

Land Grant Response to the Opioid Crisis

A Review of Research Related to Education and Prevention

September 2018



Prepared by:

Alison Brennan, Ph.D., Postdoctoral Research Associate
NCRCRD, Michigan State University

Richard Spoth, Ph.D., F. Wendell Miller Senior Prevention Scientist and Director,
Partnerships in Prevention Science Institute, Iowa State University

Mark Skidmore, Ph.D., Director
NCRCRD, Michigan State University



MICHIGAN STATE
UNIVERSITY

Acknowledgements

Thank you to the Extension Opioid Crisis Response Workgroup and Expert Partners for their suggestions and insights during the development of this document.

Extension Opioid Crisis Response Workgroup

Alison Brennan, NCRCRD
Ronald A. Brown, Mississippi State University
Courtney Cuthbertson, Michigan State University
Jami Dellifield, The Ohio State University
Alex Elswick, University of Kentucky
Novella Johnson Ruffin, Virginia State University
Richard Klemme, APLU
Brian Kowalkowski, College of Menominee Nation
Anne Lindsay, University of Nevada-Reno
Daniel Perkins, Pennsylvania State University
Roger Rennekamp, The Ohio State University
Ahlshia Shipley, USDA-NIFA
Mark Skidmore, NCRCRD
Sandy Sulzer, Utah State University

Extension Opioid Crisis Response Expert Partners

Amy Chilcote, North Carolina State University
Autumn Guin, North Carolina State University
Candy Gabel, University of Missouri
Catheryn Hockaday, Iowa State University
Daniel Perkins, Penn State University
David Young, Montana State University
Gina Crist, University of Delaware
Lajoy Spears, University of Guam
Mary Ellen Wright, Clemson University
Richard Spoth, Iowa State University
Mark Skidmore, NCRCRD

Table of Contents

Acknowledgements.....	1
Table of Contents.....	2
Introduction.....	3 – 4
Part I: Background Information.....	5 – 11
Part II: Causes and Consequences of the Opioid Crisis.....	12 – 23
Part III: Potential Solutions.....	24 – 38
Part IV: Considerations for Extension’s Strategic Planning.....	39 – 55
Conclusion	56 – 57
References.....	58 – 72
Appendix: Glossary	73 – 74

Introduction

Opioid misuse, addiction and overdose affect millions of Americans each year, draining billions of dollars from our economy and causing immeasurable disruption and suffering in the lives of individuals, families and entire communities. The reasons for the emergence and escalation of the opioid crisis are numerous and complex. Identifying and implementing effective solutions to address this epidemic will require a strategic, sustained effort. With its history of responsive community outreach and education, as well as the considerable resources and expertise present within it, the land grant system has the capacity to make a substantial contribution in response to the ongoing crisis. For this reason, the Extension Committee on Organization and Policy (ECOP) organized and convened the Extension Opioid Crisis Response Workgroup (EOCRW), charging it “...to consider ways in which CES could expand the capacity to help address the crisis.”

Although no two states are identical in the structure and functions of their Extension systems, all of them have something valuable to contribute, as does the national-level infrastructure that supports individual state systems. Certainly, the core programs within each state system already contribute, in part by improving quality of life across a range of outcomes of relevance to opioid related problems. Even so, many citizens feel compelled to do more. Toward that end, this document was written to provide guidance to the EOCRW from the relevant literatures, toward the end of the development of a strategic plan to address the ongoing crisis.

This literature review was created with land grant institutions in mind, but it contains information likely to be useful for a wide range of audiences. Part I provides general background information and recent statistics on substance use, along with a description of the guiding conceptual framework used to organize Part II. Part II describes individual, relationship,

community and societal influences factoring in the opioid crisis and provides details on the costs of the crisis to individuals and society. In Part III, potential avenues for resolving the crisis are explored in terms of demand-side and supply-side solutions. Finally, Part IV highlights Extension's historical and current features collectively suggesting its unique position and opportunities to address the crisis, as well as challenges to be addressed in efforts to realize potential contributions through seizing those opportunities. Those opportunities and challenges are factored in articulating considerations for developing the strategic planning of the EOCRW in consultation with the Expert Partners Group.

Part I. Background Information

According to the U.S. Department of Health and Human Services, in 2016 over 11 million people nationwide misused a prescription opioid, nearly one million people used heroin, and over two million people had an opioid use disorder (USDHHS, 2018). More than 42,000 people died from an opioid overdose in 2016 (USDHHS, 2018). Of those overdose deaths, over 17,000 were attributable to commonly prescribed opioids and over 15,000 were attributable to heroin (USDHHS, 2018). Elevated rates of prescription opioid misuse, heroin use and overdose deaths have prompted government responses at federal, state and local levels.

Due to the complex nature of the crisis, there is no one-size-fits-all approach for confronting it. Yet, there is an ever-growing body of research on the neuroscience of addiction, and social science research has revealed numerous protective factors and risk factors for substance use and addiction. Moreover, interventions designed to address modifiable risk and protective factors have been developed and tested. Though once assumed to be a moral failing indicative of flawed character, addiction is now recognized as a brain disease that develops through interaction of biology and environment (NIDA, 2014). Recent scientific advances in our understanding of addiction will be important to integrate in any strategy intended to address prescription opioid misuse, heroin use and opioid-related overdose.

Resolution of the current crisis is an important endeavor; however, it is vital to recognize that until underlying factors are addressed, it is likely that opioids will be replaced with other substances. The opioid crisis is deeply entangled with economic, social, political and historical factors. Put another way, there is not one problem; rather, opioid misuse and overdose are symptoms of larger, interconnected social and economic problems. In order to resolve the current crisis, and with an eye on preventing future problems, it behooves us to begin with an

examination of substance use disorders more broadly. In that vein, prior to reviewing literature specific to opioids, we provide a general overview of relevant articles on substance use. A glossary of commonly used terms is provided in the Appendix.

Substance Use Prevalence and Trends

Substance use is most often initiated in adolescence (Arnett, 2013). In the past, adolescents typically used substances in a predictable progression: beer and wine; cigarettes and/or hard alcohol; marijuana; hard drugs (Arnett, 2013). The most recent Monitoring the Future (MTF) survey, completed in 2017, indicates changing trends in substance use among adolescents. Among high school seniors, alcohol is still a commonly used substance (55.7% past year prevalence; 33.2% past month prevalence (see NIDA, 2017). Cigarette use has sharply declined compared to a decade ago; lifetime, past month and daily marijuana use are all more prevalent than cigarette use (NIDA, 2017). Past year prevalence of marijuana use among high school seniors was 45% and has remained relatively stable for the past five years; daily use of marijuana by high school seniors is now more common than daily use of alcohol (5.9% vs. 1.6%) (NIDA, 2017).

The prevalence of prescription medication misuse among adolescents increased for a span of nearly two decades before recently declining. In a meta-analysis of past-year prescription opioid misuse among adolescents and young adults, Jordan, Blackburn, Des Jarlais and Hagan (2017) found prevalence estimates ranging from 0.7-16.3% in non-probability samples and 3.9-12.7% in probability surveys. Based on their analysis, the prevalence of past-year prescription opioid misuse increased by approximately 0.4% per year from 1993 to 2010 (Jordan et al., 2017). Encouragingly, although misuse of prescription drugs among young adults has remained high, MTF 2017 data show that high school seniors' past-year misuse of prescription drugs, including

opioid medications, has declined substantially in the last decade (NIDA, 2017). The past-year prevalence of opioids other than heroin was 4.2% (NIDA, 2017). Another positive set of findings from MTF 2017 are as follows: “across all grades, past-year use of heroin, methamphetamine, cigarettes, and synthetic cannabinoids are at their lowest by many measures” (NIDA, 2017, np).

Despite the encouraging trend of declining opioid misuse among adolescents, by the time they reach adulthood many nonmedical users of prescription opioids have developed a substance use disorder. Furthermore, although the proportion of people who transition from prescription opioid use to heroin use is low in general (about 4%), the risk of initiation of heroin use is 19 times greater among individuals who have misused prescription opioids compared to those who have not (Muhuri, Gfroerer, & Davies, 2013 cited in NIDA, 2018a). Survey data from the national Treatment Episode Data Sets (TEDS) for the years 1992-2008 indicated that the most common age groups of individuals seeking treatment for opioid problems other than heroin or methadone were ages 25-29 (about one out of four individuals seeking treatment), followed by ages 21-24 (about one out of five individuals seeking treatment) (Maxwell, 2011).

Misuse of prescription opioids by adolescents and young adults are not the only pathways leading to opioid use disorder, and there are numerous, interacting factors contributing to opioid misuse, addiction and overdose. Prior to explicating these factors, it is useful to present a conceptual framework as a guide for the delineation and explanation of these factors. The National Research Council and Institute of Medicine (NRC-IOM, 2009) have proposed an ecodevelopmental model for understanding the development of mental, emotional and behavioral disorders, including substance use disorder. A key feature of the ecodevelopmental model is attention to risk and protective factors, which may differ according to developmental period (NRC-IOM, 2009). Risk factors are defined as, “A characteristic at the biological, psychological,

family, community or cultural level that precedes and is associated with a higher likelihood of problem outcomes” (NRC-IOM, 2009, p. xxviii). A protective factor is defined as, “A characteristic at the biological, psychological, family or community level that is associated with a lower likelihood of problem outcomes or that reduces the negative impact of a risk factor on problem outcomes” (NRC-IOM, 2009, xxvii).

The ecodevelopmental model considers the individual within the context of family, community and broader social systems, acknowledging the interplay of individual and contextual characteristics in human development (NRC-IOM, 2009). Based on this model, understanding the development of substance use disorders requires an understanding of interactions among biological, psychological and social factors, as well as the importance of developmental periods. Some of the major, general factors associated with the development of substance use disorders are described below. More detailed information on distinct risk and protective factors according to developmental period can be found in the NRC-IOM (2009) document. Importantly, the model posits that interventions need to be sensitive to key developmental tasks and risk and protective factors at multiple levels (NRC-IOM, 2009).

In conjunction with the ecodevelopmental model, the NRC-IOM (2009) advocates for careful consideration of the full spectrum of possible interventions, on a continuum ranging from mental health promotion, to prevention, to treatment and maintenance. In this connection, it also recommends implementing evidence-based interventions (EBIs) or sound evaluation of adapted EBIs, along with community-driven programming, with careful consideration of the advantages and disadvantages of all approaches to intervention implementation. These recommendations reflect NRC-IOM advocacy for effective translation of intervention science into community practice. Subsequent sections of this review will summarize the recommended continuum of

intervention in more detail. They also will present a model for translating intervention science into widespread community practice that follows from NRC-IOM recommendation and draws on the unique strengths of the land grant system, with clear applicability to its efforts in addressing the opioid crisis.

Contributing Factors to Substance Use Disorders

Genetics are a factor at the individual level, accounting for between 40 and 60 percent of susceptibility to addiction (NIDA, 2014). Genes contribute to risk in numerous ways, such as through temperament, predisposition to certain mental health problems, and sensitivity to particular drugs (Arnett, 2013; NIDA, 2016). Individuals with a substance use disorder are about twice as likely to have comorbid mood and/or anxiety disorders, the development of which is strongly influenced by genes (NIDA, 2011). Determining causal relationships among comorbid psychological disorders can be difficult (NIDA, 2011). For some individuals, comorbidity may be partially due to the use of substances as a form of “self-medication”, to alleviate distress accompanying mood and anxiety disorders (NIDA, 2011). Comorbidity of substance use disorders and other psychological disorders may be due to genetic vulnerabilities making both conditions more likely (NIDA, 2011).

Age at first use is an important factor in the development of substance use disorders. Substance use in childhood and adolescence is associated with greater risk of addiction, partially because the brains of children and adolescents have greater plasticity and are still developing in key areas (e.g., prefrontal cortex) (NIDA, 2014). Particularly in childhood and adolescence, stress in the environment can create epigenetic risk by impacting the expression of genes involved in substance use disorders (NIDA, 2016). Furthermore, research on adverse childhood experiences (ACEs) suggests individual factors interact with relationship factors to impact

neurodevelopment, behavioral inhibition (i.e., impulse control), and adoption of health-risk behaviors such as substance use (e.g., Felitti et al., 1998).

In the original ACEs research by Felitti and colleagues (1998), there were ten specific ACEs identified: emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect, witnessing domestic violence (specifically against mother), substance abuse by someone in the home, mental illness of someone in the home, having an incarcerated household member, and parental separation or divorce. These ten ACEs are associated with health risk behaviors and major health conditions in a dose-response manner (e.g., Felitti et al., 1998). Regarding the health risk behavior of substance use, specifically, Felitti and colleagues contend that substance use is often “an effective, immediate solution” or “coping device” in response to “the stress of abuse, domestic violence, or other forms of family and household dysfunction” (1998, p. 253-254). An additional, noteworthy finding is that ACEs are associated with increased risk of health problems even after controlling for health risk behaviors (Felitti et al., 1998).

Although not explicitly intended to be part of the body of literature on ACEs, Monnat (2018) examined the role of contextual factors in explaining variation in county-level drug-related mortality and found that family distress—measured as a composite of percentage of persons divorced/separated and percentage of families headed by single parents—was a significant predictor. Stress and problems in the home clearly contribute to substance use, addiction and drug-related mortality. Beyond the negative impacts of family stress and dysfunction, the family context includes other factors related to substance use. Parental supervision, also referred to as parental monitoring, is a crucial factor (Arnett, 2013; Kristjansson, James, Allegrante, Sigfusdottir & Helgason, 2010; NIDA, 2014). When parental monitoring is adequate, it serves as a protective factor; when parental monitoring is lacking,

adolescents are at greater risk of using substances (Kristjansson et al., 2010; NIDA, 2014).

Parents also impact substance use through modeling appropriate behavior and by facilitating access, whether passively or actively, to commonly used substances (e.g., alcohol).

Factors at the community level, such as social capital and cultural norms about substance use, also affect risk for substance use, addiction, and overdose (Arnett, 2013; Monnat, 2018; NIDA, 2014). For example, Monnat (2018) found that economic distress, housing distress, and labor market dependence on mining were associated with higher county-level drug-related mortality, while greater presence of religious establishments per population and labor market dependence on public sector jobs were associated with lower county-level drug-related mortality.

The above examples provide a general picture of factors related to substance use/misuse, addiction and related problems. Part II provides more detailed and specific information regarding individual and contextual factors contributing to the ongoing opioid crisis, beginning with a brief historical snapshot.

