opioids are not being replaced with other effective forms of pain management.⁷ Incorporating narrative tools that facilitate feelings of shared decision-making into end-of-life care may allow patients to effectively advocate for better pain management strategies. Future research should examine whether the use of narratives across different cancer pain states impacts opioid-prescribing practices and provides better outcomes for pain management. *AJPH*

CORRESPONDENCE

Correspondence should be sent to Rachel D. Altshuler, PhD, 9609 Medical Center Dr, Rockville, MD 20850 (e-mail: rachel.altshuler@nih.gov). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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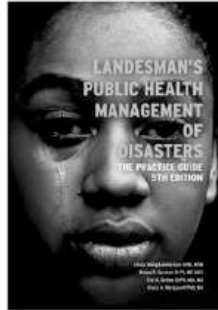
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Knowledge Translation and the Opioid Crisis

Jason N. Doctor, PhD, and Mark D. Sullivan, MD, PhD

ABOUT THE AUTHORS

Jason N. Doctor is with the Sol Price School of Public Policy, University of Southern California, Los Angeles. Mark D. Sullivan is with the School of Medicine, University of Washington, Seattle.

 See also Sud et al., p. S56.

Rapid solutions to the opioid crisis remain elusive. Prescriptions for opioids have decreased. Yet, supply limits have not reduced fatalities. Demand-side interventions have not fared any better. British Columbia, a place hit hard by the crisis, saw harm reduction at an all-time high in 2020. People there received 34 000 naloxone kits and filled 23 735 opioid agonist therapy prescriptions. Both are new records.¹ However, there was a rapid rise in opioid-related deaths in 2020 compared with 2019 (1725 vs 985). A fentanyl-laced drug supply overshadows population health efforts. Because of this, changes in practice metrics have not guaranteed improvement in outcomes.

To address these concerns, Sud et al. (p. S56) discuss three types of translations of knowledge to improve outcomes. The first is to favor complex clinical interventions over simple population-based ones. They criticize educational programs, electronic health record prompts, and prescription drug-monitoring programs for focusing on population metrics without tracking clinical outcomes to ensure better success across implementations. Sud et al. view these interventions through a clinical lens. Yet, there is much more to them than can be

measured from the standpoint of the identified patient. Although these interventions happen in a clinical setting, affect change in clinical care, and encourage best practices, patient outcomes will not capture the total social impact of opioid deprescribing. The primary benefit of fewer opioid prescriptions may be to families and communities. We know, for instance, that opioid prescriptions spread through households.² One family member receiving an opioid prescription makes it more likely that another will get one. Judicious prescribing discourages household spread, a benefit not measurable at the patient level.

Opioid use predicts loss of pleasure and motivation even after controlling for pain severity, depression, and dosage.³ Through a loss of motivation, a community's rate of opioid prescriptions may affect labor force participation: the rate of working-age people having or seeking employment. In early 2000, the labor force participation rate reached a maximum of 67.3%, and it has declined at a steady pace since then, reaching a 40-year low in September 2015 at 62.4%.⁴ Opioid prescriptions per capita increased by a factor of 3.5 nationwide between 1999 and 2015. A careful temporal analysis of county-level labor force participation

between 2014 and 2016⁴ linked to county-level opioid prescriptions nationally in 2015 found that county-level opioid prescriptions⁵ in 2015 accounted for 43% of the observed labor force decline.⁶

About half of prime-age men not in the labor force are on pain medication, and two thirds of these take prescription pain medications; these men report low levels of subjective well-being.⁶ It is likely that persons in prime age who are not in the workforce could benefit more from visiting a social worker for counseling than a physician offering pills. Other data indicate that county-level opioid marketing is associated with elevated overdose mortality one year later.⁷ Deprescribing interventions countervail community advertisements, impede the spread of prescribing through households, and may have positive effects on labor and the well-being of community members. Yet, these effects cannot be measured in a clinical setting.

Sud et al. would also like clinicians to factor population knowledge into smaller units that can translate into clinical effects. There are many clear examples. At clinic visits, it is safer for 10 people to receive 5 milligrams fewer than for one person to receive 50 milligrams fewer of an opioid. System roll-out of psychological treatment of pain may fail to curtail opioid use because opioid use is appetitive. Buprenorphine orders may not rise when regulators remove administrative and legal burdens. This is because poor care coordination, clinician stigma, and lack of peer support are also barriers.⁸ In each case, population metrics may not do justice to the complexities in different local environments. The authors' concerns seem right. And, although social

benefits may be larger than clinical ones, without a careful implementation strategy, population-based interventions may fail altogether. With behavioral interventions, “details matter.”⁹ Interventions require a clinician’s attention and appropriate interpretation of information. For an intervention to work in a new clinic or system, each feature of the intervention must map in some proper way to the new environment. In the context of widespread drug stigma, how clinicians make sense of intervention is important. There needs to be careful attention to knowledge translation. An opioid taper should not be interpreted as an act of enforcement but as a collaboration with the patient.

Finally, Sud et al. describe a tendency in medicine to rank medical facts above patient values when approaching opioid tapering. They review studies that have documented the harms of opioid tapering but neglect to mention that most studies show that most patients improve with opioid tapering. They accuse Juurlink of construing the subjective benefits of long-term opioid therapy as illusory and less relevant than objective harms. Juurlink argues that “the goal of pain medication is not simpl[e] pain relief. Like any therapy, the goal is to confer more benefit than harm.”¹⁰(pe1222) He does not devalue the patient perspective. He simply does not want to limit the patient’s perspective to pain intensity ratings (a perspective that doctors have largely forced on patients). Patients’ ability to function at work, at home, and in relationships is also relevant.

Sud et al. also call for “epistemic humility”: “Chronic pain, as an inherently subjective condition, frustrates the core epistemology of clinical biomedicine that relies on evidence to

objective pathology” (p. S61). We agree with this statement. Modern biomedicine seeks to explain subjective symptoms with objective tissue damage. It has also tended to dismiss “medically unexplained symptoms,” including pain, as not legitimately medical and likely psychological in origin. Yet modern pain research has revealed pain, especially chronic pain, to be a complex human experience with a loose and variable relationship to tissue damage. We agree that we should begin the clinical encounter by believing our patients’ reports of pain. But this is not because, as Sud et al. say, “[P]eople living with pain have unique epistemic access to their lives” (p. S63). The 17th-century French philosopher René Descartes argued that pain experience was incorrigible, but modern philosophy sees pain as interpersonal. We know a mother’s reaction has a direct effect on her child’s experience of pain.¹¹ And, when clinicians help patients dispute chronic pain’s causes and threat value, both pain experience and brain processing change.¹² This offers us new and effective means to treat the clinical and population problems of chronic pain.

Believing our patients’ reports of pain is only the beginning of our clinical responsibility to the patient with pain. Chronic pain has many causes—physical, psychological, and social—that must be investigated and addressed. Short-cutting this process by using a simple quantitative measure of pain intensity and seeking to reduce this number with opioid medication in accord with a claimed right to pain relief has brought us an opioid epidemic that has still not ended.

In sum, liberal opioid prescribing imposed a heavy cost on US communities and spawned a robust and toxic illicit market. Whether population-

based interventions impose a cost on individuals, in the long run, is a worthy concern. However, this concern will be solved best by expanding mental health care, community support, and social service rather than turning our gaze back to increasing opioid prescriptions.

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CORRESPONDENCE

Correspondence should be sent to Jason N. Doctor, Leonard D. Schaeffer Center for Health Policy & Economics, 635 Downey Way, Verna & Peter Dauterive Hall (VPD), Los Angeles, CA 90089 (e-mail: jdoctor@usc.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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Public Health Under Siege: Improving Policy in Turbulent Times

*Edited by: Brian C. Castrucci, DrPH, Georges C. Benjamin, MD,
Grace Guerrero Ramirez, MSPH, Grace Castillo, MPH*

This new book focuses on the importance of health policy through a variety of perspectives, and addresses how policy benefits society, evidently through increased life expectancy and improved health. The book describes how detrimental social determinants can be to the overall population health and emphasizes how the nation is centered on policy change to create equal health care opportunities for all sectors of health.

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Undoing Harm in Chronic Pain and Opioid Prescribing

Kate M. Nicholson, JD

ABOUT THE AUTHOR

Kate Nicholson is the founder and executive director of the National Pain Advocacy Center, Denver, CO.

See also Sud et al., p. S56.

In their article in this supplement issue of *AJPH*, Sud et al. (p. S56) begin by acknowledging that clinical interventions focused on opioid analgesic prescribing have failed to deliver significant public health benefits, while arguably doing harm. Recognizing that policymakers must act on knowledge that is provisional, the authors use Weber and Khademian's three-fold strategy of knowledge translation—as syntactic, semantic, and pragmatic—to posit a framework capable of navigating complexity, adapting to new information, and minimizing negative consequences.¹

Among the topics the authors consider is the conundrum that, while risks of opioid analgesic prescribing generally rise with higher doses, interventions targeting dosage have resulted in unintended harms. Notably, opioid tapering may actually increase patients' risk of death, in addition to destabilizing their health, mental health, and lives. Applying a "syntactic" lens to this problem, the authors conclude that interventions involving knowledge translation across systems, such as continuing medical education and prescription drug monitoring programs, have often lacked entirely in metrics to trace patient outcomes. Using the "semantic" lens of how knowledge is formulated and received,

they identify flaws in evidence characterization and suggest that policymakers ought to have focused on distribution of risk, and not just on those at higher doses, because far more overdose deaths correlate with low-dose prescribing. The relative risks that rise with higher doses also ought to have been weighed against absolute risks, in my view. One study of the impact of high-dose analgesics on overdose mortality, for example, places the absolute risk of overdose death in patients prescribed opioids at 0.022%.² In applying Weber and Khademian's framework to opioid tapering, the authors thus deftly expose gaps in knowledge translation that may explain emergent harms.

REDRESSING HARM FROM REACTIVE POLICYMAKING

To their insightful analysis, I would add a point of caution. Policymaking tends to be responsive. We see one problem: we react. Another develops: we react. To avoid the pitfalls of policy cycling that we have witnessed with opioid analgesic prescribing—and especially absent metrics to ensure safety, well-validated data, and input from various stakeholders—policymakers should also consider the value of inaction, as I

and a colleague have argued elsewhere.³

Why? When policies become entrenched in laws and mandates, undoing harm is a slow, even intractable process that can leave too many people suffering for far too long.

Iatrogenic harm to patients who use opioid analgesics is what led me into pain advocacy. In 2017, when I began to speak about my experiences with severe chronic pain and the threat of an abrupt opioid taper, I was called an "N of 1." By the end of 2018, Human Rights Watch had issued a groundbreaking report detailing harms from forced or abrupt opioid tapering.⁴ Such tapering intensified after dosage guidance in the Centers for Disease Control and Prevention's (CDC's) 2016 Guideline for Prescribing Opioids for Chronic Pain was interpreted as a maximum limit, and prescribing more than 50 to 90 morphine milligram equivalents per day subjected providers to oversight. Patients who had been stable on opioids were tapered down or off their medication in ways that endangered their health and lives.

In 2019, when a group of us representing clinicians and advocates raised these concerns with public health authorities, both the CDC and the Food and Drug Administration (FDA) course corrected. In an article in the *New England Journal of Medicine*, the authors of the CDC's guideline wrote that its dosage guidance had been misapplied as a mandate by subsequent policy actors in ways that risk patient harm.⁵ Concurrently, the FDA issued a warning on the dangers of abrupt opioid tapering.⁶

While these correctives were a relatively quick response to emerging harms, in the intervening years after the CDC published its guideline, dosage thresholds had already been translated into mandatory policies and laws throughout

the country, becoming, in effect, a standard of care used by states, payers, pharmacy benefit plans, health care systems, and providers.⁷

Far from receding in influence, dosage thresholds are now employed in algorithms that flag patients and providers alike, sometimes resulting in what one scholar has dubbed “dosing discrimination.”⁸ Even as the validity of the morphine milligram equivalent concept is coming under increased scrutiny,⁹ dosage thresholds remain enmeshed in the health care system. Course correction by public health authorities has thus failed to trickle down to the lives of patients at greatest risk of harm; indeed, I continue to receive near daily e-mails from people whose livelihoods and lives have been damaged or destroyed by opioid tapering and patient abandonment.

AVOIDING HARM WITH INCLUSIVE PROCESSES

One hopeful intervention that the authors suggest in relation to “pragmatic” knowledge translation is the concept of “epistemic humility.” Because chronic pain is a subjective experience, they argue, it frustrates the core epistemology of medicine, which relies on objective pathology. The resulting hierarchy of objective over subjective knowledge undermines the validity of patients’ subjective reporting. Given well-documented evidence of bias in pain care,¹⁰ I would add that this problem is likely to be even more pronounced in historically marginalized patients who will disproportionately experience what Miranda Fricker calls “testimonial injustice,”¹¹ or the unfairness of having one’s account disbelieved on the basis of one’s identity. Yet all patients have the epistemic privilege of knowing the experiences of their own bodies as well

as the epistemic advantage of seeing the dominant health care system from the less-privileged, patient point of view. Providers, researchers, and policy-makers should exercise humility about the limits of their own knowledge, and listen to people with pain.

It is difficult to imagine, however, that “epistemic humility” will play out in a clinical environment characterized by aggressive oversight, one in which patients who take opioid analgesics are often perceived, not as allies in a mutual quest for knowledge, but as liabilities. Increasingly, clinicians are unwilling even to treat people who use opioids to manage pain: 50% of primary care clinics in the United States will refuse to treat a prospective patient who takes opioid analgesics, according to one study,¹² and, according to another study, 81% are reluctant to do so.¹³ It is both ironic and troubling when policy interventions in public health crises result in barriers to what at-risk patients likely need most—access to health care, itself.

Applying “epistemic humility” to the research and the policy environments is more promising. To a growing extent, national research funders like Patient-Centered Outcomes Research Institute (PICORI) have recognized the importance of patient engagement and integrated patient participation into every aspect of research design. Public health authorities—and particularly agencies like the CDC that issue guidelines that are not subject to rulemaking requirements mandating robust stakeholder participation, but that predictably go on to carry the force of law—should too. Such policymakers should solicit multiple stakeholder inputs and give credence to those whose lives are likely to be most directly affected by their actions. Exercising “epistemic humility” means engaging with stakeholders in a meaningful way,

one that goes beyond window dressing or box checking. In view of the harms that have emerged on both sides of a policy pendulum swing on opioid prescribing, policymakers who are tempted to embrace simple solutions to complex problems should also place a thumb on the scale toward caution and consider that sometimes doing nothing is better than doing harm. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Kate Nicholson, JD, 2220 Pine Street, #A, Boulder, CO 80302 (e-mail: kate.nicholson@nationalpain.org). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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Healthy Aging Through The Social Determinants of Health

Edited by Elaine T. Jurkowski, PhD, MSW
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This new book examines the link between social determinants of health and the process of healthy aging. It provides public health practitioners and others interacting with the older population with best practices to encourage healthy aging and enhance the lives of people growing older.

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Toward Improved Addiction Treatment Quality and Access for Black Patients

Jessica N. Hulseley, BA

ABOUT THE AUTHOR

Jessica N. Hulseley is the founder of the Addiction Policy Forum, North Bethesda, MD.

See also Pro et al., p. S66.

People from racial and ethnic minority groups have experienced disproportionately negative health outcomes resulting from long-standing systemic and social inequities. From disparities in COVID-19 risks and fatality rates, to alarming increases in overdose rates, to significant stress and anxiety caused by racial unrest, Black Americans have been at the epicenter of colliding epidemics, pandemics, and mental health stressors.

Black people make up a similar share of COVID-19 cases relative to their share of the population (12%), but they account for a higher percentage of deaths than their population share (14% vs 12%).¹ Although drug overdose deaths in the United States hit a new high of more than 97 990 in the 12-month period ending April 2021,² there are striking racial disparities in overdose rates. Overdose deaths among Black individuals are growing faster than among White individuals across the United States. A recent study showed a 40% increase in the opioid overdose death rate for Black individuals relative to non-Hispanic White individuals, but no change among other races/ethnicities was noted.³

In their article, “Individual and Health Policy Factors Associated With Positive

Heroin and Opioid Treatment Response: United States, 2018,” Pro et al. (p. S66) examine variations in treatment outcomes and highlight the existence of multiple subepidemics among racial/ethnic groups. They used data from 46 states, including the Treatment Episode Dataset–Discharges (2018), to examine heroin and opioid treatment episodes (n = 162 846), and they identified specific factors associated with positive or negative treatment responses. The results revealed worse treatment outcomes for Black patients and identified community distress as the largest barrier to treatment success for all racial/ethnic groups.

This research presents a call to action for researchers, clinicians, and policy-makers to address the racial disparities in treatment quality and access. Overall, White and Black people do not differ significantly in their use of drugs; yet, the legal consequences, access to quality treatment, and levels of stigma are very different.

HEALTH AND RACIAL INEQUITIES

Previous research also demonstrates the deficiencies in appropriate care for

Black communities and patients. A 2018 Florida study found that Black Americans experienced significant delays in entry to addiction treatment (four to five years) compared with White Americans, leading to greater severity of symptoms and increased overdose rates.⁴ Studies have also shown that Black youths with an opioid use disorder are less likely than White youths to be prescribed medication for opioid use disorder (MOUD),⁵ and Black patients have statistically significantly lower odds of receiving a buprenorphine prescription as part of their opioid use disorder treatment.⁶

From disparities in sentencing⁷ to higher arrest rates for drug-related offenses for Black individuals than White individuals,⁸ punitive responses to addiction have disproportionately impacted communities of color. Emily Einstein, co-lead of the National Institute on Drug Abuse Racial Equity Initiative, explained,

There is a history of racial bias and discrimination around drug use in this country. Who is considered a “patient” and who is considered a “criminal” is a fraught societal issue that plays out in doctor’s offices, emergency departments, hospitals, courtrooms, prisons, and beyond.⁹

As a patient advocacy organization, the Addiction Policy Forum focuses on safety net services for patients and families nationwide and has been specifically concerned about Black patients and families in our network since the start of the pandemic. In addition to more frequent punitive approaches versus medical responses to addiction that Black patients receive, the disruption of necessary services experienced during COVID-19 shutdowns and social distancing—ranging from support groups, 12-step

meetings, and other recovery services—has had a negative effect on many patients in both treatment and recovery and those with active use disorders.¹⁰

Racial unrest and demonstrations in 2020 also took a disproportionate emotional and mental toll on Black Americans. The Census Bureau's Household Pulse surveys showed the rate of Black Americans with major signs of anxiety or depressive disorders increased from 36% to 41% in the week after George Floyd's death became public. Previous research backs this finding as well, with a 2018 study showing that after a police shooting, Black Americans experience higher levels of psychological distress than White Americans.¹¹

The Pro et al. study also found that individuals residing in communities experiencing high levels of distress had worse addiction treatment outcomes. Measures of distress were taken from the Economic Innovation Group's Distressed Communities Index, which examines economic well-being across the United States, combining seven distinct socioeconomic indicators, including poverty, employment, and income levels.

Socioeconomic distress and the lack of opportunities are drivers of poor health outcomes and even decreases in life expectancy. Princeton economists Anne Case and Angus Deaton were the first to sound the alarm in 2014 about "deaths of despair" caused by suicide, drug overdose, and alcohol use disorder, which have risen dramatically. Although Case and Deaton focused primarily on middle-aged White individuals in their research, the rates of mental health disorders, distress, overdose, and lack of opportunities consistently plague Black, Indigenous, People of Color communities as well.

A CALL TO ACTION

The clear vulnerabilities of Black Americans to COVID-19, overdose, and poor treatment access should elicit an all-hands-on-deck approach to advance improved public health responses to the community and eliminate systemic barriers to addiction care. Key barriers to address include

1. the stigma associated with MOUD;
2. the high costs of treatment;
3. red tape payer policies such as fail first and prior authorization;
4. the stigmatizing attitudes of clinicians, pharmacists, and other key professionals;
5. the lack of treatment options for individuals with co-occurring disorders; and
6. the complexity of navigating the substance use disorders care system.

Local health systems and government agencies must make evidence-based care available to Black communities, improving earlier access to MOUD, such as methadone, buprenorphine, and naltrexone, which are considered the gold standard of care. The timing and access point of MOUD for Black patients must be addressed to provide early intervention and pharmacotherapies to Black communities through health care systems, primary care, employers, and public health infrastructures and not merely through criminal justice involvement or other punitive interventions.

Harm reduction infrastructure must also be expanded, including the availability of naloxone, the lifesaving overdose reversal medication, as well as syringe service programs to prevent infectious diseases, improve survival rates, and make available safety net

services for substance-using individuals. Early intervention and prevention programs and strategies are equally critical, with an emphasis on partnering with Black leaders, Black churches, and trusted community leaders and entities not only to help ensure cultural sensitivity but also to build trust and confidence in evidence-based services for addiction. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Jessica N. Hulsey, BA, Addiction Policy Forum, 11810 Grand Park Ave, Suite 500, North Bethesda, MD 20852 (e-mail: jhulsey@addictionpolicy.org). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

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Dismantling War on Drugs Policies in COVID-19's Aftermath

Hannah L.F. Cooper, ScD, David H. Cloud, JD, MPH, Laura C. Fanucchi, MD, MPH, Michelle Lofwall, MD, and April M. Young, PhD

ABOUT THE AUTHORS

Hannah L. F. Cooper and David H. Cloud are with the Department of Behavioral, Social, and Health Education Sciences, Rollins School of Public Health, Emory University, Atlanta, GA. Laura C. Fanucchi, Michelle Lofwall, and April M. Young are with the Center on Drug and Alcohol Research, University of Kentucky, Lexington. Laura C. Fanucchi is also with the Department of Medicine, University of Kentucky College of Medicine, Lexington. Michelle Lofwall is also with the Department of Behavioral Science, University of Kentucky College of Medicine, Lexington. April M. Young is also with the Department of Epidemiology, University of Kentucky College of Public Health, Lexington.

 See also Pro et al., p. S66.

Each day of the COVID-19 pandemic's transformative months has taught us anew that viruses exploit the weaknesses of their host populations. COVID-19 arrived on our shores to find a nation made fragile by centuries of White supremacy, and the virus surfed our exhalations and inhalations toward Black people, Indigenous people, and other people of color (BIPOC) and Latinae communities. The pandemic collided with the US racialized war on drugs policies—such as police drug crackdowns targeting predominately BIPOC and Latinae neighborhoods—and exacerbated their harms. For generations, these policies have channeled HIV and the hepatitis C virus (HCV) into the networks of BIPOC and Latinae people who use drugs (PWUD); the pandemic is projected to amplify racial/ethnic inequities in these harms and has already escalated inequities in overdoses.¹⁻³ Likewise, war on drugs policies disproportionately incarcerate BIPOC and Latinae PWUD, and the COVID-19 mortality rate in prisons has been triple the national rate.

This collision has also transformed select war on drugs policies and illuminated possible pathways toward more just, compassionate, and effective approaches to drug use. These transformations are, however, currently time-limited emergency responses to the COVID-19 pandemic. We consider some of these transformations, mining the national investigation by Pro et al. (in this issue of *AJPH*; p. S66) of multilevel correlates of substance use disorder treatment success overall and for particular racial/ethnic groups. Substance use disorder treatment systems are vital to creating populations that are relatively unaffected by a host of drug-related harms, viral and otherwise. We focus in particular on the finding of Pro et al. that Black PWUD (but not other PWUD) have higher rates of substance use disorder treatment success in states with greater access to buprenorphine, a medication to treat opioid use disorder. We argue that COVID-19-era temporary reversals of policies that restrict medication to treat opioid use disorder access, and of

policies that surveil, arrest, and incarcerate PWUD, should be made permanent to help eradicate inequities in HIV, HCV, and overdoses.

In the decades before COVID-19 struck, the US opioid use disorder treatment system had created an ongoing crisis of access to buprenorphine and methadone, particularly for BIPOC and Latinae PWUD. Methadone, a schedule 2 controlled drug, was approved in 1970 at the dawn of the war on drugs, when opioid use disorder was largely perceived as a criminal-legal issue, rather than a medical illness, that primarily afflicted urban, impoverished BIPOC and Latinae communities.⁴ As a result of this perspective, methadone is highly regulated at both the federal level by the Substance Abuse and Mental Health Services Administration and the state level. Methadone cannot be prescribed for opioid use disorder treatment but must be dispensed in certified opioid treatment programs. Patients are required to attend opioid treatment programs daily for the first 90 days of treatment—including weekends—for observed dosing. Not only is daily dosing burdensome for patients, but travel distances can be exceptionally long: opioid treatment programs are not widespread, creating treatment deserts, in large part because of onerous federal and state regulations.

Regulations governing buprenorphine, however, are far less restrictive. Buprenorphine is a schedule 3 controlled medication that was approved in 2002 for the treatment of opioid use disorder, when opioid use disorder was increasingly viewed as afflicting middle-class suburban and rural White people.⁴ During congressional testimony about buprenorphine (congressional record vol. 145, no. 16; January 28, 1999), federal leaders described the methadone model of observed daily

dosing as likely ineffective for “suburban” areas experiencing increasing rates of heroin use. Stigma associated with attending opioid treatment programs and suburban zoning restrictions—themselves often effective strategies to racialize space—was explicitly cited as a barrier to expanding the methadone model beyond urban areas and as a justification for establishing a separate suburban system (Box 1). Per the resulting legislation, buprenorphine may be prescribed in an office-based setting by a variety of health care providers (e.g., primary care physicians), provided they have registered with the Drug Enforcement Agency. Patients then fill buprenorphine prescriptions at pharmacies without any supervised dosing requirement. Buprenorphine marketing aligned with federal testimony, targeting White people and their health care providers.⁴ Because of these regulatory and commercial systems, before the pandemic struck BIPOC and Latinae PWUD were far less likely to take buprenorphine than were their White counterparts and far more likely to enroll in heavily regulated opioid treatment programs.⁴

In the pandemic’s early months, the Substance Abuse and Mental Health Services Administration and the Drug Enforcement Agency lifted several

major regulatory barriers that may have increased BIPOC’s and Latinae PWUD’s access to these lifesaving medications. The Drug Enforcement Agency increased buprenorphine access via telehealth by waiving the requirement of in-person initial evaluations and by authorizing telephone consultation for initiation (rather than requiring two-way audiovisual contact).^{5,6} Although helpful for all PWUD, these changes may have been especially vital for Black PWUD: Black PWUD have exceptionally poor access to the traditional buprenorphine providers,⁷ and the research of Pro et al. suggests that increased access to buprenorphine increases opioid use disorder treatment success among Black PWUD. In another vital advance for BIPOC and Latinae PWUD, the Substance Abuse and Mental Health Services Administration revised regulations to allow state regulatory authorities to request blanket exemptions for more lenient take-home methadone policies, although implementation has not been uniform across states.

