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## Editorial

## Behavior change, health, and health disparities 2019: Opioids, tobacco, and treatment adherence

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## ABSTRACT

This Special Issue of *Preventive Medicine* (PM) is the 6th in a series on behavior change, health, and health disparities. This is a topic of critical importance to improving U.S. population health. There is broad consensus that personal behavior patterns or lifestyle such as substance abuse, physical inactivity/obesity, and non-adherence with medical regimens are among the most important modifiable causes of chronic disease, premature death and population health. Hence, effectively promoting health-related behavior change needs to be a key component of health care research and policy. In this issue we devote the majority of space (14 of 20 reports) to the U.S. opioid epidemic, especially the ongoing but still woefully inadequate efforts to build the necessary clinical infrastructure in rural communities to effectively address the epidemic. The remaining six reports focus on addressing the substantive challenges that tobacco use and non-adherence with medical regimens represent in these same communities. While giving the opioid epidemic the attention that it well deserves, we cannot afford to do so at the expense of these other longstanding and also devastating public health problems. Across each of these topics we include contributions from well-regarded investigators, clinicians, and policymakers to acquaint readers with recent accomplishments while also noting knowledge gaps and unmet challenges.

## 1. Introduction

This Special Issue of *Preventive Medicine* (PM) is the 6th in an annual series on behavior change, health, and health disparities. Contributors to these Special Issues are selected from among participants in the annual national conference on Behavior Change, Health, and Health Disparities organized by the Vermont Center on Behavior and Health (VCBH), a National Institutes of Health (NIH) and Food and Drug Administration (FDA) supported biomedical research center located at the University of Vermont (<http://www.uvm.edu/medicine/behaviorandhealth/>). A select subset of conferees was invited to contribute to this year's Special Issue because of their exemplary scholarship. Each contribution underwent thorough peer-review overseen by the Editor-in-Chief in coordination with me in the role of Guest Editor. Below I comment briefly on the rationale for organizing these annual conferences and associated publications as well as how the contributions to this 6th Special Issue advance knowledge in this important area of biomedical research.

## 2. Behavior change, health, and health disparities

As discussed in the Introductions to each of the prior special issues (Higgins, 2014, 2015, 2016, 2017, 2018), U.S. population health ranks near the bottom among developed countries due in no small part to unhealthy personal behavior patterns. Reducing the prevalence of these behavior patterns (i.e., promoting behavior change) and associated chronic health conditions, is critically important to improving U.S. population health. Moreover, because these problems are over-represented in economically disadvantaged and other more vulnerable population subgroups, it is also important to reducing health

disparities.

The VCBH, its annual conference, and this series of Special Issues of *PM* were established with those needs in mind. The overarching aim is to support and disseminate biomedical research examining (a) relationships between unhealthy behavior patterns and risk for chronic disease and premature death and (b) developing more efficacious behavior-change interventions and policies. We prioritize research that uses evidence-based principles and methods in pursuit of these overarching aims, especially those grounded in behavioral economics and behavioral pharmacology. These priorities are well represented in the contributions to this 6th Special Issue.

In this Special Issue we devote considerable attention to the ongoing U.S. opioid epidemic and the need to build the clinical infrastructure necessary to effectively meet growing demand for opioid-related clinical services, especially in rural communities. Important to know is that the 2nd Special Issue in this series published in 2015 was also largely focused on the opioid epidemic although interestingly at that time we used the descriptor "prescription" opioid epidemic. Unfortunately, with the striking increase in the prevalence of heroin use, and the horrific role that illicitly manufactured fentanyl has come to have in the illicit market place, the prescription modifier has been dropped. There is no question that considerable progress has been made since that earlier publication, although the earlier challenges persist in somewhat modified form. I comment further below on these developments in the context of discussing the specific reports on the opioid epidemic. Also in keeping with that earlier Special Issue, we allocate space in the present issue to addressing longstanding and substantive challenges around selected topics in tobacco research (five reports) and non-adherence with medical regimens in socioeconomically disadvantaged populations (one report).

