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Rural risk environments for hepatitis c among young adults in appalachian kentucky

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ABSTRACT

Background: Rural Kentucky is an epicenter of hepatitis C(HCV), especially among young adults who inject drugs. While the Risk Environment Framework (REF) has been used widely to study and address socio-ecological determinants of infectious disease among people who inject drugs (PWID), it has been almost exclusively applied to urban environments. Applying REF to rural environments can enhance our understanding of the drivers of HCV epidemics in these hard-hit areas, and inform the creation and implementation of harm reduction interventions in this local context.

Methods: Participants were recruited between March and August 2017 via community-based outreach methods (e.g., cookouts, flyers) and peer referral. Individuals who met eligibility criteria (aged 18–35, recently used prescription opioids and/or heroin to get high, lived in one of the 5 target counties) participated indepth, semi-structured interviews. The interview guide was informed by the REF, and covered HCV-related risk behaviors and environmental features that shaped vulnerability to engaging in these behaviors. Interviews were transcribed and analyzed using constructivist grounded-theory methods.

Results: Participants (N = 19) described multiple intersecting risk environment features that shaped vulnerability to HCV transmission. Economic decline generated intergenerational poverty, dwindling employment prospects, and diminished social enrichment opportunities that collectively contributed to substance misuse and risky injection practices. Geographic isolation, lack of collective knowledge about HCV transmission risks, scarce harm reduction services, familial poverty, and fear of law enforcement interacted to increase the odds of people injecting in "trap houses" (akin to shooting galleries) or secluded areas, spaces in which they rushed to inject and shared injection equipment. Pervasive stigma was a structural barrier to adopting, expanding, and using harm reduction services.

Conclusion: This exploratory study identified features of rural risk environments that may contribute to significant HCV burdens in Appalachian Kentucky. Findings signal the importance of expanding proven harm reduction strategies and anti-stigma interventions tailored to rural contexts.

Introduction

Epicenters of opioid addiction and drug related harms are shifting in the U.S., from cities to rural areas. The communities nested in Appalachian Kentucky are enduring escalating rates of hepatitis C (HCV), overdose, and other harms related to rising tides of prescription opioid (PO) and heroin use among young adults (Christian et al., 2010; Havens et al., 2011; Koneru, 2016). Between 2006 and 2012, the prevalence of HCV among people under 30 years of age in Central Appalachia grew 364%, alongside a 21.1% increase in admissions to drug treatment facilities for opioid dependency (Zibbell et al., 2015).

Research on the social-ecological determinants of HCV among people who inject drugs (PWID) in the rural U.S. is lacking. The Risk Environment Framework (REF) is a conceptual model that identifies economic, physical, social, and political determinants of drug-related harms, operating at intersecting micro and macro levels of social ecologies, in order to rapidly mobilize community-based and intersectoral interventions for marginalized groups (Rhodes, 2002, 2009). Cooper et al. expanded REF to include healthcare and law enforcement as distinct environmental domains (Cooper & Tempalski, 2014; Cooper, Bossak, Tempalski, Des Jarlais, & Friedman, 2009, 2012). REF posits that accountability for drug-related harms extends upstream, beyond the agency of individuals, and into realms of power, policy, and social forces binding systems, institutions, and societies (Rhodes, 2002, 2009).

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REF scholarship has proved vital in the design, implementation, and expansion of multi-level, intersectoral harm reduction policies and interventions worldwide (Des Jarlais et al., 2013).

To date, most REF studies have focused on urban and metropolitan settings, especially studies of drug use in the U.S. (Cooper et al., 2012, 2016; Friedman et al., 2016; Knight et al., 2014; Linton, Cooper, Kelley et al., 2016; Strathdee et al., 2010). Due to recent shifts in the dynamics of drug-related harms, from densely-populated urban centers to sparsely-inhabited rural regions, new REF-informed studies are needed to examine how properties of *rural* environments shape vulnerabilities to risky drug use and injection behaviors that lead to HCV (Cicero et al., 2014; Young & Havens, 2012; Young, Havens, & Leukefeld, 2010; Zibbell et al., 2015, 2018). Such research is necessary for accelerating the implementation of laws, policies, and programs tailored to the contextual contours of PWID living in rural places (Rhodes, 2002, 2009).