Unfortunately, most pandemic era expansions to medication to treat opioid use disorder will expire at the end of the COVID-19 emergency. However, crises of HIV, HCV, and overdoses—particularly among BIPOC and Latinae

PWUD—are escalating rather than ending. In the midst of these drug-related crises, these policy expirations will herald a regression to war on drugs era policies that restrict the access of BIPOC and Latinae PWUD to medication to treat opioid use disorder. Instead of ending these pandemic era medication to treat opioid use disorder policy advances, the Substance Abuse and Mental Health Services Administration and the Drug Enforcement Agency should recognize the ongoing (and indeed escalating) nature of these drug-related crises among PWUD, particularly BIPOC and Latinae PWUD, and make these regulatory changes permanent.

Although beyond the scope of the study of Pro et al., we turn next to war on drugs era criminal-legal policies. For decades, racialized inequalities have pervaded the criminal-legal continuum: compared with their White counterparts, BIPOC and Latinae PWUD are more likely to be stopped, searched, and killed by police; detained, prosecuted, and imprisoned by courts; and reincarcerated by parole and probation officers. Among the multitudes of harms these inequalities have generated are reduced reach and effectiveness of harm reduction programs (including substance use disorder treatment), elevated HIV, HCV, and overdose incidence, and accelerated HIV and HCV progression for BIPOC and Latinae PWUD. As with medication to treat opioid use disorder, pandemic era emergency powers authorized vital revisions to these policies. For example, some jurisdictions enacted moratoria on arrests for nonviolent offenses, and governors and courts issued executive and judicial orders that accelerated early release from jails and prisons.⁸ Unfortunately, these changes have been fleeting, and arrest and incarceration rates are

BOX 1— Department of Health and Human Services Testimony about “Amending the Drug Addiction Treatment Act of 1999” to accommodate buprenorphine (Congressional Record Vol. 145, No. 16; January 28, 1999, p. S1092)

“The issue then becomes why should buprenorphine products be delivered differently from . . . methadone . . . there are many narcotic addicts [*sic*] who refuse treatment under the current system. In a recent NIDA funded study (NIDA/VA #1008), approximately 50% of the subjects had never been in treatment before. Of that group, fully half maintained that they did not want treatment in the current [OTP-based] narcotic treatment program system. . . . Fear of stigmatization is a very real factor holding back narcotic dependent individuals from entering treatment. . . . Narcotic addiction is spreading from urban to suburban areas. The current system, which tends to be concentrated in urban areas, is a poor fit for the suburban spread of narcotic addiction. There are many communities whose zoning will not permit the establishment of narcotic treatment facilities, which has in part been responsible for the treatment gap described above.” Alan Leshner, National Institute on Drug Abuse director, October 5, 1998

already regressing to prepandemic levels.

Pandemic era emergency criminal–legal policies, however, reveal an untapped potential to mobilize existing legal mechanisms and discretionary powers to accelerate progress toward decriminalization, decarceration, and abolition. Police chiefs and prosecutors could indefinitely extend pandemic era moratoria on drug-related arrests and prosecutions for PWUD; and governors, courts, and jailers could use constitutional and statutorily granted emergency authority to accelerate the large-scale release of people sentenced under draconian drug laws. The pandemic also witnessed shifting public support for decriminalization; for example, the majority of Oregonians voted for a 2020 ballot measure that decriminalized low-level drug possession and expanded resources for substance use disorder treatment across the state.

Together, such legal reforms are vital to addressing inequitable access to medication to treat opioid use disorder and other harm reduction services in communities disparately harmed by decades of war on drugs policies. Closely monitoring the implementation of these initiatives is critical to ensuring that revenue and resources are distributed to entities committed to dismantling racialized inequities in access to substance use disorder treatment and to holding law enforcement accountable to adopting decriminalization in good faith. Such actions, combined with impact evaluations, could build broad momentum for legislative reforms to remove criminal penalties for drug possession and thus could enhance substance use disorder treatment success and bolster resilience to HIV, HCV, overdoses, and COVID-19 among BIPOC and Latinae PWUD.

Regressing to past criminal–legal approaches, by contrast, threatens to further erode this resilience.

Racialized social systems undermine the welfare of the US body politic as a whole, and the war on drugs has also collided with COVID-19 to further jeopardize the health of non-Hispanic White PWUD in rural areas, some of which (e.g., rural Appalachia) are epicenters of drug-related epidemics. Prepandemic war on drugs policies curtailing access to medication to treat opioid use disorder were also detrimental to accessing medication to treat opioid use disorder in rural areas, where transportation access can be poor and distances to opioid treatment programs exceptionally long.⁹ Likewise, war on drugs criminal–legal approaches to drug use followed the opioid epidemic into rural areas: by the early 2010s, jail-based incarceration rates in rural counties nationally were more than 30% higher than in suburban or urban metros¹⁰; incarceration rates in rural Appalachian counties are especially high.¹¹ The projected benefits of reversing war on drugs era restrictions on medication to treat opioid use disorder access and punitive policies in rural areas may be substantial: in rural Kentucky, for example, decriminalization accompanied by diversion from jail or prison to medication to treat opioid use disorder and scale-up of harm reduction could prevent an estimated 57% of new HCV infections over 10 years.¹²

Pandemics can catalyze major social and political transformations, and the COVID-19 pandemic has generated significant evolutions in US war on drugs policies. Regressing to prepandemic policies because COVID-19 infections may be waning ignores escalating crises of HIV, HCV, and overdoses among BIPOC, Latinae, and rural PWUD. The

research of Pro et al. suggests that expanding pandemic era advances in medication to treat opioid use disorder policy reforms—and, we would add, criminal–legal reforms—may strengthen resilience to HIV, HCV, and overdoses among BIPOC, Latinae, and rural PWUD in part by enhancing substance use disorder treatment effectiveness. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Hannah Cooper, 1518 Clifton Rd, NE, Atlanta, GA 30322 (e-mail: hcoope3@emory.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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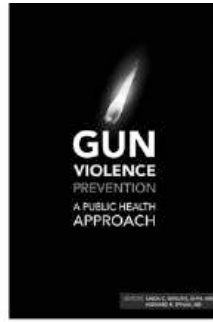
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M. Lofwall has been a scientific consultant for Titan Pharmaceuticals.

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Gun Violence Prevention: A Public Health Approach

Edited By: Linda C. Degutis, DrPH, MSN,
and Howard R. Spivak, MD

Gun Violence Prevention: A Public Health Approach acknowledges that guns are a part of the environment and culture. This book focuses on how to make society safer, not how to eliminate guns. Using the conceptual model for injury prevention, the book explores the factors contributing to gun violence and considers risk and protective factors in developing strategies to prevent gun violence and decrease its toll. It guides you with science and policy that make communities safer.

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The Need for Balance in Evaluating Opioid-Prescribing Policies

Diane E. Hoffmann, JD, MSc

ABOUT THE AUTHOR

Diane E. Hoffmann is with the School of Law, University of Maryland, Baltimore.

 See also Pro et al., p. S66.

In “Individual and Health Policy Factors Associated With Positive Heroin and Opioid Treatment Response: United States, 2018,” Pro et al. (p. S66) explore associations between (1) individual characteristics as well as state-level policies and characteristics, and (2) success in a substance use treatment program for opioid use disorder (OUD). Individual characteristics include race, ethnicity, age, and primary drug of choice at admission to a drug treatment program. State-level policies and characteristics include:

1. whether the state where the patient was treated implemented Medicaid expansion,
2. how the state ranks on a distressed community index,
3. the number of opioid prescriptions per 100 state residents,
4. the number of treatment facilities in a state accepting Medicaid payment,
5. the percentage of a state’s treatment facilities offering buprenorphine,
6. whether the state has continuing medical education requirements for pain management, and
7. whether the state has any statutory limits on opioid prescriptions.

Pro et al. determined success in an OUD treatment program by reduction in use of opioids between admission

and discharge. The authors further analyzed the data to determine whether the independent variables had a different impact on outcomes based on race or ethnicity.

As a proponent of evidence-based drug control policies, I applaud the authors for their efforts to link state policies related to opioid prescribing with OUD treatment outcomes. There are few well-designed, rigorous studies with adequate sample sizes that can inform policymakers on which policies are effective in this arena. Additionally, the effort to identify policies that might have a different impact on outcomes based on race or ethnicity contributes valuable data to the literature on health disparities. However, from the perspective of an advocate for chronic pain patients, the article and research design have some notable omissions.

Although the article makes an implicit connection between chronic pain treatment, heroin use, and OUD treatment, and the authors state in the text, “chronic pain has been shown to be closely related to opioid misuse and related morbidities and death” (p. S67), they do not provide any citation to support their assertion. Although it is true that increased opioid prescribing has been associated with increased OUD

and opioid-related deaths, it is not at all clear that most of the cases of such disorders or deaths are attributable to chronic pain patients originally prescribed opioids. Data from the National Institute on Drug Abuse indicate that approximately “21–29% of patients prescribed opioids for chronic pain misuse them,” but only 8% to 12% of chronic pain patients taking opioids develop an OUD and only 4% to 6% who misuse opioids “transition to heroin.”¹

The authors also omit an important outcome variable in their study. Ideally, a study assessing public policies on opioid prescribing would look not only at outcomes related to successful completion of an OUD treatment program but also at pain outcomes for those chronic pain patients who develop an OUD. As a result of the 2016 Centers for Disease Control and Prevention guidelines,² state laws that codified those policies,³ and Medicaid policies that set reimbursement limits on the number or dosage of opioids prescribed,⁴ many chronic pain patients had their dosages forcibly tapered down to ineffective levels of their opioids or were cut off their opioids “cold turkey,” leaving them in severe pain and desperate for relief.⁵ Some of these patients turned to illicitly available opioids, and some died by suicide.⁵ Such policy outcomes were no doubt unintended consequences; however, they illustrate policies that gave too much weight to reducing OUD and overdose deaths and too little attention to the effect on chronic pain patients, many of whom were highly functioning on large dosages of daily opioids. Forced tapers, dismissing patients, and ghost referrals to inaccessible pain management specialists in response to pain policies were both unethical and cruel.

Studies that focus exclusively on OUD treatment to assess opioid-prescribing policies miss an opportunity to explore how biases in pain treatment and pain policies affect chronic pain outcomes. Admittedly, many chronic pain patients affected by federal and state pain policies will not be captured by a study focusing on OUD treatment outcomes, but a more balanced assessment would include them. Moreover, it is important to acknowledge that chronic pain patients in an OUD treatment program may be there because their physician appropriately prescribed opioids for them or because their physician inappropriately cut them off their opioids.

Although such balanced studies would be conducted in an ideal world, researchers currently lack the data to incorporate chronic pain treatment and level of chronic pain or level of functioning into large-scale research. Data sets such as the Substance Abuse and Mental Health Services Administration's Treatment Episode Data Set: Discharges, used by Pro et al., do not include information on chronic pain patients or treatment. As a result, the researchers were unable to say what percentage of the population they studied were chronic pain patients. Although we can assume that some of the individuals who now use heroin or other opioids suffer from chronic pain, we do not know if they account for 10%, 20%, 30%, or more of the study population. Nor do other large data sets provide this information. The 2018 Federal Pain Research Strategy recognized this shortcoming, stating, "The paucity of large data sets and prospective registries of well-characterized [chronic pain] patients has delayed our understanding of acute and chronic pain and development of safe and effective pain management."⁶ Such

data pools would also enable the evaluation of policies affecting pain treatment.

Information measuring chronic pain levels, quality of life, and functioning, alongside OUD treatment outcomes for vulnerable populations would also be useful data for policymakers. As Pro et al. point out, racial and ethnic biases on the part of chronic pain treatment providers have led to disparities in pain treatment. Racist attitudes and implicit bias, for example, have resulted in inadequate treatment of patients with pain from sickle cell disease, virtually all of whom are Black.⁷ Data on the race and ethnicity of patients who participate in OUD treatment programs and which patients have better chronic pain outcomes would be helpful in designing policies that reduce biases in both chronic pain and OUD treatment. Given the literature on differential pain treatment based on sex, researchers should also incorporate sex as a variable in their study designs.

The incorporation of chronic pain data into a study like that of Pro et al. would allow researchers to explore questions such as whether there is less need for OUD treatment of individuals being adequately treated for their chronic pain or whether the success rate of OUD treatment differs for chronic pain patients (whose pain is controlled vs uncontrolled) and non-chronic pain patients.

Finally, the inclusion of a global calculus of the unintended consequences of opioid-related policies that include both measurements of success in OUD treatment and chronic pain outcomes would allow fairer and more just treatment of chronic pain patients and individuals suffering from OUD. In addition, including the voices of these individuals in the research process, along with

those of patient advocates, can add important and new perspectives to both the design and interpretation of such analyses. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Diane E. Hoffmann, University of Maryland Carey School of Law, 500 W. Baltimore St, Baltimore, MD 21202 (e-mail: dhoffmann@law.umaryland.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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Far From a “White Problem”: Responding to the Overdose Crisis as a Racial Justice Issue

Joseph Friedman, MPH, and Helena Hansen, MD, PhD

ABOUT THE AUTHORS

Joseph Friedman is with the Center for Social Medicine and Humanities and the Medical Scientist Training Program, University of California, Los Angeles. Helena Hansen is with the Department of Psychiatry and the Center for Social Medicine and Humanities, University of California, Los Angeles.

 See also Pro et al., p. S66.

The United States is in the midst of an overdose crisis of tremendous proportions. Even before overdose death rates spiked sharply during the COVID-19 pandemic, the United States had twice the mortality rate of the second highest country, and 20 times the global average.¹ Deaths from overdose have increased year after year—nearly uninterrupted—for the past four decades. During the pandemic, the United States crossed the grim milestone of 100 000 overdose deaths in a 12-month period.²

Although overdose deaths have increased for all racial/ethnic and socioeconomic groups, these increases have not been felt equally among all Americans. Overdose and addiction have long predominated among low-income communities,³ and during the “first wave” of the overdose crisis in the early 2000s, deaths were concentrated in low-income White communities.⁴

However, the racial/ethnic profile of the US overdose crisis has changed sharply.⁵ In 2020, the overdose death rates of Black individuals overtook those of White individuals and now exceed them by nearly 20%. American

Indians/Alaska Natives now have the highest overdose mortality rates of any group—30% higher than for White individuals. Far from a “White problem,” overdose prevention is now a key racial justice issue.

In this issue of *AJPH*, an analysis of a national data set by Pro et al. (p. S66) considers the individual- and state-level factors that help explain racial disparities in addiction treatment. Economic and community distress—including low education, high unemployment, and housing vacancy—had the strongest negative relationship to treatment success across all racial/ethnic groups. Black and American Indian/Alaska Native patients disproportionately presented for treatment in mid- to high-distress communities. Black patients were also much more likely to experience poor treatment outcomes. In addition, patients in states that have not expanded Medicaid were less likely to experience successful treatment.

These findings urge us to consider approaches to the overdose crisis that address the underlying causes of economic and community distress,

with a focus on systemic racial/ethnic inequalities.

MOVING BEYOND OVERDOSE AS A “WHITE PROBLEM”

Although overdose has been largely painted as a White problem in the popular press and academic literature in recent years—as deaths among low-income White communities garnered significant public attention—racial justice advocates have disputed this narrative.⁶

For example, Native communities have long experienced overdose deaths at equal or higher rates than their White counterparts, yet this has not received the same recognition.⁵ Furthermore, Black people who use drugs face much higher risk of arrest, imprisonment, and other drug-related harms—despite using drugs at similar rates—because of well-documented racial bias in the criminal justice system.⁷

However, the perception of addiction as primarily affecting White Americans has led to a softening of US drug policy.⁶ Minimum sentencing laws were reversed. Possession of drugs was downgraded from a felony to a misdemeanor in many cases, or even decriminalized in many cities.

People experiencing addiction were also humanized. They came to be regarded as “struggling with illness” instead of “immoral criminals,” which had been the prevailing societal view during previous waves of addiction, such as crack cocaine in the 1980s, which was represented as a Black problem.⁶ Even conservative politicians began to emphasize the need for medical treatment, when just a few years prior they had advocated for criminal punishment. President Trump declared the opioid

epidemic a “public health emergency,” unlocking new resources for treating addiction as a medical problem.

Now that overdose mortality is becoming a racial justice issue of enormous proportions, we must ensure that this push for evidence-based policies does not falter.

ADDRESSING RACIAL/ETHNIC INEQUALITIES AS DRIVERS OF OVERDOSE

We are living in an incredibly dangerous time to purchase street drugs. People seeking to buy opioids in illicit markets are now being sold illicitly manufactured fentanyl and other powerful synthetic drugs, often mixed together in powders and pressed into counterfeit prescription pills. This has led to massive day-to-day fluctuations in the potency of the drug supply that can catch even experienced users off guard. Although prescription opioids continue to garner significant public, media, and policy attention,³ a very small percentage of overdose deaths now involve them.² Continued reductions in access to opioid prescriptions through the health care system are unlikely to curb the rising tide of overdose deaths, as illicitly manufactured fentanyl and other synthetic compounds are the key substances driving increases.

This increasing danger of using street drugs has disproportionately harmed communities of color, for various reasons. Importantly, the variable potency of street drugs has increased the lethality of recent incarceration. While someone is in jail or prison, opioid tolerance is reduced; upon release, people who use drugs are less likely to be aware of shifts in street drug composition. Furthermore, incarceration destabilizes people socially and economically⁸: they leave prison with reduced social

supports, are disqualified from many forms of housing and employment, and have had minimal or no access to treatment for substance use disorders while incarcerated.

This is how mass incarceration, which disproportionately targets Black and Native communities,⁷ is supercharging the US overdose crisis. Notably, the carceral response to the illicit fentanyl crisis, including increasing penalties for fentanyl analogs, is reversing progress toward decriminalization. Similarly, the growing trend of prosecuting overdose deaths as homicides has led to long prison sentences for many people who use drugs and exchange them with their friends and family members.⁹ These shifts threaten to worsen racial disparities in incarceration and overdose rates.

Moving forward, the overarching drivers of overdose—including structural, social, and economic inequality—must be addressed. As Pro et al. highlight, community distress is inversely related to treatment success. Patients of color are more likely to reside in areas with poor housing, employment, and educational opportunities, which are strongly related to overdose.³ Racial segregation in housing, employment, and education, tied to disinvestments from Black and Brown neighborhoods in US cities, has fueled drug-related harms for decades.^{3,7} These factors are compounded by deep inequalities in the US health care system in which Black, Native, and Latinx Americans have less access to addiction treatment.^{10,11}

TACKLING THE OVERDOSE CRISIS AS A RACIAL JUSTICE ISSUE

Many treatment advocates call for improved access to evidence-based medications such as buprenorphine,

methadone, and naloxone. Although these medications represent important strategies, they are not magic bullets. Ample evidence indicates that social-structural inequalities reduce medication effectiveness. Therefore, medications alone will not remedy substance-related harms in a context of deep inequalities. Instead, to promote better treatment outcomes, more comprehensive services are needed that address housing and economic stability.¹²

To effectively address racial/ethnic inequalities in overdose and treatment outcomes, overdose prevention efforts must be connected to broader racial justice movements in the United States. The criminalization of drug use drives poor outcomes for people who use drugs. Similarly, racial justice advocates seek to reduce the disproportionate policing and incarceration of communities of color, which often stem largely from drug law enforcement. Drug decriminalization is therefore a key strategy for both overdose prevention and racial justice efforts.

Overdose prevention requires what racial justice movements call for: the reallocation of public funds away from racially targeted law enforcement and toward economic development in low-income communities of color. Instead of bolstering a militarized drug-focused police force, investing in small business ownership, employment, education, and housing leads to multigenerational improvements in a wide range of health outcomes, including those related to substance use.¹³ This kind of economic development has also been called for by those who identify the overdose crisis in rural, deindustrialized White communities as contributing to “deaths of despair.” However, this economic development must foreground racial equity, to redress the harms of decades of

racially stratified disinvestments from, and drug law enforcement in, communities of color.

As the US overdose crisis continues to evolve, robust and sustained attention to both economic development and racial justice is crucial to combat rising drug-related harms. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Helena Hansen, MD, PhD, Department of Psychiatry and Behavioral Sciences, UCLA David Geffen School of Medicine, B7-435, UCLA Semel Institute, Los Angeles, CA 90095-1759 (e-mail: HHansen@mednet.ucla.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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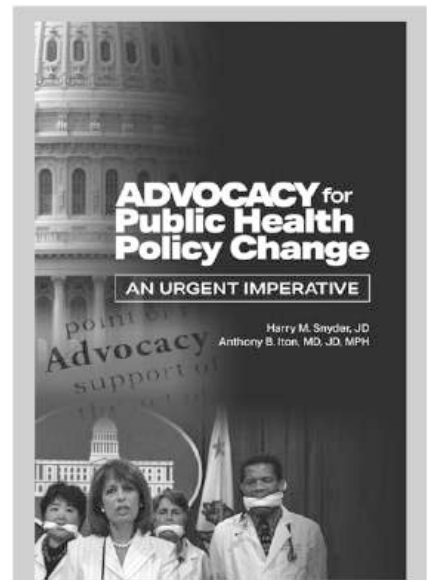
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The Work–Opioid Connection: What Do Construction Workers and Military Veterans Have in Common?

David Atkins, MD, MPH, and Amy S. B. Bohnert, PhD, MHS

ABOUT THE AUTHORS

David Atkins is with the Office of Research and Development, Department of Veterans Affairs, Washington, DC. Amy S. B. Bohnert is with the VA Center for Clinical Management Research, Ann Arbor, MI, and the Departments of Anesthesiology, Psychiatry, and Epidemiology, University of Michigan, Ann Arbor.

Note. The opinions expressed in this editorial are those of the authors alone and do not reflect official policy of the Department of Veterans Affairs or any federal agency.

 **See also Dong et al., p. S77.**

The excessive prescribing of opioids over the past two decades helped contribute to an epidemic of opioid misuse that has been documented in medical journals, popular books, television series, and courtroom documents. Although the rate of overdoses due to illegal opioids such as heroin and illicitly manufactured fentanyl overtook those due to opioid medications after 2015,¹ excessive prescribing of opioids can be harmful both to individuals and to communities in which they are diverted to recreational use. Nationally, opioid prescribing peaked about a decade ago, and some health systems, such as the Veterans Health Administration (the component of the Department of Veterans Affairs [VA] that provides medical care for eligible veterans), have instituted comprehensive programs to reduce outpatient prescribing.² Nonetheless, the use of prescription opioids in the United States still outpaces that of other Western countries.³

Acute and chronic musculoskeletal pain remains the most common indication for opioid prescribing, despite growing evidence that opioids are no more effective for many of these conditions than medications with less potential for harm.^{4–6} Populations in which musculoskeletal pain is common, such as veterans, provide some of the best-documented evidence of how increased attention to treating pain inadvertently fueled the opioid epidemic. Abetted by mistaken assumptions about the safety of opioids when used for pain, clinicians steadily increased opioid prescribing both in VA and nationally, with a resulting increase in overdose deaths. For many veterans, musculoskeletal pain and treatment with opioids may have their roots in active-duty service, where training and combat-related injuries are common. In a 2010 study, nearly one in three active-duty military personnel had received at least one

prescription for opioids in the past year.⁷ Similarly, chronic pain is common among the 9 million veterans enrolled in the VA, with nearly half of patients seeking primary care in the VA reporting persistent pain.⁸ Studies in the VA documented that overdose risk was nearly double among VA patients compared with the general population,⁹ rising with dosage of opioids and coprescribing of benzodiazepines.^{10,11} Among veterans prescribed opioids, the potential for abuse and dependence is exacerbated by mental health conditions,¹² which are common among patients seeking VA care.

In this issue of *AJPH*, Dong et al. (p. S77) examine opioid use in another population at high risk for musculoskeletal pain: construction workers. Like veterans, construction workers have a high risk of musculoskeletal injuries yet work in environments that may discourage taking needed time for recovery; however, there has been much less research on opioid use among construction workers. By analyzing three surveys conducted for the Medical Expenditure Panel Survey, Dong et al. report that a concerning 10% of all construction workers used prescription opioids annually between 2010 and 2018. The likelihood of use increased with age and was three times as high among those reporting injuries, with an estimated 25% and 24.4% of those with work-related and non-work-related injuries reporting opioid use, respectively. Use was also twice as common among those reporting a mental health disorder. Notably, use was actually higher among those reporting white-collar construction positions (e.g., managers) than among those reporting blue-collar jobs, and slightly higher in White than in non-White workers. Unfortunately, the data are aggregated

across a time span during which opioid use peaked and began to decline. One might hope that more recent data would show a lower use of opioids.

By studying opioid use in a group with a high prevalence of musculoskeletal injuries, Dong et al. have shed light on ways to address the dual problems of chronic pain and incident long-term opioid use. Primary injury prevention, in addition to preserving health and reducing disability, could act as an upstream intervention to reduce the numbers of people who develop injuries that could lead to chronic pain. This in turn would reduce their likelihood of long-term opioid use and potential for opioid-related harms. To date, however, workplace injury prevention programs have received minimal attention among the broad approaches proposed to address the opioid crisis, despite the fact that overdose prevention often falls within the purview of the injury branch of federal and state public health agencies.

