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Encouraging Disposal of Unused Opioid Analgesics in Appalachia

Donald W. Helme,

Department of Communication, University of Kentucky

Kathleen L. Egan,

Department of Health Education and Promotion, East Carolina University

Kaylee M. Lukacena,

Department of Communication, University of Kentucky

Lauren Roberson,

Department of Communication, University of Kentucky

Carina Mazariegos Zelaya,

Department of Communication, University of Kentucky

Monique Shauntelle McCleary,

Department of Public Health Education, University of North Carolina at Greensboro

Mark Wolfson

Department of Social Sciences and Health Policy, Wake Forest School of Medicine

Abstract

The Appalachian region has been disproportionately impacted by the opioid epidemic. This study, informed by the Health Belief Model (HBM), explored Appalachian community members' perspectives on prescription opioid misuse and community-based programs to dispose of unused opioid analgesics. In 2018, we conducted ten focus groups (n=94 participants) in 5 Appalachian counties. Thirteen themes across 5 of the HBM constructs emerged from our analysis. Participants perceived that their communities are susceptible to the harms associated with opioid misuse, these harms are serious, suggesting they could be motivated to change disposal behaviors. Many participants recognized the benefit to disposing of unused prescription opioids including protecting household members from misusing and protecting the home from robbery. Nevertheless, participants identified barriers to proper disposal, including keeping the medications "just in case" for future ailments and the location of drop boxes near law enforcement (due to deep-seated mistrust of law enforcement agencies). Self-efficacy was difficult to assess as many participants were completely unaware of the presence of dropboxes in the community and also expressed concerns about the inconvenience of proper disposal using dropboxes. These findings have implications for developing community-based campaign messages promoting proper disposal of unused opioids.

Please direct all correspondence to Donald W. Helme, Ph.D. at University of Kentucky, Department of Communication, 271 Blazer Dining, Lexington, KY 40526-0012. don.helme@uky.edu.

Keywords

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Opioids were involved in 66.4% (42,249 of 63,632) of all drug overdose deaths in the United States (U.S.) in 2016 (CDC, 2018b). Forty percent of opioid-related deaths involved a prescribed opioid analgesic (e.g., hydrocodone, oxycodone); the remainder involved heroin or illicitly produced fentanyl (CDC, 2018b). In addition to fatal and nonfatal overdoses, nonmedical use of opioid analgesics can result in a number of additional adverse consequences, including neonatal abstinence syndrome (Sanlorenzo, Stark, & Patrick, 2018), injuries from impaired driving (Chirhuri & Li, 2017), infectious diseases such as HIV and hepatitis C (HCV) due to sharing of drug paraphernalia and needles (Conrad et al., 2015; Zibbell et al., 2015), and opioid use disorder (McCarthy et al., 2018). A recent estimate put the economic costs of the epidemic in the U.S. at \$95.8 billion, including \$55.6 billion from lost earnings and productivity, 21.4 billion from increased health care costs, and 7.8 billion from increased criminal justice system costs (Rhyan, 2017). The impact of opioid misuse—particularly misuse of prescription opioids—has been pronounced in rural Appalachia (Havens et al., 2008; Kiang et al., 2019).

Despite reductions in the number of opioids prescribed in the U.S. since reaching a peak in 2010, the quantity of opioids prescribed remains high; approximately three times as high as in 1999 (Guy et al., 2017). The quantity of opioid prescriptions dispensed by retail pharmacies in the U.S. equated to a rate of 58.7 prescriptions to 100 people in 2017 (CDC, 2018a), and the majority of these go unused. A systematic review of opioid use by patients who have undergone surgery found that 67 to 92% reported unused opioids after recovery from surgery; accounting for 42 to 71% of the opioid tablets prescribed (Bicket, 2018). Thus, there is a considerable supply of opioid analgesics lingering in homes that have the potential for diversion or for accidental poisonings among young children (Ross-Durow, McCabe, & Boyd, 2013). Research has consistently shown the most common sources of prescription drugs for nonmedical use are friends and family (Center for Behavioral Health Statistics and Quality, 2015; McCabe & Boyd, 2005), followed by purchase from drug dealers or strangers (SAMHSA, 2014; McCabe & Boyd, 2005).