Part II: Causes and Consequences of the Opioid Crisis

Sociohistorical Context

The roots of the opioid crisis often are traced back to the 1990s, a time of shifts in the medical paradigm regarding treatment of pain (Dellapenna, 2017; Nash, 2017; Van Zee, 2009). Pain became the “fifth vital sign” monitored in healthcare, resulting in increased pressure on healthcare professionals to prescribe analgesic medications (Dellapenna, 2017; Hansen & Netherland, 2016). Patient advocacy groups that formed in response to inadequately treated pain further increased pressure to prescribe opioids (Meyer, Patel, Rattana, Quock, & Mody, 2014).

The impact of increasing emphasis on treatment of pain was compounded by marketing and sales activities of pharmaceutical companies. Pharmaceutical companies adopted several highly effective strategies, such as direct-to-consumer advertising and hiring representatives to work as “detailers”, marketing drugs to potential prescribers (Avorn, 2017; Hansen & Netherland, 2016; Salmon, Lin, & Crawford, 2002; Van Zee, 2009). Drug detailers were charismatic people trained to be engaging and interactive. Detailers were aided with thorough prescriber profiles developed for targeted efforts (Avorn, 2017; Van Zee, 2009). Drug representatives who increased sales were compensated with a “lucrative bonus system” (Van Zee, 2009, p. 223).

One remarkable strategy adopted by Purdue Pharma to increase OxyContin sales was the use of all-expenses-paid symposia for healthcare professionals, which provided opportunities to distribute marketing materials and branded promotional items (Van Zee, 2009). The use of inaccurate but persuasive materials sent directly to healthcare professionals was another strategy used to impact OxyContin sales. According to Van Zee, “Purdue distributed 15,000 copies of an OxyContin video to physicians without submitting it to the FDA for review” (2009, p. 224). The

content of the video downplayed the risk of addiction and dangerous effects, while the effectiveness for pain relief was overstated (Van Zee, 2009).

In sum, the elevation of pain relief as a major priority of healthcare, paired with aggressive and highly effective marketing efforts by pharmaceutical companies, created a culture of excessive prescribing and resulted in what has been described as an “iatrogenic catastrophe” (Nash, 2017, p. 391). Patients who received opioid prescriptions from trusted physicians became addicted to substances they believed to be safe (Dellapenna, 2017; Nash, 2017). Ubiquitous, excess opioids were easily “diverted for recreational and illicit use” (Dellapenna, 2017, p. 66). Currently, Internet pharmacies and pill mills contribute to the availability of opioids used for nonmedical purposes (Meyer et al., 2014). Overprescribing continues to fuel diversion, and opioid misuse, addiction and overdose continue to occur at alarmingly high rates. Opioid misuse and related problems, however, do not occur uniformly across demographic groups or geographic areas. Distinct factors and patterns exist in the prevalence and impact of opioid-related problems. Prior to description of these factors and patterns, a brief overview of the neuroscience of opioids is provided.

Neuroscience of Opioids

It is important to make a distinction between opiates and opioids. Whereas opiates are naturally derived from the opium poppy, opioids include opiates as well as synthetic and semi-synthetic drugs that act on opioid receptors (Mistry, Bawor, Desai, Marsh, & Samaan, 2014; National Safety Council, 2014). Heroin, codeine and morphine are all opiates; oxycodone, fentanyl and methadone are all synthetic opioids (National Safety Council, 2014). Thus, the umbrella term of opioids tends to be used, unless the focus is specifically naturally-derived drugs.

The human nervous system contains naturally-occurring opioid molecules (e.g., endorphins) that help modulate mood, regulate stress and interrupt pain signaling (Mistry et al., 2014). Opioids bind to opioid receptors on neurons located in the central nervous system and peripheral nervous system, resulting in pain relief and feelings of euphoria (Mistry et al., 2014; National Safety Council, 2014; NIDA, 2018b). Within the central nervous system, opioid receptors are abundant in the motivation and emotion centers of the brain, including the amygdala and parts of the mesolimbic dopamine system (Mistry et al., 2014). Opioid drugs engage the reward system of the brain through a mechanism known as disinhibition: the inhibition of an inhibitory mechanism. Opioids bind presynaptically, which inhibits the release of GABA, the primary inhibitory neurotransmitter in the CNS, resulting in the release of a large amount of dopamine (Mistry et al., 2014; NIDA, 2018b). The result is creation of “a positive reinforcement of pleasurable feelings” (Mistry et al., 2014, p. 157).

As with most drugs, protracted use of opioids leads to tolerance, motivating the user to take higher or more frequent doses of opioid medication to achieve the same level of pain relief or rush as before (National Safety Council, 2014). Furthermore, chronic use of opioids can lead hyperalgesia, in which perception of pain is heightened, contributing to the need for higher doses (National Safety Council, 2014). Despite tolerance to the rewarding and pain-relieving effects, the user does not experience the same tolerance to respiratory depression effects, creating elevated risk for overdose and death (National Safety Council, 2014; NIDA, 2018b). Large doses of opioids cause breathing to slow or stop, resulting in a lack of oxygen reaching the brain, a condition known as hypoxia (NIDA, 2018b). Hypoxia can cause lasting brain damage and death (NIDA, 2018b).

Contributing Factors

Genes. There are clear linkages between the expression of certain genes and the presence and concentration of particular dopamine receptors, opioid receptors, and regulatory proteins. These genetically-based differences impact brain plasticity and functioning, making opioid addiction more likely for individuals with particular genetic profiles (Mistry et al., 2014). Many of these genes are linked to personal characteristics that elevate risk, such as impulsivity and sensation-seeking. Some of these genes are implicated in the development of other addictions, as well (Mistry et al., 2014). Despite the strong genetic basis for opioid addiction, environmental factors exert a substantial effect, and the interplay must be considered (Mistry et al., 2014).

Comorbidity. Comorbid diagnoses are significantly more likely among people who misuse opioids (Meyer et al., 2014). Polydrug use and co-occurring addictions frequently are observed among individuals who misuse opioids (Cochran et al., 2017). In their research using data from the 2008 National Survey on Drug Use and Health, Vaughn, Fu, Perron and Wu (2012) conducted latent class analyses to determine risk profiles of opioid-misusing adolescents and found that lifetime anxiety (having ever been told by a medical professional that they had an anxiety disorder) was a significant predictor of belonging to profile group four, characterized by high substance use and high delinquency. Thus, in this particular study, anxiety disorders were associated with opioid misuse and polydrug use, including high usage rates of tobacco, alcohol and marijuana (Vaughn et al., 2012).

Patterns of comorbidity can vary by context. Cochran, Engel, Hruschak, and Tarter (2017) found illicit drug use was a predictor of opioid misuse among urban and rural residents. However, despite the fact that overall rates of PTSD did not differ between urban and rural participants, PTSD was a significant predictor of opioid misuse among rural residents only

(Cochran et al., 2017). The authors explain the contextually-based difference in the predictive significance of PTSD as potentially linked to greater social stigma and other treatment barriers in rural areas (Cochran et al., 2017).

Gender. A thorough consideration of reasons for observed gender disparities in opioid misuse and addiction is beyond the scope of the present review. Nevertheless, it should be noted that gendered patterns in opioid misuse, dependence and overdose have been documented. Some research suggests opioid misuse and overdose tend to be more common among men than women (Meyer et al., 2014; Osborne, Serdarevic, Crooke, Striley, & Cottler, 2017; Vaughn et al., 2012). However, in recent years the gender gap in overdose mortality has been narrowing. From 1999 to 2010, overdose deaths attributable to prescription opioids increased by 237% among men and more than 400% among women (Office on Women’s Health, 2016). Furthermore, gendered patterns in opioid misuse vary considerably by geographic region, and in some regions women are just as likely or more likely to misuse opioids (Office on Women’s Health, 2016).

Risk factors for opioid misuse vary according to gender and biological sex. Osborne and colleagues (2017) found that among adolescent boys, current tobacco use was a risk factor for having engaged in opioid misuse in the past 30 days. This finding was also true for adolescent girls; however, the greatest risk factor among girls was recent use of alcohol, which was not a risk factor among boys (Osborne et al., 2017). School grades were an additional factor associated with opioid misuse among girls only (Osborne et al., 2017).

In comparing risk factors among male and female adults, female adults are at increased risk of developing substance use disorder due to physiological differences in body composition and hormones, factors which impact metabolism of substances (Office on Women’s Health, 2016). Additional risk factors—particularly social pathways and social determinants—more

likely to affect women are described in a white paper by the Office on Women's Health (2016). Taken together, existing research suggests prevention and treatment programs may need to be gender specific (Office on Women's Health, 2016; Osborne et al., 2017).

Race/ethnicity. Numerous sources indicate the opioid crisis is largely a “white problem”, occurring among White, non-Hispanic populations (CDC, 2017; Hansen & Netherland, 2016; Maxwell, 2011). Although race and ethnicity often are thought of as individual level factors, the findings here are perhaps more appropriately classified as community or societal factors. In an *American Journal of Public Health* editorial, Hansen and Netherland (2016) assert: “An under-acknowledged cause for this racial pattern is opioid regulation and marketing, which gave US White patients the ‘privilege’ of unparalleled access to prescription opioids...” (p. 2127). They go on to say, “In the United States, where insurance coverage and access to physicians are racially stratified, opioid prescriptions disproportionately went to White patients, whereas non-White patients, even those with access to a physician, were less likely to be prescribed opioids, which increased racial differences in opioid use” (Hansen & Netherland, 2016, p. 2128). Thus, according to the commentary provided by Hansen and Netherland, racial disparities in opioid misuse and overdose are at least partially an artifact of broader community and societal factors.

Family Context. Parenting. Among adolescents, parental monitoring and involvement are protective factors against opioid misuse. Vaughn et al. (2012), found that parental involvement was significantly lower among all three risk groups identified in latent class analysis compared to the low risk group. When parental involvement was high, it was a protective factor against opioid misuse for all three risk groups (Vaughn et al., 2012). The findings indicate parenting is a crucial area for prevention efforts (Vaughn et al., 2012).

Adverse childhood experiences. Adverse childhood experiences (ACEs) demonstrate the importance of relationships in explaining opioid misuse and addiction. Using data from the original ACE Study, Dube et al. (2003) examined the relationship of ACE score to age at initiation of illicit drug use, lifetime illicit drug use, addiction to illicit drugs, using IV drugs, and having drug problems. Opioids were not examined in isolation, but heroin use would be included among these study variables. Early initiation of illicit drug use (14 years of age or under) was 1.5 times more likely with an ACE score of one compared to zero; four times more likely with an ACE score of three and, strikingly, approximately nine times more likely with an ACE score of five or higher (Dube et al., 2003). The top three ACEs most strongly related to early initiation were substance abuse in the home, emotional abuse and sexual abuse (Dube et al., 2003). There were dose-response relationships between ACE score and likelihood of ever having drug problems, ever being addicted to drugs, and IV drug use (Dube et al., 2003). The attributable risk fractions (ARFs) were 56% for ever having a drug problem, 63% for ever being addicted to illicit drugs, and 64% for ever using IV drugs (Dube et al., 2003). In response to these findings, Dube and colleagues stated, “Our estimates of ARFs for serious forms of illicit drug use are of an order of magnitude rarely seen in epidemiology and public health” (2003, p. 568).

In a follow-up study of adults from the original ACE Study, Anda, Brown, Felitti, Dube and Giles (2008) examined the impact of ACEs on past-year prescription rates and number of classes of drugs prescribed to participants, including opioid analgesics. The results indicated a graded relationship between ACE score and number of prescriptions, as well as multiple prescription classes (Anda et al., 2008). Among participants in the 18-44 age group, those with zero ACEs had 5.03 prescriptions on average in the past year, while those with three ACEs had 6.95 prescriptions on average, and participants with five or more ACEs had an average of 8.84

prescriptions (Anda et al., 2008). Based on these findings, it can be reasonably inferred that individuals with higher ACE scores are more likely to receive an opioid prescription, putting them at increased risk of opioid misuse, addiction and overdose.

Social Context. *Social networks.* Most individuals who misuse opioids other than heroin and methadone obtain them from friends or relatives, who obtained the medications from a doctor (Maxwell, 2010; Rigg, Monnat, & Chavez, 2018). The size, composition and functioning of social networks impact local availability of opioids, exposure to individuals who misuse opioids, and likelihood of obtaining medications through sharing, selling or stealing (Maxwell, 2010; Wakeland, Nielsen, & Geissert, 2015). Despite advantages with respect to recovery, social networks consisting of strong, long-lasting, emotionally close relationships can actually serve to facilitate diversion (Keyes et al., 2014; Rigg et al., 2018). Strong social and kinship networks tend to be present in rural communities and represent only one of several factors contributing to opioid misuse and related problems in rural areas (Keyes et al., 2014).

Community factors. Residing in a rural area is a risk factor for opioid misuse, addiction and overdose for several reasons. To begin, rural areas are associated with higher opioid prescription rates (Cerdá et al., 2016; Le Lait et al., 2014; Prunuske et al., 2014). Higher prescription rates in rural areas are partially attributable to higher rates of arthritis and a greater proportion of jobs in manual labor industries (Cerdá et al., 2016; Prunuske et al., 2014). However, even when compared to demographically similar counterparts—matched according to depression and arthritis diagnoses, as well as other relevant characteristics—rural patients are more likely to be prescribed opioids for non-malignant chronic pain management (Prunuske et al., 2014).

High prescription rates increase the possibility of diversion in rural areas, and tight social networks allow for faster diffusion of opioids across at-risk populations, making misuse more likely in rural areas (Cerdá et al., 2016; Keyes et al., 2014). Additional contextual contributors to opioid misuse include the outmigration of young adults, resulting in aggregation of young adults at high risk, as well as stress caused by economic deprivation, including unemployment, low wages, and lack of upward mobility (Keyes et al., 2014).

Opioid-attributable overdose deaths occur at higher rates in rural areas (Cerdá et al., 2016; Faul et al., 2015). Even within rural areas, there is heterogeneity such that overdose deaths are concentrated in “central Appalachia, New England, New Mexico and Utah” (Rigg et al., 2018, p. 120). Infrastructural factors likely to contribute to rural disparities include: limited access to substance treatment services and providers; lack of access to medication-assisted treatments, in particular; shortages in primary and emergency care services; and geographic isolation, a substantial challenge in emergency response (Rigg et al., 2018). Even when emergency services are available, use of the life-saving medication naloxone is less likely in rural areas. Using 2012 data from the National Emergency Medicine Service Information System (NEMSIS), Faul et al. (2015) determined overdose mortality was much higher in rural areas due to underutilization of naloxone (Faul et al., 2015). Expanded access to naloxone among EMS providers and bystanders are likely to be key components of addressing overdose in rural areas (Faul et al., 2015).