For construction workers already suffering from pain, the VA's success in improving pain care can inform our response to these new data. In 2011, the VA initiated a multipronged approach under the Opioid Safety Initiative—consisting of education, monitoring, integrated pain management, and risk mitigation policies—which has reduced use of opioids by 50%, with even greater effects on initiation of opioids.² As shown in VA studies, stepped care therapies that move patients through progressive intensification with nonopioid medications can be effective at managing pain without opioids for many patients.^{4,13,14} The VA increasingly uses complementary and integrative strategies—including chiropractic care, acupuncture, massage, and tai chi—as an adjunct to nonopioid

pain medication for patients with acute or chronic musculoskeletal pain. This may have helped the VA to maintain comparable pain outcomes among veterans with chronic musculoskeletal pain even as use of opioids declined over the past decade (Erin Krebs, MD, MPH, Minneapolis VA Health Care System, e-mail communication, December 1, 2021). Unfortunately, many of these approaches are much harder to implement in the diffuse and disorganized care systems relied on by many construction workers. Because construction workers are often employed as contractors or day laborers, it is reasonable to assume that the lack of comprehensive health insurance may also be a barrier. These data demonstrate that we still have work to do educating clinicians who see patients with musculoskeletal pain, including primary care, occupational, and emergency care providers. The temptation to prescribe opioids is based on two assumptions that may not apply to many routine musculoskeletal injuries: that maximal relief of pain should be the goal rather than restoring function, and that opioids are good short-term solutions to get patients back to work. Unfortunately, short-term use can turn into unplanned long-term use as acute pain becomes chronic. Because short-term pain control can often be achieved with safer alternatives than opioids, without the potential harms of opioid use, we should worry that for many of the construction workers examined in the study by Dong et al., the cure may have turned out worse than the disease. **AJPH**

CORRESPONDENCE

Correspondence should be sent to David Atkins, MD, MPH, Office of Research and Development (14RD), Department of Veterans Affairs, Washington, DC 20420 (e-mail: David.atkins@va.gov).

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Serious Illness and Limitations of Death Certificate–Based Data: Urgent Lessons From the Opioid Epidemic

Jessica S. Merlin, MD, PhD, MBA, Melissa W. Wachterman, MD, MPH, MSc, William C. Becker, MD, and Amy S. B. Bohnert, PhD, MHS

ABOUT THE AUTHORS

Jessica S. Merlin is with the Division of General Internal Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA. Melissa W. Wachterman is with the Department of Psychosocial Oncology and Palliative Care, Dana Farber Cancer Institute, and the Section of General Medicine, VA Boston Healthcare System, Boston, MA. William C. Becker is with the VA Connecticut Healthcare System, West Haven, and the Yale School of Medicine, New Haven, CT. Amy S. B. Bohnert is with the Departments of Anesthesiology and Psychiatry, University of Michigan School of Medicine, Ann Arbor.

See also Latimore et al., p. S39, and Ling et al., p. S42.

In the United States, we rely on death certificate–based cause of death (COD) data to inform decisions in numerous aspects of public life, including policy, research funding priorities, and public health practice. We are in the midst of an epidemic in which accurate reporting of COD is vital to public health: the opioid overdose crisis. Here we describe how COD is determined and, with the opioid crisis as an example, the implications of that process for obtaining data critical in public health responses to epidemics.

CAUSE OF DEATH DETERMINATION

The process of determining COD is far from scientific.¹ The US Standard Certificate of Death instructs physicians to enter the immediate cause or the “final disease or condition resulting in death” and, below that, to “sequentially list

conditions, if any, leading to the [immediate] cause.” These are termed intermediate causes. The underlying cause, defined on the death certificate as the “disease or injury that initiated the events resulting in death,” is entered on the last line, and contributing causes are entered in a separate section.²

Death certificates are typically completed by the physician whose care the patient was under at the time of death, who may or may not have been involved in the patient’s care longitudinally. Furthermore, most physicians receive no training in how to complete death certificates, and, in the absence of such training, a minority of certificates are completed accurately.³ COD determination can also be influenced by autopsy results or postmortem toxicology testing. However, whether autopsies and postmortem testing are performed is based on factors such as family preference, local resources, and

whether a death is suspected to be “unnatural,” and it likely varies significantly on the basis of jurisdiction.

CAUSE OF DEATH REPORTING

Even if immediate and underlying CODs are entered accurately according to these standards, important information is lost in the process that leads to the “leading causes of death” reported by the Centers for Disease Control and Prevention (CDC). Consider a hypothetical patient with advanced cancer and a prognosis of six months to live. She is prescribed opioids for severe cancer-related pain. Her dose is increased to improve her symptoms with the understanding that the opioid may shorten her life. She dies a month later with a presentation consistent with an overdose (e.g., sedation and respiratory depression).

Diagnostic suspicion bias could lead the physician away from listing overdose as a COD at all, given the patient’s cancer diagnosis. A physician who knows the patient might list cancer as the underlying COD and overdose as the immediate COD, but regardless of location on the certificate, both are important. However, when regional vital statistics offices share death certificate data with the CDC, the CDC’s computerized algorithm selects one diagnosis as the underlying COD, and this is the diagnosis that is reported in CDC mortality statistics.⁴ Other diagnoses appear in separate COD fields in mortality databases but in no particular order, and they are not included in the vast majority of mortality statistics. Therefore, in this example, the death might be attributed to cancer or to something else entirely. The critical information on the acute overdose

event that led to death would not be included in mortality reports.

IMPLICATIONS FOR THE OPIOID OVERDOSE EPIDEMIC

Two examples highlight how opioid overdose can be overlooked as a COD and lead to minimizing the dangers of overdose among patients with serious illnesses. One recent study involving veterans showed that opioid use was associated with overdose death among individuals without HIV (consistent with a large body of existing literature) but not among individuals with HIV.⁵ The authors concluded that differential misclassification of COD according to HIV status was the likely reason and hypothesized that certifying physicians may miss the role of opioids when a potentially life-limiting condition is present.

Another recent study of opioid-related deaths among “cancer survivors” (which the authors did not explicitly define, but they cited an article that included in its definition individuals with active disease and those with a more remote history of cancer) highlights the potential for loss of data on acute events when a serious illness and an acute event coexist at the time of death.⁶ The authors found that decedents with opioid-related primary CODs were less likely to have a cancer diagnosis included as a contributing COD than would be expected. However, their conclusion that patients with cancer are less likely to die by overdose was based on the incorrect premise that cancer must always be listed as a contributing COD in a “cancer survivor.” Furthermore, overdose deaths among patients with cancer may be underreported, whether because of a lack of

consensus about how to determine overdose when someone is seriously ill or because of a lack of interest or resources directed toward determining the precise cause (e.g., through autopsy).

In both the HIV and cancer examples, these findings could lead to the incorrect conclusion: that somehow HIV and cancer are protective against opioid-related mortality. This conclusion lacks face validity and biological plausibility. Worse yet, it could lead to inappropriately counseling patients with HIV and cancer that they are unlikely to face opioid-related dangers.

IMPLICATIONS FOR THE COVID-19 EPIDEMIC

Although this editorial focuses on the opioid epidemic, it can provide lessons instructive for another epidemic: COVID-19. For example, an out-of-hospital death caused by rapid onset of COVID-19 in a person with a preexisting serious illness that increases vulnerability to life-threatening COVID could be attributed to the preexisting illness alone. Further complicating matters, there is no consensus as to when the serious illness versus COVID-19 should be counted as the underlying COD. Both the opioid epidemic and COVID-19 underscore the urgent importance of addressing how we assess COD in the United States.

CONCLUSIONS

The current death certificate process forces the use of a chain of linear, single diagnoses to describe the complex process by which people live and die. To address concerns regarding this process, we propose the following: (1) develop a stronger consensus on how

to report COD data; (2) on the basis of this consensus, improve reporting of CODs through medical education and periodic death certificate audits with feedback; and (3) update COD databases to retain indicators for immediate and contributing diagnoses. In addition, researchers and public health professionals could make use of fields other than underlying COD to gain a more complete perspective of potential contributors to CODs.

COD reporting biases extend well beyond today's political controversies and health crises. The current process can produce data that lead to misguided conclusions. *AJPH*

CORRESPONDENCE

Correspondence should be sent to Jessica S. Merlin, MD, PhD, Associate Professor of Medicine, University of Pittsburgh, 3609 Forbes Ave, Pittsburgh, PA 15203 (e-mail: merlinjs@pitt.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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Build It Better for Public Health: Improved Data Infrastructure Is Vital to Bending the Curve of the Overdose Crisis

Amanda D. Latimore, PhD, MA, Justine Newman, BS, and Leo Beletsky, JD, MPH

ABOUT THE AUTHORS

Amanda D. Latimore is with the American Institutes for Research Center for Addiction Research and Effective Solutions and the Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. Justine Newman is with Health in Justice Action Lab, Northeastern University, Boston, MA. Leo Beletsky is with the School of Law, Bouvé College of Health Sciences, and Health in Justice Action Lab, Northeastern University, and is with the Division of Infectious Disease and Global Public Health, University of California, San Diego School of Medicine, La Jolla, CA.

🔗 See also Merlin et al., p. S36, and Ling et al., p. S42.

Amidst the many tribulations of this country's response to COVID-19, the US public health system has demonstrated capacity to rapidly stand up a data infrastructure to track cases, deaths, vaccinations, and other key information. These data have been crucial to inform actions and policies, including those related to intense racial disparities. This stands in stark contrast with the data infrastructure deployed in response to another ongoing public health emergency—the overdose crisis. Now in its third decade, this crisis still lacks timely and accurate data, hampering effective responses.

Concerns about poor standardization and accuracy of death investigation and reporting are not new.¹ Improving the accuracy of cause-of-death (COD) determination requires the involvement of both clinical and death investigation professionals. For most decedents, the COD is determined by the attending

physician or nurse; however, death investigations are required for cases in which the COD is sudden or unexpected, is not of natural causes, is unattended, or is unexplained.² Therefore, coroners and medical examiners are typically the authorized certifiers of death in cases involving overdose.³

In this issue of *AJPH* (p. S36), Merlin et al. provide a timely analysis of overdose surveillance in the health care settings, where deaths may be miscategorized by attending physicians for decedents with underlying illness. Although it is important to reduce suspicion bias in clinical settings, the vast majority of fatal overdoses are not certified in health care institutions. Meanwhile, serious structural flaws undermine the entire system for COD determination in the United States. As we grapple with the need to rebuild our public health institutions and policies in the wake of the COVID-19 pandemic, fissures in the

nation's overdose and other mortality surveillance infrastructure deserve urgent attention. Among the most critical imperatives in this broader agenda are setting appropriate standards for workforce expertise and addressing systemic racial bias.

THE SKILL, RESOURCES, AND OBJECTIVITY OF COD CERTIFIERS

Half of the US population is served by the coroner system.⁴ Compared with medical examiners, a position that is appointed to an individual with board-certified medical training, coroners are typically part-time elected officials, often elected on a partisan ballot. The skills needed to perform the duties of a coroner today are very different from how this position was conceptualized at its inception, when the primary focus was to collect taxes owed to the Crown. Even today, in some jurisdictions, one need little more than to be older than 25 years and attend a 1-week training to be a coroner. According to Centers for Disease Control and Prevention (CDC) data, of the 28 states with county coroners, 22 states do not have a state medical examiner, and half do not require the coroner position to be held by a medical professional or an individual with certified credentials to conduct autopsies, such as pathology, toxicology, and forensic medicine.⁴

The accuracy of COD related to drugs is higher for medical examiners than for coroners. For example, the specific drug was not listed for 38% of death certificates in states with decentralized county coroner systems, compared with 8% in states with a statewide medical examiner system, leading to underestimates for death rates.³ Even in situations

where medical examiners are present, death investigations continue to be substantially underfunded and threaten the accuracy of COD data. Although toxicology is recommended for deaths involving drugs, limited resources often prevent the implementation of best practices.⁵ Instead of the recommended full toxicology panel, jurisdictions may use less accurate screening tests or limit the number of drug analogs tested. This has led to substantial heterogeneity in toxicology data, contributing to an insufficient recognition of the role of polysubstance use and failure to detect early trends in the penetration of synthetic opioids such as fentanyl in the illicit drug supply. Medical examiner budget cutbacks and other funding challenges have slowed the modernization—and thus the coordination and standardization—of data collection and have limited the ability of medical examiner offices to offer competitive salaries to a shrinking workforce, further promulgating job strain and conditions for data challenges.

SYSTEMATIC RACIAL BIAS

Research suggesting that improvements are needed in the surveillance of heroin-related deaths found that 26% of heroin cases among Black females were identified by standard surveillance processes, compared with 58% among White males.⁶ This research highlights the limitations of current surveillance standards and how biased COD data and surveillance protocols could be contributing to institutional racism and the systemic erasure of the needs of Black communities. Many jurisdictions do not provide timely, public-facing reports on overdose deaths by race,⁷ which has contributed to the oversimplification of the overdose crisis as a rural White problem. The underreporting of

Black deaths suggests that the racial/ethnic disparities in overdose deaths are likely worse than we realize.⁸ Similar findings for the inaccuracies of vital statistics data by race, including the missingness of the decedent's race altogether,⁹ and the challenges funeral directors face in specifying race,¹⁰ suggest that the designation of race is poorly understood, these issues are not exclusive to overdose, and broad-based solutions may be needed for in a population that is increasingly composed of people of color and multiracial.

The cause of racial differences in COD reporting errors is likely multifactorial. COD determination exists within a broader context of institutional racism and racial bias in clinical policy and practice.¹¹ Genomic research has unequivocally determined that race is not a biological categorization; yet, erroneous beliefs persist in the medical community about biological differences between Black and White individuals.¹² These biases are associated with clinical recommendations and how services are delivered.¹³ Recognizing signs that overdose may have occurred is also limited by the lack of foundational training provided by medical institutions for substance use disorder, despite its being a leading COD for unintentional injury.

THE WAY FORWARD

Given the issues of objectivity and racial bias that contribute to the inaccuracy of COD determinations, we believe that Merlin et al.'s recommendations are necessary but not sufficient. Although consensus on COD reporting can remove some of the need for certifier discretion, racial disparities will continue without attention to underlying reasons for the missingness of race and increased errors for people of color. We need

additional research to understand the most influential points of intervention to address the disparities in reporting. Standards must be set to ensure certifiers must possess the knowledge and skills needed to accurately determine COD, including the requirement for an appropriate board certification. Historic increases in overdose deaths and widening racial disparities in health, particularly among people of color, suggest medical institutions should include as core competencies basic knowledge of substance use disorder and an understanding of the role of racial bias in medicine. Resources must be directed to support the forensic workforce, which is likely further strained by the colliding COVID-19 and overdose crises.

Challenges with accuracy in reporting of overdose COD have tremendous implications for the nation's vital statistics data and our ability to understand one of our most pressing health challenges. A lack of validity threatens the inferences made by researchers and weakens the ability of health officials and other leaders to make data-informed decisions. In response, the CDC launched in 2019 the Overdose Data to Action in part to improve the surveillance of fatal and nonfatal overdoses. With jurisdictions across 47 states funded through Overdose Data to Action and CDC-led outreach to improve surveillance,¹⁴ there is some promise for improvements. However, the resources provided to address issues with overdose and COD data more broadly do not match the level of benefit these data provide to our nation's institutions. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Amanda Latimore, PhD, MA, American Institutes for Research, 6003 Executive Blvd, Ste 3000, Rockville, MD 20852 (e-mail: alatlmore@air.org). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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CONTRIBUTORS


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Oral Health in America: Removing the Stain of Disparity

Edited by: *Henrie M. Treadwell, PhD*
and *Caswell A. Evans, DDS, MPH*

Oral Health in America details inequities to an oral health care system that disproportionately affects the poor, those without insurance, underrepresented and underserved communities, the disabled, and senior citizens. This book addresses issues in workforce development including the use of dental therapists, the rationale for the development of racially/ethnically diverse providers, and the lack of public support through Medicaid, which would guarantee access and also provide a rationale for building a system, one that takes into account the impact of a lack of visionary and inclusive leadership on the nation's ability to insure health justice for all.

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Opportunities to Enhance the Utility of Cause of Death Information From Death Certificates

Shari M. Ling, MD, Margaret Warner, PhD, and Robert N. Anderson, PhD

ABOUT THE AUTHORS

Shari M. Ling is with the Centers for Medicare & Medicaid Services, Baltimore, MD. Margaret Warner is with the National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, MD. Robert N. Anderson is Chief, Mortality Statistics Branch, National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville.

 See also Merlin et al., p. S36, and Latimore et al., p. S39.

In this issue of *AJPH*, Merlin et al. (p. S36) describe the implications for improved reporting of cause of death (COD) as it applies to the opioid crisis. They go on to suggest that the current death certificate process forces a chain of linear, single diagnoses, and to suggest the enhancement of processes to improve the accuracy and validity of COD data. While a single, underlying cause is still desirable from a statistical standpoint to avoid double counting of deaths in tabulations, the authors are correct that the underlying cause does not always adequately describe the complexity of COD, especially for decedents with multiple comorbid diseases and other health conditions.

The National Center for Health Statistics (NCHS) releases public use mortality data files annually on the NCHS Web site, and also makes mortality data available through public, online platforms such as CDC's Wide Ranging Online Data for Epidemiologic Research (CDC WONDER; <https://wonder.cdc.gov>) and Web-based Injury Statistics Query and System (WISQARS; <https://www.cdc.gov/injury/wisqars/index.html>). The data that include death certificate information serve as the basis for the report by Merlin et al. The microdata files contain two sets of "multiple cause" codes in the microdata: (1) the entity axis codes that reflect what is actually reported on the certificate and that include coding to indicate on which line and in which position (first, second, etc.) the COD "entity" is reported, and (2) record axis codes that represent a processed version of the entity axis codes. Using the mortality microdata, specific diseases or conditions of interest may be identified as immediate, intermediate, or contributing. For example, if opioid overdose is reported anywhere on the death certificate, it is captured and included in the multiple cause codes. Nonetheless, there is opportunity to enhance the quality of COD information entered by certifiers. If an overdose is suspected, a medical examiner or coroner should investigate and certify the death. Physicians should also know how to report and certify deaths

generally. Current resources for death certification include handbooks, cause-specific reporting guidance (including for drug overdose deaths), a training module for COD certifiers (with continuing medical education and continuing nursing education credits), and a mobile app that serves as a quick reference guide.¹

The Centers for Medicare & Medicaid Services (CMS) provides health coverage to more than 170 million people through the Medicare, Medicaid, and the Children's Health Insurance Program, and the Health Insurance Marketplace programs,² with increasing heterogeneity in the beneficiary population served over time. The Medicare population alone has exhibited increasingly prevalent physical and mental health comorbid conditions that, individually or together, enhance risk of functional limitations and risk of death. Based on fee-for-service Medicare claims data, less than 5% Medicare fee-for-service beneficiaries with a diagnosis of substance use disorder, including alcohol or opioid use disorders, had that condition alone, while approximately 25% also had three or four other chronic conditions, with nearly 50% with five or more other chronic conditions; noting there is also variability over geographic region and time.³ Therefore, the underlying cause may not adequately convey the complexity of COD, especially for decedents with multiple comorbid diseases and other conditions, and populations in which comorbidities are highly prevalent. However, it is currently possible to examine how these conditions cluster on death certificates and may enable classification of death by disease process and comorbidities rather than simply underlying COD.

As highlighted by Merlin et al., mortality data can be used for a variety of purposes including outcomes of clinical research, impacts of public health interventions, and evaluation of health care policies. In addition, mortality and COD data may be useful in the evaluation and planning of health care service delivery and policy. The CMS provides payments for health care services and treatments to optimize beneficiary health outcomes. CMS authorized policies and programs rely on scientific evidence and data sources that contain outcome and process data to develop, implement, evaluate, and refine policy and program decisions. Mortality events are core indicators in CMS authorized programs and, in some instances, along with hospital admissions, readmissions, and emergency room visits, are considered indicators of the quality of care provided. Importantly, the underlying COD may be different from the terminal condition and may be challenging to ascertain in highly multimorbid populations, as would be the case for Medicare and Medicaid dually eligible populations.⁴

Quality measurement is a strategic and impactful policy tool that increasingly relies on electronic health records and other technical capabilities. Hospitals, professionals, and clinicians already use electronic clinical quality measures (eCQMs)⁵ to provide feedback on their care systems and to inform quality improvement initiatives. As with other areas of focus under way, eCQMs could be developed to assess the quality of health care provided to people with behavioral health conditions who may be at risk for substance use disorder- and opioid use disorder-related death. Detailed clinical data needed to support COD reporting of “underlying” COD conditions, and

that can interface with the COD databases with indicators for immediate and contributing diagnoses, could be identified and standardized to assess clinical effectiveness and quality of services delivered by health care providers and organizations.

The CMS and other federal agencies use eCQMs in a variety of provider-level quality reporting and value-based purchasing programs, as does the Joint Commission and commercial payers in programs that track and reimburse providers based on quality reporting. Capabilities such as the FHIR (Fast Healthcare Interoperability Resources) and API (Application Program Interface) have the potential to further promote data interoperability for standardized transmission of clinical data while reducing administrative burden. Other federal efforts are under way that could enhance quality of COD and behavioral health data. The Centers for Disease Control and Prevention’s (CDC’s) Data Modernization Initiative is taking a comprehensive approach in transforming data to better support public health surveillance⁶ with specific improvements to include vital statistics modernization through national health statistics networks.⁷ The United States Core Data for Interoperability (USCDI)⁸ is a standardized set of health data classes and constituent data elements for nationwide, interoperable health information exchange. Information relevant to COD may be included across USCDI data classes of clinical notes, social history, and harmful substance use. An immediate opportunity is to delineate the data elements that support COD that are critical for the exchange of information across the purposes mentioned above. Linkages of death certificate data with electronic health record and Medicare data may

also provide additional information that can inform how people die.

Taken together, the aforementioned efforts could eventually enable access to real-time data for timely bedside quality improvement including clinical decision support with less administrative burden of manual abstraction and reporting for providers and clinicians, and could collectively support the newly announced US Department of Health and Human Services (HHS) coordinated response to prevent overdoses⁹ and improve behavioral health. In addition to providing enhanced mortality surveillance and statistics, CDC data sources and data modernization efforts can synergize with CMS authorized policies and programs including coverage, quality measurement, and value-based alternative payment models to enable improvement of behavioral health care for the people with pain, behavioral health issues, opioid use disorder, and substance use disorder as envisioned across HHS. **AJPH**

CORRESPONDENCE

Correspondence should be sent to Shari M. Ling, MD, Deputy Chief Medical Officer, Centers for Medicare and Medicaid Services, 7500 Security Blvd Mail Stop S3-02-01, Baltimore MD 21244-1850 (e-mail: shari.ling@cms.hhs.gov). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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


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A Multicentered Randomized Controlled Trial Comparing the Effectiveness of Pain Treatment Communication Tools in Emergency Department Patients With Back or Kidney Stone Pain

Zachary F. Meisel, MD, MPH, MSHP, Frances Shofer, PhD, Abby Dolan, MPH, Erica B. Goldberg, MSW, Karin V. Rhodes, MD, MS, Erik P. Hess, MD, MSc, Venkatesh R. Bellamkonda, MD, Jeanmarie Perrone, MD, Carolyn C. Cannuscio, ScD, Lance Becker, MD, Melissa A. Rodgers, MEd, Michael M. Zyla, BS, Jeffrey J. Bell, RN, Sharon McCollum, Eden Engel-Rebitzer, BA, Max Jordan Nguemini Tiako, MD, MS, Greg Ridgeway, PhD, and Marilyn M. Schapira, MD, MPH

 See also Keefe, p. S9, and Altshuler, p. S12.

Objectives. To compare the effectiveness of 3 approaches for communicating opioid risk during an emergency department visit for a common painful condition.

Methods. This parallel, multicenter randomized controlled trial was conducted at 6 geographically disparate emergency department sites in the United States. Participants included adult patients between 18 and 70 years of age presenting with kidney stone or musculoskeletal back pain. Participants were randomly assigned to 1 of 3 risk communication strategies: (1) a personalized probabilistic risk visual aid, (2) a visual aid and a video narrative, or 3) general risk information. The primary outcomes were accuracy of risk recall, reported opioid use, and treatment preference at time of discharge.

Results. A total of 1301 participants were enrolled between June 2017 and August 2019. There was no difference in risk recall at 14 days between the narrative and probabilistic groups (43.7% vs 38.8%; absolute risk reduction = 4.9%; 95% confidence interval [CI] = -2.98, 12.75). The narrative group had lower rates of preference for opioids at discharge than the general risk information group (25.9% vs 33.0%; difference = 7.1%; 95% CI = 0.64, 0.97). There were no differences in reported opioid use at 14 days between the narrative, probabilistic, and general risk groups (10.5%, 10.3%, and 13.3%, respectively; $P = .44$).

Conclusions. An emergency medicine communication tool incorporating probabilistic risk and patient narratives was more effective than general information in mitigating preferences for opioids in the treatment of pain but was not more effective with respect to opioid use or risk recall.

Trial Registration. ClinicalTrials.gov identifier: NCT03134092. (*Am J Public Health.* 2022;112(S1):S45-S55. <https://doi.org/10.2105/AJPH.2021.306511>)

Opioid use disorder (OUD) in the United States is a public health crisis, responsible for more than 70 000

overdose deaths per year and \$78.5 billion in health and social costs annually from prescription opioids alone.^{1,2}

Almost 218 000 people in the United States died from overdoses related to prescription opioids between 1999 and

2017.³ Many patients with chronic pain and prescription opioid use were originally prescribed this class of medication for an acutely painful condition.⁴

The emergency department (ED) represents the interface between health care systems and the communities in which they are situated. With 42% of ED visits related to pain, acute care settings are vital locations for providers and patients to manage pain while avoiding the risk of future misuse of opioids.⁵ Conversion to prolonged opioid use can occur after even a single index emergency department visit for acute pain.⁶ Risk factors for OUD after an initial prescription include younger age; a history of illicit drug use, tobacco use, alcohol misuse, or childhood sexual abuse; and a family history of drug or alcohol use disorder or behavioral health conditions such as depression, anxiety, or post-traumatic stress disorder.⁷

ED care is a lens into the overlapping public health crises of pain treatment and substance use disorder. In practice, providers may make therapeutic decisions, particularly about prescription analgesia, without engaging patients about their individual risks, benefits, preferences, and values. Although EDs typically distribute generic written information about risks related to procedures and treatment plans on discharge, this is not always an effective strategy. An ED randomized controlled trial demonstrated that a fact-based, literacy-appropriate information sheet alone did not improve patients' knowledge or safe use of opioid analgesics relative to usual care.⁸ Moreover, when providers do discuss analgesics with patients, the communication rarely addresses the long-term risks of opioid prescribing, including substance use disorder.^{9,10} Likewise, although probability-based tools have

been established as a way to communicate information about harms and benefits to patients facing medical decisions,¹¹ they often lack individualized estimates that prompt patients to consider their own risk.