To prevent diversion of unused opioid analgesics from homes, many communities throughout the U.S. have implemented medicine disposal programs (ONDCP, 2011). The Secure and Responsible Drug Disposal Act of 2010 provided law enforcement agencies and private citizens with guidelines for securely and properly disposing of unused medications (DEA, 2014a). These guidelines cover two forms of organized disposal efforts: (1) community take-back events, which usually occur biannually and last for 1–2 days, and (2) year-round permanent drug donation boxes (i.e., dropboxes), which are usually located at law enforcement agency offices and are monitored 24 hours a day to prevent theft or tampering (DEA, 2014b). With the issuance of the final rule in 2014 implementing the Secure and Responsible Drug Disposal Act of 2010, dropboxes could be installed by authorized manufacturers, distributors, reverse distributors, narcotic treatment programs, hospitals and clinics with on-site pharmacies, and retail pharmacies (DEA, 2014b). Research

on these programs, to date, has primarily focused on the quantity and type of medications disposed at take-back events (Egan et al., 2016; Gray & Hagemeyer, 2012; Stewart, Malinowski, Ochs, Jaramillo, & Sullivan, 2014) and self-reported disposal or intent to dispose (e.g., Brummett et al., 2019; Egan et al., 2019; Maughan et al., 2016; Yanovitzky, 2016). Even with these multiple disposal options available to citizens, one study found that less than 1% of controlled prescription medications dispensed are actually disposed of at dropboxes and take-back events (Egan, Gregory, Sparks, & Wolfson, 2016).

One potential reason for low rates of utilization may be a general lack of awareness of disposal programs, stemming in part from an absence of effective messaging promoting disposal (Egan, 2019). A critical step in developing health promotion campaigns is to understand the awareness and perceptions of the target audience. While many efforts to promote disposal exist, to our knowledge, there is only one peer-reviewed evaluation of a disposal campaign in the literature, which assessed the impact of statewide implementation of the American Medicine Chest Challenge (AMCC) in New Jersey (Yanovitzky, 2016). Although this study found a statistically significant relationship between exposure to the campaign and self-reported disposal of unused medications at a collection site, only one-third of respondents stated that the campaign influenced their decision to safely dispose of their medications (Yanovitzky, 2016). Given this finding, and the scarcity of peer-reviewed evaluations of campaigns, we conducted focus groups to inform the development of a theory-based campaign to influence the disposal of unused medications.

To our knowledge, no systematic research has been conducted to explore community members' perceptions of medicine disposal programs. An understanding of community perceptions of disposal programs is needed to design effective communication campaigns encouraging their utilization. We sought to address this gap in research by conducting a theory-driven qualitative study to explore perceptions of the opioid crisis and disposal programs among residents of five rural, Appalachian counties (three in Kentucky and two in North Carolina) that have been heavily affected by the opioid crisis. We applied the Health Belief Model (HBM; Hochbaum, Rosenstock, & Kegels, 1952; Strecher & Rosenstock, 1997) to gain a better understanding of attitudes and beliefs held about disposal of unused opioid medications. The HBM includes six constructs: susceptibility, severity, benefits, barriers, self-efficacy, and cues to action. According to the HBM, for an individual to perform a recommended health behavior, she or he must perceive that (1) he/she is at risk for developing a serious health outcome (*susceptibility*); (2) developing this serious health outcome would have severe negative consequences (*severity*); (3) the benefits of performing the recommended behavior to prevent the serious health outcome (*benefits*) would (4) outweigh the potential costs (*barriers*); and (5) they have or are able to attain the ability to perform the recommended action (*self-efficacy*). Lastly, (6) *cues to action* act as a stimulus, which may be internal or external (e.g., education or media information), that triggers an individual to perform the recommended behavior (Hochbaum, Rosenstock, & Kegels, 1952; Strecher & Rosenstock, 1997).

Utilizing the HBM as our underlying theory, we sought to understand how Appalachian communities perceived their susceptibility to, and severity of what is known nationally as the opioid crisis. In addition, we aimed to examine perceived benefits and barriers

to disposing of unused opioid medications and how these beliefs could be targeted to build self-efficacy and develop cues to action for disposal. Understanding the beliefs of these community members is critical for informing health communication practitioners, policymakers, and community organizations seeking to develop and deliver persuasive messages that are likely to resonate with community members and increase utilization of safe and secure drug disposal programs.