Broader issues. Broader factors contributing to the current crisis include, but are not limited to: mental health stigma in general, as well as stigma associated with opioid use specifically (Rigg et al., 2018); overreliance on law enforcement and the criminal justice system as a primary means of addressing the crisis, rather than utilizing community-based solutions to

solve underlying problems (Albert et al., 2011); and lack of regulations—or lack of sufficient enforcement of regulations—around marketing practices of pharmaceutical companies, as well as involvement of pharmaceutical companies in medical education (Van Zee, 2009).

Consequences for Individuals and Society

In 2006, the total cost of prescription opioid misuse in the United States was estimated at \$53.4 billion (Hansen, Oster, Edelsberg, Woody, & Sullivan, 2011). In 2007, the total cost was estimated at \$55.7 billion (Birnbaum et al., 2011). These estimates take into account healthcare costs, economic costs and criminal justice costs. Each category is considered separately below.

Healthcare costs. Individuals who misuse prescription opioids utilize medical services at much higher rates than the general public. In a review of research on the clinical and economic impact of prescription opioid misuse from 2002 to 2012, Meyer et al. (2014) noted that individuals who misuse prescription opioids are four times more likely to visit the ER, 11 times more likely to have a mental health outpatient visit, and 12 times more likely to be hospitalized. Hansen et al. (2011) estimated healthcare costs at \$3.1 billion, of which \$2.2 billion went to substance abuse treatment and \$0.9 billion went to medical complications. Birnbaum et al. (2011), estimated healthcare costs at \$25 billion, including prevention and treatment costs. Substance abuse treatment costs were \$1.1 billion (4.5% of healthcare costs), and research and prevention accounted for less than one percent of healthcare costs (\$69 million and \$85 million, respectively, see Birnbaum et al., 2011). It should be noted that there are a number of reasons for discrepancies in cost estimates (see Hansen et al., 2011, for example). See the cited articles for further explanations of cost estimates.

Economic costs. Premature death due to drug overdose represents a large portion of economic costs through lost future earnings, estimated at \$12.4 billion for 2006 (Hansen et al.,

2011) and \$11.2 billion for 2007 (Birnbaum et al., 2011). Additional sources of economic costs include absenteeism, presenteeism (diminished productivity while at work), lost wages due to incarceration, and lost wages due to subemployment or unemployment. In total, workplace-related economic costs were estimated at \$42 billion for 2006 (Hansen et al., 2011) and \$25.6 billion for 2007 (Birnbaum et al., 2011).

Criminal justice costs. Criminal justice costs include policing, legal costs (e.g., adjudication), incarceration and corrections, and crime. Hansen et al. (2011) estimated overall criminal justice costs attributable to prescription opioid misuse at \$8.2 billion, \$2.5 billion of which was spent on incarceration. Birnbaum et al. (2011) estimated overall criminal justice costs at \$5.1 billion, of which \$2.3 billion went to correctional facilities. Thus, according to the estimates provided by Birnbaum et al. (2011), correctional facilities accounted for twice as much spending as substance abuse treatment, and the amount spent on correctional facilities (\$2.3 billion) was almost 15 times as much as the amount spent on research and prevention combined (\$154 million).

Additional considerations. The costs described above do not factor in the devastating impacts of misuse, addiction and overdose for relationships, family functioning and intergenerational transmission of adversity. Resolution of the opioid crisis is imperative not only for individuals, communities and society at present, but for the well-being of the next generation. As previously noted, adverse childhood experiences constitute an immensely impactful set of social experiences with powerful public health implications. Having someone in the home who has a substance-related problem is an adverse childhood experience. Furthermore, substance misuse and addiction can create tension and strain in relationships, increasing the risk for parental separation or divorce, either of which is an adverse childhood experience. Death of a

parent to overdose is an adverse childhood experience. Incarceration of a household member due to drug-related offenses also is an adverse childhood experience. In order to stop the intergenerational transmission of adversity, effective solutions must be identified and implemented.

Part III reviews a range of potential solutions compiled from numerous, associated bodies of scientific literature. While not an exhaustive review of all possible solutions, Part III highlights many of the potential solutions likely to be within the capacity and mission of land grant institutions. Some solutions are not avenues within the control or purview of land grant institutions, but are nonetheless included to promote awareness and a more comprehensive view of the efforts necessary for solving the current crisis.

Part III: Potential Solutions

Potential solutions evident in relevant bodies of research are detailed below. They are organized according to whether they are demand-side solutions or supply-side solutions. Demand-side solutions focus on consumers, the people who are using, misusing, or at risk of misusing an opioid of any kind. Supply-side solutions focus on the people who prescribe medications, dispense medications, or are otherwise involved in determining the types and quantities of opioids available to consumers. Broad policy considerations are discussed separately.

Demand-Side Solutions

Demand-side solutions fall into two broad categories. The first concerns alternatives to typical patterns of consumer use of the opioid drugs themselves, including alternative approaches to pain management and opioid storage and disposal. The second category includes the various types of interventions that focus more directly on either changes in knowledge, attitudes and beliefs affecting opioid misuse, or treatment and maintenance of opioid-related disorders. Both of these categories of solutions are considered from the perspective of the NRC-IOM (2009) ecodevelopmental approach to a proposed science-with-practice conceptual framework and related considerations for a land grant response to the opioid crisis articulated in Section IV.

Consumer use patterns—Promoting pain management alternatives. This solution focuses on pain relief through non-opioid drugs, alternative approaches and holistic treatments. Over-the-counter (OTC) pain relief medications are a major area of focus. OTC medications are inexpensive, widely available and can be highly effective in treating pain. According to a National Safety Council report on effectiveness of over-the-counter (OTC) medications and prescription opioids, some OTC pain relievers, or combinations of OTC pain relievers, are

actually more effective than opioids (Teater, 2018). For example, the combination of 200mg of ibuprofen with 500 mg of acetaminophen is more effective than 15mg of oxycodone in treating acute postoperative pain, and at least four nonsteroidal anti-inflammatory drugs (NSAIDs) are more effective for acute pain than Percocet 5/325, 10mg intramuscular morphine, and 50 mg of tramadol (Teater, 2018). Although opioids are indicated and well-supported for terminal care, there is little high-quality evidence supporting the use of opioids in treatment of nonmalignant chronic pain (Teater, 2018).

Another, more controversial alternative discussed in the literature is medical cannabis. A fair number of studies suggest cannabis products—including THC pills, derivative sprays, tinctures, and inhaled formulations—are effective for chronic pain management, though specific findings are nuanced and have been somewhat inconsistent across studies (Hwang & Clarke, 2016; Lucas 2012). An interesting point in the literature, which is highly relevant to the opioid crisis, is the substitution effect of legal cannabis: when cannabis is available legally, hard drug users will reduce their use in favor of using cannabis (Lucas, 2012). Lucas (2012) states that the cannabis “gateway or stepping stone hypothesis” has been “convincingly debunked” through research (p. 128), and national governments should seriously consider cannabis and cannabinoids as legitimate medicine for pain management, as well as possible exit drugs for hard drug users.

Research by Vigil, Stith, Adams and Reeve (2017) seems to support the assertions of Lucas (2012). In a nonrandomized trial of the New Mexico Medical Cannabis Program (MCP randomization could not be performed due to legal considerations at the federal level), habitual opioid-using patients with chronic pain belonging to the MCP treatment group were significantly more likely to reduce and altogether cease opioid use (40.5% of MCP participants completely stopped using opioids vs. 3.4% of the comparison sample—see Vigil et al., 2017). Vigil and

colleagues arrived at a conclusion similar to that of Lucas (2012): “From a harm reduction standpoint, our results highlight the necessity of more extensive research into the possible use of cannabis as a substitute for opioid painkillers” (2017, p. 11).

Additional replacements for opioid drugs include alternative medicine and mind-body wellness approaches. In a systematic review of literature on complementary and alternative medicine (CAM) as therapies for chronic pain, Houze, El Khatib, and Arobour (2017), evaluated the effectiveness of natural products (e.g., herbal therapies including cannabinoids), mind and body practices (e.g., yoga), and other approaches (e.g., electromagnetic therapies). The most promising therapies were yoga, hypnosis, graded motor imagery, Compound Kushen Injection (CKI), and inhaled cannabis (Houze et al., 2017). Unfortunately, some studies were of poor quality and heterogeneity was high for most CAM modalities examined, suggesting a need for research trials using standardized protocols and clear comparisons to mainstream treatment (Houze et al., 2017).

The CDC suggests all people can do their part to address the opioid crisis by considering non-opioid pain management options, including OTC pain medications, exercise and physical therapy; importantly, these treatment options should be considered in consultation with a doctor (2017). Given the potential liability of making recommendations that could be perceived as medical advice, as well as the possible violation of state or federal legislation for particular alternatives (i.e., cannabis), Extension systems should exercise prudence with respect to integration of information on non-opioid pain management options in efforts to address the opioid crisis.

Consumer use patterns—Education on proper storage and disposal. This strategy intends to reduce the diversion and misuse of prescription opioid medications that have already

been dispensed. Numerous researchers, practitioners and health authorities have indicated that consumer education on these topics is a necessary part of mitigating the harmful effects of widely available opioid medications (CDC, 2017; Dellapenna, 2017; Gray et al., 2015). However, providing education on proper storage and disposal, though necessary, is not sufficient. Recipients of prescription opioids must have convenient, reliable access to disposal sites, and communities must be willing and able to host and successfully promote drug take-back events.

Permanent safe disposal sites and drug take-back events have been fruitful in a number of states. Gray and colleagues (2015) collected and analyzed prescription medications from eight permanent drug donation boxes in Tennessee over a span of approximately five years and found that opioid analgesics accounted for five of the top 10 controlled substances donated, and the median time from prescription date to donation was 36 months (3 years). Stewart and colleagues (2015) collected medications from 11 take-back sites in Maine from 2011 to 2013 and found that opioid analgesics accounted for 59% of distinct controlled substances and 68% of all controlled substance units. Comparison of the number of original units to returned units showed that waste of hydrocodone + acetaminophen formulations was 74.4%, and oxycodone waste was 69.5% (Stewart et al., 2015). Clearly, a large amount of opioid medication is kept, unused, for extensive periods of time in the homes of U.S. consumers. Given the fact that most opioids diverted for nonmedical use are obtained, sometimes without consent, from a family member or friend with a prescription, education on proper storage and disposal is an important part of addressing the opioid crisis (USDHHS, 2014). In an effort to make it easier to dispose of unused medications, in 2014 take-back efforts expanded to include a system allowing use of the postal service to mail unused medications in “pre-paid, mail-back packages” obtainable from pharmacists (USDHHS, 2014, p. III-7).

Continuum of interventions—Promotion and prevention. The National Research Council and Institute of Medicine (2009) provide guidance on the range of possible interventions related to mental, emotional and behavioral disorders, including substance use disorders. In their update of the intervention framework presented in the 1994 IOM report, promotion of mental health was a major new addition; furthermore, the committee made clearer distinctions between prevention and treatment (NRC-IOM, 2009). The resulting continuum of interventions includes: promotion, prevention, treatment and maintenance. Each of these is described with greater detail below.

Promotion. Mental health promotion interventions typically are geared toward the general public and their content focuses on enhancing individual, developmentally appropriate competencies and capacities that function as protective factors (NRC-IOM, 2009). Based on this definition, positive youth development approaches would be considered part of the continuum of mental health intervention. Positive youth development is a hallmark activity of the land grant system. Positive youth development is an area of practice and research intended to prevent problems and encourage optimal development—also described as “thriving”—by helping youth identify and pursue areas of passion, develop proficiencies and capacities that are meaningful for their lives, and experience sustained relationships with caring adult mentors (Larson, 2000; Lerner et al., 2014). There is a compelling body of research demonstrating that youth participation in positive youth development programs, including 4-H, is associated with better mental health and decreased risk behaviors including substance use (e.g., Lerner et al., 2014).

Prevention. Broadly speaking, preventive interventions are “interventions that occur prior to the onset of a disorder” and these interventions are “intended to prevent or reduce risk for the disorder” (NRC-IOM, 2009, p. xxvii). Preventive interventions can be further classified

into three categories: universal, selective and indicated (NRC-IOM, 2009). Universal prevention, like mental health promotion, includes the whole population; however, it differs from promotion because universal prevention deliberately addresses risk factors. Selective prevention addresses a narrower audience and focuses on individuals or groups identified as at risk due to “biological, psychological, or social risk factors that are known to be associated with the onset of a disorder” (NRC-IOM, 2009, p. xxviii). Finally, indicated prevention is preventive intervention for “high-risk individuals who are identified as having minimal but detectable signs or symptoms that foreshadow mental, emotional, or behavioral disorder, as well as biological markers that indicate a predisposition” but the criteria for a diagnosable disorder are not met (NRC-IOM, 2009, p. xxvi).

Examples of existing evidence-based universal prevention programs being utilized within Extension include Life Skills Training, with distinct curricula for elementary, middle and high school students, and The Strengthening Families Program 10-14 (SFP 10-14), a family-based program designed to increase protective factors and reduce risk factors for adolescent substance use. SFP 10-14 has been particularly effective when delivered in conjunction with Life Skills Training as part of the PROSPER delivery model (Crowley, Jones, Coffman, & Greenberg, 2014; Spoth et al., 2017). PROSPER is “a delivery system that utilizes the outreach arm of the land grant university, the Cooperative Extension System (CES), to catalyze community teams to deliver school-based and family-focused interventions targeting middle school students” (Spoth et al., 2017, p. 2247). A Surgeon General Call to Action to prevent prescription drug abuse among youth underscored the importance of developing community-wide strategies, noting that PROSPER serves to support long-term sustainability of efforts. This delivery system uses a four-tiered partnership structure, consisting of community-based teams led by Extension staff, a

state-site prevention coordinator team, a state-site management team, a cross-state PROSPER Network Team (Spath & Greenberg, 2011).