Setting

Appalachia is a vast region of the U.S. landmass, where 25 million people live within 420 counties, spanning 205,000-square-miles that encompass all of West Virginia and segments of 11 other states (Commission, 2017). About 42% of Appalachia is designated as rural. Rural Eastern Kentucky is among the most impoverished areas of Appalachia, where more than a quarter of households live below the federal poverty line (Commission, 2017), and residents have endured disparate burdens of premature death and disability rooted in structural socioeconomic inequities (Billings & Blee, 2004; Greenberg, 2016; Kannapel & Flory, 2017; Smith, 2015; Tsou, 2011) and healthcare disparities for decades (Commission, 2017; Harris et al., 2016; Lane et al., 2012).

This study focuses on a cluster of five rural Appalachian counties where between 23% and 32% of residents live below the federal poverty level, defined as a household income less than $25,000 for a family of four. We are not listing the names of these counties to avoid compounding stigma. In a recent study, 59% of PWUD residing in these counties tested positive for HCV (Hannah et al., 2018). Downsizing of coal mining (Hendryx, 2009; Scott et al., 2012), workforce de-unionization, and outmigration(Tighe, 2013; Ulrich-Schad, Henly, & Safford, 2013) are among the forces deepening impoverishment and stagnating economic mobility in this area (Kratzer, 2015; Tsou, 2011;). Beginning in the 1990s, targeted prescription pain pill marketing tactics and loosely regulated prescribing practices (Dyer, 2014; Luu et al., 2018) flooded Kentucky's socioeconomically distressed communities with an abundance of potent POs (Leukefeld et al., 2005, 2007; Moody, Satterwhite, & Bickel, 2017). These communities were already strained by high prevalence of chronic pain from work-related injuries and unmet mental health needs (Hendryx, 2009; Moody et al., 2017). The influx of POs, such as oxycodone has contributed to reported increased initiation of injecting and fatal overdoses (Bunn & Slavova, 2012) among young adults (Young & Havens, 2012). Subsequently, policies aimed at curbing supply of POs have expanded market demands for heroin as a cheaper alternative (Victor et al., 2017). Between 2004 to 2014, Kentucky was 1 of 2 US states where treatment admissions attributed to heroin injection increased by more than 1000% (Zibbell et al., 2018).

A recent study found most of the 220 US counties identified as highly susceptible to localized HCV and HIV outbreaks were rural, with nearly a quarter of these counties located in Kentucky (Van Handel et al., 2016). Yet, beyond research on social and risk networks (Rudolph, Young, & Havens, 2017; Young, Jonas, & Havens, 2013; Young & Havens, 2012; Young et al., 2013; Young, Rudolph, & Havens, 2018), surprisingly few studies have examined social-ecological determinants of drug use and HCV in eastern Kentucky, or in any rural area (Broz et al., 2018). Prior studies of Appalachian Kentucky show relationships between PO use, injecting practices, and features of social networks (Buer, Leukefeld, & Havens, 2016; Jonas et al., 2012; Young & Havens, 2012; Young et al., 2010). These studies suggest that oxycodone (OxyContin) operates as currency for social capital in PWID networks (Jonas et al., 2012); linkages exist among loggers and miners' chronic pain, health service barriers, and PO use (Leukefeld et al., 2005, 2007); and that gender, kinship, and intimate partnership dynamics are correlated with PO use and HCV risk for women (Buer et al., 2016; Staton-Tindall et al., 2015). Studies also suggest that people lack adequate access to MAT. A recent survey found that 23% of people who used opioids to get high in the study area tried to get into MAT in the past 6 months but were unsuccessful (Hannah et al., 2018). The present qualitative, exploratory study builds on this important work. Using REF as a "sensitizing framework," (Charmaz, 2003) we advance understanding of rural US risk environments by describing features of the local risk environment, and exploring how they may interact to influence opioid use and HCV vulnerability, from the lived experiences and perspectives of young adults who use opioids and live in rural Appalachian Kentucky.

Methods

Participants were recruited between March and August 2017 via community-based outreach methods (e.g., cookouts, flyers) and peer referral. We admininstered brief screenings to identify eligible participants. Eligibility criteria included being aged 18–35 years, using PO or heroin to get high in the past 30 days, and living in one of thefive target counties. Participants who reported injecting or using opioids by other routes of administration were eligible. Eligible individuals took part in an indepth, one-on-one interview. The interview guide was constructed using REF, and explored each domain of the rural risk environment–economic, physical, social, political, and healthcare/law enforcement interventions – as well as risk behaviors for HCV (Cooper & Tempalski, 2014; Cooper, Wypij, & Krieger, 2005; Rhodes, 2002, 2009). Each participant took part in a brief survey after the one-on-one qualitaive interview that queried drug use patterns and sociodemographic characteristics. Interviews were conducted by trained interviewers in places that were private, convenient to participants, and safe; interview locations included cars, libraries, and local health departments. Interviews were audiorecorded and lasted 60–90 minutes; participants received $30 for taking part in the interview. All audiorecordings were transcribed verbatim.