Methods

We used an inductive, thematic, qualitative focus group methodology to answer the research questions. Focus groups provide an opportunity for participants to interact with one another, speak openly about their perceptions, and share stories based on their lived experiences (Kreuger & Casey, 2015; Tracy, 2012). Furthermore, focus groups provide researchers with the opportunity to gather participants' beliefs about a particular topic, and home in on why they hold these beliefs (Lindlof & Taylor, 2011). Last, but not least, focus groups offer researchers a vehicle for better understanding the language used by the community of interest (Tracy, 2012). Ultimately, focus groups help practitioners design messages that incorporate the language of the target audience to better resonate with them. In summary, focus groups are a method to collect rich data by gathering stories, observing interactions, and facilitating a collaborative dialogue to gain a deeper understanding of the community, community members' perspective on the health concern the community is facing, and adapting to the community's language choices.

Participants

Five counties, three in Kentucky and two in North Carolina, were selected for this study based on the following three major criteria: (1) high rate of prescription opioid overdose deaths, in comparison to the other counties in the state, (2) high rate of controlled medication prescriptions in comparison to the other counties in the state, and (3) classified as an Appalachian community by the Appalachian Regional Commission (Appalachian Regional Commission, 2018). The researchers partnered with the county health department in each of five counties to recruit participants for the focus groups. Eligibility criteria for focus group participants included (1) residing in the local community and (2) being 18 years of age or older. The participating health departments placed advertisements promoting the study in their offices, lobbies, and waiting rooms, as well as verbally inviting visitors to the health department to sign up for the study. Additional recruitment posters were posted in the community at grocery stores, banks, and other high traffic areas. Individuals who wished to participate were directed to phone, text, or email a Google Voice account designated for the research study. Individuals would could either directly speak to a research assistant or leave a message indicating their desire to participate. Eligible participants were then able to select from predetermined focus group dates scheduled in their community. Recruitment materials and the focus group protocol were approved by Institutional Review Boards at the two universities of the co-principal investigators of the project (names redacted). Our goal was to recruit individuals who would be likely to have leftover or unused opioid medications in their medicine cabinets or homes, which puts them and others household members at risk

for robbery or theft of opioids and accidental or intentional ingestion of opioids by family members or visitors to the home.

A semi-structured focus group guide with 14 primary questions along with potential probes for each of the primary questions was used. The questions were designed to utilize the constructs of HBM to gather information about perceived susceptibility (e.g., *How susceptible do you think people in your community are to the harmful effects of prescription drug abuse?*), perceived seriousness (e.g., *How would you describe the health risks associated with nonmedical use (abuse) of prescription medications?*), perceived benefits of taking action (e.g., *What do you think influences people's decision to make use of these drop off locations?*), perceived barriers to taking action (e.g., *What reasons do you think people have for keeping leftover prescription medications after they don't need them for medical reasons anymore?*), and potential cues to action (e.g., *What do you think would motivate or persuade people in your community to make use of these drop-off locations?*) regarding safe and secure disposal of unused medications. Nonmedical prescription drug use was defined as using or taking a previously prescribed medication for any reason other than that for which it was prescribed, or by any person other than the individual for whom the prescription was written. Although the protocol involved examination of nonmedical prescription drugs in general, the participants' conversations were overwhelmingly focused on the topic of prescription opioid analgesics.

The focus groups were conducted in a private conference room or office at each of the five participating health departments between March 2018 and May 2018. Signed informed consent was obtained from each participant. Prior to the beginning of each focus group, all participants completed a brief demographic survey. Focus groups lasted approximately one hour and were conducted by a trained moderator and an on-site observer who recorded field notes. All focus groups were audio-recorded. Participants received compensation in the form of a \$25 gift card. A total of 10 focus groups with 94 participants were conducted, with two focus groups held in each participating county. Seventy percent of the participants were female, 43% were between the ages of 35–54, 54% earned less than \$25,000 annually, 39% were married, 35% were employed full time, and 95% indicated their race as white.

Analytic Strategy

The recorded discussions were transcribed verbatim by two of the authors. These authors then analyzed the data using an inductive, thematic qualitative approach to describe and understand community members' perspectives about the impact of nonmedical use of opioid analgesics on their community. The analysis process included three stages. First, two members of the study team thoroughly read and independently coded a subset of the focus groups (N=3) using NVivo software, version 12 (QSR International Pty Ltd., 2018). This first stage of coding entailed each coder independently exploring the data for the key constructs of the HBM listed above; however, the coders remained open to themes that could naturally emerge from the participants' perspectives outside of the HBM framework. After the initial round of coding, the two coders discussed and resolved by consensus any significant discrepancies in coding. In the second stage, the authors then independently examined the transcripts to identify themes within the broader identified HBM constructs.