PROSPER has been cited as an example of a highly effective, sustainable community-based approach for prevention of youth prescription drug misuse (USDHHS, 2014). In addition, PROSPER delivery of SFP 10-14 with Life Skills Training has been described as an “efficient allocation of societal money” for addressing prescription opioid misuse (Crowley et al., 2014, p. 75). A randomized controlled study is underway to examine the effectiveness of an extension of the PROSPER Delivery System that supports a continuum of interventions, including treatment, by adding a Screening, Brief Intervention and Referral to Treatment (SBIRT) component.

Continuum of interventions—Treatment and maintenance. Treatment refers to interventions for “individuals who are identified as currently suffering from a diagnosable disorder” (NRC-IOM, 2009, p. xxix). The goal of treatment is to reduce symptoms, ameliorate effects and/or, if possible, cure the disorder (NRC-IOM, 2009). Additional aspects of treatment include “prevention of disability, relapse, and/or comorbidity” (NRC-IOM, 2009, p. xxix). In the context of opioid use disorder, treatment includes (but is not limited to) individual or group counseling or psychotherapy and medication-assisted treatments (MATs) such as buprenorphine, naltrexone, and methadone. Access to MATs varies considerably and is particularly low in rural areas; however, recent developments in formulations of MATs, such as implants and extended-release injections, can help address barriers of geographic and transportation barriers (Rigg et al., 2018). The results of the Extension Behavioral Health Survey conducted in spring 2018 by the Extension Opioid Crisis Response Workgroup and Expert Partners suggests engagement in treatment interventions by state Extension systems is rare.

The maintenance end of the mental health intervention spectrum refers to long-term compliance with treatment goals, including reduction in relapse and recurrence, and treatment after-care activities including rehabilitation (NRC-IOM, 2009). Similar to the survey results regarding treatment, the Extension Behavioral Health Survey suggests maintenance interventions for any type of substance use disorders are rare within Extension.

Community development to support the continuum of interventions. Most mental health interventions presented in the literature, as well as the specific approaches and programs reviewed above, are focused on individuals and their micro-contexts (schools and families). However, it is evident that aspects of broader social systems significantly impact development of addiction generally and opioid use disorder specifically. Therefore, community development work being done by Extension, including economic development and community capacity-building, should be considered as solutions in resolving the opioid crisis. According to Rigg et al. (2018), these strategies are essential: “The most important upstream solution may well be a revitalized economy and social safety net. It is no coincidence that overdose rates are highest in places with the most disadvantaged labor markets... Therefore, existing interventions are unlikely to be effective without addressing the underlying social and economic determinants, including poverty, unemployment, and declining opportunities for upward mobility (Dasgupta et al., 2018)” (p. 126).

One example of an effective community-based effort outside of Extension is Project Lazarus out of Wilkes County, North Carolina (Albert et al., 2011). This comprehensive, community-based intervention integrated many demand-side and supply-side strategies, and included components at all levels of the mental health intervention spectrum. Community organization and activation efforts included town hall meetings, creation of task forces and

coalition-building (Albert et al., 2011). Community-based prevention and education included: a public health campaign with billboards, radio and newspaper ads; presentations at community events; school-based interventions; and patient education and support (Albert et al., 2011). The set of supply reduction and diversion control activities incorporated take-back events, permanent disposal sites and training of specialized law enforcement (Albert et al., 2011). Demand reduction and harm reduction efforts included making naloxone and buprenorphine widely available (Albert et al., 2011). In addition, there were supply-side efforts involving prescriber education in the form of academic detailing; promotion of the use of prescription drug monitoring programs (PDMPs), and licensing actions against prescribers engaging in overtly harmful or criminal prescribing practices (Albert et al., 2011). Some of these supply-side strategies are described with greater detail in the section that follows.

Supply-Side Solutions

Abuse-deterrent formulations. The development of opioids resistant to tampering (crushing, dissolving, etc.) is a strategy used to make misuse and overdose less likely, independent of implementing additional regulations or reducing the supply of prescription opioids. Abuse-deterrent formulations of prescription opioids include physical and chemical barriers, as well as agonist/antagonist combinations to cause interference or aversive effects if manipulation has occurred (Covvey, 2015). With this strategy, it is crucial to note that abuse-deterrent is not synonymous with “abuse-proof” (Covvey, 2015). Individuals who have a substance use disorder often find innovative ways to bypass such modifications, particularly when experiencing withdrawal. In one especially memorable anecdote, the medical director of Heartview Foundation in North Dakota recounted a time when an individual with opioid use

disorder was able to make use of an abuse-deterrent formulation by first dissolving it in turpentine, then injecting it (Dr. Melissa Henke, personal communication, July 25, 2017).

Although abuse-deterrent formulations can reduce the population of individuals who engage in tampering, this approach can actually *accelerate* the transition to heroin use for individuals with opioid addiction (Wakeland, Nielsen, & Geissert, 2015). Wakeland et al. (2015) suggest a better approach is to prevent entry into a misuse trajectory by discouraging medication sharing and promoting proper disposal of leftover medication.

Prescribing guidelines and prescription drug monitoring programs. Public health and medical professionals agree that adherence to new prescribing guidelines, as well as use of prescription drug monitoring programs (PDMPs), are essential measures clinicians need to take (CDC, 2016; Dellapenna, 2017; Nash, 2017). PDMPs are an integral resource for pharmacists in determining if patients are engaging in drug-seeking behaviors such as doctor shopping (USDHHS, 2014). PDMPs allow for timely supervision of patient and prescriber histories.

PDMPs are useful for reducing the possibility of patient misuse, and they provide valuable information that can be used in formulating interventions to protect public health and safety. For example, in an evaluation of the impact of recent hydrocodone scheduling changes (from schedule III to schedule II), preliminary data from the South Dakota PDMP suggest “prescribers compensated for the more stringent requirements by writing fewer hydrocodone prescriptions with larger days supplies” (Mort & Kuschel, 2016, p. e6). Furthermore, an increase in other types of opioid prescriptions suggests “an unintended compensatory approach” (Mort & Kuschel, 2016, p. e6). This information, which would be difficult to obtain without the PDMP, can now be integrated in training or interventions.

Unfortunately, most healthcare providers do not routinely use PDMPs to review patient information, use of PDMPs is voluntary in most states, and information-sharing capabilities are limited (USDHHS, 2014). Promotion or incentivization of provider use of PDMPs, as well as “improving PDMP interoperability and information-sharing standards” would increase the effectiveness of PDMPs (USDHHS, 2014, p. III-5).

Training of medical professionals. Some experts propose a cultural shift among doctors is required, and that such a shift can only be achieved through changes to educational curriculum and training (Avorn, 2017; Gastala 2017; Meyer et al., 2014; Nash, 2017). Gastala (2017) notes that when doctors try to address opioid misuse and addiction, they often encounter pushback from patients and their families. Hostility, anger, guilt, shame and fear are common responses, and doctors need training to be able to manage these responses rather than succumb to intense pressure to write another prescription (Gastala, 2017). Meyer et al. (2014) state that lack of adequate physician training in pain management has contributed to over-reliance on opioids to treat pain, and Nash (2017) suggests providers need better education on social and behavioral determinants of health risk behaviors.

Avorn (2017) proposes academic detailing as a solution. In this approach, education is provided by charismatic, research-savvy clinicians able to incorporate baseline knowledge and attitudes into the educational process, which includes literature on “efficacy, risk and cost-effectiveness” packaged in accessible, compelling formats (Avorn, 2017, p. 361). Academic detailers essentially would serve as the unbiased, scientific counterpart to pharmaceutical companies’ drug detailers. Academic detailers would help address the problems of “passive and inelegant communicators, standing behind podiums in optional continuing education classes, delivering one-way didactic presentations” (Avorn, 2017, p. 361).

An additional consideration is the role of provider perceptions, knowledge and attitudes towards medication-assisted therapy, particularly buprenorphine. Some primary care providers are reluctant to prescribe medication-assisted therapies for individuals with opioid use disorder because of perceptions of high risk of diversion, time constraints, and attraction of drug users to their practice (Andrilla, Coulthard, & Larson, 2017). Physician reluctance to prescribe buprenorphine may be due to attitudes and beliefs rooted in stigma and myths (Wakeman & Barnett, 2018). Some of the myths impacting physician willingness to provide buprenorphine are: patients will become addicted to buprenorphine (false); detoxification, or abstinence-based treatments are more effective than medication-assisted treatments (false); and buprenorphine treatment is “onerous and time consuming” (this one is more complicated, but basically false) (Wakeman & Barnett, 2018, p.3). Wakeman and Barnett (2018) suggest education about buprenorphine treatment should be part of medical school training for all physicians.

In a comment posted under the online version of the perspective article by Wakeman and Barnett (2018), one professional wrote the following:

An ongoing, significant challenge to team-based MAT care and to addiction treatment in general is the stigma associated with drug use. This abstract cultural force may be the one thing preventing the successful resolution of the opioid epidemic. For 100-plus years as a society, America has criminalized and punished people who use drugs. This has fostered a pervasive and pernicious attitude that drug-addicted people are wrongdoers and perpetrators of their own problems; not that they are victims of a disease requiring treatment. As long as drug use and addiction are viewed primarily as moral failures and not medical problems, medication assisted treatment will not reach its full potential to help, regardless of whether it is cost effective (Dr. John Bachman, July 5, 2018).

Pharmacists as a point of intervention. In addition to changes in training for medical professionals, it has also been suggested that pharmacists receive special training and support so they can serve in a preventive capacity and engage in intervention as needed (Cochran, Field, & Lawson, 2015; USDHHS, 2014; McCarthy et al., 2014; Tai, Hata, Wu, Frausto, & Law, 2015). Several studies suggest major gaps to be addressed with regard to the role of pharmacists in preventing misuse. In a cross-sectional study of 149 adults living in two large cities, one week after filling a new prescription for an opioid analgesic only 1.3% recalled the pharmacist discussing the addictive potential of the medication, and there was no indication that any of the study participants had received information on safe storage or disposal (McCarthy et al., 2014).

In a cross-sectional study of 739 pharmacists in Texas and Utah, only about half of pharmacists indicated screening patients for prescription opioid misuse (Cochran et al., 2015). Pharmacists' attitudes, beliefs and access to resources were significant factors. Pharmacists who felt awkward asking patients about misuse were less likely to engage in screening; discussions about misuse were less likely among pharmacists who did not believe they had the right to inquire about patients' use of their prescription opioids; and lack of training, as well as lack of access to screening tools, made screening less likely (Cochran et al., 2015). The findings suggest a need for additional training and resources for pharmacists to help them gain comfort screening and discussing misuse with patients (Cochran et al., 2015).

In addition to training and resources about patient misuse of prescription opioids, Tai et al. (2015) suggest a need for pharmacist training and resources on proper disposal practices. In a cross-sectional study of 142 community pharmacists in ten counties in California, despite the fact that 80.9% ($n = 114$) held a PharmD degree, 38% ($n = 54$) did not recall receiving any formal education on proper disposal (Tai et al., 2015). While 56.3% ($n = 80$) knew of DEA

recommendations, only 34.5% ($n = 49$) were aware of FDA recommendations, and only 10.1% ($n = 14$) correctly identified all methods of proper disposal for controlled substances (Tai et al., 2015). Some recommended disposal practices that were not even possible within their communities (Tai et al., 2015).

Policy recommendations. While not an exhaustive list of possible policy changes, the following recommendations represent large-scale changes with the potential to attenuate the ongoing crisis: encouraging states that have opted out of Medicaid expansion to adopt it (this recommendation implicitly supports continuation of the most recent Medicaid expansion) (Hirschak & Murphy, 2017); health insurance coverage of medication-assisted therapies such as buprenorphine (Hirschak & Murphy, 2017); lifting federal restrictions to allow randomized controlled trials examining cannabinoids as possible substitutes for opioids in the treatment of pain (Hwang & Clarke, 2016; Lucas, 2012; Vigil et al., 2017); modifying current federal regulations and processes for physicians obtaining DEA waivers to prescribe buprenorphine (Stein et al., 2015; Wakeman & Barnett, 2018); and shifting from a sociocultural prioritization of law enforcement and incarceration to prioritizing prevention, harm reduction and treatment (Dellapenna, 2017; Hansen & Netherland, 2016). Hansen and Netherland (2016) suggest additional, more radical changes are necessary:

Moreover, we must rectify current and past harms of US drug policies. Decriminalizing personal possession of drugs and expunging the arrest records of thousands of mostly young men of color who have been caught up in punitive drug policies are steps in the right direction. Racial impact statements—which require legislators to evaluate if and how criminal justice reforms will affect racial disparities before voting on legislation—are another example of proactive policies that seek to address systematic racism. Unless

we scrutinize narcotics policies for their racial targeting, they reinforce inequalities in health care and law enforcement and leave White individuals, along with others, vulnerable in the face of inadequate attention to public health (p. 2128).

Part IV: Considerations for Extension's Strategic Planning

The purpose of this final section is to link the information in the previous sections with the mission and activities of Extension, with attention to the opportunities and challenges for Extension in undertaking efforts to address the opioid crisis. A summary of considerations that factor the combination of opportunities and challenges is provided to inform strategic planning.

History, Mission and Functions of Extension

With its historical mission and land-grant driven functions, the CES is uniquely positioned to help address the opioid crisis, in several ways. First of all, it has existing infrastructure and capacity in all states/counties. That infrastructure and capacity is very well-suited to diffusion of innovative, science-with-practice solutions for behavioral health issues. Further, to perform typical Extension functions, CES personnel typically serve as change agents, building relationships to link community stakeholders with access to resources required for addressing local problems, including those resources/organizations that are especially central to addressing the opioid crisis (e.g., social services, public education, public health). Importantly, there has been an expansion of CES-based behavioral health programming over past two decades. These prior efforts—ones that build on (1) existing research-based practices, (2) systematic, practical evaluation integrated into programming efforts, and (3) an expanding orientation to evidence-based programming, with greater attention to measurable community-level impact—are addressed in more detail below.

“The Extension system exists to disseminate the findings of research beyond the academic community to practitioners, policy makers, and the general public” (Hamilton, Chen, Pillmer, & Meador, 2013, np). Put another way, the function of Extension is to use scientific research to address the needs of individuals, families and groups in local communities (Hill &

Parker, 2005; Molgaard, 1997) or, briefly stated, a primary function of Extension is to apply science to practice. Extension exists as a result of a series of distinct federal acts spanning the late 1800s into early 1900 (for details, see Molgaard, 1997). Early programming was focused on the needs of rural populations and heavily centered around agriculture. Over time, program areas expanded to include youth development, parent education, nutrition and more (Molgaard, 1997).