Narratives can be defined as illustrative stories about personal experiences.¹² They provide information about scene and characters, raise unanswered questions or unresolved conflicts, and provide a resolution.¹³ In addition, narratives have been noted to improve communication of health information by holding people's attention and "transporting" their mental state.¹⁴ Narratives have also been shown to help clarify the values and trade-offs associated with risk in a more relatable manner than statements of risk or numerical facts alone.¹⁵ When incorporated into decision aids, narratives have been found to affect judgments and decisions.¹²

Communicating risk via narratives has also been demonstrated to benefit subgroups at lower levels of education, literacy, and numeracy.¹⁵⁻¹⁸ For example, prior research has shown that these types of decision aids are associated with self-advocacy and lower decisional conflict among patients with low literacy.¹⁹ However, the role of narratives in communicating risk and improving evidence-based pain treatment in acute care settings has not been evaluated in a comparative manner.^{13,14,20} In particular, communication of opioid risk—without worsening untreated pain—is important in light of the contribution of prescription opioid use to the opioid epidemic.

Kidney stone pain and back pain are common reasons for presentation to an ED with moderate or severe acute or subacute pain.^{21,22} Treatment of these painful conditions can include

nonopioids, opioids, or both.²¹⁻²³ On the basis of the prevalence of, variations in care for, and severity of pain related to these conditions, our study team selected acute renal colic pain and acute musculoskeletal back pain as the most appropriate model conditions to evaluate a risk communication approach to treating patients with pain in acute care settings.²¹⁻²³

We conducted the Life Stories for Opioid Risk Reduction in the ED (Life STORRIED) study to test whether a risk tool—communicated to patients during an ED visit for acute low back or kidney stone pain—that incorporates a patient's individualized risk assessment regarding opioid misuse with and without a story-based video narrative can improve patient-centered outcomes. Outcomes assessed included risk recall, preference for opioids, and use of opioids among patients with musculoskeletal back or kidney stone pain presenting to the ED.

METHODS

This study was a multicentered, parallel randomized controlled trial. Patients presenting to 4 United States EDs with kidney stone or musculoskeletal back pain were eligible for enrollment.

Study Setting

Patients were recruited from EDs or ED observation units in 4 United States hospital centers. These centers were selected to capture geographically and ethnically diverse patient populations and clinical practices.

Participants

All patients between the ages of 18 and 70 years who presented to participating

study sites with chief complaints suggestive of kidney stone or musculoskeletal back pain (during the hours when study coordinators were available) were screened for eligibility to participate in the trial. To be included, participants had to be able to provide informed consent, be able to communicate in English, and have access to a smartphone or e-mail account. Patients were enrolled only if the treating provider anticipated discharge within 24 hours with a diagnosis of kidney stone or musculoskeletal back pain.

Individuals in police custody, those known to be pregnant, those under the influence of illicit drugs or alcohol, those identified as suicidal or homicidal, and those identified as mentally or cognitively unstable (as determined by the treating provider) were excluded from the trial. We also excluded people unable to take opioids or nonsteroidal anti-inflammatory medications, those with chronic kidney disease (glomerular filtration rate < 60 mL/min/1.73 m³), and those who had used opioid medications in the preceding 30 days (with the exception of those using such medications within 48 hours of the visit for the current condition). Finally, we excluded patients who exhibited evidence of drug-seeking behavior, as determined by the treating provider.

Eligible participants were randomly assigned in a 1:1:1 ratio to receive opioid risk information in the form of generalized risk information (GRI), a personalized probabilistic risk tool (PRT), or a narrative enhanced probabilistic risk tool (NE-PRT).

Generalized risk information. In addition to standard ED discharge instructions, all study participants were provided a generalized, fact-based risk information sheet on kidney stone or

back pain according to their chief complaint. The risk sheet included information on benefits, side effects, and risks of various analgesic options, including opioids.²⁴ The group that received only GRI was the de facto control group.

Probabilistic risk tool. The personalized PRT is a risk communication intervention derived from the previously validated Opioid Risk Tool (ORT).²⁵ The ORT is designed to assess the risk of OUD among patients for whom an opioid prescription is being considered in outpatient settings. It has been validated among patients presenting to a pain clinic setting.²⁵ The ORT considers multiple clinical and experiential factors in assessing risk of future opioid misuse and reports risk on a scale of 0 to 26, divided into 3 categories.²⁵ Using iterative development incorporating patient feedback (as previously described),²⁴ we developed a visual tool that displayed both the individualized numerical probability of opioid misuse and an individualized overall risk category shown on a color-coded visual thermometer. Tool development followed best practices for risk communication in the context of decision support as described in the International Patient Decision Aid Standards.²⁶ The prototype was also informed by our team's previous work in identifying patient²⁷ and provider²⁸ perspectives on this topic.

Narrative enhanced probabilistic risk tool. The NE-PRT was designed through an iterative process in which our research team combined the PRT with a choice of viewing up to 8 short video narratives of real patients' stories. Each video shared a personal story that included the use of opioids for pain and, in some cases, resultant OUD. The 8 narratives were recorded by

professional videographers and edited to balance negative and positive experiences with pain treatment, including treatment with opioids. The narratives included speakers with varying gender, age, and racial backgrounds. The narratives were intended to maximize the known properties of narrative communication,¹²⁻¹⁴ tested through an iterative feedback process that included patient investigators and patient advisors, and described in detail in a previous publication.²⁴ If randomized into the NE-PRT group, a study participant could select and view between 1 and 8 narrative vignettes within an elapsed time of 1 to 3 minutes. All interventions were administered during the ED visit.

Outcomes

We tested the impact of the risk communication strategies for postvisit pain treatment on outcomes that were determined to be meaningful, important to patients, and relevant to other stakeholders such as providers and health policy decision makers. We identified patient-centered reportable outcomes with input from our patient investigators and a community and patient family engagement team. During our discovery process (described elsewhere), we found that knowledge of individual risk and reduced preference for and use of potentially addictive medications were of greatest importance to patients.²⁴ This informed our primary outcomes of risk recall, opioid use, and preferences for analgesia at discharge. Outcomes were assessed via text or e-mail message-based surveys.

Primary outcomes. As noted, the pre-specified main outcomes of this trial were risk recall, opioid use, and

analgesia preferences. Risk recall was assessed in 2 ways. First, participants were asked to indicate the category of their risk (at risk, high risk, or highest risk). This outcome was assessed only in the PRT and NE-PRT groups as these were the only participants who received their risk score as part of an active intervention. Second, participants were queried at days 1 to 2, 4 to 6, 14, and 90 after discharge to report their opioid use per day ("How many opioid pills have you taken in the last 24 hours?"). Because opioids may have been prescribed beyond the index ED visit in which the study was performed, our primary opioid use outcome was a dichotomous measure of whether or not patients reported taking opioids at day 14. Patient preference for pain control (opioids vs no opioids as a postdischarge prescription) was measured during the initial encounter (after randomization and exposure to the interventions).

Secondary outcomes. The prespecified secondary outcomes assessed were patient participation in the pain treatment decision, satisfaction with pain treatment, and alignment between patients' preferences and providers' decisions. We assessed patient participation in the pain treatment decision with the CollaboRATE scale²⁹ and the American Pain Society's shared decision-making measure.³⁰ Outcomes related to overall patient satisfaction with pain treatment were assessed with the American Pain Society's Patient Outcome Questionnaire.³⁰ These outcomes were assessed 1 day after ED discharge. The outcome of alignment was measured as the provision of a prescription for the patient's preferred analgesic class at discharge. These secondary outcomes, although

predetermined, were intended only for generating hypotheses.

Sample Size Determination

Sample size was based on differences in self-reported opioid use between the PRT and NE-PRT groups, as prespecified by the patient and investigator team according to known variations in prescription opioid use for kidney stone and back pain.^{21-23,31} We used a 2-sided likelihood ratio test with an overall predicted initial sample size of 1100 participants (a number that was increased to 1300 midstudy as a result of lower-than-expected response rates at day 14) to achieve 80% power at a .05 significance level and detect a minimum 8% to 10% reduction in opioid use when the proportion of PRT group participants not taking opioids at 14 days was 0.70 and the loss to follow-up rate was 25% to 30% (approximately $n = 300$ per study arm).

In the case of risk recall, with sample sizes of 300 in the PRT and NE-PRT groups, we could detect a minimum difference of 11% assuming that PRT group recall ranged from 40% to 50%. With respect to preference for an opioid medication, we could detect a minimum difference between 7% and 9% assuming that preference in either the PRT or GRI group ranged from 20% to 35%.

Enrollment Protocol and Data Collection

The detailed enrollment and data collection protocol for Life STORRIED has been described elsewhere.²⁴ All outcome data were collected through a secure, self-reporting Web portal and electronic database.³² Electronic consent and simple unblinded randomization within strata and hospital centers

were conducted automatically during enrollment via computer-generated random numbers. Participants randomized into the PRT and NE-PRT arms were given a tablet device during their clinical encounter that displayed a graphic indicating that they were at 1 of the 3 risk levels for long-term opioid use on the basis of their ORT score. For participants randomized to the NE-PRT group, the tablet displayed the same graphic followed by a menu of narratives that included a picture of the storyteller sharing his or her own story. When selected on the touch screen, each narrative would play as a video. Baseline and outcome data were collected at day 0 and on follow-up days 1 to 7, 14, and 90. Patients were enrolled until recruitment targets were met.

Analysis

Correct recall by participants of their ORT risk category at 14 days was classified as concordant, and rates of concordance were compared between the PRT and NE-PRT groups. Opioid preference at discharge, reported opioid use at 14 days, and alignment between patient preference and provider prescription were assessed via the χ^2 or Fisher exact test. We used analysis of variance, with Tukey-Kramer tests for post hoc pairwise comparisons to adjust for type I error, to determine differences between the PRT and NE-PRT groups with respect to satisfaction with pain treatment (Patient Outcome Questionnaire; 0-10 scale), patient shared decision-making (CollaboRATE; 0-9 scale), and the question "Were you allowed to participate in decisions about your pain treatment as much as you wanted to?" (Patient Outcome Questionnaire; 0-10 scale).

To account for missing data at various follow-up time points, we used a mixed-effects model to capture correlations between completed responses at different time periods. Because some respondents had missing values for 1 time period, correlations between completed responses at different periods allowed us to use respondents' answers at other periods to infer what those missing values might have been.

Numeric data are presented as means and standard deviations or medians and interquartile ranges. SAS statistical software (SAS Institute Inc, Cary, NC) was used in performing all analyses.

RESULTS

A total of 1301 patients were enrolled between June 2017 and August 2019; 434 were randomized to GRI only, 434 were randomized to the PRT group, and 433 were randomized to the NE-PRT group. Patients' mean age was 40 years (SD = 14); 53% were female, 43% were White, and 38% were Black; 75% were in the back pain group; and 25% were at high or highest risk of OUD according to the ORT (Table 1). We collected data on follow-up self-reported outcomes from 1132 of the study participants; 957 participants (73.5%) completed the day 14 survey, and 855 (65.7%) completed the day 90 survey (Figure 1). Relative to those who did not complete the day 14 survey, the day 14 respondents were similar in terms of site of enrollment, condition, gender, race, education, and baseline ORT risk score. The mixed-effects model adjusting for missing data did not reveal any significant differences across the primary and secondary outcomes.

Primary Outcomes

Accurate risk recall (concordance with the ORT risk category) at 14 days after ED discharge was similar in the PRT and NE-PRT groups (38.8% and 43.7%, respectively; absolute difference = 4.9%; 95% confidence interval [CI] = -3.0, 12.8; Table 2). In a stratified analysis by ORT risk category, the narrative group demonstrated a higher level of recall than the probabilistic-only group (39.5% vs 19.2%; absolute difference = 20.4%; 95% CI = 1.1, 38.8).

Rates of preference for opioids were lower among NE-PRT participants than among GRI participants (25.9% vs 33.0%; difference = 7.0; 95% CI = -13.1, -1.0; Table 2). After control for triage pain score, the GRI group had higher odds of preferring an opioid than the NE-PRT group (adjusted OR = 1.36; 95% CI = 1.007, 1.823; $P = .044$). Although 23% of participants received an opioid prescription at discharge from the enrollment visit, overall reported use of any opioids at day 14 was low (11.4%) among all groups, with no significant between-group differences (Table 2). Opioid use at 90 days (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>) and time to no opioid use (Table B, available as a supplement to the online version of this article at <http://www.ajph.org>) among those who were given an ED prescription did not differ between assignment groups. Among those who were taking opioids, the amounts taken 48 hours after discharge did not differ significantly according to self-reported pill counts (Table C and Figure A, available as supplements to the online version of this article at <http://www.ajph.org>).

Secondary Outcomes

When surveyed at day 1 (the day after enrollment), the NE-PRT group reported greater satisfaction with pain treatment (7.3 on the 0–10 scale) than the PRT (6.6; $P = .006$) and GRI (6.6; $P = .009$) groups. However, these differences were not present when the probabilistic group was compared with the general risk group, and they dissipated on future follow-up days (Table 3). NE-PRT participants scored higher on the American Pain Society shared decision-making measure than GRI participants (mean scores of 7.28 and 6.52, respectively; difference = 0.76; 95% CI = 0.07, 1.45; Table 3). The difference in point estimates on the CollaboRATE measure of shared decision-making did not reach statistical significance (difference = 0.39; 95% CI = -0.05, 0.83). Alignment (percentage agreement for class of analgesia) between stated patient preference and prescription received at discharge did not vary significantly between the 3 communication strategies (Table 3).

DISCUSSION

In a randomized trial of patients presenting with back or kidney stone pain, we found no overall difference between groups on accuracy of risk recall, self-reported opioid use, alignment of patient preferences with provider prescriptions, or rates of self-reported opioid use after discharge. However, risk recall was highest among high-risk participants in the narrative enhanced arm. We did find that a communication tool with narrative and probabilistic risk information was more effective than general risk information in decreasing preferences for opioid prescriptions at

TABLE 1— Baseline Characteristics of 1301 Participants in a Randomized Controlled Trial of 3 Strategies for Communicating Opioid Prescription Risk to Adult Emergency Departments With Acute Kidney Stone and Back Pain: Life STORRIED Study, United States, 2017–2019

Demographic	GRI (n = 434), No. (%), Mean ±SD, or Median (IQR)	PRT (n = 434), No. (%), Mean ±SD, or Median (IQR)	NE-PRT (n = 433), No. (%), Mean ±SD, or Median (IQR)
Site			
University of Pennsylvania Health System	139 (33.2)	139 (33.2)	141 (33.7)
Northwell Health	173 (33.8)	171 (33.4)	168 (32.8)
Mayo Clinic	79 (33.5)	77 (32.6)	80 (33.9)
University of Alabama, Birmingham	43 (32.1)	47 (35.1)	44 (32.8)
Age, y	40.2 ±13.9	41.2 ±14.1	40.32 ±13.8
Gender			
Female	224 (51.6)	229 (52.8)	239 (55.2)
Male	210 (48.4)	203 (46.7)	193 (44.6)
Other	0 (0)	2 (0.5)	1 (0.2)
Race			
Black/African American	175 (40.6)	156 (36.0)	167 (38.7)
White	180 (41.8)	190 (43.9)	185 (42.8)
Other/multiracial	76 (17.6)	87 (20.1)	80 (18.5)
Ethnicity			
Hispanic/Latinx	47 (10.9)	45 (10.4)	48 (11.1)
Non-Hispanic	385 (89.1)	387 (89.6)	383 (88.9)
Educational attainment			
< high school	29 (6.7)	25 (5.8)	31 (7.2)
High school or equivalent	131 (30.3)	117 (27.0)	137 (35.6)
Some college/2-year degree	137 (30.3)	138 (31.8)	119 (27.6)
Bachelor's degree	88 (20.4)	95 (21.9)	89 (20.6)
Graduate or professional school	47 (10.9)	59 (13.6)	56 (13.0)
Type of pain			
Back/neck	337 (77.7)	329 (75.8)	336 (77.6)
Kidney stone	97 (22.3)	105 (24.2)	97 (22.4)
Risk tool score			
At risk	312 (71.9)	328 (75.6)	327 (75.5)
High risk	74 (17.0)	60 (13.8)	65 (15.0)
Highest risk	48 (11.1)	46 (10.6)	41 (9.5)
Opioids given in emergency department	125 (29.1)	118 (27.4)	100 (23.1)
Average pain score (0–10)	6.8 ±2.2	6.7 ±2.2	6.5 ±2.2
Length of stay, hours	3.9 (2.7–5.8)	3.9 (2.8–6.2)	3.7 (2.7–5.2)
Subjective numeracy scale score (1–6)	4.2 ±1.2	4.3 ±1.1	4.2 ±1.1
Health literacy score (0–12)	7.1 ±1.6	7.2 ±1.7	7.2 ±1.6

Note. GRI = generalized risk information; IQR = interquartile range; Life STORRIED = Life Stories for Opioid Risk Reduction in the Emergency Department; NE-PRT = narrative enhanced probabilistic risk tool; PRT = probabilistic risk tool.

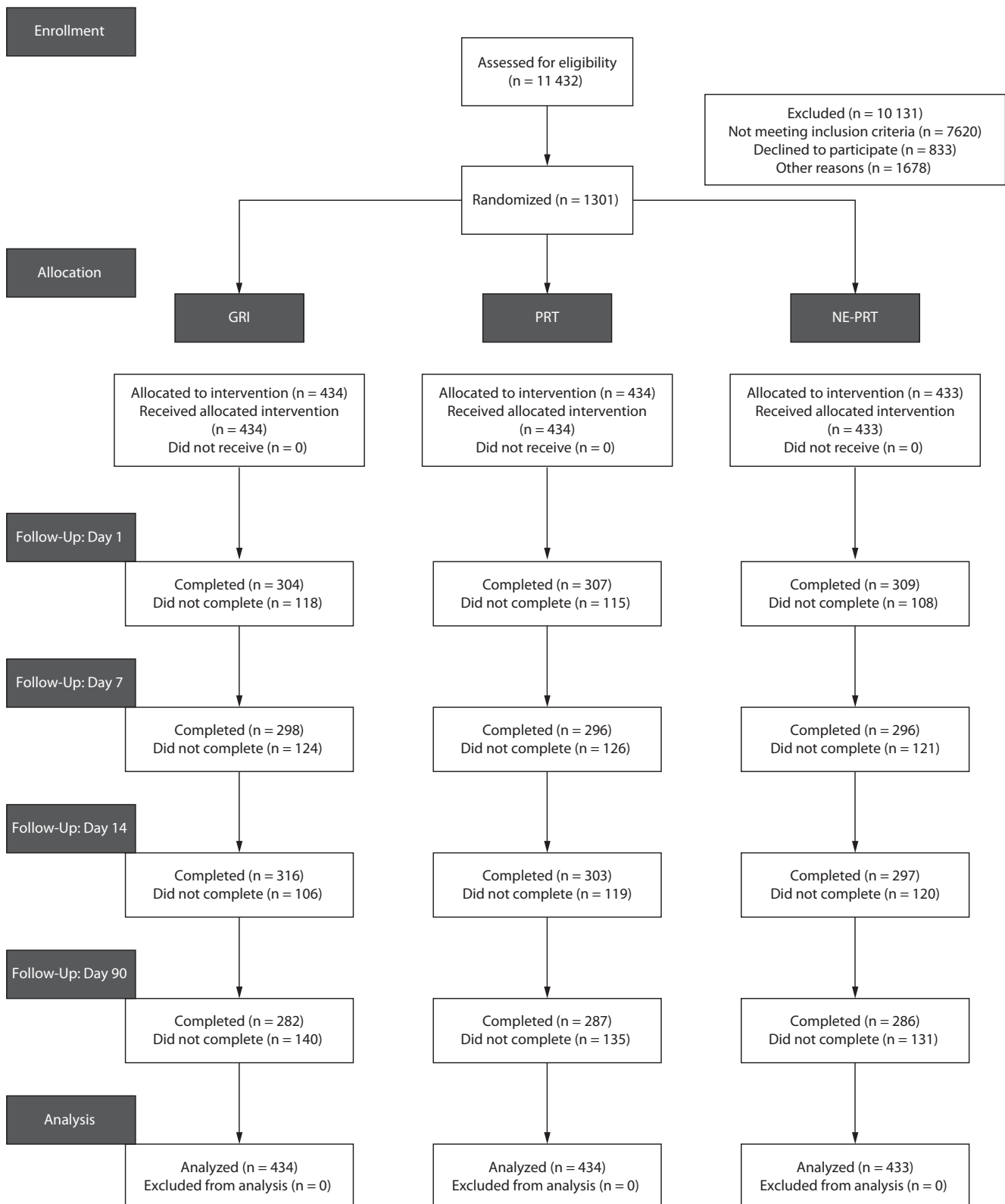


FIGURE 1— CONSORT Flow Diagram for Randomized Trial Participants: Life STORRIED Study, United States, 2017-2019

Note. GRI = generalized risk information; Life STORRIED = Life Stories for Opioid Risk Reduction in the Emergency Department; NE-PRT = narrative enhanced probabilistic risk tool; PRT = probabilistic risk tool.

TABLE 2— Risk Recall, Postdischarge Opioid Use, and Preference for Opioid Medication Outcomes: Life STORRIED Study, Day 14 Survey, United States, 2017–2019

Outcome	No.	GRI, No. (%)	PRT, No. (%)	NE-PRT, No. (%)	NE-PRT vs PRT, Δ (95% CI)	NE-PRT vs GRI, Δ (95% CI)	PRT vs GRI, Δ (95% CI)
Risk recall at 14 d							
All	599		118 (38.8)	129 (43.7)	4.91 (−3.0, 12.8)		
At risk	450		105 (46.5)	105 (46.9)	0.42 (−8.8, 9.6)		
High risk	90		9 (19.2)	17 (39.5)	20.4 (1.1, 38.8) ^a		
Highest risk	59		4 (12.9)	7 (25.0)	12.1 (−9.0, 33.7) ^a		
Taking opioids at 14 d ^a	912	42 (13.3)	31 (10.3)	31 (10.5)	0.2 (−4.7, 5.3)	−2.71 (−7.90, 2.50)	−2.95 (−8.1, 2.2)
Preference for any opioid medication at baseline	1301	143 (33.0)	123 (28.3)	112 (25.9)	−2.4 (−8.3, 3.5)	−7.00 (−13.1, −1.0)	−4.61 (−10.7, 1.5)

Note. CI = confidence interval; GRI = generalized risk information; Life STORRIED = Life Stories for Opioid Risk Reduction in the Emergency Department; NE-PRT = narrative enhanced probabilistic risk tool; PRT = probabilistic risk tool.

^aDifferences were assessed via the Fisher exact test.

discharge and increasing satisfaction with pain management 1 day after discharge. When measured via a pain-specific scale, reported levels of shared decision-making were higher in the NE-PRT group than in the general risk group.

This study builds on prior investigations of education and decision support interventions for pain management in the ED setting. In a randomized controlled trial of patients discharged from the ED with a prescription for opioids, an information sheet describing the risks associated with opioids increased patients' knowledge and decreased their reports of driving while on pain medication in comparison with a control group.⁸ In a pilot randomized controlled trial of patients presenting to the ED with acute pain, a Web-based decision aid for pain management was found to increase subjective knowledge and decrease decisional conflict (but not shared decision-making) relative to

a control group.³³ Our study is the first we are aware of to assess the comparative effectiveness of a narrative or probabilistic risk communication tool for pain management in the ED in terms of risk awareness, preference for opioids, and patient satisfaction with pain management.

The Life STORRIED study explored the novel use of narratives in combination with probabilistic risk information. The intervention was aimed at increasing informed shared decision-making using narratives that provide a context to experiences of acute pain and sequelae of treatment. Although the goal was not necessarily for these tools to dissuade patients from taking opioids, we hypothesized that, at a population level, informed decision-making would lead to a decrease in preference for opioids and opioid use overall. Narratives are currently being used by national organizations such as the Centers for Disease Control and Prevention

to communicate the risks and benefits of opioid prescriptions to providers as well as patients and their families.³⁴ Our findings offer limited support for the use of narratives in efforts to navigate the twin epidemics of OUD and pain.

Limitations

This study involved several limitations. For example, not all participants had complete data. Although only 170 of the 1301 participants were completely lost to follow up, 345 did not complete the survey at day 14. Social desirability bias could have influenced the way respondents reacted to the narrative videos. Although the narratives were true stories told by individuals who had experienced pain and challenges with opioids, they may have been perceived as allegories, and thus participants may have responded to the surveys according to the perceived moral as opposed

TABLE 3— Satisfaction, Shared Decision-Making, and Alignment With Provider Treatment Decision Outcomes: Life STORRIED Study, Surveys at Day 1, Day 7, and Day 14, United States, 2017–2019

Outcome	No.	GRI, Mean (95% CI) or No. (%)	PRT, Mean (95% CI) or No. (%)	NE-PRT, Mean (95% CI) or No. (%)	NE-PRT vs PRT, Δ (95% CI)	NE-PRT vs GRI, Δ (95% CI)	PRT vs GRI, Δ (95% CI)
Satisfaction with pain control ^a							
1 d	924	6.57 (6.21, 6.93)	6.58 (6.22, 6.94)	7.25 (6.89, 7.61)	0.67 (0.06, 1.28)	0.69 (0.08, 1.29)	0.02 (–0.59, 0.62)
7 d	894	6.50 (6.12, 6.88)	6.49 (6.11, 6.87)	6.92 (6.54, 7.30)	0.43 (–0.21, 1.08)	0.42 (–0.22, 1.07)	–0.13 (–0.65, 0.63)
14 d	913	6.58 (6.20, 6.96)	6.56 (6.17, 6.95)	6.82 (6.43, 7.21)	0.26 (–0.40, 0.92)	0.24 (–0.41, 0.89)	–0.02 (–0.67, 0.63)
APS shared decision-making at day 1 ^a	924	6.52 (6.11, 6.92)	6.87 (6.47, 7.28)	7.28 (6.87, 7.69)	0.41 (–0.28, 1.10)	0.76 (0.07, 1.45)	0.35 (–0.33, 1.04)
CollaboRATE shared decision-making at day 1 ^a	926	6.83 (6.57, 7.09)	7.07 (6.81, 7.33)	7.22 (6.96, 7.48)	0.15 (–0.29, 0.59)	0.39 (–0.05, 0.83)	0.24 (–0.20, 0.68)
Alignment of patient preference with provider prescription	1299	286 (65.9)	300 (69.3)	303 (70.1)	0.8 (–5.3, 7.0)	4.2 (–2.0, 10.4)	3.4 (–2.9, 9.5)
Alignment if given opioid prescription	296	43 (47.3)	49 (45.3)	40 (41.2)	–4.1 (–17.5, 9.5)	–6.0 (–20.0, 8.2)	–1.9 (–15.7, 11.9)
Alignment if not given opioid prescription	1003	243 (70.9)	251 (77.2)	263 (78.5)	1.3 (–5.1, 7.6)	7.7 (1.1, 14.2)	6.4 (–0.3, 13.0)

Note. APS = American Pain Society; CI = confidence interval; GRI = generalized risk information; Life STORRIED = Life Stories for Opioid Risk Reduction in the Emergency Department; NE-PRT = narrative enhanced probabilistic risk tool; PRT = probabilistic risk tool. Pairwise comparisons for differences between means were performed with the Tukey–Kramer test. Proportions were calculated via the χ^2 test with the exception of the alignment category, in which the Fisher exact test was used.