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### 3. U.S. opioid epidemic

The contributions on this topic begin with an insightful commentary based on Dr. Sharon Walsh's outstanding conference keynote address (Walsh and Long, 2019, in this issue). Walsh and Long remind us that this epidemic is now in its third decade and showing no signs of dissipating in the near future. They provide insights into factors that contributed to the start of the epidemic and those that continue to stymie progress. Key among them is the failure to offer evidence-based medications for opioid use disorder (MOUD). Despite overwhelming empirical evidence supporting the efficacy of FDA approved medications for treatment of opioid use disorder (buprenorphine, methadone, and extended-release naltrexone) delivered as a maintenance intervention, only a small minority of those in need are receiving these interventions (~1 in 10). Walsh and Long note that barriers to increasing use of MOUD "include an inadequate workforce, inadequate reimbursement, challenges navigating the treatment system, and profiteering bad actors (e.g., treatment brokers, programs delivering non-evidenced-based care). Perhaps the greatest challenge (and deterrent from receiving MOUD) is stigma and lack of public knowledge about their efficacy." There is little question that considerable progress has been made on this front since the 2015 Special Issue, but that progress is unevenly distributed within and across states and regions. Indeed, one aim of the current Special Issue is to offer examples from those places where substantive progress has been made as potential models for areas that are earlier on in those efforts.

Following the Walsh and Long overview, we drill down into more specifics starting with overdose prevention. Substantial, life-saving progress has been made on disseminating knowledge and resources to put naloxone overdose-reversal kits into the hands of first responders, opioid users and their families, and the larger public. That is a critically important effort that must continue, but also needs to be bolstered. Bagley et al. (2019, in this issue) contribute a scoping literature review identifying programs that are emerging across the U.S. focused on overdose survivors. Following the maxim that past behavior is the best predictor of future behavior, those who survive overdose are an extremely high-risk group for future overdose. Bagley and colleagues identify 27 programs located throughout the U.S. that are making efforts to provide services to survivors and their families. These programs offer naloxone kits and training along with protocols for connecting survivors with addiction treatment. These are mostly bottom-up programs that are developing out of efforts by first responders, emergency department staff, and others in affected communities to adapt to this emerging and critically important challenge. The second report on overdose prevention is by Bergeria et al. (2019, in this issue) who report on an efficacious web-based intervention that increases overdose-risk knowledge and decreases self-reported risk behavior for one month post-intervention among individuals using opioids for (a) acute pain, (b) chronic pain, and (c) for non-medical purposes.

Transitioning from overdose prevention to addiction treatment, Sigmon (2019, in this issue) offers a commentary focused on addressing the unsettling challenge of underutilization of evidence-based treatments for opioid use disorder. Contrasting this situation with other life-threatening medical conditions like cancer where only a small minority go without evidence-based treatment, Sigmon offers concrete suggestions on how to expand and diversify efforts to enroll patients in evidence-based treatment through emergency departments, hospitals, criminal justice settings, and syringe exchanges. Included among those insightful suggestions is an innovative and highly efficacious intervention that Dr. Sigmon developed in Vermont for delivering buprenorphine to opioid-dependent treatment seekers who often get wait-listed, typically without clinical services, in rural areas with insufficient treatment capacity to meet rapidly growing treatment demand (Sigmon et al., 2016). Complimenting Dr. Sigmon's contribution is a report by Rawson and colleagues (Rawson et al., 2019a, in this issue) detailing results from a qualitative evaluation of Vermont's 'Hub and Spoke'