During the rural crisis of the late 1980s, Extension was integral in working with distressed families. County staff had earned the reputation of being trusted and valued sources of information and support, and rural citizens were willing to discuss difficult topics and to disclose personal struggles to county agents, despite being reluctant to do so with other public service entities (Molgaard, 1997). It became increasingly clear to county staff that understanding mental health was essential to working effectively in their communities: “While some staff were concerned that Extension was trying to turn them into counselors, it soon became evident to most that a rudimentary level of counseling skills was essential in order to deal effectively with distressed clients” (Molgaard, 1997, p. 523). In addition to one-on-one support, county agents assisted in creating grass-roots coalitions to address mental health needs. The root causes of distress (e.g., economic changes) were addressed through job skills training and referrals for financial assistance programs (Molgaard, 1997, p. 524). This history of Extension involvement in the arena of mental health may get glossed over, or is perhaps unknown, but numerous states have expanded their programming to include these important issues as part of their work with youth, adults, families and communities.

Challenges in Seizing Opportunities

Extension’s unique positioning and resources, with attendant opportunities for effectively addressing the opioid crisis, should be considered in light of relevant challenges in seizing those

opportunities to realize the Extension potential in addressing the opioid crisis. These challenges include the need for moving toward a common language (e.g., clarifying definitions for “behavioral health,” “research-based,” “evidence-based,” “evidence-informed,” terminology), plus a shared understanding of standards regarding evidence-based programming. This shared understanding would require attention to literature-based distinctions between program development based on evidence-based principles and evaluation-driven program development that entails careful assessment of program outcomes.

Although the EOCRW remains in the process of finalizing its definition of “behavioral health,” the following captures key elements of the EOCRW definition recommended to date. That is, behavioral health describes the connections between behaviors and the health and well-being of the body, mind and spirit; including wide-ranging aspects of both mental illness and mental well-being. One example of an Extension-grounded effort to address definitional issues is a study by Sellers et al. (2017). Impetus for the study was lack of consistent use of the terms “research-based” and “evidence-based” among educators in Human Sciences Extension at Iowa State University. For purposes of the study, a professional development series was developed. Participants completed a baseline survey and there then was follow-up after the series. Prior to the professional development series, about two-thirds of the participants were able to correctly identify the standard for research-based. However, only about one in five were able to correctly identify the accepted standard for evidence-based. At the follow-up, about the same number correctly identified research-based programs (68% v. 63% at baseline); there was an increase in correct identification of evidence-based programs, though it still was quite low (35% vs. 21% at baseline) (Sellers et al., 2017). Most participants reported that the majority of programs in Human Sciences Extension and Outreach at Iowa State were research-based.

Additional treatment of the issue has led to the suggestions for definitions that could contribute to the development of a common language (see Fetsch et al., 2012). A suggested definition of Evidence-based Programs (EBPs) was "...well-defined programs that have demonstrated their efficacy through rigorous, peer-reviewed evaluations and have been endorsed by government agencies and well-respected research organizations" (Fetsch et al., 2012). The label "efficacious" would be applied to interventions that are supported by at least two rigorous trials, usually involving random assignment, with long-term positive outcomes and no iatrogenic effects. Further, the label "effective" would denote everything included in efficacious, plus having the manuals, training and support needed for third-party adoption and implementation and showing practical, statistically significant outcomes under "real-world conditions." Finally, "ready for dissemination" would be used to describe programs or interventions for which cost information is available, monitoring and evaluation tools exist, and it is clear that the program can be scaled up (Fetsch et al., 2012).

Related challenges include those highlighted in the literatures on adopting evidence-based programming and conducting evaluation of programming. In this connection, there have been scientist-practitioner tensions in the implementation and evaluation of behavioral health programming that are important to consider. These tensions in partnerships between scientists and practitioners often are due to differences in goals and priorities, especially as concerns balancing the advantages and disadvantages of implementing evidence-based programs as they were in original program evaluation research vs. community-driven adaptations of a program. Reward structures for scientists and community practitioners differ greatly, as well. Focus on interrelated goals can help ease tensions, with a clear focus on delivery process (Spath & Greenberg, 2005).

Another challenge concerns the limited data on existing CES capacity for addressing the opioid crisis (e.g., state CES portions of budget/resource support directed toward identified behavioral health problems, the portion of total relevant programming efforts, numbers of counties with programs, numbers of participants reached with programs). There also has been very limited evaluation of related capacity-building strategies. Capacity-building efforts could benefit from arriving at Extension stakeholder consensus on defining capacity and the capacity-building intent from among the many possible lines of capacity building (capacity for facilitating access to opioid-related resources vs. enhancing measurable community-level impacts, for example).

Widespread implementation of EBPs within CES could create considerable and sustained impact on opioid misuse and related problems, though there are many barriers to this pursuit. In addition to the previously described problems with definitions and use of terminology, community educator knowledge regarding EBPs would require focused professional development. In a study of Extension professionals in the state of Washington, Hill and Parker (2005) found that although two-thirds of staff reported a perceived need for prevention programming to address teen substance abuse, only about half believed they had skills to identify and implement evidence-based prevention programs. In a more recent survey study among Extension educators in the state of New York, Hamilton and colleagues (2013) found that 4-H educators felt less competent than agriculture or human ecology educators in their self-rated knowledge of specific EBPs, ability to determine whether a program is an EBP, and awareness of resources for finding EBPs. Broader studies of Extension educators across numerous states (e.g., Perkins et al., 2014) suggest that gaps in knowledge and proficiency regarding EBPs,

particularly among 4-H/youth development staff, are not isolated to a few institutions or state Extension systems.

The studies summarized immediately above underscore the knowledge, attitude and proficiency factors in Extension's readiness to implement EBPs more broadly. Spoth, Schainker, Redmond, Ralston, Yeh and Perkins (2015) addressed a broader set of readiness factors in a sample of Extension representatives from all but one state. More specifically, they conducted a survey of Extension concerning readiness for implementation of evidence-based behavioral health programming, comparing results with parallel surveys of Departments of Education (DOE) and Departments of Public Health (DPH) employees in all 50 states. Drawing on published measures of readiness-related constructs, key readiness factors assessed included: state engagement in prevention programming, support for prevention, knowledge of EBPs, commitment to evaluation, perceived need for EMP collaborations, organizational capacity, perceived resources, collaboration experience, system openness to change, as well as staff training and development. Concerning perceived resources, the authors emphasized that "The financial resource-related factor has become especially prominent in the last 4-5 years, as a result of shrinking federal and state budgets" (p. 255). The findings indicated that there was a mixed picture of Extension readiness, with: (1) only a moderate level of overall readiness nationally; (2) readiness-related variations in different regions of the country; and (3) indications of relatively higher levels of readiness among DOE and DPH employees. Relatively higher readiness was reported in Northeast and South, with the North Central region showing more middling levels and the West have relatively lower readiness levels. Notably, the authors conclude that findings indicate all surveyed systems have some readiness-related strengths and that results indicate

suggest the potential of the surveyed systems for enhanced dissemination of EBPs, especially when working in combination.

Educator attitudes regarding the utility, appropriateness and relative effectiveness of EBPs are another area of potential challenges. Agents in the field often find that they can more readily address emerging issues through responsive programs developed in-house (Fetsch et al., 2012). Furthermore, several studies indicate that programs developed within CES are perceived to be equally as effective as externally-developed EBPs in preventing problem behaviors (Hamilton et al., 2013; Hill & Parker, 2005; Perkins et al., 2014). Among 4-H educators, these findings could be reflective of historical tension between prevention and positive youth development approaches (Perkins et al, 2014). Prevention approaches tend to focus on deficits and avoiding negative outcomes, whereas positive youth development approaches focus on promoting positive outcomes through building competencies and strengths (Perkins et al., 2014). Importantly, both approaches are useful and necessary, and these approaches are not incompatible or mutually exclusive (NRC-IOM, 2009). Perkins and colleagues (2014) have recommended finding a way to combine the “best practices of existing 4-H culture” with EBPs, and utilizing strengths-based EBPs with general audiences.

The literature reviewed above suggests a conceptual framework that could guide efforts to take advantage of opportunities and to address challenges in the land grant response. The ecodevelopmental model is an organizational frame for a science-with-practice (translating prevention/behavioral science into widespread community practice) conceptual framework that addresses how to build specific capacities for CES-assisted actions designed to ameliorate specific effects of the crisis. Importantly, this framework includes factors and contexts to be considered in approaching solutions to the opioid crisis, as will be discussed next.

Recent Progress to Inform Our Response to the Current Crisis

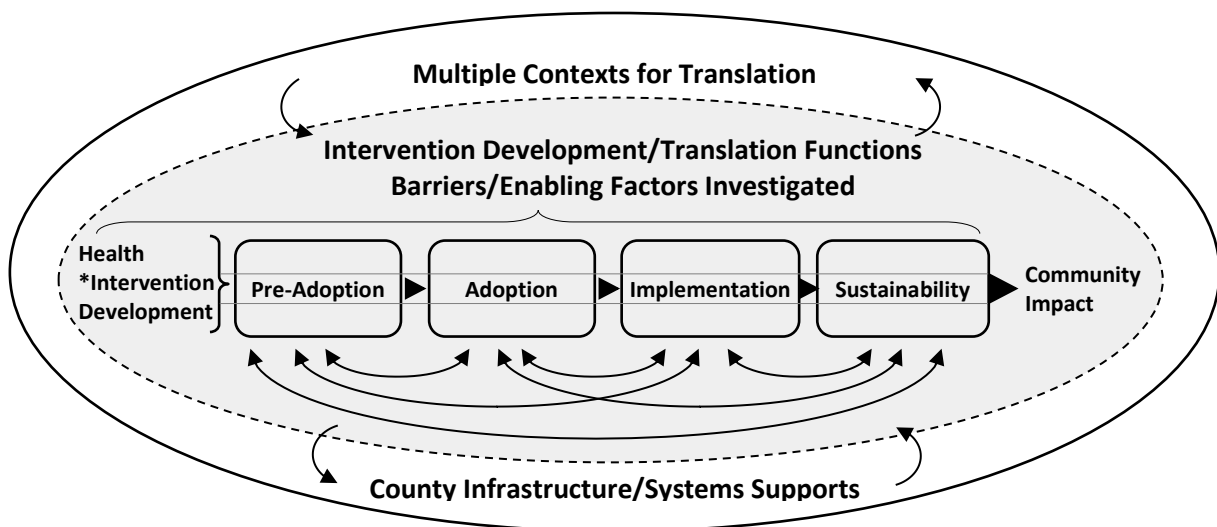
There has been increased awareness and use of EBPs within Extension, along with more attention to novel scholarship on translating science into practice (often referred to as “Type 2” translation). This type of translation can create high collective impact, not just with regard to the opioid crisis, but for behavioral health more broadly. Evidence-based programming within Extension has been an area of focus in publications of the *Journal of Extension* (e.g., Hamilton et al., 2013; Hill & Parker, 2005; Perkins et al., 2014). Type 2 translation is another area of scholarship that has been applied in the Extension arena, but only fairly recently. It provides valuable insight to inform Extension efforts to address the opioid crisis. Type 2 translational research “investigates the complex processes and mechanisms through which tested and proven interventions are integrated into practice and policy on a large scale and in a sustainable way, across targeted populations and settings” (Spoth et al., 2013, p. 321). Because this area of scholarship is likely unfamiliar to many audiences, the Appendix provides a glossary of common terms used in literature. A brief review of relevant literature is provided.

Type 2 Translation. Type 2 translation research ensures that research knowledge actually reaches intended audiences, and that programs, services or treatments are correctly implemented with those audiences (Woolf, 2008). According to Rohrbach and colleagues, “the primary goal of Type 2 translation is to institutionalize effective programs, products, and services” (p. 303). Type 2 translation draws on Diffusion of Innovation theory and organizational change theories, as well as program implementation research (Rohrbach et al., 2006). A number of theoretical frameworks exist under the umbrella of Type 2 translation, but providing details on

each is beyond the scope of the present review. The Translation Science to Population Impact (TSci) Framework (Spoth et al., 2013) has been selected as an illustrative example.

This conceptual framework integrates the established phases of translation-related systems with the well-established Diffusion of Innovation theory (e.g., Rogers, 1995), to facilitate optimization of an opioid response. A graphic representation of the framework for purposes of this literature review is represented in the figure below. A key advantage of the conceptual framework for CES is that it could guide evaluation and programming addressing translation barriers in county-based opioid response efforts. As shown in the figure below, the translation cycle begins with existing intervention pilot work and outcome research that have served as a basis for a sound programming framework; however, subsequent “science with practice” is needed to address four other factors that influence translation to county or community settings, with consideration of both contextual and infrastructural support factors.

A Conceptual Framework for Translating Science into Practice



* Intervention is broadly defined to include programs, environmental strategies, other practices, policies.

Source: Adapted from Spoth, Rohrbach, Greenberg, et al. (2013). Addressing core challenges for the next generation of Type 2 translation research and systems: The Translation Science to Population Impact (TSci Impact) framework. *Prevention Science* 14(4), 319-351.

There are three components of the TSci Impact Framework. The first component consists of the four translation phases: preadoption, adoption, implementation and sustainability (Spoth et al., 2013, pp. 323-325). The pre-adoption phase entails examination of factors “that could influence the ultimate adoption” of evidence-based interventions, such as consumer and provider preferences, packaging of materials, and marketing. The adoption phase focuses on the decision-making process and relevant factors, such as incentives for adoption, potential economic benefits and institutional readiness for change. Implementation research targets the process of implementation rather than outcomes, and it includes factors such as program fidelity, adaptation of curricula, training and technical assistance, and participant factors. The fourth phase, sustainability, considers maintenance of evidence-based interventions as a function of funding strategies and structures, organizational capacity, policies, and other factors (Spoth et al., 2013).

The second component of the TSci Impact Framework concerns multiple contexts of implementation, “ranging from local communities and organizations to national, state, and county governments that ultimately affect the population impact” (Spoth et al., 2013, p.325). A variety of factors within these multiple contexts impact T2 translation, and the complex relationships among them create a complicated set of interrelated contextual influences. The third and final component of the TSci Impact Framework is infrastructure supports for practice and research. On the research side, practitioner-scientist partnerships, research resources, and researcher workforce development are among the necessary supports. On the practice side, there is a need for market analysis systems, dissemination systems, technical assistance during implementation, and numerous additional types of supports and infrastructure (Spoth et al., 2013).