The themes for each construct were revised, refined, and the research team as a whole worked together to develop a comprehensive codebook to represent the perspectives of the participants. Third, the focus group transcripts were coded independently by the same coders using the final codebook. Analysis of the focus group data continued until we reached inductive thematic saturation (Saunders et al., 2018).

Results

The results are organized by the five major HBM constructs. Although only one or two exemplar quotes are provided per theme, please see Appendix A for additional exemplar quotes.

HBM Construct 1: Perceived Susceptibility to the Prescription Opioid Epidemic (N=114 quotes)

Perceived susceptibility to the opioid epidemic was illustrated by the participants' reasoning to explain why these counties experience high use of prescription opioids for nonmedical purposes. Participants discussed three themes related to susceptibility to the opioid epidemic, including drug use as a "family tradition," the impact of economic depression, and the recognition that addiction to prescription opioids is not a choice.

Theme 1: Family Tradition (n=47 quotes).—A clear tension existed between sympathy for, and frustration with, those experiencing opioid addiction. Many participants shared that they had friends or family members who were battling addiction, or had lost their lives to addiction. In addition, participants indicated that nonmedical use of prescriptions was an intergenerational concern affecting families:

"It's a family tradition. It just keeps on going. You'll see a family that's on drugs, 99% of the time, them kids will be - unless they wanna fight it."

The above quote illustrates the perception that the problem is experienced and sustained by multiple generations of a family.

Theme 2: Economic Depression (n=42 quotes).—In addition to recognizing this pattern in families, the economic situation affecting the community came up frequently in the discussions. Several participants described their community as lacking employment opportunities:

"When you're living in a depressed area, people feel like you're high, you can forget about your problems...and it doesn't work...They're just so depressed, because they either can't get a job or they can't get a good job or they lost their job."

This quote demonstrated how some community members may have been drawn to nonmedical use of opioid analgesics as an escape from the reality of the limited economic opportunity, which in turn made it even more challenging for them to find and keep a job.

Theme 3: Addiction is not a choice (n=25 quotes).—Although community members expressed frustration with the opioid epidemic and the impact it had on their community,

many recognized that community members who became addicted to opioids did not do so intentionally. One participant described how addiction can unintentionally occur:

“I don’t think any addict really goes into starting taking out pain medicine wanting to become addicted. So, in a situation where someone is only given a certain amount of pain medication, I mean they’re not, you know, knowing beforehand how their body is going to react to taking that drug until they’re already on it and then it’s like that prescription runs out and then they’re like, “Well I need it, I want it.” And that addiction has started to develop, but I don’t think anyone really wants, like “I want to be addicted to oxycodones” or any kind of opioid.”

This quote sheds light on how simply complying with a physician’s prescribed regimen may lead to dependency on opioids.

HBM Construct 2: Perceived Severity of the Prescription Opioid Epidemic (N=186 quotes)

To better understand how serious a concern the opioid epidemic was for participants, we asked about risks associated with nonmedical prescription opioid use at both the individual and community level. A theme that emerged was the potential for severe health consequences and even death. An additional theme emerged concerning the difficulty of obtaining opioid analgesics for legitimate ailments as a result of provider suspicion.

Theme 4: Health Consequences (n=147 quotes).—Community members recognized the negative impact that nonmedical use of opioid analgesics can have on an individual’s health. One participant recalled a family member’s struggle with opioid use:

“You know, you think they just destroyed their body and even if a drug user doesn’t overdose... I had a first cousin; he died. He didn’t overdose but he had just damaged his heart so badly that he just didn’t wake up one morning.”

Participants reported that a myriad of adverse health issues may ensure from nonmedical use of opioid analgesics. Fatal overdose was a particular concern, as demonstrated by the following quote:

You’ll hear about something to the neighborhood, you’ll be walking the streets and ‘Oh he died last week’ and it’s common. It’s not shocking you anymore.

These quotes demonstrated a perception that the lives of community members are at stake when prescription opioids are widely available for nonmedical use.

Theme 5: Difficulty Obtaining Legitimate Access to Medication (n=39 quotes).—Participants noted that although the opioid epidemic has had a devastating impact on those addicted to prescription opioids, the response to the epidemic has created problems for others in the community. Participants expressed concern about how the opioid epidemic made it challenging for themselves or for others to obtain opioid analgesics for pain management. There was a belief that some physicians believed that many individuals in these Appalachian communities are “drug-seeking,” as well as a national trend of decreased opioid prescribing rates (IQVIA, 2019), resulting in greater caution in prescribing opioids.