model for expanding treatment capacity for opioid use disorder in rural settings. As Rawson and colleagues detail, Hubs are licensed specialty opioid treatment programs with the authority to dispense methadone and buprenorphine/naloxone while Spokes are primary care practices that offer office-based opioid treatment with buprenorphine/naloxone. The concept is that Hubs and Spokes work in a coordinated manner so that more complex patients in need of greater services can be treated in the former while those who are relatively stable and needing fewer services can be served in the latter. Results of this qualitative review indicate that patients treated in both settings largely report positive outcomes, which is consistent with results from a prior quantitative evaluation of the model by these same investigators that also noted positive outcomes for patients treated in Hubs and Spokes (Rawson et al., 2019b). Rawson and colleagues are careful to note that both represent preliminary evaluations of the Hub and Spoke model, but nevertheless offer a statewide, evidence-based model of treatment delivery that has served Vermont well in its effort to rapidly respond to this opioid epidemic.

Next are two articles on reproductive health. Higgins et al. (2019b, in this issue) describe two somewhat different evidence-based models from Vermont and New Hampshire for integrating medication assisted treatment and maternity care to women with opioid use disorder who may present in the outpatient offices for obstetrical or addiction treatment, emergency departments, and labor and delivery units. Again, these are programs that hopefully can serve as exemplars for rural states that are earlier in their efforts to develop evidence-based care for opioid dependent pregnant woman. The other report by Heil et al. (2019, in this issue) reviews the literature on preventing unplanned pregnancies, which subsumes the vast majority of pregnancies among women with opioid use disorder. Assisting women with opioid use disorder who are not currently planning to get pregnant with initiation of medically approved contraception is an important but often ignored clinical opportunity to avoid the far more challenging and costly tasks of providing maternity services or infant care for neonatal abstinence syndrome. Among the interventions reviewed is a novel multi-element intervention that Heil et al. (2016) developed that was demonstrated in a controlled trial to increase use of long acting reversible contraceptives by several orders of magnitude while also decreasing unplanned pregnancy rates.

Next, we have two contributions addressing medical challenges in treatment of patients with opioid use disorder. Fanucchi et al. (2019, in this issue) detail a promising integrated treatment model that they are developing for patients with co-morbid opioid use disorder and severe, injection-related infections (SIRI), a problem that is rapidly increasing as part of this opioid epidemic. In this innovative model, patients are initially inducted onto medication assisted treatment in the inpatient hospital setting and then transitioned to outpatient addiction services as opposed to the usual practice of retaining these patients in hospital until they complete antibiotic treatment. The efficacy of this intervention is currently under evaluation, but clearly offers great promise in terms of cost effectiveness and greater appeal to patients and health care providers alike. Maruti et al., (2019, in this issue) provide an insightful commentary on the challenge of increased suicide risk among those with opioid use disorder and the need to include accurate suicide risk assessment and clear documentation of acute risk in the health care setting and community when treating this population.

Martin et al., 2019 (in this issue) detail results from an observational study examining perceived barriers to continuing treatment following release among participants in the Rhode Island Department of Correction's first in the nation, statewide program offering MOUD to opioid-dependent individuals during incarceration. Importantly, this program offers an important, scalable model for increasing enrollment in evidence-based treatment by leveraging incarceration as a window of opportunity. An earlier report noted that implementation of this program was associated with reductions in statewide overdose rates (Green et al., 2018). This study offered encouraging evidence that the vast

majority of program participants (82%) who could be reached during the month following release reported continuing with MOUD. That news has to be considered in light of the fact that only 36% of those eligible for participation could be reached. Lack of transportation or not desiring further treatment were the primary reasons noted among those who did not continue treatment.

Curtailling the impact of the opioid epidemic in rural communities will require effective epidemiological surveillance methods for examining trends. [Stopka et al. \(2019, in this issue\)](#) report on a novel surveillance model they used to examine trends across a five-year period in in- rural counties in three New England states (Massachusetts, New Hampshire, Vermont) that share high prevalence rates of opioid use disorder. Using health policy summaries and logic models they were able to develop promising state-level comparisons on epidemic-related policies, risk environments, and outcomes (e.g., overdose, infectious disease rates) that have the potential to be highly useful in guiding publichealth planning around efforts to curtail the devastating impact of this epidemic in rural communities.