^aScored as a scale, with 0 = not at all, 10 = very much.

to reflecting on greater knowledge or awareness of risk.

In addition, our findings may not apply to other opioid prescribing contexts. The ORT was designed for outpatient use among patients for whom opioids are being considered for pain treatment; however, no ED scale has been validated for pure opioid risk stratification among patients presenting with acute chronic pain or flare-ups. This study was underpowered to detect a smaller than 8% absolute difference in opioid use at 14 days with statistical significance. Finally, we excluded patients who did not have access to a smartphone or e-mail, potentially limiting the generalizability of our findings. However,

studies have demonstrated that approximately 95% of US ED patients have mobile or smartphone access.³⁵

Public Health Implications

The public health implications of this patient-centered risk communication study may help shape efforts to develop and implement communication strategies that navigate the challenges of individual clinical care in the setting of broader public health dilemmas. The combination of numerical and narrative data may have the power to communicate a variety of trade-offs at the intersection of patient-centered and population-based care. [AJPH](#)

ABOUT THE AUTHORS

Zachary F. Meisel, Frances Shofer, Abby Dolan, Erica B. Goldberg, Melissa A. Rodgers, Michael M. Zyla, Jeffrey J. Bell, Sharon McCollum, Eden Engel-Rebitzer, and Max Jordan Nguemeni Tiako are with the Center for Emergency Care Policy and Research, Department of Emergency Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia. Karin V. Rhodes is with the Agency for Healthcare Research and Quality, Bethesda, MD. Erik P. Hess is with the Vanderbilt University School of Medicine, Department of Emergency Medicine, Nashville, TN. Venkatesh R. Bellamkonda is with the Department of Emergency Medicine, Mayo Clinic Alix School of Medicine, Rochester, MN. Jeanmarie Perrone is with the Center for Addiction Medicine and Policy, University of Pennsylvania. Lance Becker is with the Department of Emergency Medicine, Zucker School of Medicine at Hofstra/Northwell, New York, NY. Carolyn C. Cannuscio is with the Center for Public Health Initiatives, University of Pennsylvania. Greg Ridgeway is with the Department of Criminology, University of Pennsylvania. Marilyn M. Schapira is with the Center for Health Equity and Research Promotion, Philadelphia VA Medical Center.

CORRESPONDENCE

Correspondence should be sent to Zachary F. Meisel, MD, MPH, MSHP, Center for Emergency Care Policy and Research, Department of Emergency Medicine, Perelman School of Medicine, University of Pennsylvania, 523 Guardian Dr, Suite 413, Philadelphia, PA 19104 (e-mail: zfm@penmedicine.upenn.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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CONTRIBUTORS

Z. F. Meisel, F. Shofer, K. V. Rhodes, E. P. Hess, J. Perrone, C. C. Cannuscio, M. A. Rodgers, M. M. Zyla, J. J. Bell, S. McCollum, and M. M. Schapira originated the study. Z. F. Meisel, F. Shofer, A. Dolan, E. B. Goldberg, K. V. Rhodes, E. P. Hess, V. R. Bellamkonda, Lance Becker, and M. M. Schapira executed the study and conducted and supervised participant enrollment. Z. F. Meisel, F. Shofer, A. Dolan, and E. B. Goldberg oversaw data acquisition and data integrity. Z. F. Meisel, F. Shofer, A. Dolan, E. Engel-Rebitzer, M. J. N. Tiako, G. Ridgeway, and M. M. Schapira conducted the analysis. Z. F. Meisel, F. Shofer, A. Dolan, E. B. Goldberg, and M. M. Schapira wrote the initial draft with input from all of the other authors.

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CONFLICTS OF INTEREST

The authors report no relevant competing interests.

HUMAN PARTICIPANT PROTECTION

This study was approved by the institutional review boards of the University of Pennsylvania, the Mayo Clinic, and the University of Alabama at Birmingham. All participants provided electronic or written informed consent.

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Racism: Science & Tools for the Public Health Professional

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Chandra L. Ford, PhD
Derek M. Griffith, PhD
Marino A. Bruce, PhD
and Keon L. Gilbert, DrPH

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This important publication builds on the racial health equity work that public health advocates and others have been doing for decades. They have documented the existence of health inequities and have combatted health inequities stemming from racism. This book, which targets racism directly and includes the word squarely in its title, marks an important shift in the field's antiracism struggle for racial health equity. It is intended for use in a wide range of settings including health departments, schools, and in the private, public, and nonprofit sectors where public health professionals work.

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Chronic Pain and Opioid Prescribing: Three Ways for Navigating Complexity at the Clinical–Population Health Interface

Abhimanyu Sud, MD, CCFP, Daniel Z. Buchman, PhD, MSW, Andrea D. Furlan, MD, PhD, Peter Selby, MBBS, CCFP, MHSc, Dip ABAM, Sheryl M. Spithoff, MD, MSc, and Ross E. G. Upshur, MD, MA, MSc, CCFP

 See also Doctor and Sullivan, p. S15, and Nicholson, p. S18.

Clinically focused interventions for people living with pain, such as health professional education, clinical decision support systems, prescription drug monitoring programs, and multidisciplinary care to support opioid tapering, have all been promoted as important solutions to the North American opioid crisis. Yet none have so far delivered substantive beneficial opioid-related population health outcomes. In fact, while total opioid prescribing has leveled off or reduced in many jurisdictions, population-level harms from opioids have continued to increase dramatically.

We attribute this failure partly to a poor recognition of the epistemic and ethical complexities at the interface of clinical and population health. We draw on a framework of knowledge networks in wicked problems to identify 3 strategies to help navigate these complexities: (1) designing and evaluating clinically focused interventions as complex interventions, (2) reformulating evidence to make population health dynamics apparent, and (3) appealing to the inseparability of facts and values to support decision-making in uncertainty.

We advocate that applying these strategies will better equip clinically focused interventions as complements to structural and public health interventions to achieve the desired beneficial population health effects. (*Am J Public Health*. 2022;112(S1):S56–S65. <https://doi.org/10.2105/AJPH.2021.306500>)

Population health challenges are widely understood as wicked problems—they defy definitive formulation, relate to sets of other problems in complex causal chains, lack clear end points, and are changed irreversibly by every intervention, among other notable characteristics.^{1,2} The ever-increasing harms from opioids in high-income North America have been identified as one such wicked problem.^{3,4} There are multilevel and multidirectional dynamics at play in this crisis ranging from pain management to substance use to opioid use disorder.

Likewise, diverse sets of actors with diverse experience have been called upon to address this wicked problem. This crisis is perhaps unique in that clinical interventions, particularly the prescribing of high-dose, long-acting opioids for pain management, initially fueled the “first wave” of the crisis.^{5,6} This approach has driven ongoing crisis responses using clinically focused interventions, namely interventions focused on changing clinical practice and clinician behavior. Yet, the particular focus around reducing opioid prescribing has been met with limited success and

contributed to subsequent waves of the crisis. Prescribing has fallen or leveled off in many jurisdictions (though absolute levels remain very high compared with previous decades, to other countries, and to levels considered safe and effective for chronic pain management),^{7–10} but opioid-related harms have continued to escalate, especially because of ongoing criminalization of substance use, which has fostered the conditions for a toxic street drug supply.

Clinical interventions failing to improve population health outcomes

may be a general problem. Clinical systems have increasingly been oriented toward population goals, but the investments in high-performing, networked clinical systems have yet to substantially deliver.^{11–13} Many have appropriately called on the increased prioritization of population health interventions focusing on root causes of the opioid crisis, particularly around intersecting issues relating to the social determinants of health, criminalization of drug use, stigma, and discrimination.¹⁴ We very much agree.¹⁵ However, we propose here that addressing the complex dynamics at the interface of clinical practice and population health can inform better design and delivery of clinical interventions to achieve the desired population effects and, thus, better complement existing and future population health interventions.¹⁶

As Weber and Khademian note in their synthesis of the role of knowledge and networks in addressing wicked problems, “a fundamental challenge to effectively managing any public problem in a networked setting is the transfer, receipt and integration of knowledge across participants.”^{2(p334)} In particular, they identify 3 kinds of knowledge translation processes that can increase the collaborative capacities networks to address wicked problems: knowledge as “syntactic,” as “semantic,” and as “pragmatic.” On the basis of our previous research and experience intervening in the North American opioid crisis, we use this 3-fold strategy to identify how clinical interventions can be more likely to address population health goals for the chronic pain and opioid crises: (1) designing and evaluating clinically focused interventions as complex interventions (knowledge as syntactic), (2) reformulating evidence to make

population health dynamics apparent (knowledge as semantic), and (3) appealing to the inseparability of facts and values to support decision-making in uncertainty (knowledge as pragmatic). We focus our discussion here on the subissues of chronic pain and opioid analgesic prescribing, but we aim for the approaches to be generalizable to related crisis interventions, such as the treatment of opioid use disorder.

KNOWLEDGE AS SYNTACTIC

Weber and Khademian label the first knowledge-based strategy for improving network capacity as “syntactic”—namely, “finding ways to standardize or make compatible methods of communication to facilitate the transfer of knowledge from one participant or organization to the next.”^{2(p339)} We suggest here that applying practices for the design and evaluation of complex interventions to clinical interventions can support appropriate knowledge transfer for the opioid crisis.

Common clinically focused interventions for the opioid crisis have included education programs for clinicians as well as the deployment of prescription drug monitoring programs and clinical decision support systems.¹⁷ Chronic pain and opioid prescribing education have been identified as key opioid crisis solutions.^{18–20} This has been driven by the recognition of the long-standing deficiencies across the educational continuum, including the co-optation of education by commercial interests.^{21–23}

A recent systematic review by Sud et al.²⁴ synthesized the evaluations of 32 opioid analgesic continuing education programs, primarily from the

United States and Canada, and demonstrated that 84% of programs used population-level opioid harms to justify their development and design. Only 3 programs^{25–27} reported population health outcomes, none of which could be related directly to the specific patients or communities of program participants. Generally, program evaluation designs were insufficient for determining population health effects—a challenge endemic to continuing medical education perhaps because of the lack of conceptual frameworks for population health in this field.²⁴

Clinical decision support systems and prescription drug monitoring programs have also been widely deployed as interventions to improve opioid prescribing and chronic pain care. Clinical decision support systems are electronic systems that assist clinical decision-making by providing point-of-care, patient-specific data.^{28–30} The scoping review of clinical decision support systems for opioid prescribing in primary care by Spithoff et al.³¹ identified 14 program evaluations between 2009 and 2019. Outcomes typically focused on opioid-prescribing patterns and concordance of clinical practices with guidelines. There was poor utilization of evidence-based design components, minimal assessment of program implementation, no measurement of patient health or population health outcomes, and no assessment for unintended negative consequences. Similar findings have been reported for prescription drug monitoring programs.³² Importantly, the comprehensive systematic review by Furlan et al. of interventions for opioid prescribing and opioid-related harms identified a high rate of unintended negative consequences from clinical interventions, such as overdose, improper prescribing, and increased

stigma, even though not all evaluations assessed for these consequences.¹⁷ Health interventions of many types have benefited from being conceptualized, delivered, and evaluated as complex interventions.³³ Clinically focused interventions for the opioid crisis often meet criteria for complexity—they involve the actions of people and complex chains of steps, are embedded in social systems shaped by context, and are open systems subject to change.^{34,35} Based on a recent systematic review,²⁴ we will describe the only 2 continuing education programs explicitly conceptualized as complex interventions with formal implementation evaluations to highlight how acknowledging this complexity may help overcome some of the challenges identified previously.

Safer Opioid Prescribing is a Canadian continuing education program designed as a multipart, scalable intervention to improve clinical practices around chronic pain and opioid prescribing, aiming for positive population-level impacts (A. S. is director for this program).³⁶ The program was designed using the PRECEDE-PROCEED model, commonly used in population health initiatives.^{37,38} This framework allowed program developers to

- a) *contextualize* [the program] within the specific circumstances of the Canadian contemporary opioid epidemic and the range of other policy options for addressing it; b) *involve* the target audience for the intervention in program planning; and, c) *conceptualize* and categorize specific implementation and effectiveness outcomes during the initial design stages.^{36(p3)}

Initial evaluation of the program identified an important syntactic convergence between frameworks for the planning and evaluation of complex

interventions and frameworks for continuing education, including distinguishing among implementation, effectiveness, and impact outcomes.^{39,40} Formally evaluating implementation is fundamental in answering questions about how and why programs work, besides answering questions of whether they work.^{41,42} Likewise, implementation evaluations help explain how programs operate within specific environments and so can be useful in informing transferability to different contexts.⁴³

Barth et al.⁴⁴ describe the use of the Medical Research Council's complex intervention framework to develop and evaluate an academic detailing intervention to improve use of the South Carolina prescription drug monitoring program. The key advantage of conceptualizing the program in this way is that it allowed the developers "to identify and clarify potential component parts of the intervention and how the active components might relate to the expected outcome[s]."^{44(p103)} Using the Medical Research Council framework further allowed them to identify and address implementation challenges, iteratively develop the program, and adapt it to different practice settings and evolving legislation.

Although neither of these programs have yet demonstrated population-level impacts, their explicit use of complexity frameworks still accomplishes 3 important objectives. First, it provides the infrastructure for understanding program function and its relation to outcomes, including possible unintended negative outcomes. Second, it provides opportunities for iterative program development and responsiveness to changing context, such as policy and epidemiological trends. Third, it provides a connecting "syntactic" bridge between

the fields of population-focused and clinically focused interventions—this can allow for better intercalation between these kinds of interventions, which is essential for responding to a wicked problem in which no single intervention, or intervention type, is going to be sufficient.²

As a further example, chronic pain self-management has been implemented as key population health intervention.⁴⁵ Interventions that are effective for pain management—even at a population level—are not guaranteed as effective population-level interventions for reducing opioid-related harms. However, we advocate here that a syntactic approach of using complex interventions, especially the concurrent assessment of implementation and effectiveness outcomes,⁴⁶ is a useful means to design and assess for such effects.⁴⁷

KNOWLEDGE AS SEMANTIC

Interventions and, thus, their effects are shaped by the knowledge drawn upon for their development. This influence is conspicuous in some of the interventions described previously, whose goals were described as "guideline-concordant care." Thus, attention to the knowledge called upon by opioid crisis interventions, including specifically knowledge synthesized in clinical practice guidelines, is essential to equipping them for population-level impacts. This follows Weber and Khademian's second knowledge-based strategy—namely a "semantic" strategy of translating and interpreting available knowledge to make it useful for the task at hand.² We propose here that opioid crisis-related evidence must be considered in terms of population health dynamics

to expect interventions to achieve population health effects.⁴⁸ In the following sections we explore the knowledge synthesis and translation process especially as it has played out in North American opioid prescribing guidelines. This is relevant because of the prominence afforded to such guidelines despite the absence of evidence as effective policy interventions.

Risk Concentration vs Risk Distribution

Over the past decade, there has been substantial and sustained attention to the harms caused by high-dose prescribed opioids. This concern can be traced to recommendations in 2 national clinical practice guidelines and observational studies referenced therein.^{49–52} In 1 study, Dunn et al.⁵¹ examined a cohort of 9940 US health management organization patients on long-term opioid therapy for pain. They stratified the cohort into 5 groups by opioid dose and determined the overdose hazard ratio. The primary observation was that overdose risk increased with dose. Those who were prescribed more than 100 morphine milligram equivalents (MME) per day had a nearly

9-fold higher overdose risk compared with those prescribed 1 to 20 MME per day (Table 1). This important and compelling finding has influenced innumerable clinical interventions, all aiming to decrease harms in the highest-risk population with doses greater than 100 MME per day.

In the influential formulation of population health by Rose et al.,⁴⁸ focusing interventions on those prescribed high doses is a classic example of the “high-risk” strategies often favored by clinicians—it focuses intervention on the subpopulation with the highest concentration of risk. Such a high-risk orientation is made explicit in the 2017 Canadian Opioid Guidelines, which recommended tapering opioids to the lowest effective dose for patients currently using 90 MME of opioids per day or more.⁵⁰ This guideline targets “those who prescribe opioids or create policy regarding this issue,”^{50(p.e660)} clearly signaling its health policy-informing intentions.

Yet, one of Rose’s key injunctions is that population health interventions not only must address this high-risk element of the population but also must consider risk distribution within a population.⁴⁸ In a typical population, the majority of cases will be contained

in the low-risk subpopulation, apparent when we reinterpret the observations of Dunn et al.⁵¹ from a risk distribution perspective (Figure 1).

As made visible in this representation, more than twice as many overdoses were in the 1 to 20 MME compared with the 100 MME or higher group. We advocate here that clinically focused interventions aiming to have population-level effects should “semantically” reinterpret their evidence to identify such distributive effects and, thus, inform the nature of their interventions toward populations.

Context and Complexity in Evidence Synthesis

One clinical strategy promoted as an opioid crisis response has been multidisciplinary care (MDC).⁵³ Indeed, there is long-standing evidence for the efficacy of MDC for chronic pain management, including some evidence that MDC can constrain opioid prescribing.⁵⁴ Despite this evidence and the high burden of complex chronic pain, even high-resource health systems provide persistently poor access to MDC.^{55,56} In response, as 1 example, the Ontario Ministry of Health initiated

TABLE 1— Hazard Ratios Between Opioid Doses and Overdose: Washington State, 1997–2005

Opioid Dose	Patients Who Overdosed, No. (%)	Person-Years	Overdose Rate per 100 000 Person-Years (95% CI)	All Overdose Events, HR (95% CI)
None	6 (12)	16 780	36 (13, 70)	0.31 (0.12, 0.80)
Any opioid use	45 (88)	17 582	256 (187, 336)	5.16 (2.14, 12.28)
1 to < 20 MME	22 (43)	13 770	160 (100, 233)	1 (Ref)
20 to < 50 MME	6 (12)	2 311	260 (95, 505)	1.44 (0.57, 3.62)
50 to < 100 MME	6 (12)	886	677 (249, 1317)	3.73 (1.47, 9.50)
≥ 100 MME	11 (22)	614	1 791 (894, 2995)	8.87 (3.99, 19.72)

Note. CI = confidence interval; HR = hazard ratio; MME = morphine milligram equivalents per day.

Source. Dunn et al.⁵¹

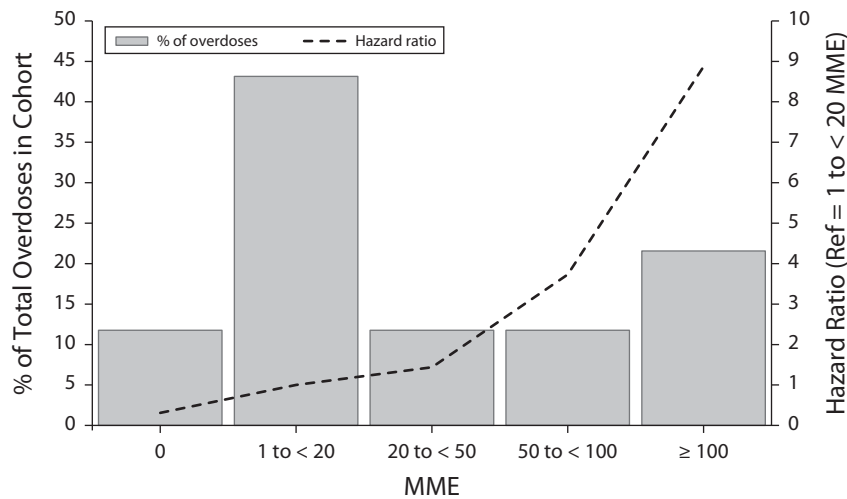


FIGURE 1— Risk Concentration and Risk Distribution of Opioid Overdose: Washington State, 1997–2005

Note. MME = morphine milligram equivalents.
Source. Adapted from Dunn et al.⁵¹

CAD \$17 million in annual funding to support the development and operation of 17 MDC pain clinics. Notably, the funding announcement came not as part of a provincial response to a crisis of chronic pain but specifically as a response to the province's opioid crisis.⁵⁷ While the mechanisms and effects of MDC for the management of chronic pain have been well-studied and understood for decades, the operation of MDC as an opioid dose-reduction strategy aiming for population-level effects is much less clear. Given complex dynamics, it is not necessary that an effective chronic pain management intervention will be effective for opioid-related harms.

A recent systematic review of 21 studies using MDC strategies for opioid tapering identified a mean opioid discontinuation rate of 87% (range = 29%–100%). The significant heterogeneity across studies with respect to program components, personnel, philosophical approaches, duration, and settings did not allow

any further synthesis using traditional aggregative synthesis methods. Despite this heterogeneity, the 2017 Canadian Opioid Prescribing Guideline made a strong recommendation that patients using opioids and experiencing serious challenges in tapering should be referred to formal multidisciplinary program.⁵⁰ In addition to the lack of access to MDC, an important challenge of this recommendation is that the guideline did not clearly define MDC for opioid tapering. Without a clear definition, it is difficult to interpret and operationalize this recommendation as either a clinical or opioid crisis intervention.

The appropriate mobilization of evidence for complex problems or interventions is not a new challenge. The methodological and epistemological diversity of evidence available to inform such interventions requires synthesis methods distinct from those used for the aggregation of outcomes from clinically focused trials in highly controlled conditions.⁵⁸ Methods such as

realist synthesis instead acknowledge the complexity of context and the relevance of context to determining intervention effects.

Sud et al.⁵⁹ conducted a realist synthesis of 95 MDC program evaluations across 5 decades, which reached distinct findings compared with previous systematic reviews and guideline recommendations, and suggests specific population health lessons not previously apparent. First, this review identified 3 necessary but insufficient components related to opioid-dose reductions: pain relief, behavior change, and active medication management. This defies the conventional understandings of MDC mechanisms, which suggest that substituting pharmacological analgesia with nonpharmacological analgesia is sufficient for achieving opioid dose reductions. Second, the review identified that context very much mattered. The national orientation toward opioids directly influenced MDC program design and effects. While Northern European and American programs had similar pain and function outcomes, Northern European programs typically did not include active medication management and, thus, did not reduce opioid doses. Finally, the rate of return to opioid use after achieving opioid dose reduction was as high as 20% to 40%. This could be an acceptable and harm-reducing outcome, especially as the return to use was often at a lower dose than at program outset. However, in the contemporary context of a highly toxic street drug supply and restricted access to pharmaceutical opioids, even a small return to use involving street drugs could easily undo any modest population benefits of prescribed dose reductions.

In summary, because of heterogeneity in how interventions are defined,

implemented, and then also evaluated, an intervention that is effective for improving chronic pain carries no guarantee of being an effective intervention for the opioid crisis. To expect clinically focused interventions to have specific population effects, the knowledge base informing these interventions must be “semantically” reinterpreted and synthesized from the perspectives of population health. Besides the complex nature of the interventions, this includes the complex nature of the contexts in which they will be deployed.⁶⁰

KNOWLEDGE AS PRAGMATIC

While “syntactic” processes can be developed to help speak a common language within a network, and “semantic” interpretation may help adapt different kinds of knowledge available in a network, knowledge is always incomplete.⁶¹ Knowledge is also always provisional and defeasible—new knowledge may arise to supplant or otherwise change existing knowledge.⁶² Yet, the duty to care and act, on the parts of both clinicians and policy-makers, is not removed when knowledge is incomplete, provisional, and defeasible.⁶³ Building on Weber and Khademan’s identification of knowledge as localized and tied to practice,² we identify here that knowledge as the basis for decision-making in response to wicked problems, besides being constituted by facts, is also constituted by values. While some may despair at this acknowledgment that values are inherent to knowledge and, thus, to clinical and policy decision-making, lest it undermine evidence-based practice, we offer an alternative view that making such values explicit can improve the

capacity to address wicked population health problems.⁶⁴

Facts and Values Are Not Separate

A common assumption is that scientific evidence presents “just the facts.” Indeed, the logic of evidence-based medicine is that empirically derived facts can reduce uncertainty around intervention effects and mechanisms and thus inform what interventions ought to be implemented. Facts, or knowledge as generated through scientific methods, are considered as separate from values, which cannot be derived empirically or logically. Values (e.g., normative ethics analysis about how the world ought to be, including what counts as an “effective” intervention) are subjective and part of personal or communal ethics. This separation of facts and values is called the fact–value distinction.^{65–67}

Closely examining the practice of opioid tapering as a harm-reducing opioid crisis intervention provides a useful example of the inseparability of facts and values. Retrospective observational studies have demonstrated that stopping opioid therapy can actually substantially increase overdose or suicide mortality.^{68,69} Inappropriate tapering can also lead to poor pain control and loss of functional abilities as well as a sense of medical abandonment.⁶³ This presents a challenging situation: the facts about the harm-reducing effects of lower doses of opioids are provisional and defeasible, and so seem insufficient to guide appropriate intervention.⁶⁷ Instead, values, implicitly or explicitly, guide decision-making in this context.