Developing the requisite infrastructure and capacity is a core challenge of Type 2 translation, and a highly relevant challenge for Extension in scaling up of EBPs. Scaling up, defined as “deliberate efforts to increase the impact of evidence-based interventions” (Gottfredson et al., 2015, p. 895), is likely to involve a number of barriers that may require innovative solutions. Funding is always an important consideration for CES programming, irrespective of scaling up. However, scaling up requires ample, sustainable funding beyond what has been described as the “patchwork quilt of yard and bake sales, car washes, and temporary grants” often used to fund prevention programs (IOM & NRC, 2014, p. 54). Insufficient organizational capacity, which includes lack of staff with necessary training or expertise as well as burnout or high turnover, is another prominent scale-up challenge (IOM & NRC, 2014). Considerable variation exists within CES in terms of organizational capacity (e.g., Spoth et al., 2015). In the recent EOCRW Extension Behavioral Health Programs Survey, fewer than a quarter of respondents felt their state Extension system has the existing capacity needed to respond to the opioid crisis.

Literature-Based Considerations for Extension’s Strategic Plans

Given the differences in capacity, readiness and structure across state systems within CES, as well as differences in severity of impact of the opioid crisis, it is difficult to delineate considerations that will be relevant to all state systems. Nevertheless, we have articulated several considerations and implications that we believe will help CES in addressing the opioid crisis, regardless of state-level variation in the previously listed factors.

Consideration One: Readiness and Capacity Assessments. The literature highlights varying levels of readiness and capacity among states. State systems need to assess local readiness including need and capacities (internal and external) to address behavioral health

issues; this could be done in a coordinated, consistent way with standardized assessments, to allow for comparison and common approaches across states and regions. In this vein, the literature review summarized articles showing how to measure and evaluate readiness, including a range of capacity-related factors. This literature specifies how to conduct state assessments of readiness that, in turn, could guide strategies that would optimally align with a state's current capacity, clarifying how to build from there. Basically, this would begin with needs and resource assessments guiding how to best “start where states/territories are at,” assisting with movement toward enhanced capacity.

For example, the first level could include states/territories that presently have both limited capacity and interest but might respond to preliminary capacity-building supports (e.g., for awareness building about the problem and solutions, along with other groundwork that could be undertaken). The second level could include states/territories that have stronger intent to address the crisis but also have somewhat limited capacity to do more than they already are. For them supports could entail assistance with gap analysis and with improved access to additional information/tools or other educational resources that they could use, given that such resources do not require much by way of additional budgetary or other resources. The third level would include states/sites with both intent and greater readiness/capacity to support adoption, implementation and sustainability of research- or evidence-based programs integrated with research (process and outcome evaluation)—programs that are more likely to contribute to community- or population-level impact. Cutting across all levels would be technical assistance or other supports for assisting states/sites in assessing gaps and moving forward in whatever way indicated, by way of building capacity or otherwise expanding efforts within their states/territories.

Consideration Two: Basic Training for Community-Based Educators. Though it may be tempting to think of behavioral health as primarily or solely relevant to Family and Consumer Science, Community Development, and/or 4-H Youth Development professionals whose work might directly involve behavioral health topics, all CES staff who interact with the general public should have a basic level of behavioral health knowledge and skills. During the farm crisis of the 1980s, county agents in rural areas came to understand the importance of mental health literacy and de-escalation skills (Molgaard, 1997); similar issues are likely to surface due to current opioid-related conditions, both economic and social. For example, ANR agents are who are working directly with distressed dairy producers may see and hear things that do not emerge in other social contexts. As trusted and well-connected members of their communities, they are in a position to identify individuals who may be in need of behavioral health interventions and refer them to professional services or resources. In order to do this, agents need to be able to recognize signs and symptoms of distress and have the skills and training necessary to respond appropriately. A critically important component of this basic training would entail efforts to move closer to a common behavioral health language and understanding, as described above (in the sections on challenges to be addressed).

Consideration Three: Prioritizing Programs. State systems need to consider the level of evidence supporting behavioral health programs currently in use. Program leaders may have to make tough decisions, which could include prioritizing programs with greater evidence and relevance to the opioid crisis, requiring careful evaluation of prognosis with unknown impact, or the replacement of scientifically weak programs. Those programs with limited outcome data on their efficacy should be further evaluated, as is suggested by the NRC-IOM (2009) report. To be most effective, programs need to address both risk and protective factors, particularly within the

4-H/youth development area. Furthermore, in accordance with the ecodevelopmental model, programming needs to occur across multiple contexts (individual, family, community) and multiple portions of the lifespan (NRC-IOM, 2009), highlighting the importance of communication and collaboration across program areas. For example, 4-H/youth development and FCS professionals could implement programming focused on individual and family factors, whereas CD professionals could focus their efforts on broader systems, especially community capacity-building. It would be highly impactful if all program areas could coordinate complementary programming or work together as part of a comprehensive effort.

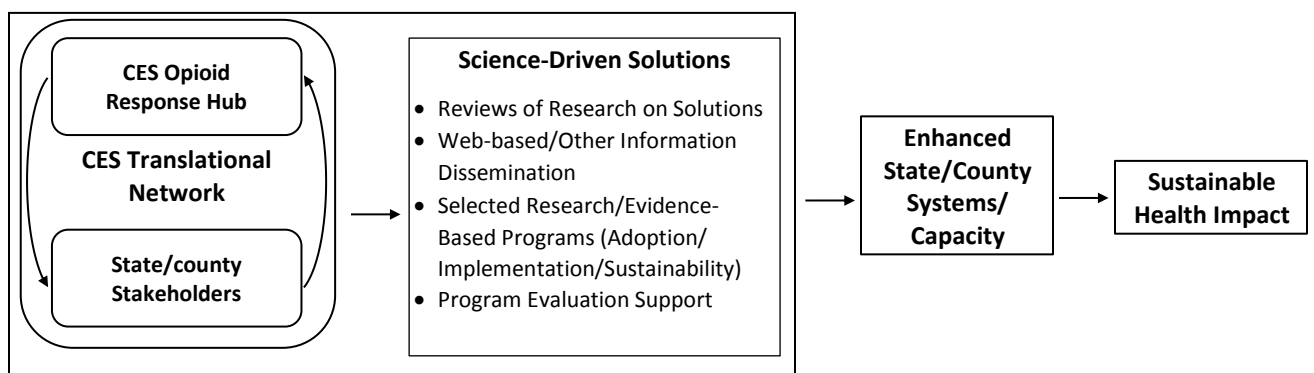
Consideration Four: Increased Knowledge about Guiding Models for Translating Science into Practice. It would help if regional and state leaders became better-versed in the literature on translating behavioral health research into widespread community practice, along with cultivating institutional culture and capacity to support it. Consideration of the definition and purpose of T2 translational research alongside the mission of Extension, suggests that T2 translation could be the crux of the landgrant “science with practice” system. To assist leadership in this endeavor, recommended readings on T2 translation are included in the references portion of the present document and indicated with an asterisk (*). Consideration of the guiding models for translating behavioral health preventive intervention science into practice through extension-based partnerships could be especially helpful.

Consideration Five: Capacity-Building for an Opioid Response Network. An important consideration would be adopting a capacity-building opioid response network guided by the aforementioned indications of readiness to address the crisis. This network would support adoption of effective responses to the opioid crisis following the translation of science into

practice model; it would entail an Extension-based support system for multiple levels of state/territory readiness to address the crisis.

Adopting this “*science-with-practice*” approach to strategies and solutions to respond to the opioid crisis would be central to the mission of land grant universities. A CES Translational Network could address key limitations that prevent the translation of science to practice and, thereby, lead to transformative changes in the ways that counties and communities address this crisis. In this connection, the need to build community capacity has been well articulated in the recent National Academies reviews (e.g., IOM-NRC, 2014) that specifically highlight the need to address specified knowledge gaps and barriers constraining the “translation” of evidence-based interventions into widespread, community-based practice. A key gap concerns how to put systems in place to enable utilization of evidence-based practices, programs, and interventions. A CES Translational Network could fill this gap.

Building CES Capacity for Translating Prevention into Community Practice: An Illustrative Framework for a Capacity-Building Opioid Response Network



As shown in the figure above, the proposed Network would directly facilitate linkages between a land grant university CES Opioid Response Hub and state/county stakeholders to support the continuous ‘*science with practice*’ feedback loops essential for effective and impactful translational work. Community capacity to support related initiatives could be enhanced through the specified science-driven solutions. This, in turn, could lead to sustainable community health impact.

Consideration Six: Coordination with Federal Agencies. It would be helpful to develop strategic plans for coordinating with federal agencies addressing the opioid crisis, especially for following through on the above considerations. Several leading professional organizations, including the American Psychological Association Science Directorate and the Trust for America’s Health, are advocating for federal-level action in addressing the addiction crisis in the US. Increasingly, this includes advocacy for collaborative efforts and coordinated funding among federal agencies to address the crisis. Notably, USDA, NIFA/RD could take a leading role in seeking coordinated funding efforts among key US stakeholder agencies (HHS’s SAMHSA, CDC, NIH, HHS’s HRSA)—funding efforts that would both factor the above five considerations and assist with implementation of the strategic plan developed through the EOCRW. An illustration of such a coordinated effort is provided by the recent announcement that HHS’s Substance Abuse and Mental Health Services Administration (SAMHSA) is engaging with the Cooperative Extension System (CES) to bring opioid prevention, treatment and recovery activities to rural America more efficiently. Specifically, it is creating an opportunity to apply for grants from the U.S. Department of Health and Human Services (HHS) to build on successful 2017 and 2018 USDA-NIFA Rural Health and Safety Education projects that focus on opioid abuse.

Consideration Seven: Federal Funding to Assist with Capacity Building. In conjunction with the literature highlighting the challenges that Extension must address to provide for a strong response to the opioid crisis, there is a clear need for capacity building. Notably in this context the Behavior Health Survey supported by the EOCRW highlighted how Extension is hampered by limited available capacity to address the crisis, especially because of competing demands for resources and a limited budget for supporting the response to the crisis. In addition to taking a lead role in organizing cooperative efforts with other stakeholder Federal Agencies, as mentioned in connection with Consideration Six above, the USDA-NIFA could increasingly fund more grants for projects that optimally well align with the above considerations overall. A recent illustration of such funding is another recent announcement by the Assistant to the Secretary for Rural Development in USDA concerning how USDA is partnering with rural communities in 22 states to support opportunities for opioid prevention, treatment and recovery, consistent with findings from and recommendations by the Interagency Task Force on Agriculture and Rural Prosperity intended to increase prosperity in rural communities, including increased investments in rural infrastructure.

Conclusion

Millions of Americans misuse prescription opioids each year, and tens of thousands die of opioid overdoses. Opioid-related problems result in billions of dollars in healthcare costs, lost earnings and diminished workplace productivity, plus law enforcement and incarceration costs. In addition, the opioid crisis has had devastating impacts on families and communities, contributing greatly to the intergenerational transmission of adversity in the future.

The current crisis has emerged in the context of complex, interconnected historical, economic and social factors, such as changes in the relative importance of treating pain within the medical community, as well as marketing and sales practices of pharmaceutical companies lacking timely regulation or accountability. In examining opioid misuse and addiction through the lens of an ecodevelopmental model, the complicated interplay of individual, social and community factors suggests a need for comprehensive interventions addressing risk and protective factors at multiple levels, across social contexts.

Numerous demand-side and supply-side solutions exist to address the current crisis. These solutions will be most effective if implemented jointly, in the context of broader policy-level change. While other organizations are positioned to provide treatment for opioid use disorder and to work on supply-side solutions, the land grant system is very well suited to engage in demand-side solutions falling on the promotion and prevention end of the continuum of interventions.

CES has existing infrastructure and capacity in all states, and Extension personnel often serve as change agents, linking citizens with resources and relevant organizations. Moreover, CES is well-suited to diffusion of innovative, science-with-practice solutions to behavioral health issues. From this perspective, it has exhibited expansion and growing openness of programming

to include behavioral health topics in recent times. Harnessing the assets of the land grant system to realize CES potential in addressing the opioid crisis will require overcoming a number of challenges. These challenges highlight many needs, including:

- The establishment of a common language across program areas and program-specific roles;
- State and community-level assessments of readiness and capacity;
- Professional development opportunities for CES staff in the areas of behavioral health;
- Broader dissemination of evidence-based programming; and
- The application of science-with-practice translation models, particularly those directed toward capacity-building and scale-up efforts, supported through the formation of a CES capacity-building opioid response network.

Importantly, coordination with federal agencies will be necessary to ensure adequate resources and sustained funding to meet these needs.

In sum, the staggering statistics in the literatures showing the health, social and economic consequences of the opioid crisis compel us to action. Behind these statistics there are countless stories of devastation wreaked among our families and communities, bringing home the need to find viable and effective solutions to the crisis. Clearly there is an opportunity to seize at this point in time: harnessing the transformative power of Extension systems across the country to implement solutions for the sake and benefit of our families, communities and nation.

References

- Albert, S., Brason, F. W., Sanford, C. K., Dasgupta, N., Graham, J., & Lovette, B. (2011). Project Lazarus: Community-based overdose prevention in rural North Carolina. *Pain Medicine, 12*, S77-85.
- American Psychiatric Association. (2013). Substance-related and addictive disorders. Retrieved from <https://www.psychiatry.org/psychiatrists/practice/dsm/educational-resources/dsm-5-fact-sheets>
- Anda, R. F., Brown, D. W., Felitti, V. J., Dube, S. R., & Giles, W. H. (2008). Adverse childhood experiences and prescription drug use in a cohort study of adult HMO patients. *BMC Public Health, 8*, 198. <http://www.biomedcentral.com/1471-2458/8/198>
- Andrilla, C. H. A., Coulthard, C., & Larson, E. H. (2017). Barriers rural physicians face prescribing buprenorphine for opioid use disorder. *Annals of Family Medicine, 15*(4), 359-362. <https://doi.org/10.1370/afm.2099>
- Arnett, J. J. (2013). Chapter 13: Problems and resilience. In J. J. Arnett, *Adolescence and Emerging Adulthood: A Cultural Approach*, pp. 362 – 393. Upper Saddle River, NJ: Pearson Education.
- Avorn, J. (2017). Academic detailing: “Marketing” the best evidence to clinicians. *Journal of the American Medical Association (JAMA), 317*(4), 361-362.
- Birnbaum, H. G., White, A. G., Schiller, M., Waldman, T., Cleveland, J. M., & Roland, C. L. (2011). Societal costs of prescription opioid abuse, addiction, and misuse in the United States. *Pain Medicine, 12*, 657-667.