Interrelationships between pain, its proper management, and opioid addiction are many and longstanding. Hence, we are pleased to have three contributions on this topic. Two are from ([Henningfield et al., 2019a,b](#)), in this issue). The first is an insightful commentary on how U.S. opioid prescribing practices for pain over the past approximately 30 years swung from gross under prescribing to rampant over prescribing leading in no small part to the current epidemic. Within that historical context, Henningfield and colleagues make a prudent case for thoughtful, evidence-based opioid prescribing practices for effective, evidence-based treatment of pain and opioid use disorder. Sufficient scientific understanding of the analgesic effects and addiction potential of opioids is available to avoid repeating the swings of the pendulum on prescribing practices that contributed to the current epidemic. ([Henningfield et al. 2019b](#)) pivot from that insightful overview to a more targeted essay arguing that recent actions to curtail use of kratom, a naturally growing plant in several Asian countries, out of concerns of overdose are incongruent with extant evidence on its pharmacology and risk for fatal overdose. Closing out the contributions on the opioid epidemic, Peck and colleagues ([Peck et al., 2019, in this issue](#)) contribute evidence from a U.S. nationally representative survey that when young adults are queried about reasons for past year non-medical use of opioids, they endorse treatment of physical pain at more than twice the rate of using to feel good/get high or experimentation. Those data certainly provide food for thought in the context of the pendulum swings noted above.

#### 4. Other behavioral health problems: tobacco use and adherence to medical regimens

As we strive to curtail the U.S. opioid epidemic, we cannot ignore other ongoing serious public health challenges where behavior is a proximal cause. There is no better or more lethal example than cigarette smoking and other tobacco use. Indeed, often these are not independent challenges. For example, in a recent study examining substance use among 2000 patients treated in urban primary care settings, current tobacco users were seven times more likely than non-tobacco users to report past-year opioid misuse, and 84% and 89% of those who reported past year opioid misuse or opioid use disorder were tobacco users, respectively ([John et al., 2019](#)). Similarly, being a current cigarette smoker predicts non-adherence with life-saving medical regimens including, for example, cardiac rehabilitation for those who have experienced a recent cardiac event ([Gaalema et al., 2017](#)).

Included among the reports on tobacco use in this Special Issue, are two systematic literature reviews. The first is a detailed review of all studies on adult tobacco use among vulnerable populations conducted as part of the Tobacco Centers of Regulatory Science (TCORS) collaborative initiative launched in 2013 by the National Institutes of Health and Food and Drug Administration (NIH/FDA) ([Higgins et al., 2019a in](#)

[this issue](#)). The TCORS mission is to support sound multidisciplinary research relevant to the 2009 Tobacco Control Act, landmark legislation that granted FDA regulatory authority over the manufacture, distribution, and marketing of tobacco products with the overarching aim of protecting the U.S. public health against the harms of tobacco use ([Office of Disease Prevention, 2018](#)). Higgins and colleagues provide a detailed and comprehensive review of the relatively large body of TCORS research (71 original studies reported in peer-reviewed journals) reported during 2013–2018 examining how tobacco regulations impact tobacco use in adult vulnerable populations (a review on youth was reported separately by [Perry et al., 2019](#)).

[Zvorsky et al. \(2019, in this issue\)](#) examine the growing literature on hypothetical purchase tasks (HPTs). HPTs are a behavioral-economic method for investigating the relative reinforcing value of cigarettes and other substances ([Roma et al., 2017](#)). HPTs require individuals to estimate their consumption and expenditure rates under varying prices and have been shown to be quite sensitive to individual differences in use patterns corresponding to such independent variables as dependence severity. HPTs produce a detailed demand curve that is most often represented by five indices, intensity of demand (consumption at zero price), *Omax* (maximal expenditure in a specified time period), *Pmax* (price point where demand becomes elastic—sensitive to price), breakpoint (price at which demand decreases to zero), and elasticity (overall sensitivity to price). The overarching aim of the Zvorsky et al. review is to discern which of these indices is most sensitive to individual differences in demand. Their findings point to demand intensity and *Omax* as the most sensitive of these five demand indices, a potentially important observation in terms of gaining insight into the striking and impactful individual differences in motivation underpinning use of cigarettes and other addictive substances.