Identifying a crisis of chronic pain and epistemically valuing its treatment

versus identifying a crisis of opioid-related mortality and valuing avoidance of iatrogenic harm justify different kinds of interventions. For example, Juurink⁷⁰ construes the (subjective, unprovable) benefits of long-term opioid therapy as illusory and, thus, less relevant in decision-making compared with the (objectively) demonstrated risk of harms. This differential valuing of objective over subjective knowledge entails a particular mode of action—in this example, reducing opioid doses over maintaining them. Decisions about whether one ought to pursue opioid tapering reflects an interrelationship between facts and values that is often overlooked. Chronic pain, as an inherently subjective condition, frustrates the core epistemology of clinical biomedicine that relies on evidence of objective pathology. This introduces an epistemic hierarchy within clinical care and policy, prioritizing objective over subjective evidence. As a result, pain sufferers and people who use drugs continue to have their credibility undermined and their testimonies about their individual experiences, values, or priorities marginalized.⁷¹

Clinical–Population Health Values

When discussions of values regarding the concurrent chronic pain and opioid overdose crises have been made explicit, questions have been raised about whether ethical analysis should focus on clinical or population health levels.⁷² From a clinical perspective, opioid tapering raises ethical issues of respect for patient autonomy, voluntary free and informed consent, safety, individual risk–benefit profiles, and the patient–clinician relationship.^{73,74} Alternatively, hazards attributable to

commercial involvement in aggressive marketing, sponsorship of medical education, and interference in policy processes are well established and have been raised as prominent population health ethics issues. So have the issues of discrimination and stigmatization, which have intensified the inequities of people living with pain, alongside people who use drugs.⁷⁵

The concept of structural iatrogenesis can help make explicit the values at the intersection of these 2 levels, specifically to support decision-making when facts are insufficient. Stonington and Coffa⁷⁶ define structural iatrogenesis as the harm to patients caused by bureaucratic systems within health care, including systems intending to benefit patients.⁷⁶ They provide a case example of how a clinician could notice how aspects of her clinic’s opioid prescribing policy (e.g., urine screens, opioid contracts) created frequent gaps in medication coverage and created harms for patients within larger-scale

social forces (e.g., lack of transportation, manual labor for economic survival). Other examples of structural iatrogenesis abound at the intersection of pain and opioid use in the form of requiring prescriptions for naloxone, requiring special authorizations to prescribe agonist therapies,⁷⁷ or the use of (often punitive) opioid treatment agreements.⁷⁸ Such decisions are not only individual actions but they are also the result of structural processes reflecting intersecting concerns, interests, and actions of people in pain, people who use drugs, clinicians, professional and political organizations, insurance companies, pain and opioid policies, and laws.

The values inherent to structural iatrogenesis can provide guidance for the improvement of health at the clinical–population health interface (Figure 2). Such values include solidarity (a shared interest in survival, safety, and security)⁸⁰; distributive and social justice, represented by equitable access

to life-saving interventions such as pain management, naloxone, and opioid-agonist therapies; and epistemic humility, which is of particular relevance when considering knowledge-based processes. Making these values explicit in decision-making can help shift the gaze from individual patients as “dysfunctional” or “high-risk” to a focus on their needs and the responsibilities of the broader public to help meet those needs.⁸¹

Specifically, epistemic humility is a disposition and a commitment to engage in collaborative effort that arises out of recognizing the limits of one’s knowledge.^{71,78,82} One’s picture of a clinical scenario, or one’s facts about how structural processes might disproportionately harm certain patients, are incomplete. Identifying the limits of facts, and thereby making apparent the active role of implicit values, is a key strategy that Stonington and Coffa identify for addressing structural iatrogenic harms.⁷⁶

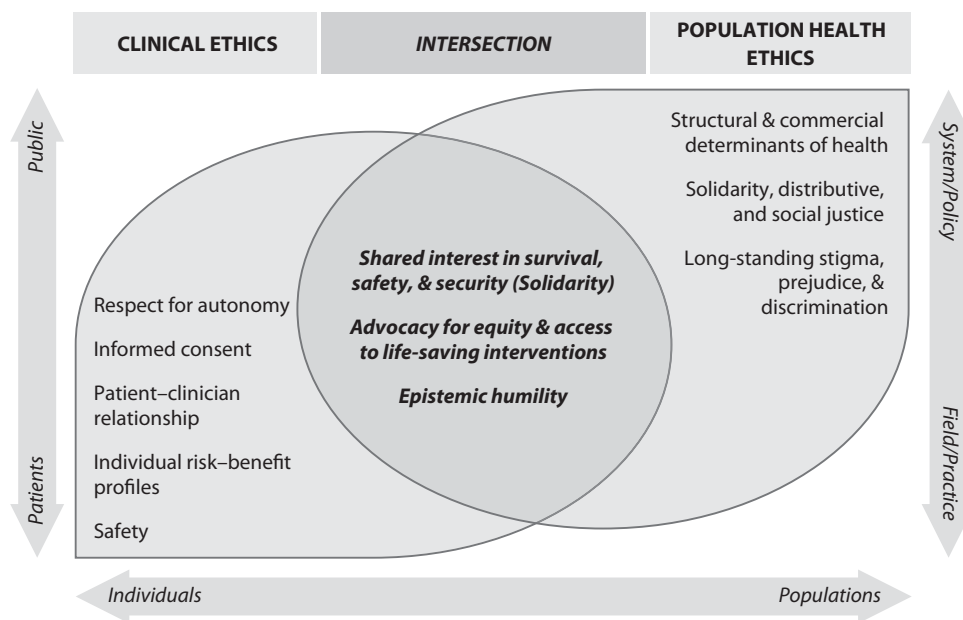


FIGURE 2— The Intersection of Clinical and Population Health Ethics

Note. Adapted from Levesque et al.⁷⁹

Embracing epistemic humility under conditions of uncertainty challenges the presumed knowledge hierarchy between decision-makers and people with lived experience, recognizes that people living with pain have unique epistemic access to their lives, and emphasizes that inclusion of their voices in treatment decision-making and policy-making is necessary. Decision-makers can avoid committing epistemic injustice by not presuming “objective facts” to be the only relevant considerations in treatment and intervention decisions.⁸³ A commitment to epistemic humility when making decisions in the context of uncertainty means balancing the patient’s experiences, priorities, and values with the specialized content knowledge and inseparable values of the decision-maker.

CONCLUSIONS

For the intersecting crises of chronic pain and opioids, the potential for conflict between the knowledge and values of clinical practice with those of population health is high. Yet, wicked population health problems necessarily call on the knowledge and values of diverse system actors to identify tractable solutions. Using Weber and Khademian’s 3-fold conceptualization of “knowledge in networks”² to increase collaborative capacity for addressing wicked problems, we have identified 3 means for action at this complex interface of clinical and population health: Knowledge as “syntactic” facilitates knowledge transfer and use by allowing network actors to “speak the same language,” as we have identified around designing and evaluating clinically focused interventions as complex interventions. Knowledge as “semantic” identifies the importance of interpretation across

network actors, as we have suggested in reformulating evidence in terms of both risk concentration and distribution, as well as in terms of synthesizing evidence that is context-responsive. Finally, a “pragmatic” view of knowledge understands that knowledge is changing, highly contextual, socially situated and embedded in practice, and, thus, irreducibly connected to values. Clinically focused measures continue to be essential for addressing chronic pain and the opioid crisis. We advocate that applying this more nuanced understanding of knowledge at the clinical–population health interface will better equip clinically focused interventions to have the desired beneficial population health effects.

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ABOUT THE AUTHORS

Abhimanyu Sud is with the Department of Family and Community Medicine and Institute for Health Policy, Management, and Evaluation, University of Toronto, Canada. Daniel Z. Buchman is with Centre for Addiction and Mental Health and Dalla Lana School of Public Health, Toronto. Andrea D. Furlan is with the Institute for Work and Health and Department of Medicine, University of Toronto. Peter Selby is with the Centre for Addiction and Mental Health and Department of Family and Community Medicine, Department of Psychiatry, University of Toronto. Sheryl M. Spithoff is with Department of Family and Community Medicine, University of Toronto. Ross E. G. Upshur is with the Bridgepoint Collaboratory for Research and Innovation, Department of Family and Community Medicine, Dalla Lana School of Public Health, University of Toronto.

CORRESPONDENCE

Correspondence should be sent to Abhimanyu Sud, 500 University Ave, 5th Floor, Toronto, ON M5G 1V7 Canada (e-mail: abhimanyu.sud@utoronto.ca). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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A. Sud and D. Z. Buchman conceptualized and wrote the original article draft. A. D. Furlan, P. Selby, S. M. Spithoff, and R. E. G. Upshur wrote, reviewed, and edited the article.

CONFLICTS OF INTEREST

A. Sud receives an academic stipend as director of Safer Opioid Prescribing. D. Z. Buchman received salary support from the Centre for Addiction and Mental Health. A. D. Furlan is the inventor of the Opioid Manager, a point-of-care tool and app that is sold in iTunes; all proceeds belong to the hospital where she works. A. D. Furlan receives advertising revenues from Google Inc. for her YouTube channel. P. Selby reports receiving grants, salary, and research support from the Centre for Addiction and Mental Health, Health Canada, Ontario Ministry of Health and Long-Term Care, Canadian Institutes of Health Research, Canadian Centre on Substance Use and Addiction, Public Health Agency of Canada, Ontario Lung Association, Medical Psychiatry Alliance, Extensions for Community Healthcare Outcomes, Canadian Cancer Society Research Institute, Cancer Care Ontario, Ontario Institute for Cancer Research, Ontario Brain Institute, McLaughlin Centre, Academic Health Sciences Centre, Workplace Safety and Insurance Board, National Institutes of Health, and the Association of Faculties of Medicine of Canada. P. Selby also reports receiving funding, honoraria, or both from the following commercial organizations: Pfizer Inc/Canada, Shoppers Drug Mart, Bhasin Consulting Fund Inc, Patient-Centered Outcomes Research Institute, ABBVie, and Bristol-Myers Squibb. Furthermore, P. Selby reports receiving consulting fees from Pfizer Inc/Canada, Evidera Inc, Johnson & Johnson Group of Companies, Medcan Clinic, Inflexion Inc, V-CC Systems Inc, MedPlan Communications, Katka Medical Communications, Miller Medical Communications, Nvision Insight Group, and Sun Life Financial. R. E. G. Upshur receives salary support from the Lunenfeld Tanenbaum Research Institute and holds an endowed chair from the Dalla Lana School of Public Health at the University of Toronto.

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The development of this article did not involve research including human participants.

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Individual and Health Policy Factors Associated With Positive Heroin and Opioid Treatment Response: United States, 2018

George Pro, PhD, MPH, Corey Hayes, PhD, MPH, Clare C. Brown, PhD, MPH, Johnathan Goree, MD, and Nickolas Zaller, PhD

See also Hulsey, p. S21, Cooper et al., p. S24, Hoffman, p. S28, and Friedman and Hansen, p. S30.

Objectives. To identify client- and state-level factors associated with positive treatment response among heroin and opioid treatment episodes in the United States.

Methods. We used national data from 46 states using the Treatment Episode Dataset–Discharges (2018) to identify heroin and opioid treatment episodes (n = 162 846). We defined positive treatment response as a decrease in use between admission and discharge. We used multivariable regression, stratified by race/ethnicity, to identify demographic, pain-related, and state-level factors associated with positive treatment response.

Results. Lower community distress was the strongest predictor of better treatment outcomes across all racial/ethnic groups, particularly among White and American Indian/Alaska Native episodes. A primary opioid of heroin was associated with worse outcomes among White and Hispanic episodes. Legislation limiting opioid dispensing was associated with better outcomes among Hispanic episodes. Buprenorphine availability was strongly associated with better outcomes among Black episodes.

Conclusions. State-level variables, particularly community distress, had greater associations with positive treatment outcomes than client-level variables.

Public Health Implications. Changes in state-level policies and increased resources directed toward areas of high community distress have the potential to improve opioid use disorder treatment and reduce racial/ethnic disparities in treatment outcomes. (*Am J Public Health.* 2022;112(S1):S66–S76. <https://doi.org/10.2105/AJPH.2021.306503>)

The ongoing opioid epidemic has been paralleled closely by an epidemic of chronic pain and an influx of health care use for issues related to pain and drug use.¹ Chronic pain medicine has played a key role in advancing the treatment of pain and reducing the impact of pain on disability and quality of life.² At the same time, an unprecedented tide of prescription opioids has altered the medical, public health, and social landscapes to such a degree that

unpacking the multiple and intersecting factors affecting adverse opioid outcomes requires input from nearly all corners of society. Racism and racial/ethnic inequities are key strands that persist and permeate all of the pathways that connect pain medicine, opioid prescriptions and their alternatives, opioid use disorder (OUD) treatment, and treatment outcomes.^{3–6} Under this framework, we attempted to explain these complex relationships, in part by

considering social, environmental, and policy determinants of health as exposures with varying and potentially compounding effects within racial/ethnic groups, as opposed to defining race/ethnicity itself as an exposure. Pathways connecting the diagnosis and treatment of chronic pain, laws affecting the practice of chronic pain medicine, implicit biases that affect opioid prescribing patterns, and OUD treatment and outcomes are all connected and likely

differ by racial/ethnic group in both the direction and strength of effects.

Pain is a natural part of human inflammatory and healing processes, and chronic pain is broadly defined as pain that exists in the absence of tissue inflammation or persists after a healing process has resolved.⁷ Dahlhamer et al.⁸ estimated that 20% of US adults (approximately 50 million people) have chronic pain, with 8% expressing “high impact” chronic pain, which is defined as chronic pain that limited life or work activities on most days or every day during the past 6 months. Importantly, chronic pain has been shown to be closely related to opioid misuse and related morbidities and death. In 2018, the United States experienced nearly 50 000 opioid overdose deaths,⁹ but disentangling how, when, or under what conditions a chronic pain diagnosis leads to OUD and a heightened risk for overdose and death continues to challenge public health researchers.^{10,11}

One approach to reducing risk is through the implementation of Centers for Disease Control and Prevention guidelines in pain management and medical settings. The first guideline for providers about determining when to initiate or continue opioids for chronic pain states that

Nonpharmacologic therapy and non-opioid pharmacologic therapy are preferred for chronic pain. Clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh the risks to the patient. If opioids are used, they should be combined with nonpharmacologic therapy and nonopioid pharmacologic therapy, as appropriate.^{12(p16)}

In addition, recent literature has demonstrated no benefit in the use of

opioids over nonsteroidal antiinflammatory drugs and acetaminophen for the treatment of chronic back pain and osteoarthritis.¹³ However, a recent systematic review by Busse et al.¹⁴ paints a somewhat more nuanced picture, in that opioids may have small benefits that diminish over time but are unlikely to be superior to other analgesics.

The nature of pain is relatively subjective, and pain treatment is further complicated among racial/ethnic minority populations. In efforts to combat the wide variability in pain care and related disparities, 527 federal and state opioid-related policies were instituted between 2016 and 2018.¹⁵ A large number of these policies included mandatory continuing medical education (CME) for prescribers, but few of the policies directly addressed racial/ethnic disparities. Importantly, little research has addressed how CME may translate to differences in OUD risk and overdose or the differential impact it may have among subpopulations.

Despite the introduction of educational interventions for opioid prescribers, Mills et al.¹⁶ demonstrated that racial/ethnic minority patients were less likely than were White patients to receive an opioid for abdominal or back pain during an emergency department encounter. In addition, in a meta-analysis assessing trends in opioid prescribing, African Americans were found to be 29% less likely to be prescribed opioids for chronic pain.¹⁷ Providers’ implicit bias toward racial/ethnic minority patients also increases physician talk time and verbal dominance while decreasing patient affect, patient centeredness, and ratings of interpersonal care.^{18,19} In a disease like chronic pain—in which subjective patient information is needed for diagnosis—these dynamics can have lasting impacts on

patient care and related health outcomes. For example, racial/ethnic minorities are more likely to have negative experiences with providers regarding their communication of pain.²⁰ In the context of increasing overdoses nationwide and somewhat counterintuitively, discrimination in medical settings that resulted in fewer opioid prescriptions among Blacks may have had a protective effect against—or at least delayed—the high risk for misuse and death. Lippold and Ali²¹ recognized the differences in the timing and risk factors for overdose deaths and have provided support for the existence of multiple subepidemics among racial/ethnic groups.

Underlying these subepidemics are the relationships among prescription opioid supply, heroin supply, state-level laws and policies, and patient outcomes, all of which are complex and intersect across multiple ecological levels. In addition, the nature of the epidemic has shifted over the past several decades and in different ways among racial/ethnic groups.^{21,22} For example, opioid prescribing rates vary widely by state, with some states reaching more than 1 prescription per person. In 2018, Hawaii had the lowest opioid prescribing rate (33.4 opioid prescriptions per 100 state residents), while Alabama had the highest (97.5 opioid prescriptions per 100 state residents).^{23,24}

Relatedly, preference for heroin or prescription opioids depends on multiple factors, including price and availability. A survey of patients in treatment of OUD found that 94% chose to use heroin because prescription opioids were more difficult to obtain or more expensive,²⁵ which is likely the product of changing opioid prescribing rates. African Americans saw a 480% increase in the rate of unintentional overdose deaths (per 100 000) between 2000

and 2017,²⁶ and overdose deaths involving the synthetic opioids fentanyl and tramadol—often unknowingly combined with heroin—were 18 times higher among African Americans, compared with 12 times higher among Hispanics and 9 times higher among Whites.²⁷ It remains unclear whether state-level laws and policies positively affect patient outcomes. For example, a comprehensive evaluation of opioid overdoses and characteristics of opioid therapy found no significant association between multiple opioid outcomes and implementation of prescription opioid-related laws.²⁸

A critical indicator of the direction of the ongoing opioid epidemic is OUD treatment utilization and successful treatment completion. Generally, treatment is effective at reducing and eliminating opioid use and improving health and well-being. Methadone, buprenorphine, and naltrexone are all effective medications for OUD, with buprenorphine emerging as the standard of care and most commonly covered by commercial insurance.²⁹ However, treatment uptake remains very low and is particularly low among Black populations and among populations with low socioeconomic statuses.³⁰ Administration of buprenorphine in a private office-based setting has increased substantially, but this increase has been driven nearly entirely by White clients and those who pay with private insurance or cash,³¹ highlighting the stark disparities in opioid treatment. Furthermore, the majority of American Indian/Alaska Native (AI/AN) clients in specialty treatment services do not receive the standard of care of buprenorphine or methadone maintenance.³² Among individuals who do receive opioid treatment, Black and Hispanic clients have been shown to be less likely than Whites to complete it successfully.³³ Several

factors exist that can facilitate or inhibit treatment use and outcomes. For example, Medicaid expansion has generally improved access to treatment services for underrepresented populations, but expansion alone is not sufficient, as some expansion states like Arkansas have implemented exceedingly few initiatives aimed at curbing opioid use.³⁴ Better understanding the multiple and overlapping social determinants of health—from economic security and health policy to community stressors—is critical in developing equitable access to and completion of opioid treatment.

The relationships among pain medicine, OUD, and OUD treatment are nuanced, and national reports that consider the competing roles of individual, social, and policy factors are scant. To our knowledge, no studies have combined Treatment Episode Dataset–Discharges (TEDS-D) data with external state-level clinical and policy data to examine these relationships on a national level. The purpose of this study was to use national data to investigate the association between multiple factors from across socioecological levels (pain medicine, state laws, and OUD treatment) and positive treatment response. We also stratified our findings to determine if there are differences in the direction and size of the associations by racial/ethnic group. We stratified our model by race/ethnicity primarily because racial/ethnic disparities have been observed in many of these elements individually and because the equitable evaluation of epidemiological trends must include discussion of structural barriers that are based on racial and economic oppression.³⁵

METHODS

We used the 2018 TEDS-D ($n = 1\,666\,366$) to identify outpatient treatment episodes

with heroin or other opioids indicated as primary substances of use at treatment admission and with complete data for all study variables, resulting in a final analytic sample of 162 846 treatment episodes. TEDS-D is a cross-sectional administrative data set that describes treatment and demographic characteristics of treatment episodes in the United States. Survey administration and data housing are conducted by the Center for Behavioral Health Statistics and Quality within the Substance Abuse and Mental Health Services Administration (SAMHSA). Additional information about the administrative survey questionnaire, data housing and maintenance, and public access to TEDS-D has been documented by SAMHSA.³⁶ Please note that we use the word “client” or “episode” to reflect that each record in the data is a unique admission, rather than an individual.

Variables

Our outcome of interest was a binary indicator of positive opioid treatment response between 2 time points—treatment admission and treatment discharge. Starting in 2015, SAMHSA began reporting data on several variables at both admission and discharge, including the frequency of drug use in the past month (daily use, some use, or no use). Before 2015, analyses using TEDS-D data were limited to a single variable indicating whether the treatment episode resulted in successful completion. By using the new frequency-of-use variables at 2 time points, we were able to construct a more nuanced metric for the treatment outcome of each episode. We defined a positive treatment response as (1) a reduction in use between admission and discharge (from daily to some use, from daily to no use, or from some to no use) or (2) no

use at both admission and discharge. Our inclusion of treatment clients who reported no use at both time points reflects the ongoing challenges opioid patients face and acknowledges the challenges and successes experienced on their personal paths to recovery. Conversely, no treatment response or a negative response was defined as (1) any treatment episode that increased use (from no to some use, from no to daily use, or from some to daily use) or (2) maintained the same level (some or daily use) between admission and discharge. Other studies using TEDS-D have operationalized the frequency of use variables in a similar way.^{37,38}

We considered several treatment episode- and state-level covariates, based on a priori understanding of factors that likely influence positive treatment response among clients in treatment for heroin or other opioids. Treatment episode-level demographic and clinical data sourced from TEDS-D included race/ethnicity (non-Hispanic White [referent], non-Hispanic Black, non-Hispanic AI/AN, or Hispanic of any race), age group (18–29 [referent], 30–39, 40–49, or ≥ 50 years), primary drug of choice at treatment admission (heroin or all other nonheroin opioids [referent]), and whether methadone, buprenorphine, or naltrexone was used as part of the client's treatment plan (yes or no [referent]). The age group variable combined several age ranges in TEDS-D and was designed to be a simple indicator of adults in their late teens and 20s, 30s, 40s, and older. This approach has been applied in other studies that used TEDS-D opioid data.^{39,40}

We sourced several state-level variables externally and merged them to the TEDS-D data set by state. We defined state Medicaid expansion status by whether a state had adopted

expansion under the Affordable Care Act in 2018 or earlier.⁴¹ We sourced state distress levels from the Economic Innovation Group's Distressed Communities Index,⁴² which is a single metric that accounts for community levels of low education, housing vacancy, adults not working, poverty, income, changes in employment, and changes in the number of business establishments. The Distressed Communities Index ranges from 0 to 100, where 0 indicates the least distress and 100 indicates the most distress. The rate of opioid prescriptions per 100 state residents in 2018 was sourced from the National Institute on Drug Abuse.²³ We calculated the number of treatment facilities in a state that accepts Medicaid payments per 100 000 Medicaid enrollees. We identified the raw number of treatment facilities accepting Medicaid by state by using data from the 2018 National Survey of Substance Abuse Treatment Services (N-SSATS; numerator).⁴³ We sourced the number of Medicaid enrollees in July 2018 (denominator) from the Kaiser Family Foundation,⁴⁴ and it was based on analyses of data from the Centers for Medicare and Medicaid Services. We also used data from N-SSATS to calculate the percentage of treatment facilities in each state that offered buprenorphine in 2018. For ease of interpretation of continuous rates, we categorized the Distressed Communities Index, rate of opioid prescriptions, number of treatment facilities that accept Medicaid payment, and the percentage of a state's facilities that offer buprenorphine into 3 groups of low, mid, and high, based on tertile distributions for each variable.

We derived state requirements for pain management CME from a report

by the *New England Journal of Medicine's* Knowledge Plus online tool.⁴⁵ As each state has different CME requirements, we categorized states into 3 groups, including states with no CME requirements or less than 1 credit hour per year, states with a requirement of 1 CME credit per year or 5 hours 1 time, and states with more than 1 credit per year or more than 5 hours 1 time. Finally, we considered whether states had enacted any laws that limit opioid prescriptions by enacting statutory limits on the duration of the prescribed opioid supply or a limit on morphine milligram equivalents (any or no limits), derived from a report by the National Conference of State Legislatures.⁴⁶

Analysis

We used SAS software (version 9.4; SAS Institute, Cary, NC) to conduct all analyses. We reported descriptive statistics of the TEDS-D sample for each study variable for the full sample and stratified by whether treatment episodes responded positively to treatment. We used the χ^2 test of independence to assess the strength of the bivariate associations between each independent variable and our outcome. We used multivariable logistic regression to model the adjusted association between each independent variable and positive treatment response.

To assess the impact of client- and state-level variables among clients of different races/ethnicities, we stratified our models to provide estimates separately for White (n = 128 363), Black (n = 16 961), American Indian/Alaska Native (n = 2084), and Hispanic (n = 15 438) clients. To account for potential clustering of treatment episodes within states, we included a CLUSTER statement in SAS at the state

level. We checked for multicollinearity between study variables by using a Pearson's correlation coefficient cutoff of a P value less than .80. Finally, because of the large sample size, very small differences in means between groups are more likely to be detected as statistically significant. Therefore, we followed steps for analyses of TEDS-D data outlined by Sahker et al.⁴⁷ to avoid misidentifying trivial significance and to account for multiple tests by adjusting the threshold of P values and odds ratios. For this study, we considered a given association to be clinically meaningful if it had a P value of less than .0001. In addition to Sahker et al., others have also recommended similar methods to help differentiate between statistical significance and clinical or practical meaningfulness.⁴⁸

Supplemental Analyses

We also conducted several descriptive and analytic supplemental analyses to complement the primary model detailed previously. First, to assess differences in frequency of use among clients of different races/ethnicities, we disaggregated our outcome variable of positive treatment response into all 9 possible combinations of opioid use at admission and at discharge, stratified by race/ethnicity. This allowed for a more nuanced evaluation of the underlying components of our outcome and whether the levels of opioid use varied depending on race/ethnicity. Second, we considered opioid problem severity as a variable in our model (dependence vs abuse [referent]). TEDS-D includes information about *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*; Washington, DC: American Psychiatric Association; 1994) diagnoses of abuse or dependence, but

18% of observations were missing diagnostic estimates, so we opted not to include problem severity in the primary model outlined previously. We described the distribution of opioid abuse or dependence among clients of differing racial/ethnic status, and then fit a new model adjusting for severity among clients with nonmissing information for severity ($n = 116\,241$).

RESULTS

Among 162 846 heroin and opioid treatment episodes, we identified 80 900 (49.7%) that demonstrated a positive treatment response. In univariate analyses, worse treatment outcomes were most strongly associated with non-Hispanic Black race/ethnicity. At the state level, worse treatment outcomes were most strongly associated with residence in non-Medicaid-expansion states, high community distress, mid opioid prescription rates, and mid availability of buprenorphine (Table 1). In our supplemental assessment of the frequency of opioid use at admission and discharge, we identified that Black clients were the most likely to report daily use at both admission and discharge (45%) compared with White (33%), AI/AN (33%), and Hispanic (28%) clients (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>). We additionally see that Black clients (18%) were nearly half as likely to be admitted with "no use" relative to White clients (33%) or AI/AN clients (31%). White clients were also the most likely to have a more severe diagnosis of dependence (80%), compared with Black (78%), AI/AN (66%), and Hispanic (63%) clients (Table B, available as a supplement to the online version of this article at <http://www.ajph.org>).