The study adopted a constructivist grounded-theory approach (Charmaz, 2003; Glaser & Strauss, 2017; Strauss & Corbin, 1990). The codebook was created based on prior literature and a system of open-coding. Consistent with Charmaz and others, we used REF as a set of inter-related sensitizing concepts in this analysis. "Sensitizing concepts offer ways of seeing, organizing, and understanding experience; they are embedded in our disciplinary emphases and perspectival proclivities" (Charmaz & Belgrave, 2012).

REF is a framework, and not a theory, and thus provided a generative starting point for data collection and analyses to explore which features of participants' environments shaped HCV risk, and how they did so. As with all sensitizing concepts used in Grounded Theory, data collection and analyses allowed for departures and negations of REF (Charmaz & Belgrave, 2012). Transcripts were double-coded and reviewed for consistency; coding discrepancies were resolved through discussion. We used an interactive process of conceptual ordering, axial coding, diagramming, selective coding, and memoes to identify and describe emergent properties and intersecting features of categories, and explore how REF constructs promoted drug use, and safe versus harmful injection-related behaviors. We explored possible gender differences in risk environments, and in the processes through which they affected HCV risk beahviors. We used NVivo version 12 to support analyses (QSR International Pty Ltd, 2018).

In this exploratory study, we recruited participants who reported injecting and using drugs through non-injection routes - the latter were

Table 1
Characteristics of young adults who live in rural Kentucky and reported recently using opioids to get high (N = 19).

Characteristics	Mean/N	SD/%
Age (years)	26.30	4.20
Gender		
Men	11	57.90
Women	8	42.10
Race/Ethnicity		
Non-Hispanic White	19	100.00
Drugs used (multiple responses permitted; most commonly reported answers presented here)		
Heroin	9	47.37
Prescription opioids	17	89.50
Methamphetamines	11	57.90
Injected drugs (past 6 months)	14	76.10
Drugs Injected (multiple responses permitted; most commonly reported answers presented here)		
Heroin	8	42.10
Prescription opioids	9	47.37
Methamphetamines	7	36.84

included because they reported using drugs with PWID and demonstrated firsthand knowledge of the places where people inject and social contexts surrounding risky injection behaviors. Moreover, the interview guide encouraged participants to describe risk environments for other young adults in the area. Data collection ceased when we reached saturation on our guiding questions about the risk environment and drug-related harm

Ethics statement

All data collection protocols for this study were approved by Institutional Review Boards at Emory University. Audiofiles and transcripts were stored on a HIPAA-compliant server; paper documents were stored in a locked cabinet accessible only to project staff.

Results

Sample characteristics

Participants included 19 non-Hispanic white adults, 58% of whom were men (n = 11; Table 1). The mean age was 26 years (SD = 4.20), and participants reported living in the five county area for an average of 11 years (range = 0.5–27 years). Akin to the study area (which was 95% non-Hispanic White), 100% of the sample was non-Hispanic White. Participants reported using multiple drugs to get high within the past 30 days, and 90% and 47% of participants reported recent use of POs to get high and heroin, respectively. Most participants (74%, n = 14) reported injecting at least one type of drug in past 6 months, and heroin, POs, and methamphetamines were the most commonly injected drugs. Participants reported knowing an average of 41 other young adults who consumed opioids and lived in the area.

Qualitative findings

A range of features of social, economic, political, law enforcement, healthcare, and physical domains, operating at multiple, intersecting levels, emerged as prominent factors shaping young adults' drug use and vulnerabilities to HCV in the study area. We first discuss features of rural risk environments that appeared to propagate propensities for drug use, and then turn to describing how these features shaped HCV vulnerability, from participants' perspectives. Fig. 1 provides a visual portrayal of our findings. We explored gender differences in HCV risk behaviors and in experiences with the REF, but found none in this sample, and so present findings for women and men together.