- *Brown, L. D., Feinberg, M. E., & Greenberg, M. T. (2010). Determinants of community coalition ability to support evidence-based programs. *Prevention Science, 11*(3), 287-297.
doi: <https://doi.org/10.1007/s11121-010-0173-6>
- Centers for Disease Control and Prevention. (2017). Opioid prescribing: Where you live matters. *CDC Vital Signs*. Retrieved from: <https://www.cdc.gov/vitalsigns/opioids/index.html>
- Cerdá, M., Gaidus, A., Keyes, K. M., Ponicki, W., Martins, S., Galea, S., & Gruenewald, P. (2017). Prescription opioid poisoning across urban and rural areas: identifying vulnerable groups and geographical areas. *Addiction, 112*, 103-112. doi:10.1111/add.13543
- *Chilenski, S. M., Olson, J. R., Schulte, J. A., Perkins, D. F., & Spoth, R. (2015). A multi-level examination of how the organizational context relates to readiness to implement prevention and evidence-based programming in community settings. *Evaluation & Program Planning, 48*, 63-74. doi: <https://doi.org/10.1016/j.evalprogplan.2014.10.004>
- Cochran, G. T., Engel, R. J., Hruschak, V. J., & Tarter, R. E. (2017). Prescription opioid misuse among rural community pharmacy patients: pilot study for screening and implications for future practice and research. *Journal of Pharmacy Practice, 30*(5), 498-505.
doi: 10.1177/0897190016656673
- Cochran, G., Field, C., & Lawson, K. (2015). Pharmacists who screen and discuss opioid misuse with patients: future directions for research and practice. *Journal of Pharmacy Practice, 28*(4), 404-412. doi: 10.1177/0897190014522064
- *Cooney, S. M., Huser, M., Small, S., & O'Connor, C. (2007). Evidence-based programs: An overview. What works, Wisconsin research to practice series, 6. Madison, WI: University of Wisconsin-Madison/Extension. Retrieved from
https://fyi.uwex.edu/whatworkswisconsin/files/2014/04/whatworks_06.pdf

- Covvey, J. R. (2015). Recent developments toward the safer use of opioids, with a focus on hydrocodone. *Research in Social and Administrative Pharmacy, 11*, 901-908.
<http://dx.doi.org/10.1016/j.sapharm.2015.02.001>
- Crowley, D. M., Jones, D. E., Coffman, D. L., & Greenberg, M. T. (2014). Can we build an efficient response to the prescription drug abuse epidemic? Assessing the cost effectiveness of universal prevention in the PROSPER trial. *Preventive Medicine, 62*, 71-77. <http://dx.doi.org/10.1016/j.ypmed.2014.01.029>
- Dellapenna, A. (2017). An environmental health perspective on the opioid epidemic. *Journal of Environmental Health, 80*(5), 64-66.
doi: 10.1080/02791072.2012.684624
- Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003). Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: The Adverse Childhood Experiences study. *Pediatrics, 111*, 564-572.
doi: 10.1542/peds.111.3.564
- *Dunifon, R., Duttweiler, M., Pillemer, K., Tobias, D., & Trochim, W. M. K. (2004). Evidence-based extension. *Journal of Extension, 42*(2), Article 2FEA2. Retrieved from www.joe.org/joe/2004april/a2.shtml
- *Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*(3-4), 327-350. doi: <https://doi.org/10.1007/s10464-008-9165-0>

*Elliott, D. S., & Mihalic, S. (2004). Issues in disseminating and replicating effective prevention programs. *Prevention Science*, 5, 47-53.

<https://doi.org/10.1023/B:PREV.0000013981.28071.52>

Faul, M., Dailey, M. W., Sugerman, D. E., Sasser, S. M., Levy, B., & Paulozzi, L. J. (2015).

Disparity in naloxone administration by emergency medical service providers and the burden of drug overdose in US rural communities. *American Journal of Public Health*, 105(S3), e26-e32.

*Feinberg, M. E., Bontempo, D. E., & Greenberg, M. T. (2008). Predictors and level of sustainability of community prevention coalitions. *American Journal of Preventive Medicine*, 34(6), 495-501. doi: <https://doi.org/10.1016/j.amepre.2008.01.030>

<https://doi.org/10.1016/j.amepre.2008.01.030>

Felitti, V. J., Anda, R. J., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., ...

Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the Leading Causes of Death in Adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14(4), 245-258.

*Fetsch, R. J., MacPhee, D., & Boyer, L. K. (2012). Evidence-based programming: What is a process an extension agent can use to evaluate a program's effectiveness? *Journal of Extension*, 50(5), Article 5FEA2. Retrieved from

<https://www.joe.org/joe/2012october/a2.php>

*Flanagan, S.K., Varga, S.M., Zaff, J.F., Margolius, M. and Lin, E.S. (2018). *The Impact of Comprehensive Community Initiatives on Population-Level Children, Youth, and Family Outcomes: Research Brief*. New York: Weiss Institute. Retrieved from

http://www.americaspromise.org/sites/default/files/d8/CCI_summary_FINAL_1.PDF

*Flaspohler, P. D., Meehan, C., Maras, M. A., & Keller, K. E. (2012). Ready, willing, and able:

Developing a support system to promote implementation of school-based prevention programs. *American Journal of Community Psychology*, 50(3-4), 428-444. doi:

<https://doi.org/10.1007/s10464-012-9520-z>

*Flay, B. R., Biglan, A., Boruch, R. F., Castro, F. G., Gottfredson, D., Kellam, S., ... Ji, P.

(2005). Standards of evidence: Criteria for efficacy, effectiveness and dissemination.

Prevention Science, 6(3), 151-175. doi: <https://doi.org/10.1007/s11121-005-5553-y>

*Foster-Fishman, P. G., Cantillon, D., Pierce, S. J., & Van Egeren, L. A. (2007). Building an

active citizenry: The role of neighborhood problems, readiness, and capacity for

change. *American Journal of Community Psychology*, 39(1-2), 91-106. doi:

<https://doi.org/10.1007/s10464-007-9097-0>

Gastala, N. (2017). Denial: the greatest barrier to the opioid epidemic. *Annals of Family*

Medicine, 15(4), 372-374.

*Glasgow, R. E., Lichtenstein, E., & Marcus, A. C. (2003). Why don't we see more translation

of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition.

American Journal of Public Health, 93(8), 1261-1267. Retrieved from

<https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.93.8.1261>

*Gottfredson, D.C., Cook, T. D., Gardener, F.E.M., Gorman-Smith, D., Howe, G. W., Sandler,

I.N., Zafft, KM. Standards of Evidence for Efficacy, Effectiveness, and Scale-up Research

in Prevention Science: Next Generation. *Prevention Science*, 16 (7), 893-926.

<https://link.springer.com/article/10.1007/s11121-015-0555-x>

- Gray, J., Hagemeyer, N., Brooks, B., & Alamian, A. (2015). Prescription disposal practices: a 2-year ecological study of drug drop box donations in Appalachia. *American Journal of Public Health, 105*, e89-94. doi: 10.2105/AJPH.2015.302689
- *Hamilton, S. F., Chen, E. K., Pillemer, K., & Meador, R. H. (2013). Research use by cooperative extension educators in New York State. *Journal of Extension, 51*(3), Article 3FEA2. Retrieved from <https://www.joe.org/joe/2013june/a2.php>
- Hansen, H., & Netherland, J. (2016). Is the prescription opioid epidemic a white problem? *American Journal of Public Health, 106*, 2127-2129. doi: 10.2105/AJPH.2016.303483
- Hansen, R. N., Oster, G., Edelsberg, J., Woody, G. E., & Sullivan, S. D. (2011). Economic costs of nonmedical use of prescription opioids. *Clinical Journal of Pain, 27*, 194-202.
- *Hill, L. G., & Parker, L. A. (2005). Extension as a delivery system for prevention programming: Capacity, barriers, and opportunities. *Journal of Extension, 43*(1), Article 1FEA1. Retrieved from <https://www.joe.org/joe/2005february/a1.php>
- Hirschak, K. A., & Murphy, S. M. (2017). Assessing differences in the availability of opioid addiction therapy options: rural versus urban and American Indian reservation versus nonreservation. *The Journal of Rural Health, 33*, 102-109. doi: 10.1111/jrh.12178
- Houzè, B., El-Khatib, H., & Arbour, C. (2017). Efficacy, tolerability, and safety of non-pharmacological therapies for chronic pain: An umbrella review on various CAM approaches. *Progress in Neuropsychopharmacology & Biological Psychiatry, 79*, 192-205. <http://dx.doi.org/10.1016/j.pnpbp.2017.06.035>
- Hwang, J. K., & Clarke, H. (2016). Cannabis and pain: A review. *Journal of Pain Management, 9*(4), 395-413.

- *Institute of Medicine (IOM) and National Research Council (NRC). (2014). *Strategies for scaling effective family-focused preventive interventions to promote children's cognitive, affective, and behavioral health: Workshop summary*. Washington, DC: The National Academies Press. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK230080/>
- Jordan, A. E., Blackburn, N. A., Des Jarlais, D. C., & Hagan, H. (2017). Past-year prevalence of prescription opioid misuse among those 11 to 30 years of age in the United States: a systematic review and meta-analysis. *Journal of Substance Abuse Treatment, 77*, 31-37. <http://dx.doi.org/10.1016/j.jsat.2017.03.007>
- Keyes, K. M., Cerdá, M., Brady, J. E., Havens, J. R., & Galea, S. (2014). Understanding rural-urban differences in nonmedical prescription opioid use and abuse in the United States. *American Journal of Public Health, 104*(2), e52-59.
- Kristjansson, A. L., James, J. E., Allegrante, J. P., Sigfusdottir, I. D., & Helgason, A.R. (2010). Adolescent substance use, parental monitoring, and leisure-time activities: 12-year outcomes of primary prevention in Iceland. *Preventive Medicine, 51*(2), 168-171. <https://doi.org/10.1016/j.ypmed.2010.05.001>
- Larson, R. W. (2000). Toward a psychology of positive youth development. *American Psychologist, 55*(1), 170-183. doi: 10.1037/0003-066X.55.1.170
- Le Lait, M.-C., Martinez, E. M., Severtson, S. G., Lavery, S. A., Bucher-Bartelson, B., & Dart, R. C. (2014). Assessment of prescription opioid intentional exposures across the rural-urban continuum in the United States using both population and drug availability rates. *Pharmacoepidemiology and Drug Safety, 23*, 1334-1337.
- Lerner, R. M., Wang, J., Chase, P. A., Gutierrez, A. S., Harris, E. M., Rubin, R. O., & Yalin, C. (2014). Using relational developmental systems theory to link program goals, activities,

- and outcomes: The sample case of the 4-H Study of Positive Youth Development. *New Directions for Youth Development*, 144, 17-30. doi: 10.1002/yd.20110
- Lucas, P. (2012). Cannabis as an adjunct to or substitute for opiates in the treatment of chronic pain. *Journal of Psychoactive Drugs*, 44(2), 125-133.
- Maxwell, J. C. (2011). The prescription drug epidemic in the United States: a perfect storm. *Drug and Alcohol Review*, 30, 264-270. doi: 10.1111/j.1465-3362.2011.00291.x
- McCarthy, D. M., Cameron, K. A., King, J. P., Mullen, R. J., Bailey, S. C., Jacobson, K. L., ... Wolf, M. S. (2014). Patient recall of health care provider counseling for opioid-acetaminophen prescriptions. *Pain Medicine*, 15, 1750-1756.
- Meyer, R., Patel, A. M., Rattana, S. K., Quock, T. P., & Mody, S. H. (2014). Prescription opioid abuse: a literature review of the clinical and economic burden in the United States. *Population Health Management*, 17(6), 372-387. doi: 10.1089/pop.2013.0098
- Mistry, C. J., Bawor, M., Desai, D., Marsh, D. C., & Samaan, Z. (2014). Genetics of opioid dependence: A review of the genetic contribution to opioid dependence. *Current Psychiatry Reviews*, 10, 156-167.
- Molgaard, V. K. (1997). The extension service as key mechanism for research and services delivery for prevention of mental health disorders in rural areas. *American Journal of Community Psychology*, 25(4), 515-544. doi: <https://doi.org/10.1023/A:1024611706598>
- Monnat, S. M. (2018). Factors associated with county-level differences in U.S. drug-related mortality rates. *American Journal of Preventive Medicine*, 54(5), 611-619. doi: <https://doi.org/10.1016/j.amepre.2018.01.040>

- Mort, J., & Kuschel, L. (2016). Impact of the hydrocodone schedule change on opioid prescription patterns in South Dakota. *Research in Social and Administrative Pharmacy*, 12, e1-e9.
- Nash, D. B. (2017). "Opioids equal heroin". *American Health & Drug Benefits*, 10(8), 391-392.
- National Institute on Drug Abuse. (2011, March). Comorbidity: Addiction and other mental disorders. Retrieved from:
<https://www.drugabuse.gov/publications/drugfacts/comorbidity-addiction-other-mental-disorders>
- National Institute on Drug Abuse. (2014). Drugs, brains and behavior: The science of addiction (NIH Pub No. 14-5605). Washington, D.C.: National Institutes of Health; U.S. Department of Health and Human Services.
- National Institute on Drug Abuse. (2016, February). Genetics and epigenetics of addiction. Retrieved from: <http://www.drugabuse.gov/publications/drugfacts/genetics-epigenetics-addiction>
- National Institute on Drug Abuse. (2017, December). Monitoring the Future 2017 Survey Results. Retrieved from <https://www.drugabuse.gov/related-topics/trends-statistics/infographics/monitoring-future-2017-survey-results>
- National Institute on Drug Abuse. (2018a, January). Prescription opioids and heroin. Retrieved from <https://www.drugabuse.gov/publications/research-reports/relationship-between-prescription-drug-heroin-abuse/prescription-opioid-use-risk-factor-heroin-use>
- National Institute on Drug Abuse. (2018b, January). Prescription opioids. Retrieved from <http://www.drugabuse.gov/publications/drugfacts/prescription-opioids>

National Research Council and Institute of Medicine. (2009). Preventing mental, emotional and behavioral disorders among young people: Progress and possibilities. In M. E. O'Connell, T. Boat, & K.E. Warner (Eds.), *Committee on the prevention of mental disorders and substance abuse among children, youth, and young adults: Research advances and promising interventions*. Washington, DC: The National Academies Press.