As patients, participants were aware that physicians may question their intent for seeking opioid analgesics for pain management:

“I am on the other end of that spectrum. I am not a former addict... I... have been diagnosed with a chronic pain condition and I am terrified to ask for pain pills because I don't want them to think that is what I am there for...”

These unintended consequences angered some community members, as they perceived policies and practices in response to the opioid epidemic increased the difficulty of legitimate access as well as creating a stigma associated with seeking medication to manage a chronic health condition or injury.

HBM Construct 3: Perceived Benefits of Disposing Unused Prescription Opioids (N=135 quotes)

Four themes were present in participants' descriptions of the benefits of disposing unused opioids. These included (1) decreased risk of robbery or burglary, (2) prevention of misuse, (3) prevention of accidental ingestion among household members, and (4) getting rid of unused medication that was no longer needed or wanted.

Theme 6: Protection against Robbery and Burglary (n=39 quotes).—Several participants viewed disposal as a means of protecting themselves from being robbed or their homes from being burglarized. One participant went so far as to describe possession of unused prescription opioids as a life or death concern:

“They broke in her house, shot her, and took her medicine that was on the nightstand. That is the fear that is here. So that would be my main reason that I would think people would want to dispose of it and not have it in their house.”

Theme 7: Prevention Against Misuse (n=33 quotes).—Many participants recognized that other people may be able to access their unused medications for use other than intended. Specifically, participants shared stories of family members gaining access to medications and using them for nonmedical purposes:

“I mean there is a lot of, you know, people abusing it and that are misusing it and you don't want a family member or someone coming in your house taking that and you know, using it for the wrong reason.”

Theme 8: Prevention of Accidental Ingestion by Household Members (n=32 quotes).—Some participants had a perception that disposing of unused prescription opioids was a means to keep family members safe from accidental ingestion. For example, one individual commented on the importance of properly disposing of medications in order to protect children living in the household:

“She's a toddler, she grabs and grabs and grabs... At home looking at our medicine cabinet and just even the shelf in our bathroom that she climbs on all the time.”

This theme – the importance of family safety and security – was present in each of the focus groups.

Theme 9: No Longer Need or Want Medications (n=31 quotes).—Participants shared that no longer wanting or needing prescription opioids would motivate them to dispose of unused medications:

“If you don’t need them, why continue to use them later on? Like say you forget about them. A few months later you got these prescription drugs in the medicine cabinet and you aren’t going to have that same pain you had a few months ago. You can get it prescribed again to you.”

These four themes demonstrated that many participants viewed proper disposal as a beneficial behavior. However, they also identified barriers that could prevent community members from engaging in proper disposal.

HBM Construct 4: Barriers to Disposing Unused Prescription Opioids (N=184 quotes)

Participants described potential barriers to disposal of, or justifications for keeping, unused opioid analgesics. A theme that emerged was the desire to keep them “just in case” they are needed in the future, especially in light of the high cost of medications. A second theme emerged when participants were informed of the existence of local disposal facilities, most of which are located at or near the offices of local law enforcement agencies. Many participants expressed that these locations would discourage community members from properly disposing of their unused prescription medications. This was due to a deep-seated mistrust of local law enforcement authorities in these communities.

Theme 10: Just in Case (n=92 quotes).—One participant noted that the habit for keeping unused prescriptions is a custom that has been passed down in the family:

“That’s it, my grandparents...they’d hold onto it to keep them from having to make another doctor’s visit you know, if they go through something they’ve got that to take again.”

Similarly, another participant expressed how holding on to leftover medications proved to be useful, especially when finances are tight:

“If you don’t have a lot of money and you’re in pain and you don’t have money to go to the doctor...[it’s important to keep prescribed medications in the household].”

Theme 11: Mistrust of Authority (n=92 quotes).—Participants in all five of the communities expressed a concern stemming from mistrust of local authority figures – specifically law enforcement, fire, and EMS services. Many participants had a perception that local law enforcement agencies were corrupt. Participants in one county recalled the arrest and conviction of a former county sheriff and several deputies for sale and distribution of opioid analgesics. In addition, some participants mistrusted fire and EMS services because of perceived or actual discrimination against individuals suspected of opioid use or overdose:

“That creates kind of a bad message...you take the addict who is 30 days clean and who had a different way to live ... sees the Sheriff say ‘If you want to dispose of your drugs bring them to my office and we’ll dispose of them.’ Immediately it is

not they are going to dispose of my drugs. ‘I am going to be safe and this is going to be an amnesty program.’ It is going to be ‘He is trying to set me up’ because he is still in that mentality that law enforcement is against me.”