The direction and magnitude of associations varied between racial/ethnic groups in our adjusted models (Table 2). The primary opioid of heroin (vs all other opioids) was associated with worse treatment outcomes among White (adjusted odds ratio [AOR] = 0.78; 95% confidence interval [CI] = 0.68, 0.90; $P < .0001$) and Hispanic (AOR = 0.69; 95% CI = 0.61, 0.78; $P < .0001$) episodes. Lower community distress was strongly associated with positive treatment response across all groups, particularly among White and AI/AN clients. Of note, AI/AN treatment episodes in low-distress states had nearly 5 times the odds of positive treatment response compared with AI/AN episodes in states with high distress (AOR = 4.58; 95% CI = 2.77, 7.54; $P < .0001$). High buprenorphine availability (vs low availability) was only positively associated with treatment response among Black episodes (AOR = 2.24; 95% CI = 1.19, 4.18; $P < .0001$). In our sensitivity analysis that included severity as a covariate, we identified a modest negative association between a more severe diagnosis of opioid dependence (vs abuse) and treatment response among White and Black clients (Table C, available as a supplement to the online version of this article at <http://www.ajph.org>).

DISCUSSION

The pathways connecting chronic pain, OUD, and treatment outcomes are critical pieces to address as the opioid epidemic continues to grow and burden communities. It is also incumbent upon researchers to consider differential associations by race/ethnicity to more equitably design public health programs and policies. We used a comprehensive set of variables from multiple axes of influence to identify whether predictors

TABLE 1— Outpatient Heroin and Opioid Treatment Episode Characteristics: Treatment Episode Dataset-Discharges, United States, 2018

Variables	Total (n = 162 846), %	Positive Treatment Response (n = 80 900 [49.68%]), %	No or Negative Treatment Response (n = 81 946 [50.32%]), %	χ^2	<i>p</i> ^a
Demographic characteristics					
Race/ethnicity				1 437.67	< .0001
Non-Hispanic White	78.82	80.03	77.63		
Non-Hispanic Black	10.42	7.78	13.02		
Non-Hispanic American Indian/Alaska Native	1.28	1.30	1.26		
Hispanic, any race	9.48	10.89	8.09		
Age group, y				184.15	< .0001
18–29	32.57	33.34	31.82		
30–39	37.00	37.79	36.22		
40–49	17.00	16.17	17.83		
≥ 50	13.43	12.71	14.14		
Primary drug of choice at admission				66.10	< .0001
Heroin	67.35	68.30	66.41		
All other nonheroin opioids	32.65	31.70	33.59		
Other drugs or alcohol reported at admission				676.52	< .0001
Yes	66.29	69.36	63.27		
No	33.71	30.64	36.73		
Medication for opioid use disorder was part of treatment plan				136.19	< .0001
Yes	47.85	49.30	46.41		
No	52.15	50.70	53.59		
State-level characteristics					
Treatment episode resides in a Medicaid expansion state				10 590.19	< .0001
Yes	71.96	83.49	60.58		
No	28.04	16.51	39.42		
Community distress level				12 674.46	< .0001
Low	21.18	26.84	15.60		
Mid	44.00	51.61	36.48		
High	34.82	21.55	47.92		
Opioid prescriptions per 100 state residents				10 235.09	< .0001
Low	33.67	44.02	23.45		
Mid	44.06	32.36	55.60		
High	22.27	23.61	20.95		
No. of treatment facilities in a state that accept Medicaid payment (per 100 000 Medicaid enrollees)				7 336.69	< .0001
Low	33.73	41.58	25.97		
Mid	27.19	29.34	25.06		
High	39.09	29.08	48.97		

Continued

TABLE 1— Continued

Variables	Total (n = 162 846), %	Positive Treatment Response (n = 80 900 [49.68%]), %	No or Negative Treatment Response (n = 81 946 [50.32%]), %	χ^2	P ^a
Percentage of a state's treatment facilities that offer buprenorphine				13 281.02	< .0001
Low	33.22	35.39	31.08		
Mid	33.30	20.63	45.81		
High	33.48	43.98	23.11		
State pain management CME requirements				1 444.16	< .0001
No requirement or < 1 hour per year	16.16	18.94	13.42		
1 hour per year or 5 hours 1 time	55.70	51.38	59.97		
> 1 hour per year or > 5 hours 1 time	28.13	29.68	26.61		
State has any legislation governing statutory limits on opioid prescriptions				44.76	< .0001
Yes	81.57	80.93	82.21		
No	18.43	19.07	17.79		

Note. CME = continuing medical education. The total sample size was 162 846.

^aWe considered a given association to be clinically meaningful if it had a $P < .0001$.

of positive treatment response were different among racial/ethnic groups. Notably, economic and community distress was the strongest inhibitor of treatment success across all racial/ethnic groups. This finding helps to reiterate the importance of social and structural determinants of health and their influence on health outcomes, and our findings align with others about the importance of considering socioeconomic status and exposure to economic determinants in studies addressing the opioid crisis.^{49,50} In addition, it is important to understand the distribution of populations in mid- and high-distress areas. For example, 20% of treatment episodes in mid- and high-distress areas were Black and 3% were AI/AN (results not shown), compared with the overall Black and AI/AN populations making up 13% and 1.5% of the US population, respectively. This unbalanced distribution suggests that, while all groups were impacted by high levels

of community distress, racial/ethnic minority populations are at a higher risk of adverse treatment outcomes resulting from geographic, environmental, and structural barriers.

We found that buprenorphine access was a strong predictor of treatment success only among Black treatment episodes. This finding aligns with other research that identified a strong relationship between receipt of medication for OUD and positive treatment response among Black men and women.³⁸ This is an important asset-based characteristic to highlight and broadly points to supportive mechanisms underlying OUD treatment experiences among Black clients. However, the vast majority of Black individuals with a treatment need do not initiate treatment,³⁰ which underscores the importance of screening and referral to treatment among high-risk and historically underserved populations. While buprenorphine access appears

particularly beneficial to Black communities, the overlapping experience of disproportionate distress may also undermine initiatives aimed at strengthening buprenorphine services. Furthermore, Black treatment episodes were overrepresented in states with low or mid access to buprenorphine (results not shown).

One in 5 treatment episodes were in a state that had no statutory limits on opioid prescribing, and racial/ethnic minority groups were disproportionately represented in these states. However, we found a moderate increase in the likelihood of positive treatment response for AI/AN and Hispanic episodes in states with any laws that require limits. Pletcher et al. found that Hispanic individuals were less likely than White individuals to be prescribed opioids for pain-related emergency department visits.¹⁷ Our study adds to this literature by accounting for other general health care setting and policy-

TABLE 2— Multivariable Regression Modeling Positive Treatment Response Among Outpatient Heroin and Opioid Treatment Episodes: Treatment Episode Dataset–Discharges, United States, 2018

Variables	White (n = 128 363), AOR (95% CI)	Black (n = 16 961), AOR (95% CI)	American Indian/Alaska Native (n = 2084), AOR (95% CI)	Hispanic (n = 15 438), AOR (95% CI)
Demographic characteristics				
Age group, y (Ref = 18–29)				
30–39	1.03 (0.97, 1.09)	1.04 (0.77, 1.39)	1.01 (0.75, 1.34)	0.91 (0.82, 1.00)
40–49	0.99 (0.89, 1.10)	0.83 (0.67, 1.03)	1.47 (0.92, 2.33)	0.91 (0.75, 1.11)
≥ 50	1.03 (0.93, 1.14)	0.84 (0.65, 1.07)	1.08 (0.81, 1.43)	1.00 (0.75, 1.32)
Primary drug of choice at admission (Ref = all other nonheroin opioids)				
Heroin	0.78 (0.68, 0.90)*	0.84 (0.61, 1.14)	0.77 (0.62, 0.97)	0.69 (0.61, 0.78)*
Other drugs or alcohol reported at admission (Ref = no)				
Yes	1.00 (0.94, 1.07)	1.03 (0.82, 1.28)	1.04 (0.81, 1.34)	1.05 (0.92, 1.20)
Medication for opioid use disorder was part of treatment plan (Ref = no)				
Yes	0.80 (0.66, 0.98)	1.12 (0.80, 1.57)	0.79 (0.60, 1.04)	0.83 (0.58, 1.19)
State-level characteristics				
Treatment episode resides in a Medicaid expansion state (Ref = no)				
Yes	1.01 (0.63, 1.61)	0.83 (0.41, 1.69)	0.84 (0.53, 1.32)	0.50 (0.22, 1.13)
Community distress level (Ref = high)				
Low	4.17 (2.15, 8.08)*	3.29 (1.29, 8.39)	4.36 (2.65, 7.21)*	5.56 (1.60, 19.36)
Mid	4.14 (2.12, 8.11)*	2.96 (1.11, 7.92)	4.58 (2.77, 7.54)*	3.38 (1.25, 9.15)
Opioid prescriptions per 100 state residents (Ref = low)				
Mid	0.80 (0.47, 1.36)	0.51 (0.23, 1.14)	0.95 (0.59, 1.52)	1.10 (0.45, 2.61)
High	1.21 (0.83, 1.77)	1.29 (0.82, 2.03)	1.48 (0.99, 2.24)	1.51 (0.78, 2.91)
No. of treatment facilities in a state that accept Medicaid payment (per 100 000 Medicaid enrollees; Ref = low)				
Mid	0.81 (0.46, 1.42)	0.72 (0.35, 1.49)	0.71 (0.43, 1.17)	0.61 (0.30, 1.22)
High	1.12 (0.54, 2.34)	1.12 (0.47, 2.71)	0.88 (0.51, 1.52)	0.51 (0.14, 1.76)
Percentage of a state's treatment facilities that offer buprenorphine (Ref = low)				
Mid	0.48 (0.25, 0.93)	0.88 (0.29, 2.62)	0.31 (0.20, 0.46)*	0.22 (0.09, 0.58)
High	1.09 (1.03, 1.15)	2.24 (1.19, 4.18)*	0.80 (0.48, 1.34)	0.79 (0.32, 1.95)
State pain management CME requirements (Ref = no requirement or < 1 hour per year)				
1 hour per year or 5 hours 1 time	0.90 (0.45, 1.82)	1.06 (0.49, 2.28)	0.76 (0.47, 1.23)	1.10 (0.36, 3.34)
> 1 hour per year or > 5 hours 1 time	1.03 (0.61, 1.75)	1.68 (0.70, 4.04)	0.95 (0.65, 1.39)	2.46 (0.82, 7.36)
State has any legislation governing statutory limits on opioid prescriptions (Ref = no)				
Yes	1.51 (0.96, 2.35)	1.48 (0.81, 2.69)	1.92 (1.21, 3.05)	3.32 (1.34, 8.19)

Note. AOR = adjusted odds ratio; CI = confidence interval; CME = continuing medical education. The total sample size was 162 846. Standard errors clustered at the state level.

*Clinically meaningful at $P < .0001$.

level covariates like legislation governing prescription limits.

Limits on prescriptions likely reduced the quantity of opioids available for diverting to illicit sales, simultaneously driving the street price of prescription pills upward. Limits on prescriptions likely facilitated a change in the preferred opioid of choice from prescription opioids to heroin, especially among poor and minority communities flooded with cheaper heroin. Our study identified worse treatment outcomes for primary heroin users among Whites and Hispanics. In addition, in a subanalysis of our TEDS-D sample, we found that Hispanic treatment episodes demonstrated the highest proportion of heroin as a drug of choice (Hispanic = 84%; Black = 81%; White = 63%; AI/AN = 58%). This is partially aligned with previous findings that limited supply and higher street prices for prescription opioids has resulted in a surge in cheaper heroin.^{25,51} Thus, clearly articulating the pathway between opioid prescribing legislation, subsequent transition to heroin, and treatment outcomes among Hispanic treatment episodes is challenging and warrants further investigation. Importantly, strengthening prescribing legislation could be a relatively actionable goal, and more research is needed to inform policy decisions aimed at equitable health-related programming.

Limitations

This study has several limitations that come from the use of the TEDS-D administrative data. First, our definition of positive treatment response is a unique adaptation of newly available SAMHSA variables. While this metric is

not a validated tool for clinical decision-making, it is a novel use of the TEDS-D data that can aid in research evaluating a complex disease. While comprehensive clinical notes and medical diagnoses are typically unavailable in national administrative data sets, future research may confirm our findings of racial/ethnic differences using a more conventional definition of treatment success.

TEDS-D includes observations from all treatment service providers that receive federal funding; many private, office-based treatment settings may not be included in the TEDS-D population. TEDS-D also does not include data on treatment provided through federal agencies, including the Veterans Administration, the Department of Defense, or the Bureau of Prisons. In addition, not all states report treatment services data to SAMHSA. In 2018, Georgia, Oregon, Washington, and West Virginia did not report data to SAMHSA, and they are not included in the analytic sample.

The severity of an OUD is an important covariate to consider in treatment outcome studies. TEDS-D does have a variable that indicates *DSM-IV* diagnoses of abuse and dependence, but 18% of treatment episodes have missing values, which ranged from 16% missing among White clients, followed by Black (19%), AI/AN (30%), and Hispanic (34%) clients. We opted to keep these observations in our primary analysis and not use the available severity data. However, we assessed this relationship among episodes in which severity data were available in our sensitivity analysis.

Public Health Implications

The continuum of health care for individuals with chronic pain and OUD is

complex, and multiple individual-, community-, and policy-level factors compete to influence treatment outcomes. Connecting multiple fragmented systems is a challenge for epidemiological research, as data systems often lack information across the spectrum of care. We used national data merged with several other state-level resources to illustrate how multiple factors influence heroin and opioid treatment success. Community distress, which broadly encompasses poverty, struggling educational systems, unemployment, and insufficient income, was associated with negative treatment response among all racial/ethnic groups. Critically, racial/ethnic minority treatment episodes were disproportionately represented in the most distressed states. Social determinants of health must be embedded within all research and public health practice that addresses any one of the many points along the chronic pain and OUD treatment spectrum of care. While identifying risk factors is important in disease surveillance, the identification of differential associations by racial/ethnic group can help to highlight community assets like buprenorphine availability, as opposed to the conventional focus on community deficits. [AJPH](#)

ABOUT THE AUTHORS

George Pro and Nickolas Zaller are with Department of Health Behavior and Health Education and the Center for Public Health and Criminal Justice Research, University of Arkansas for Medical Sciences, Little Rock. Corey Hayes is with the Center for Health Services Research, College of Medicine, University of Arkansas for Medical Sciences, and the Center for Mental Healthcare and Outcomes Research, Central Arkansas Veterans Healthcare System, Little Rock. Clare C. Brown is with the Department of Health Policy and Management, University of Arkansas for Medical Sciences. Johnathan Goree is with the Department of Anesthesiology, College of Medicine, University of Arkansas for Medical Sciences.

CORRESPONDENCE

Correspondence should be sent to George Pro, PhD, MPH, University of Arkansas for Medical Sciences, 4301 W Markham St, Little Rock, AR 72201 (e-mail: gopro@uams.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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CONTRIBUTORS

G. Pro conceptualized the study, conducted analyses, and organized the drafting of the article. C. Hayes, C. C. Brown, J. Goree, and N. Zaller all provided substantial input into the concept and design of the study, made decisions around methodological and analysis considerations, interpreted results, and wrote article sections. All authors agreed to the final submission.

CONFLICTS OF INTEREST

All authors report no conflicts of interest.

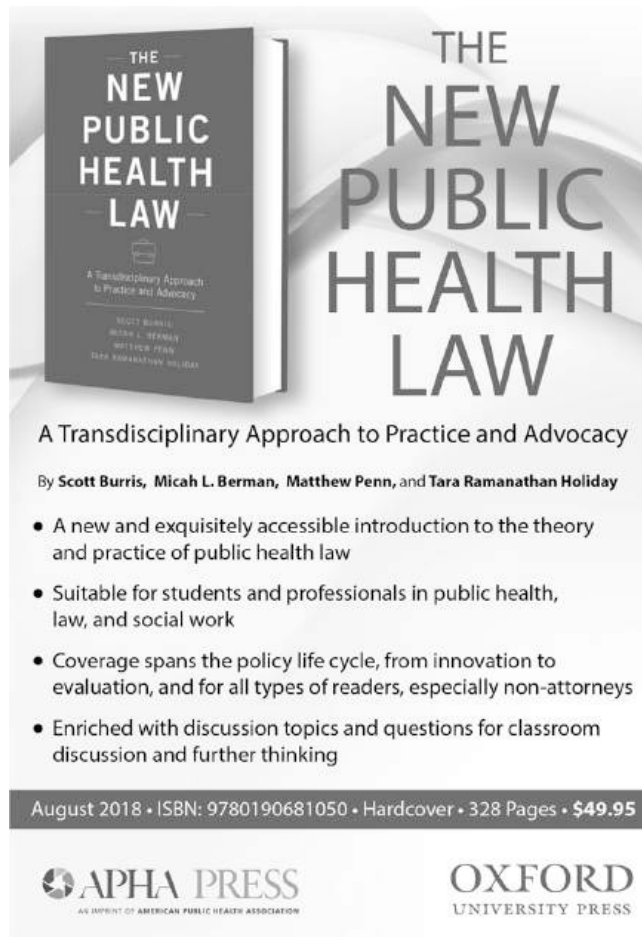
HUMAN PARTICIPANT PROTECTION

This study used secondary, administrative data housed by the Substance Abuse and Mental Health Services Administration (SAMHSA). The Treatment Episode Dataset–Discharges data set is de-identified client-level information and available for free to download through SAMHSA. As this was a secondary analysis of pre-existing administrative data, no human participants were involved in this study.

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Pain and Prescription Opioid Use Among US Construction Workers: Findings From the 2011–2018 Medical Expenditure Panel Survey

Xiuwen Sue Dong, DrPH, Raina D. Brooks, MPH, Christopher Rodman, MPH, Richard Rinehart, ScD, and Samantha Brown, MPH

 See also Atkins and Bohnert, p. S33.

Objectives. To examine prescription opioid and nonopioid analgesic use among US construction workers and their associations with pain conditions and sociodemographic factors.

Methods. We analyzed data for about 9000 (weighted 11.5 million per year) construction workers who responded to the Medical Expenditure Panel Survey from 2011 to 2018. We applied both descriptive statistics and multiple logistic regression procedures in the analyses.

Results. An estimated 1.2 million (10.0%) of construction workers used prescription opioid analgesics annually. The adjusted odds of prescription opioid use were significantly higher for workers suffering from work-related injuries (adjusted odds ratio [AOR] = 3.82; 95% confidence interval [CI] = 2.72, 5.37), non-work-related injuries (AOR = 3.37; 95% CI = 2.54, 4.46), and musculoskeletal disorders (AOR = 2.31; 95% CI = 1.80, 2.95) after we controlled for potential confounders. Adjusted odds of prescription opioid use were also higher among workers with poorer physical health (AOR = 1.95; 95% CI = 1.42, 2.69) or mental health disorders (AOR = 1.95; 95% CI = 1.41, 2.68).

Conclusions. Work- and non-work-related injuries and musculoskeletal disorders significantly increased prescription opioid use among construction workers. To prevent opioid use disorders, multipronged strategies should be approached. (*Am J Public Health.* 2022;112(S1):S77–S87. <https://doi.org/10.2105/AJPH.2021.306510>)

The opioid epidemic and its impact on the US population have raised national concerns.^{1,2} Over the past 2 decades, more than 446 000 opioid-related deaths have occurred in the United States,³ with 71% of drug overdose deaths in 2019 involving opioids.⁴ From 1999 to 2019, overdose deaths in the United States increased by 4-fold.⁵

Opioids have also had adverse effects on millions of working people in the United States. In 2019, 60% of adults who misused opioids were employed.⁶ One study that used nationally

representative survey data found that about 12.6% of US workers used prescription opioids, which accounted for about \$3 billion in medical expenses annually.⁷ Meanwhile, fatal work injuries from unintentional overdose increased by an average of 24% per year from 2011 to 2018, of which 41% were from nonmedical drugs (n = 528) and 32% were from multiple drugs, alcohol, and medicines (n = 411).⁸ The most recent data from the US Bureau of Labor Statistics (BLS) show that the unintentional overdose fatalities that

occurred in the workplace increased in 2019, totaling 1606 deaths from 2011 to 2019.⁹ This number only captures a small proportion of overdose fatalities, because decedents who were not at their worksite or performing work duties may be out of the scope of the BLS data collection, even though initially the decedent could have used medication to alleviate the pain from a work-related injury.¹⁰

Among workplaces confronting the opioid epidemic, the construction industry was especially pronounced.

A study based on the BLS data shows that overdose deaths on construction jobsites increased 9-fold from 2011 to 2018, which was twice that of the increase observed in all industries combined.¹¹ Using data from the National Occupational Mortality Surveillance system, researchers found that proportional mortality ratios for both heroin-related overdose deaths and methadone-related overdose deaths were highest for the construction occupation group, and proportional mortality ratios were also significantly elevated for all types of opioids within construction trade workers.¹² Studies using different data sources at the state or national level all concluded that construction workers were more likely to use opioids and die of opioid-related overdoses than workers in other industries.^{12–15}

The elevated opioid-related overdoses among construction workers could be preceded by injuries that happen in the workplace. Research has found that injuries and musculoskeletal conditions were associated with increased opioid use among construction workers.^{16,17} The odds of prescription opioid use for workers with occupational injuries was more than triple that of their noninjured counterparts when demographics and occupational factors were controlled.¹⁶ Furthermore, research indicates that construction workers diagnosed with chronic musculoskeletal disorders (MSDs) were more than 4 times as likely to develop opioid use disorders compared with those who started on opioids for other diagnoses, and the relationship between opioid use disorders and doses or duration of opioid use was positively correlated: the higher doses and longer duration, the higher probability to develop opioid use disorders.¹⁸

Construction is one of the most dangerous industry sectors in the United States. Despite continuous intervention efforts, the construction industry still reports more fatalities and a higher injury rate than other major industries in the nation. According to the most recently published data from BLS, 1102 construction workers died on jobsites in 2019, accounting for nearly 21% (1102 of 5333) of fatal injuries in all industries.¹⁹ This is disproportionately high given that construction employment only accounted for approximately 6% of the overall workforce in the United States.²⁰ In the same year, 79 660 construction workers suffered severe injuries or illnesses involving days away from work.¹⁹ While the rate of overall reported injuries and illnesses was similar for construction and all private industries combined in 2019, the rate of injuries involving days away from work in construction was 29% higher than the rate for workers in all private industries on average (112.3 vs 86.9 cases per 10 000 full-time workers).¹⁹ Therefore, it is not surprising that injured workers in construction were more likely than injured workers in other industries to be prescribed opioids to treat their pain.²¹

The effects of opioid use and misuse are not isolated to work or home environments.²² Given that construction workers are commonly prescribed opioid pain relievers, it is necessary to better understand patterns of prescribed opioid use and how the use is associated with work and nonwork factors among this high-risk working population. To achieve this goal, we examined types of pain and analgesic use among construction workers, as well as factors associated with their use. We hypothesized that prescription opioid use was determined by types of pain or medical

conditions the worker experienced, and the use was associated with demographic and employment characteristics of the user. We anticipate the results to provide information for workplace interventions targeting opioid use and misuse in the construction industry, and to stakeholders battling the opioid epidemic.

METHODS

Data were from the Medical Expenditure Panel Survey (MEPS), a set of large-scale national surveys collecting information on health, health care cost, and health care utilization among noninstitutionalized people in the United States. MEPS is cosponsored by the Agency for Healthcare Research and Quality and the National Center for Health Statistics.²³ Every year, a new panel of MEPS survey participants is followed for 2 calendar years, during which they complete 5 rounds of interviews. We downloaded 3 household component data files between 2011 and 2018 from the Agency for Healthcare Research and Quality Web site for this study: (1) full-year consolidated files for demographic and employment information collected from 3 survey rounds in each calendar year, (2) medical condition files for data on injury and other medical conditions, and (3) prescribed medications files for data on prescription opioid and nonopioid analgesic use. These 3 files were linked by individual survey identifiers for analyses.

Measures

Construction workers were respondents who were aged 16 years or older and self-reported that their primary employment was in the construction industry during at least 1 of the 3

survey rounds in the year, regardless of their occupation. The construction industry was coded as “3” in the MEPS industry codes, corresponding to the code “23” in the North American Industry Classification System.

Opioids in this study refers to only outpatient prescription fills of opioids including narcotic analgesics and narcotic analgesic combinations.^{16,24} A prescription opioid user was a respondent who had 1 or more prescription opioid fills in any survey round during the year.^{16,24} Nonopioid analgesics purchased by respondents included nonsteroidal antiinflammatory agents, salicylates, topical nonsteroidal antiinflammatories, topical anesthetics, and analgesic combinations.^{16,24}

Injury was identified by 2 questions. When the MEPS respondents reported a medical condition, they were asked whether the condition was caused by an accident or injury. If they answered “yes,” they were asked whether the accident or injury occurred at work. If the answer was “yes,” a work-related injury was counted.¹⁶

We defined musculoskeletal disorders (MSDs; excluding musculoskeletal injuries) and musculoskeletal injuries based on the *International Classification of Diseases (ICD)* codes adopted by the MEPS, with the *ICD-9* for 2011–2015 data²⁵ and the *ICD-10* for 2016–2018 data.²⁶ *ICD* codes were also used to define other pain conditions (i.e., cancer and headaches, including migraines) and mental health disorders (i.e., adjustment disorders, anxiety disorders, attention-deficit conduct and disruptive behavior disorders, impulse-control disorders, mood disorders, personality disorders, schizophrenia and other psychotic disorders, alcohol-related disorders, substance-related disorders, and miscellaneous mental health disorders).

The respondent self-rated perceived health status at the time of the interview. We used 3 categories to analyze both physical and mental health: (1) excellent or very good, (2) good, and (3) fair or poor.

We defined age in 3 groups: 16 to 34 years, 35 to 54 years, and 55 years or older. We combined and grouped race and ethnicity into 3 major categories: Hispanic, non-Hispanic White, and non-Hispanic other. We grouped educational attainment into 3 categories: (1) less than high-school diploma or GED, (2) high-school diploma or GED, and (3) postsecondary. We defined family poverty status according to the US Census Bureau’s poverty threshold: poor to low income (< 200%), middle income (200% to < 400%), and high income (\geq 400%).²⁷

Self-employment status referred to workers who were self-employed at their current main job. White-collar occupations were composed of management or professional and administrative support, sales, or service. Blue-collar occupations included construction trade workers (e.g., roofers, carpenters) and other production occupations (e.g., truck drivers). We grouped average hours worked per week as part-time (< 35 hours), full-time (35–40 hours), and overtime (> 40 hours).