National Safety Council. (2014). Opioid painkillers: How they work and why they can be risky. Retrieved from: <http://www.nsc.org/RxDrugOverdoseDocuments/opioid-painkillers-how-they-work-and-why-they-are-risky.pdf>

Office on Women's Health. (2016, December). White Paper: Opioid Use, Misuse, and Overdose in Women. Retrieved from <https://www.womenshealth.gov/files/documents/white-paper-opioid-508.pdf>

*Olson, J. R., Welsh, J. A., & Perkins, D. F. (2015). Evidence-based programming within Cooperative Extension: How can we maintain fidelity while adapting to meet local needs? *Journal of Extension*, 53(3). Retrieved from <https://www.joe.org/joe/2015june/a3.php>

Osborne, V., Serdarevic, M., Crooke, H., Striley, C., & Cottler, L. B. (2017). Non-medical opioid use in youth: gender differences in risk factors and prevalence. *Addictive Behaviors*, 72, 114-119. <http://dx.doi.org/10.1016/j.addbeh.2017.03.024>

*Perkins, D. F., Chilenski, S. M., Olson, J. R., Mincemoyer, C. C., & Spoth, R. (2014). Knowledge, attitudes, and commitment concerning evidence-based prevention programs: Differences between family and consumer sciences and 4-H youth development educators. *Journal of Extension*, 52(3), Article 3FEA6. Retrieved from <https://www.joe.org/joe/2014june/a6.php>

- *Perkins, D. F., Mincemoyer, C. C., & Lillehoj, C. J. (2006). Extension educators' perceptions of community readiness, knowledge of prevention science, and experience with collaboration. *Journal of Family and Consumer Sciences*, 98(4), 20-26. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3798072/pdf/nihms58256.pdf>
- Porter, L., & Anda, R. (2015). *Understanding N.E.A.R.: Neuroscience, Epigenetics, Adverse Childhood Experiences and Resilience* [PowerPoint slides]. Peachtree City, GA: ACE Interface.
- Prunuske, J. P., Hill, C. A., Hager, K. D., Lemieux, A. M., Swanoski, M. T., Anderson, G. W., & Lutfiyya, M. N. (2014). Opioid prescribing patterns for non-malignant chronic pain for rural versus non-rural US adults: a population-based study using 2010 NAMCS data. *BMC Health Services Research*, 14, 563. <http://www.biomedcentral.com/1472-6963/14/563>
- Rigg, K. K., Monnat, S. M., & Chavez, M. N. (2018). Opioid-related mortality in rural America: Geographic heterogeneity and intervention strategies. *International Journal of Drug Policy*, 57, 119-129. <https://doi.org/10.1016/j.drugpo.2018.4.011>
- *Rogers, E. M. (1995). *Diffusion of Innovations* (4th ed.). New York: Free Press.
- Salmon, J. W., Lin, S.-J., & Crawford, S. Y. (2002). Influences on the adoption of new pharmaceutical technologies: the example of the fentanyl patch. *Clinical Research and Regulatory Affairs*, 19(4), 397-412. doi: 10.1081/CRP-120016436
- *Sandler, I., Ostrom, A., Bitner, M. J., Ayers, T. S., Wolchik, S., & Daniels, V. S. (2005). Developing effective prevention services for the real world: A prevention service development model. *American Journal of Community Psychology*, 35(3-4), 127-142. doi: <https://doi.org/10.1007/s10464-005-3389-z>

- *Sellers, D., Schainker, L., Lockhart, P., & Yeh, H.C. (2017). Establishing a Common Language: The Meaning of Research-Based and Evidence-Based Programming (in the Human Sciences). *Journal of Extension*, 55(6), Article 6FEA2.
<https://joe.org/joe/2017december/a2.php>
- *Spoth, R. (2008). Translating family-focused prevention science into effective practice: Toward a translational impact paradigm. *Current Directions in Psychological Science*, 17(6), 415-421. doi: <https://doi.org/10.1111/j.1467-8721.2008.00617.x>
- *Spoth, R. L., & Greenberg, M. T. (2005). Toward a comprehensive strategy for effective practitioner–scientist partnerships and larger- scale community health and well- being. *American Journal of Community Psychology*, 35(3-4), 107-126. doi: <https://doi.org/10.1007/s10464-005-3388-0>
- *Spoth, R., & Greenberg, M. (2011). Impact challenges in community science-with-practice: Lessons from PROSPER on transformative practitioner-scientist partnerships and prevention infrastructure development. *American Journal of Community Psychology*, 48(1-2), 106-119. doi: <https://doi.org/10.1007/s10464-010-9417-7>
- *Spoth, R., Greenberg, M., Bierman, K., & Redmond, C. (2004). PROSPER community–university partnership model for public education systems: Capacity-building for evidence-based, competence-building prevention. *Prevention Science*, 5(1), 31-39. doi: <https://doi.org/10.1023/B:PREV.0000013979.52796.8b>
- Spoth, R., Redmond, C., Shin, C., Greenberg, M. T., Feinberg, M. E., & Trudeau, L. (2017). PROSPER delivery of universal preventive interventions with young adolescents: long-term effects on emerging adult substance misuse and associated risk behaviors. *Psychological Medicine*, 47, 2246-2259. doi: 10.1017/S0033291717000691

- *Spoth, R., Rohrbach, L. A., Greenberg, M., Leaf, P., Brown, C. H., Fagan, A., ... Hawkins, J. D. (2013). Addressing core challenges for the next generation of type 2 translation research and systems: The translation science to population impact (TSci Impact) framework. *Prevention Science, 14*(4), 319-351. doi: <https://doi.org/10.1007/s11121-012-0362-6>
- *Spoth, R., Schainker, L. M., Redmond, C., Ralston, E., Yeh, H. C., & Perkins, D. F. (2015). Mixed picture of readiness for adoption of evidence-based prevention programs in communities: Exploratory surveys of state program delivery systems. *American Journal of Community Psychology, 55*(3-4), 253-265. doi: <https://doi.org/10.1007/s10464-015-9707-1>
- Spoth, R., Trudeau, L., Shin, C., & Redmond, C. (2008). Long-term effects of universal preventive interventions on prescription drug misuse. *Addiction, 103*, 1160-1168. doi: 10.1111/j.1360-0443.2008.02160.x
- Spoth, R., Trudeau, L., Shin, C., Ralston, E., Redmond, C., Greenberg, M., & Feinberg, M. (2013). Longitudinal effects of universal preventive intervention on prescription drug misuse: three randomized controlled trials with late adolescents and young adults. *American Journal of Public Health, 103*(4), 665-672. doi: 10.2105/AJPH.2012.301209
- Stein, B. D., Pacula, R. L., Gordon, A. J., Burns, R. M., Leslie, D. L., Sorbero, M. J., ... Dick, A. W. (2015). Where is buprenorphine dispensed to treat opioid use disorders? The role of private offices, opioid treatment programs, and substance abuse treatment facilities in urban and rural counties. *The Milbank Quarterly, 93*(3), 561-583.
- Stewart, H., Malinowski, A., Ochs, L., Jaramillo, J., McCall III, K., & Sullivan, M. (2015). Inside Maine's medicine cabinet: findings from the Drug Enforcement Administration's medication take-back events. *American Journal of Public Health, 105*(1), e65-e71. doi: 10.2105/AJPH.2014.302207

- Tai, B.-W. B., Hata, M., Wu, S., Frausto, S., & Law, A. V. (2015). Prediction of pharmacist intention to provide medication disposal education using theory of planned behaviour. *Journal of Evaluation in Clinical Practice*, 22, 653-661. doi: 10.1111/jep.12511
- Teater, D. (No date). Evidence for the efficacy of pain medications. *National Safety Council*. Retrieved March 6, 2018 from www.nsc.org
- United States Department of Health and Human Services. (2018, January). The Opioid Epidemic by the Numbers. Retrieved from: <https://www.hhs.gov/opioids/sites/default/files/2018-01/opioids-infographic.pdf>
- United States Department of Health and Human Services. (2014). *Draft version of the Surgeon General's Call to Action to Prevent Prescription Drug Abuse among Youth: The Dangers of Improper Use of Controlled Medications*. Unpublished.
- Van Zee, A. (2009). The promotion and marketing of OxyContin: Commercial triumph, public health tragedy. *American Journal of Public Health*, 99(2), 221-227.
- Vaughn, M. G., Fu, Q., Perron, B. E., Wu, L.-T. (2012). Risk profiles among adolescent nonmedical opioid users in the United States. *Addictive Behaviors*, 37, 974-977. doi: 10.1016/j.addbeh.2012.03.015
- Vigil, J. M., Stith, S. S., Adams, I. M., & Reeve, A. P. (2017). Associations between medical cannabis and prescription opioid use in chronic pain patients: A preliminary cohort study. *PLoS ONE*, 12(11), e0187795. <https://doi.org/10.1371/journal.pone.0187795>
- Wakeland, S. E., & Barnett, M. L. (2018). Primary care and the opioid-overdose crisis—buprenorphine myths and realities. *New England Journal of Medicine*, 379(1), p. 1-4. doi: 10.1056/NEJMp1802741

Wakeland, W., Nielsen, A., & Geissert, P. (2015). Dynamic model of nonmedical opioid use trajectories and potential policy interventions. *American Journal of Drug and Alcohol Abuse*, 41(6), 508-518. doi: 10.3109/00952990.2015.1043435

*Woolf, S. H. (2008). The meaning of translational research and why it matters. *JAMA*, 299(2), 211-213. <https://doi.org/10.1001/jama.2007.26>

World Health Organization. (1994). *Lexicon of alcohol and drug terms*. Geneva, Switzerland:

World Health Organization. Retrieved from:

http://www.who.int/substance_abuse/terminology/who_ladt/en/

Appendix: Glossary

Abuse	This term has often been used disapprovingly to refer to use of illicit substances and indicates “non-medical or unsanctioned patterns of use” or ongoing use of a substance, despite harmful consequences (WHO, 1994, p.4). This term was removed from the Diagnostic and Statistical Manual of Mental Disorders in the most recent edition, DSM-5 (APA, 2013). Use of this term is discouraged by a number of organizations (WHO, 1994).
Addiction	“A chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences” (NIDA, 2014, p. 5). Use of the term addiction in NIDA documents is “regarded as equivalent to a severe substance use disorder as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition” (NIDA, 2014, p. 5).
Dependence	This term has been used synonymously with addiction and refers to needing to use a substance in order to function psychologically and/or physically (WHO, 1994). This term is not used in the DSM-5.
Effective	Practical, statistically significant outcomes under “real world” conditions (Fetsch et al., 2012).
Effectiveness trials	Research in which the benefits of an intervention outweigh the harms under “real world” conditions (heterogeneous sample with varying sources and levels of motivation); methods are typically quasi-experimental (Glasgow et al., 2003).
Efficacious	Interventions that are supported by at least two rigorous trials, usually involving random assignment, with long-term positive outcomes and no iatrogenic effects (Fetsch et al., 2012).
Efficacy trials	Research in which the benefits of an intervention outweigh the harms under controlled conditions using a true experiment (random assignment); participation is voluntary, participants are typically highly motivated, and the sample is fairly homogenous (Glasgow et al., 2003).
Evidence-based programs (EBPs)/ Evidence-based interventions (EBIs)	“Well-defined programs that have demonstrated their efficacy through rigorous, peer-reviewed evaluations and have been endorsed by government agencies and well-respected research organizations” (Fetsch et al., 2012, np). Programs that have a sound theoretical base and have demonstrated impact when evaluated using rigorous research methodology (Perkins et al., 2014).
Misuse	“Use of a substance for a purpose not consistent with legal or medical guidelines, as in the non-medical use of prescription medications” (WHO, 1994, p. 45). This term is preferred to the term abuse because it has a less judgmental connotation (WHO, 1994).

Readiness for change	Mindset or outlook regarding possibilities for change; includes elements of hope and collective efficacy; “the overall belief in the possibility of change” (Foster-Fisherman et al., 2007, p. 94).
Research-based	Content is based on scientific evidence; however, cannot be considered evidence-based unless there is “scientific evidence that it works” (Cooney et al., 2007, p. 3).
Scaling up	“Deliberate efforts to increase the impact of evidence-based interventions” (Gottfredson et al., 2015, p. 895).
Substance Use Disorder	This term refers to a specific diagnosis defined and described in the DSM-5, which combines two previous categories (substance abuse and substance dependence) (APA, 2013). Severity is determined by number of criteria met from a list of eleven criteria, including substance-related problems such as impaired behavioral control, risky use, not meeting expectations at work or school, relationship difficulties, and physiological indicators of addiction (APA, 2013). Specific substances are addressed as separate use disorders (APA, 2013).
Tolerance	“A decrease in response to a drug dose that occurs with continued use” (WHO, 1994, p. 62). One of the long-term effects of drug misuse; the person has to take larger volumes or concentrations of a drug in order to achieve the same level of “high” (NIDA, 2016). Tolerance is indicative of the downregulation of dopamine in response to repeated overstimulation (NIDA, 2016).
Type 1 (T1) translational research/ Type 1 translation	Basic science used to create new products or services that can be used in clinical settings or commercialized (Woolf, 2008). T1 translation “addresses the application of basic research findings to the development of interventions” (Spoth et al., 2013, p. 321).
Type 2 (T2) translational research/ Type 2 translation	“Ensuring that new treatments and research knowledge actually reach the patients or populations for whom they are intended” (Woolf, 2008, p. 211). T2 translation “investigates the complex processes and mechanisms through which tested and proven interventions are integrated into practice and policy on a large scale and in a sustainable way, across targeted populations and settings” (Spoth et al., 2013, p. 321).
Withdrawal	Physical and psychological symptoms that occur when someone with substance use disorder stops using the drug(s) (NIDA, 2016; WHO, 1994). Although specific symptoms are dependent upon the type of substance, common withdrawal symptoms include mood disturbances, anxiety, difficulty sleeping, sweating and muscle aches (NIDA, 2016; WHO, 1994).