HBM Construct 5: (Lack of) Self-Efficacy (N=65 quotes)

Self-efficacy was difficult to assess, given that most participants were unaware that prescription dropboxes existed in their community (theme 12). When informed of the locations of dropboxes, many participants shared that obtaining transportation to these locations could be difficult if not impossible, or costly, and not worth the expense or effort involved (theme 13).

Theme 12: Awareness (n=55 quotes).—Aside from several participants who worked in healthcare or public health, the majority of participants had no idea that dropboxes existed or where they were located in the community. This inhibited participants from believing that they could dispose of their unused medications:

“I really think it needs to be known better that we do have one [a dropbox]. You can take it here. Because I would say a lot of people have no idea. I mean I didn’t.”

Theme 13: Inconvenience (n=10 quotes).—Many participants stated that disposal of unused prescription opioids at dropboxes has been inconvenient. Participants reported that, when they do dispose of unused medications, they either flush them down the toilet, discard them in the trash, or return them to a healthcare provider (for providers who would take them, but most would not). However, collecting unused prescriptions and transporting them to a local dropbox was often considered inconvenient for many participants due to difficulty obtaining transportation to the locations, which could be many miles from their homes:

“I think a lot of it is just convenience. It is easier just to throw it in the trash or down the toilet rather than have to go someplace.”

“You’re at home, you ain’t got to leave. Throw ‘em in the toilet, flush it and then go on.”

These quotes demonstrate how a general lack of knowledge about dropboxes as well as the perception that their locations are generally inconvenient (unless one lives downtown) can leave community members with a lack of confidence in their ability to safely use disposal facilities.

Discussion

Medication disposal programs—including both take-back events and dropboxes—have become a mainstay in the response of local communities to the current epidemic of opioid overdoses. For example, a recent systematic assessment found that 91 out of 100 North Carolina counties had at least one dropbox in 2016, with an average of 3.4 boxes per county (Egan et al., 2018). While published studies are limited, the available evidence suggests that disposal programs are not widely utilized by community members to dispose of unused opioid analgesics and other medications (Lewis, Cucciare, & Trafton, 2014; Egan et al., 2016). We sought to address a critical gap in the literature: the reasons why disposal

programs are often underutilized and how individuals can be encouraged to utilize them to dispose of unused opioid analgesics.

In this paper, we report the results of 10 focus groups, with a total of 94 participants, conducted in three Kentucky and two North Carolina Appalachian counties. Thirteen themes based on constructs of the Health Belief Model (HBM) emerged from the focus groups. Taken together, these themes, which pertain to susceptibility and severity of the opioid epidemic, benefits of and barriers to utilization of disposal programs, and self-efficacy to dispose of unused medications, can be used to improve upon and increase participation in disposal programs.

Participants believed that their communities were *susceptible* to harms associated with the opioid epidemic. Participants shared that their communities were impacted by opioids, in part, due to economic depression. Economic depression may be challenging for disposal, especially if individuals hold onto excess medications “just in case” they need them in the future (Kennedy-Hendricks et al., 2016; Lewis et al., 2014) or sell excess medication to cover living expenses (Eaton, 2017; Radcliffe, 2011). Individuals also shared that their communities were susceptible, given that opioid misuse is intergenerational and that addiction is not a choice but rather can be an unintentional and unexpected result of continued opioid use. These themes suggest potential avenues for messaging. Specifically, addressing the intergenerational and health impacts of opioid misuse while providing alternative solutions for economic difficulties.

With respect to the HBM concept of *seriousness*, focus group participants identified several significant consequences of nonmedical use of prescription opioids, including the risk of overdose death and addiction. Another concern was related to challenges in people legitimately accessing opioids for pain management. Importantly, participants reported these consequences occurring at the individual, family, and community level. While these themes reflect the now extensive literature on the consequences of nonmedical use of opioids, their emphatic expression, often in personal terms, by the vast majority of focus group participants suggests that many community residents are deeply concerned about the issue and the ways in which it is affecting them, their families, and their communities. Because of the perceived seriousness of the issue, participants may be more willing to act to prevent opioid misuse.