Data Analyses

We pooled data from 2011 through 2018 MEPS to increase sample size and improve data reliability. We used MEPS survey weight variables to weight all calculations and divided by 8 for annual averages. We stratified prescription analgesic use categories by pain categories (i.e., injury, MSDs, or other pain), other health indicators, and demographic and employment

characteristics. Because 1 respondent may report more than 1 medical or pain condition, or multiple records of prescription opioid or nonopioid analgesic use, we used person-times in the percentage calculations for each category. We calculated weighted percentages and their 95% confidence intervals (CIs), and applied the χ^2 test to measure whether differences in prescription analgesic use among worker subgroups were statistically significant. We also evaluated prescription analgesic use by medical condition and calculated weighted percentages.

We used multiple logistic regressions to tabulate adjusted odds ratios (AORs) and their 95% CIs to examine how the selected independent variables affected prescription opioid use collectively. We selected variables included in the multiple regression model based on the level of significance in the descriptive statistics and correlation coefficients. We assessed multicollinearity, and no collinearity was present in the model. Results of correlation coefficients and multicollinearity assessment are in Tables A, B, and C (available as supplements to the online version of this article at <http://www.ajph.org>). All statistical testing (including the χ^2 test) was 2-sided, and we considered *P* values of less than .05 statistically significant. We used SAS version 9.4 (SAS Institute, Cary, NC) for the data analysis. We applied SAS SURVEY procedures and MEPS survey weights, strata, and clusters for all statistical analyses accounting for the MEPS survey design.

RESULTS

Approximately 11.5 million (weighted) workers reported that they were employed in the construction industry annually from 2011 to 2018 (Table 1).

TABLE 1— Characteristics of US Construction Workers: 2011–2018

Characteristic	Distribution, % (95% CI)
Demographics	
Gender	
Men	90.8 (89.8, 91.8)
Women	9.2 (8.2, 10.2)
Age group, y	
16–34	35.3 (33.6, 37.0)
35–54	45.5 (43.8, 47.1)
≥ 55	19.2 (17.7, 20.8)
Race/ethnicity	
Hispanic	26.4 (23.8, 28.9)
Non-Hispanic White	63.7 (60.9, 66.5)
Non-Hispanic other	9.9 (8.5, 11.2)
Education	
< high school diploma or GED	19.3 (17.8, 20.8)
High school diploma or GED	40.6 (38.7, 42.5)
Postsecondary	40.1 (38.1, 42.0)
Family poverty status^a	
Poor to low (<200%)	26.1 (24.4, 27.8)
Middle (200% to <400%)	34.0 (32.4, 35.5)
High (≥ 400%)	39.9 (37.8, 42.0)
Employment	
Occupation	
White-collar	31.2 (29.3, 33.1)
Blue-collar	68.8 (66.9, 70.7)
Self-employed	
Yes	27.4 (25.5, 29.2)
No	72.6 (70.8, 74.5)
Average hours worked per week	
35–40	55.6 (53.5, 57.7)
< 35	16.5 (15.2, 17.8)
> 40	27.9 (25.8, 29.9)
Health indicators	
General physical health status	
Excellent or very good	62.9 (61.1, 64.7)
Good	27.4 (26.0, 28.9)
Fair or poor	9.7 (8.8, 10.5)
Mental health status	
Excellent or very good	73.5 (71.8, 75.2)
Good	22.6 (21.2, 24.1)
Fair or poor	3.9 (3.3, 4.5)
Mental health disorders	
Yes	11.6 (10.4, 12.7)
No	88.4 (87.3, 89.6)
Injury status	
No injury	80.0 (78.6, 81.5)

Continued

Construction was predominantly male, as women accounted for less than 10% of its workforce. The majority of construction workers were younger than 55 years, and 1 in 5 were 55 years or older. Hispanic workers made up a major component of construction employment, at 26.4% on average during this period. A large number of construction workers had lower educational attainment; nearly 20% of workers did not have a high-school diploma or GED. Despite being employed, about 26% of construction workers had poor or low income according to the federal poverty level.

More than two thirds of workers in construction held a job in blue-collar occupations, such as construction trades (e.g., roofers, carpenters) and other production occupations (e.g., truck drivers), and the rest were employed in white-collar occupations (e.g., managers, engineers, professionals, office workers). While more than half of construction workers reported working full-time, or 35 to 40 hours weekly, nearly 28% of construction workers worked overtime (> 40 hours/week), and another 16.5% worked part-time (< 35 hours/week). Furthermore, about 27.4% of construction workers were self-employed.

Nearly 10% of workers in construction perceived their physical health as fair or poor. Although less than 4% of workers self-rated their mental health as fair or poor, 11.6% reported they had mental health disorders. Conditions that typically caused pain were not uncommon among construction workers: MSDs (25.7%) and injuries (11.2% for non-work-related injuries and 8.7% for work-related injuries) were major pain-related conditions among these workers, and a smaller proportion (4.8%) was attributable to

TABLE 1— Continued

Characteristic	Distribution, % (95% CI)
Work-related injury	8.7 (7.7, 9.8)
Non-work-related injury	11.2 (10.2, 12.3)
MSD	
Yes	25.7 (24.0, 27.4)
No	74.3 (72.6, 76.0)
Other pain ^b	
Yes	4.8 (4.0, 5.6)
No	95.2 (94.4, 96.0)

Note. CI = confidence interval; GED = general educational development; MSD = musculoskeletal disorder. The total sample was 9070, and the weighted total was 11 484 000. All values in table are weighted.

^aDefined according to the US Census Bureau's poverty threshold.

^bOther pain category comprises cancer and headaches, including migraines.

other conditions (i.e., cancers and headaches, including migraines).

From 2011 to 2018, about 1.8 million construction workers (weighted) used prescription analgesics per year on average, accounting for nearly 16% of the study population (Table 2). Prescription opioid analgesics were used more frequently than prescription non-opioid analgesics among these workers, with 1.2 million (10.0%) for opioid analgesics, and nearly 1.1 million (9.3%) for nonopioid analgesics.

In general, prescription opioid or nonopioid analgesic use varied among worker subgroups. Both opioid and nonopioid prescription analgesic use increased with age. Higher use was found among women, non-Hispanics, and workers in poorer health ($P < .05$). Prescription opioid analgesic use was also higher among construction workers who worked part-time or overtime and those who held a white-collar occupation ($P < .01$). Moreover, prescription opioid use was highest among workers suffering an injury (work-related: 25.0%; non-work-related: 24.4%) or MSD (21.5%). We found similar results for prescription nonopioid analgesic use at

21.6% for work-related injuries and 22.9% for MSDs. Furthermore, workers with mental health disorders were also more likely to use prescription opioid or nonopioid analgesics than their counterparts without such disorders.

Patterns of prescription analgesic use by pain-related conditions are illustrated in Figure 1. Construction workers who suffered an injury (work- or non-work-related injuries, or musculoskeletal injuries), had a mental health disorder, or had cancer were more likely to use prescription opioids than nonopioid analgesics. Conversely, workers who experienced back pain alone or headaches (including migraines) were more likely to use prescription nonopioids than opioid analgesics.

Table 3 presents the results of the multiple logistic regression model showing major factors associated with prescription opioid use. Workers with work-related injuries were 3.8 times more likely to use prescription opioids than workers without such injuries (AOR = 3.82; 95% CI = 2.72, 5.37). Higher prescription opioid use was found among workers with non-work-related injuries as well (AOR = 3.37;

95% CI = 2.54, 4.46). Prescription opioid use among workers with MSDs was twice that of those without such conditions (AOR = 2.31; 95% CI = 1.80, 2.95). Poorer physical health (fair or poor vs excellent or very good; AOR = 1.95; 95% CI = 1.42, 2.69) and mental health disorders (AOR = 1.95; 95% CI = 1.41, 2.68) were also significant in the model. In addition, women and older construction workers were 49% and 44%, respectively, more likely to use prescription opioids than their male and younger counterparts (women: AOR = 1.49; 95% CI = 1.03, 2.17; those aged 55 years or older: AOR = 1.44; 95% CI = 1.04, 1.98). Odds of prescription opioid use among Hispanic workers were significantly lower than among their non-Hispanic White counterparts when other factors were constant (AOR = 0.59; 95% CI = 0.46, 0.75).

DISCUSSION

In this study, we used a large national household survey to examine pain-related conditions and their associations with prescribed opioid and nonopioid use among US construction workers. The demographic distribution of this sample was consistent with the results from other population surveys, such as the Current Population Survey and American Community Survey during similar time periods,²⁰ indicating that the study sample was normally distributed and nationally representative. The results show that about 16% of construction workers used prescription analgesics on average during 2011 to 2018, and 10% used prescription opioids.

The findings support the study hypothesis that prescription opioid use was determined by types of pain conditions. Construction workers who suffered an injury were more likely to use

TABLE 2— Prevalence of Prescription Analgesic Use by Selected Characteristics Among US Construction Workers: 2011–2018

Characteristic	Any Analgesic, % (95% CI)	Opioid, ^a % (95% CI)	Nonopioid, ^a % (95% CI)
Overall	15.9 (14.7, 17.0)	10.0 (9.1, 11.0)	9.3 (8.3, 10.2)
Gender ^{b,c,d}			
Men	15.2 (13.9, 16.4)	9.5 (8.5, 10.4)	8.9 (7.9, 9.9)
Women	22.6 (18.7, 26.5)	15.4 (12.2, 18.7)	12.7 (9.4, 16.0)
Age group, y ^{b,c,d}			
16–34	11.7 (10.2, 13.1)	7.7 (6.5, 8.9)	6.7 (5.3, 8.1)
35–54	16.4 (14.9, 18.0)	10.3 (8.9, 11.7)	9.7 (8.4, 10.9)
≥ 55	22.2 (18.9, 25.5)	13.5 (11.0, 16.0)	13.1 (10.2, 16.0)
Race/ethnicity ^{b,c,d}			
Hispanic	10.3 (9.0, 11.5)	5.3 (4.3, 6.3)	6.9 (5.9, 7.9)
Non-Hispanic White	18.2 (16.6, 19.8)	12.2 (10.8, 13.5)	10.1 (8.7, 11.4)
Non-Hispanic other	15.6 (12.8, 18.5)	8.7 (6.6, 10.8)	10.3 (8.0, 12.7)
Education ^{b,c,d,e}			
< high school diploma or GED	13.2 (11.1, 15.2)	6.9 (5.5, 8.2)	8.5 (6.9, 10.1)
High school diploma or GED	17.4 (15.5, 19.2)	10.9 (9.4, 12.5)	10.7 (9.2, 12.3)
Postsecondary	15.8 (14.1, 17.5)	10.8 (9.3, 12.2)	8.2 (6.9, 9.6)
Family poverty status ^f			
Poor to low (<200%)	14.8 (13.1, 16.6)	9.9 (8.4, 11.4)	8.6 (7.1, 10.1)
Middle (200% to <400%)	15.1 (13.3, 16.9)	9.0 (7.6, 10.4)	10.0 (8.5, 11.5)
High (≥400%)	17.1 (15.0, 19.3)	10.9 (9.2, 12.6)	9.1 (7.4, 10.7)
Self-employed			
Yes	16.8 (14.3, 19.3)	11.2 (9.0, 13.4)	9.0 (7.0, 10.9)
No	15.4 (14.0, 16.7)	9.5 (8.5, 10.5)	9.3 (8.1, 10.5)
Average hours worked per week ^c			
35–40	14.8 (13.3, 16.4)	8.7 (7.5, 9.8)	9.5 (8.2, 10.9)
< 35	18.1 (15.6, 20.6)	13.0 (10.8, 15.2)	9.2 (7.4, 11.0)
> 40	16.2 (13.9, 18.5)	11.0 (9.0, 13.1)	8.5 (6.8, 10.1)
Occupation ^{b,c,e}			
White-collar	17.6 (15.5, 19.8)	11.7 (9.9, 13.5)	9.5 (7.8, 11.3)
Blue-collar	14.9 (13.5, 16.2)	9.1 (8.0, 10.2)	8.9 (7.8, 10.1)
General physical health status ^{b,c,d}			
Excellent or very good	11.4 (10.1, 12.6)	6.9 (6.1, 7.8)	6.5 (5.6, 7.4)
Good	22.2 (19.9, 24.6)	14.8 (12.8, 16.9)	12.6 (10.6, 14.6)
Fair or poor	26.9 (22.8, 31.1)	16.3 (13.0, 19.7)	17.6 (13.7, 21.5)
Mental health status ^{b,c,d}			
Excellent or very good	14.0 (12.7, 15.3)	8.8 (7.8, 9.8)	8.3 (7.3, 9.4)
Good	19.6 (17.3, 21.9)	12.2 (10.1, 14.4)	11.0 (9.2, 12.9)
Fair or poor	28.7 (21.9, 35.5)	20.1 (14.6, 25.6)	16.4 (10.2, 22.5)
Mental health disorders ^{b,c,d}			
Yes	30.0 (26.0, 34.1)	21.0 (17.0, 25.1)	15.2 (12.1, 18.3)
No	14.0 (12.9, 15.1)	8.6 (7.7, 9.5)	8.5 (7.6, 9.4)
Injury status ^{b,c,d}			
No injury	11.2 (10.0, 12.3)	6.4 (5.5, 7.2)	6.6 (5.8, 7.5)
Work-related injury	35.5 (30.8, 40.2)	25.0 (20.6, 29.3)	21.6 (17.7, 25.5)

Continued

TABLE 2— Continued

Characteristic	Any Analgesic, % (95% CI)	Opioid, ^a % (95% CI)	Nonopioid, ^a % (95% CI)
Non-work-related injury	34.1 (30.0, 38.1)	24.4 (20.4, 28.5)	18.4 (14.7, 22.1)
MSD ^{b,c,d}			
Yes	35.2 (32.2, 38.2)	21.5 (18.8, 24.1)	22.9 (20.2, 25.6)
No	9.1 (8.1, 10.2)	6.0 (5.2, 6.9)	4.5 (3.8, 5.3)
Other pain ^{b,c,d,g}			
Yes	24.5 (18.3, 30.8)	17.5 (11.5, 23.4)	16.6 (11.3, 21.9)
No	15.4 (14.3, 16.6)	9.6 (8.7, 10.6)	8.9 (8.0, 9.8)
Weighted total, no.	1 820 000	1 150 000	1 064 000

Note. CI = confidence interval; GED = general educational development; MSD = musculoskeletal disorder. All values in table are weighted. The Rao-Scott χ^2 test was used.

^aPrescription opioid and prescription nonopioid analgesic categories are not mutually exclusive. For instance, workers included in the prescription opioid analgesic use category may also be included in the prescription nonopioid analgesic use category.

^b $P < .05$ for any prescription analgesic.

^c $P < .05$ for prescription opioid analgesic.

^d $P < .05$ for prescription nonopioid analgesic.

^eFor education, P values were calculated using “no college” and “some college and higher” categories. For occupation, P values were calculated using “white-collar” and “blue-collar” categories.

^fDefined according to the US Census Bureau’s poverty threshold.

^gOther pain category comprises cancer and headaches, including migraines.

prescription opioids than nonopioid analgesics, while those who experienced back pain or headaches were more likely to use prescription nonopioids than opioid analgesics. Adjusted odds of prescription opioid use among construction workers with work-related injuries was almost 4 times higher than those without such injuries, and the use for workers with MSDs was double that of those without MSDs. Although this study was unable to define the work-relatedness of MSDs, previous research indicates that construction workers are frequently involved in lifting, carrying, working in awkward positions, and other heavy work.²⁰ While employers are required by the Occupational Safety and Health Administration to provide a safe and healthful workplace for their workers, there are no specific ergonomic regulations.²⁸ Because these hazards are poorly controlled, construction workers are at a high risk for developing chronic

MSDs.²⁹ Moreover, poor physical health and mental health disorders were associated with greater prescription opioid use, which is consistent with previous studies.^{16,17,21}

The study also confirms the hypothesis that workers’ sociodemographic factors were associated with prescription opioid use. The odds of prescription opioid use among older construction workers (aged ≥ 55 years) were significantly higher than among younger workers when other variables remained constant. Older workers are more likely to have MSDs and chronic conditions.^{17,29} Considering the increasing aging workforce trends, this age group should be given special attention because they are more likely to have an adverse event, even death, when taking opioid medications.³⁰ Meanwhile, prescription opioid use among female workers was significantly higher, although less than 10% of construction workers were women. This

finding was consistent with studies showing greater vulnerability in opioid use among women.³¹ Moreover, both prescription opioid and nonopioid use were significantly lower among Hispanic workers. The racial/ethnic disparities in prescription opioid use among construction workers reported in this study confirm previous findings that minorities are less likely to receive prescription opioids.^{7,32} In addition to variations in age, insurance coverage and other factors not examined in this study may have an impact on lower prescribed opioid use among Hispanic construction workers. Previous research found that Hispanic workers are more likely to be uninsured, and workers are less likely to seek health care if they lack health insurance coverage.²⁰ In addition, workers who become dependent on prescribed opioids and have those prescriptions abruptly stopped, possibly because of increased public awareness of the role

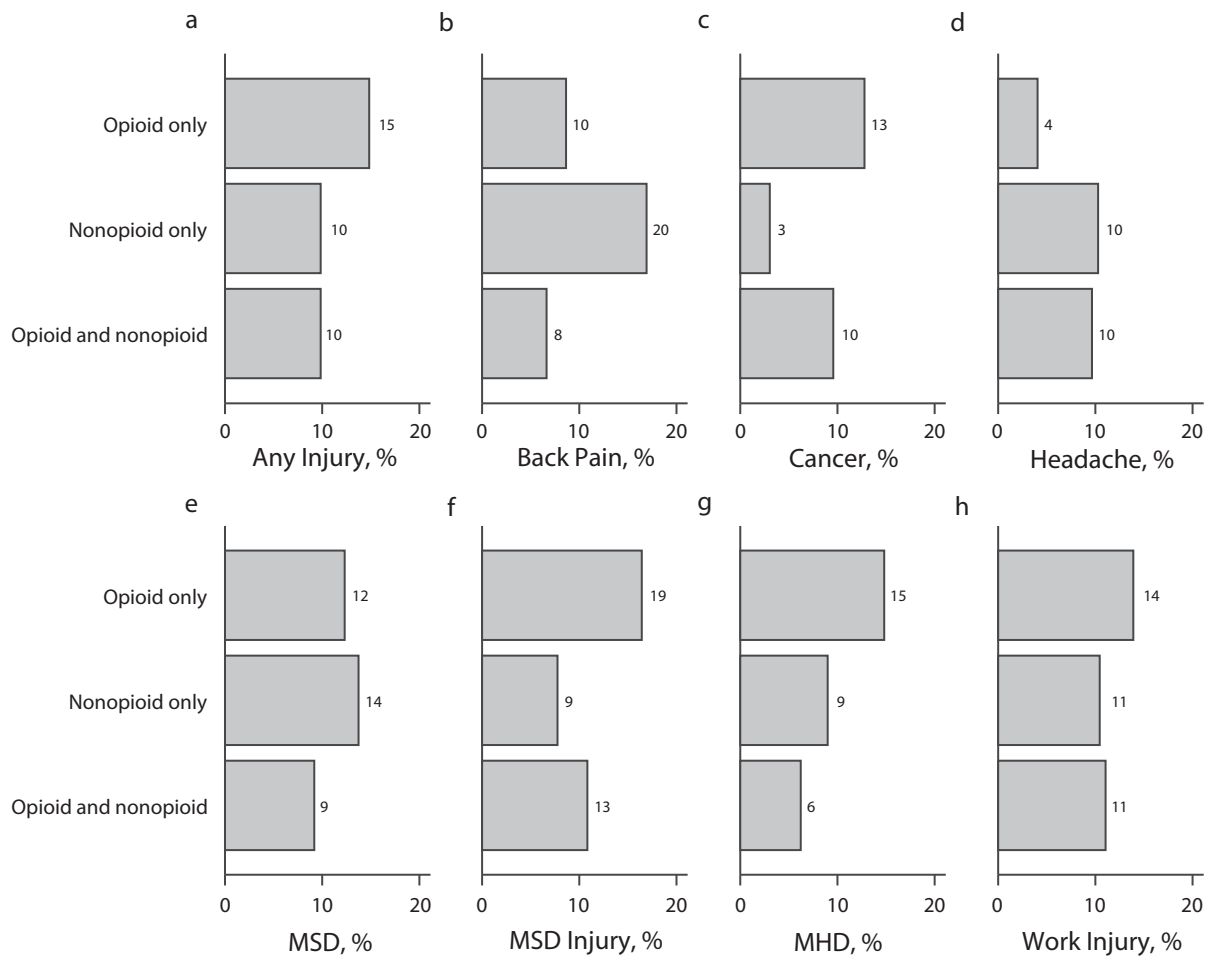


FIGURE 1— Average Prescription Analgesic Use Among Construction Workers With (a) Any Injury, (b) Back Pain, (c) Cancer, (d) Headache, (e) Musculoskeletal Disorder (MSD), (f) MSD Injury, (g) Mental Health Disorder (MHD), and (h) Work-Related Injury: United States, 2011–2018

Note. Weighted percentages are presented. Prescription analgesic categories are mutually exclusive. The “any injury” category includes work-related and non-work-related injuries.

pharmaceutical companies have played in the opioid crisis, may seek illicit sources driven by opioid withdrawal syndrome.³³ Both scenarios could make the opioid crisis even worse.

Limitations

This study has some limitations that should be taken into consideration. First, the study only examined outpatient prescription opioid use. Because most opioid overdose deaths involve nonprescription opioids,^{3,12} and there

is a higher prevalence of illicit opioid use among construction workers,^{11,15} studies on nonprescription opioid use and illicit drug use should be conducted to understand the overall opioid crisis in this industry. In addition, although the MEPS is a panel survey, this study was designed as cross-sectional based on the data collected in the calendar year rather than the entire 2-year follow-up period. Therefore, the causal relationships between prescription opioid use and the independent variables included in the

model were unable to be fully determined.

Despite the limitations, this study expanded previous research and explored the relationship between pain and prescription opioid use among construction workers while taking multiple socioeconomic factors into consideration. In addition, the findings were based on 8 years of data from a large, nationally representative sample, which increases the validity and reliability of the results. Furthermore, the high prevalence of prescription opioid use among injured

TABLE 3— Multiple Logistic Regression of Prescription Opioid Use (Versus Nonuse) Among US Construction Workers: 2011–2018

Characteristic	Multiple Logistic Regression (n = 7 101), AOR (95% CI)
Gender	
Men (Ref)	1
Women	1.49 (1.03, 2.17)
Age group, y	
16–34 (Ref)	1
35–54	1.13 (0.87, 1.47)
≥ 55	1.44 (1.04, 1.98)
Race/ethnicity	
Non-Hispanic White (Ref)	1
Hispanic	0.59 (0.46, 0.75)
Non-Hispanic other	0.83 (0.60, 1.15)
Average hours worked per week	
35–40 (Ref)	1
< 35	1.28 (0.99, 1.64)
> 40	1.12 (0.86, 1.45)
Occupation	
White-collar (Ref)	1
Blue-collar	0.96 (0.75, 1.24)
General physical health status	
Excellent or very good (Ref)	1
Good	2.07 (1.63, 2.62)
Fair or poor	1.95 (1.42, 2.69)
Mental health disorders	
Yes	1.95 (1.41, 2.68)
No (Ref)	1
Injury status	
No injury (Ref)	1
Work-related injury	3.82 (2.72, 5.37)
Non-work-related injury	3.37 (2.54, 4.46)
MSD	
Yes	2.31 (1.80, 2.95)
No (Ref)	1
Other pain^a	
Yes	1.25 (0.72, 2.17)
No (Ref)	1

Note. AOR = adjusted odds ratio; CI = confidence interval; MSD = musculoskeletal disorder. All values in the table are weighted.

^aOther pain category comprises cancer and headaches, including migraines.

construction workers suggests that strategies to cope with the opioid crisis should include a range of tactics to improve worker safety and health, provide training and education to

prevent occupational injuries and illnesses, effectively manage pain, and provide treatments and support for workers with substance use disorders or in recovery.

Conclusions and Policy Implications

This study reveals that the primary factors underlying prescription opioid use among construction workers were work- or non-work-related injuries and MSDs. Considering the high risks and high injury rates in the construction industry,^{21,22} these findings may partially explain why construction workers were more likely to use opioids and die of opioid-related overdoses than workers in other industries.^{12–15} In any case, the findings confirm that both poor physical and mental health were associated with increased opioid prescription use. It is possible that these factors may also contribute to the high suicide rate among male construction workers.³⁴

The study suggests that the workplace plays an important role in curbing the opioid crisis. The upstream factors, such as workplace safety policies, may have downstream effects on opioid-related overdose and suicide. This could be characterized as syndemic given the presence and interlinkages of occupational health and general public health through the influences of common social and structural workplace-specific factors.³⁵ Specifically, it is necessary to provide guidance to employers and medical providers regarding opioid use, support workers with pain conditions in recovery, and assist workers who are already in need of health care or mental health care. It is also important to monitor opioid prescription practices and offer related education and training to medical providers, workers, and employers. Furthermore, improving working conditions and reducing work-related injuries, pain, job loss, stress, and other work-related factors that may be

leading to the use and misuse of opioids are essential. Multipronged strategies could be an effective and efficient approach to prevent opioid misuse and disorders. *AJPH*

ABOUT THE AUTHORS

All authors are with CPWR – The Center for Construction Research and Training, Silver Spring, MD.

CORRESPONDENCE

Correspondence should be sent to Xiuwen Sue Dong, CPWR – The Center for Construction Research and Training, 8484 Georgia Ave, Suite 1000, Silver Spring, MD 20910 (e-mail: sdong@cpwr.com). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

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CONTRIBUTORS

X. S. Dong designed the study, interpreted the results, drafted and revised the article critically for important intellectual content, and agreed to be accountable for all aspects of the work. R. D. Brooks conducted literature reviews, analyzed data, created tables, and drafted the article. C. Rodman and R. Rinehart aided in drafting the introduction and discussion. S. Brown aided in drafting the introduction and formatting the references. All authors approved the final version before submission.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

Because this study used only publicly accessible data, it was exempt from institutional board review by the CPWR institutional review board.

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