The three remaining reports on tobacco use each describe original empirical studies. Continuing with the topic of behavioral economics, [Davis et al. \(2019, in this issue\)](#) demonstrate that the economic metric of Unit Price can be used to predict shifts in preference between cigarettes differing in nicotine content, a topic of considerable interest in light of the policy currently under consideration by FDA that would reduce the maximal nicotine content of cigarettes to non- or minimally-addictive levels ([Gottlieb and Zeller, 2017](#)). [Coleman et al. \(2019, in this issue\)](#) circle back to a finding in two recent studies on smoking risk in U.S. adults showing that having a four-year college education was the single strongest protective factor among a wide range of potential predictors examined ([Gaalema et al., 2018](#); [Higgins et al., 2016](#)) with prevalence rates of 9–11% compared to rates that went as high as 74% among those with less than a college education depending on what other co-occurring risk factors were present. They note that because approximately one-third of U.S. adults have a college education, even such relatively low prevalence rates still translate into some 7–8.5 million college-educated current smokers raising the question of what predicts smoking in this group. The results point to past-year psychiatric conditions having a substantial role among the colleague educated. Of course, psychiatric conditions also predict smoking among those with less than a college education, but are of relatively greater strength among those who are college educated. Closing out this series of original studies on tobacco use is a report by [Pericot-Valverde et al. \(2019, in this issue\)](#) examining use of non-combusted tobacco products (e.g., e-cigarettes) among those who suffered a recent cardiac event, an understudied topic in this highly vulnerable population. The population was 205 current tobacco users hospitalized for a recent cardiac event in one of two medical centers located in Texas and Vermont. 83% of participants used only a combusted product, while 14% were using a non-combusted product on at least some days, especially younger cardiac patients (< 50 yrs), with 10% of all patients reporting e-cigarette use, and 2% and 4% reporting snus and smokeless tobacco use, respectively. These results send a clear message to health care professionals to be sure to assess use of tobacco products in addition to cigarettes when caring for cardiac patients.

The final report in this Special Issue also focuses on cardiac patients (Gaalema et al., 2019, in this issue), but on adherence with participation in cardiac rehabilitation. Gaalema et al. report results from a secondary analysis examining whether measures of executive function, a set of behavioral/cognitive abilities deemed important to behavioral regulation, may moderate treatment response in a randomized, controlled clinical trial demonstrating that financial incentives approximately double rates of adherence with cardiac rehabilitation among socioeconomically disadvantaged (Medicaid insured) cardiac patients (Gaalema et al., 2019). Delay Discounting (DD), a behavioral-economic task that assesses the extent to which one discounts the value of delayed rewards, was especially sensitive. Greater DD rate interacted significantly with treatment condition by predicting poorer treatment adherence in the Usual Care but not the financial incentives condition. Put differently, the results indicated that financial incentives ameliorated the adverse influence of DD on poor treatment adherence. Considering that on average those who are socioeconomically disadvantaged discount at greater rates than those who are more affluent, these results help to elucidate the processes underpinning the well-established efficacy of financial incentives for promoting health-related behavior change in disadvantaged populations (e.g., Higgins et al., 2012).

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### Declaration of competing interest

I have no conflicts of interest to report.

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Stephen T. Higgins  
*Vermont Center on Behavior and Health, Departments of Psychiatry and  
Psychological Science, University of Vermont, United States of America*  
E-mail address: [Stephen.Higgins@uvm.edu](mailto:Stephen.Higgins@uvm.edu).