Participants identified several *perceived benefits of taking action*—in this case, by properly disposing of opioid analgesics using a dropbox. These include preventing harm to family members—especially children in the participants’ own household. In addition, several participants believed that retaining unused prescription opioids in the home puts them at risk of robbery or burglary. The fact that prescription opioids and other medications often had exceeded their expiration date was another inducement to dispose of them properly. Campaigns to promote disposal could build on these perceptions of the benefits of taking action.

There were several *perceived barriers to action* identified at both a personal and community level. One of these is the perceived value of keeping opioid analgesics in the household

in case they are needed at a later date. This is consistent with previous research on this topic (Kennedy-Hendricks et al., 2016; Lewis et al., 2014). It was also noted that this economic motivation is particularly pronounced and widespread in these economically distressed communities. In addition, participants perceived that the most common location of dropboxes - at law enforcement agencies - was a barrier to using them. A pervasive mistrust of local law enforcement and emergency medical services (EMS) was common in all 5 communities. Initially, dropboxes could only be placed at law enforcement agency offices. However, in 2014, following issuance of the final rule of the Secure and Responsible Drug Disposal Act of 2010 (DEA, 2014b), eligible locations for dropboxes were expanded, and a growing number of pharmacies have now installed them (Egan et al., 2018). The expansion of dropboxes to pharmacies, a location which the public frequently patronizes, may result in greater comfort in using dropboxes for disposal of unused medications. That said, there was widespread agreement that disposal programs requiring any travel are more inconvenient than methods of disposal that do not, but that are suboptimal from a public health or environmental standpoint, such as flushing and discarding in the trash. Given that strong perceived barriers exist, including mistrust of local law enforcement and EMS services, it is important that efforts to promote disposal of unused prescription opioids use message strategies appropriate for the community and barriers to disposal programs are minimized as much as possible.

Two potential *perceived barriers to action* that were not addressed by participants in the focus groups were their own nonmedical prescription opioid use or sale of prescribed opioids to others. We utilized a community sample, which may have been less likely to include individuals who use or sell prescription opioids for nonmedical purposes. Even if such individuals were included in our sample, they may have been reluctant to share these less socially desirable opinions related to illegal behaviors in a focus group with other members of their community. Thus, we our study design and methods may have missed some perceived barriers to disposal.

The next component of HBM, *self-efficacy*, was demonstrated in our data as a perceived *lack* of self-efficacy regarding safe and proper disposal of unused prescription opioids. The vast majority of focus group participants were unaware that disposal programs existed. Those who had some awareness of disposal programs usually did not know their location, and when informed indicated that for many getting to and from that location would be difficult or impossible given transportation challenges. This finding highlights the need to implement evidence-based messaging campaigns to raise awareness and influence the use of existing disposal programs as well as expanding disposal options for communities.

To our knowledge, this is the first paper to report the results of focus groups examining factors related to disposal of unused opioid analgesics in local communities. We identified that residents of rural, Appalachian counties in Kentucky and North Carolina perceive that their communities are susceptible to the harms associated with opioid misuse and that these harms are serious, which suggests that they could be motivated to make behavior changes pertaining to disposal. In addition, we identified benefits to highlight and barriers to overcome to maximize the effectiveness of disposal programs and prevent opioid misuse and diversion. Our findings suggest that messaging campaigns that target families, highlight

prevention of theft and misuse, and raise awareness of disposal programs may be effective in increasing rates of disposal. That said, the barriers we identified would likely need to be addressed in larger systems-level approaches. For example, the locations of disposal programs should be in locations that are more convenient and trusted by community members. A common concern among participants was about access to opioid analgesics for legitimate treatment of pain. The combination of economic depression and difficulty in obtaining medical pain relief may result in individuals being less likely to dispose of medications in spite of perceived benefits and messaging campaigns.

Limitations and Future Directions

This study has several limitations. First, it is limited to five counties in two states in the Appalachian region, so it is unclear whether our results may be generalizable outside of these communities. We are also not able to infer any correlational or cause-and-effect relationships between the issues we studied and the broader social context within which our participants live nor make any causal links between our participants' other health risk factors and their experience with opioid analgesics use. In addition, the method we used, an inductive, thematic focus group protocol, may have been subject to social desirability bias among our participants. Nevertheless, we endeavored to minimize bias in the development and implementation of the protocol.

With the opioid epidemic being a multi-faceted problem, there are no single and quick solutions. We do not naively believe that better disposal practices will solve the opioid crisis. However, based on the availability hypothesis (Babor et al., 2010), which states that the convenience and simplicity of obtaining psychotropic substances is related to subsequent use or abuse, effective disposal may play an important role in reducing supply that could complement efforts to increase the availability of treatment and harm reduction services, such as syringe services programs (McCarthy et al., 2018; Platt et al., 2017). It stands to reason that reducing or eliminating unused opioids from households could help prevent nonmedical use of opioid analgesics as well as related issues, such as victimization by theft and robbery. To effectively encourage people to securely and properly dispose of their unused opioids, it is imperative to understand how nonmedical use of opioid analgesics affects and is perceived by individuals, families, and communities of a region deeply impacted by the opioid crisis.

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Appendix

Appendix A

Perceived Susceptibility		
Theme	Count	Example
Family Tradition	N = 47	It is worse for the younger ones because they are growing up thinking that it is okay to do it because they grow up seeing all these other people around them doing it. It is very influential on them.
Economic Depression	N = 42	I think this area is very susceptible to all these, to all these drug all abuse-- I mean all the health risks that are associated because our economy here --- I don't know if that is a question you are going to ask us or not --- we have so many people who are out of work and they are trying to find ways to generate income and it just a snowball effect. Like they said, these kids they don't know any better; that is the norm for them. You know "That is what my parents did".
Addiction is not a Choice	N = 25	Most of the time it started with a prescription, like it started with that. And it progresses from that point. And I've said this a thousand times, nobody wakes up and says, "Oh I'm going to be a drug addict today."

Perceived Seriousness		
Theme	Count	Example
Health Consequences	N = 147	But his heart gave out on him so he had a heart attack. And also, my husband's family -- there are two brothers that have heart attacks and it is from drugs. So, I think the longer that they take these drugs, that it does cause their heart to give out on them. And some of them may not die; some of them may live forever. But he said it wasn't the drugs that was killing them it was effects.
		And I think ultimately death. When you are taking a medicine that is not specifically for you, it is like playing Russian roulette.
Difficulty obtaining legitimate access to medication	N = 39	I've been hurt for ten years. I had a bad accident that severed a nerve in my leg that makes my leg not work. I fought it; didn't want medications. The doctors couldn't help me. When I do need help, they look at me like I just somebody "Oh, what's wrong with you. You just in here whining like everybody else." For the ones who really do need it, they can't get it because of the ones who is abusing it.

Perceived Benefits (Reasons for Disposing)		
Theme	Count	Example
Protection from Robbery	N = 39	You know, the first thing they said to us, they brought in the lock box and they said, "Don't let no one know." This is in 1996. This ain't yesterday. 1996, "Don't let no one know you've got this. People will rob you and kill you for this."
Prevention of Misuse	N = 33	They don't want them to get in the wrong hands and for somebody to die from them either. Cause I think you can get charged for that now. If you... if someone gets ahold of something that come from you, it's like manslaughter.
Safety from Accidental Ingestion by Household Members	N = 32	Because there's too many people out there that are taking them and it's dangerous and it can get into the wrong hands, especially when you stop and think it could get into the hands of a child.
No longer want/need	N = 31	And you don't realize they are expired and the chemical composition of the meds change when they expire. They do go bad.

Barriers to Disposal		
Theme	Count	Example
Just in Case	N = 92	I think a lot of people would be hoarders. Just be like “I might need that one day.”
		In my case, in my case, I lost insurance for a while and so I had some leftover medicine. It was either take what I had left from the last time I was sick or not be able to take anything because I couldn't afford to go to the doctor and 50 dollars for that same medicine again.
Mistrust of Authority	N = 92	I think that is the worst idea. I don't want anything to do with the cops. I never had a bad experience but it is just not the experience I want to take a chance on.

(Lack of) Self Efficacy		
Theme	Count	Example
Lack of Awareness	N = 55	People like my nanny and my mother-in-law, people like that, they would drop it off if they knew it was there. They don't know of anything like that. I think they'd probably drop some off right now.
		I really think it needs to be known better that we do have one. You can take it here. Because I would say a lot of people have no idea. I mean I didn't.
Inconvenience	N = 10	Just like batteries; you are not supposed to throw the batteries in the trash but I think... I can say I have done it. Ya know, because it is just easier to throw them in the trash than to go look for something

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