Economic adversity, lack of social enrichment, and stigma: Drivers of Substance Use

A barren job market, diminished formal opportunities for social enrichment, and stigma were macro-level features of the social and economic environment that shaped drug use among young adults. Four of the five counties in the study area were more rural and less populated than a county ["County Z"] with a small city that contained a large hospital and a state university anchoring its downtown. Participants who currently lived in or had recently relocated from more rural counties within the study area reported worse employment situations than residents of this more populated county. As one woman who recently moved from a more to less rural county to work at a fast food restaurant said: "*Yeah.. there ain't no jobs there like there is here* [County Z]." Longer-term residents of "County Z," however, still reported significant challenges with employment. A young man who recently competed high school remarked:

> "It is hard to get a job after graduating. I still can't get a job. I have applied to every fast food [restaurant].. when I was in high school, I applied everywhere. Then I was like ok… once I graduate, then they will call me, but they still haven't. I have applied like three times everywhere in this town."

The costs of criminal justice involvement compounded participants' economic distress. A history of arrest or incarceration made it extremely difficult to get work. As a 27-year old woman explained:

> "Nobody will hire me because of my record, and [my boyfriend] is doing everything [paying bills] himself."

While features of the physical environment provided young adults with places for socialization, reflection, and recreation, economic distress limited social opportunities. Lakes, mountains, and trails were identified as places where young adults engaged in outdoor activities such as such as fishing, swimming, camping, and four-wheeling. As a 33-year old woman described it:

> "That's what I love to do: go out four-wheeling. It gets your mind off of stuff. That's what I did to get rid of some of my drug habits– I went out four-wheeling. Got muddy."

Yet, the effects of community-level economic decline has also extended to decaying resources for youth and young adults in the area. Participants expressed nostalgia for places, events, and activities that once provided sources of social enrichment for families and communities during childhood. A 29 year old woman stated: "*There is literally nothing here. It wasn't like that when I was younger.. . there was [sic] pool halls and stuff that got shut down."*

A 27-year old woman also longed for more structured activities for youth in the area.

> "They used to have a bowling alley. They shut that down. They took the city pool out. There's nothing. There's no events to take the kids to – no concerts – You sit at home, or ….maybe get to go to McDonald's or something."

Analysis suggests that diminished sources of social enrichment, paired with poor prospects for financial security, contributed to feelings of disempowerment and depression among local young adults.

A 25-year old man said:

> "There is a lack of jobs – that tends to send people into a depressive state; because they are trying, but it ain't getting them nowhere; and it tends to be easier to backpedal than it is to try to go forward."

Participants reported that they and others used opioids to cope with economic adversity and depression. For instance, a 26-year old man reflected on the negative consequences of a bleak job market: *"If jobs*

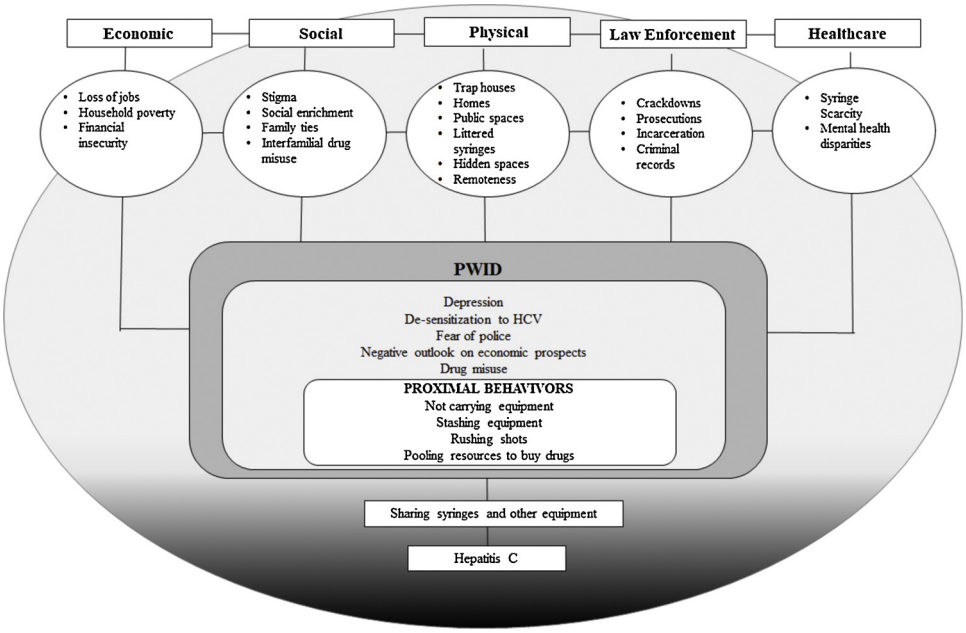

Fig. 1. Rural Risk Environment for Hepatitis C Among Young Adults in Appalachian Kentucky.

could be found around here. It wouldn't be that bad. We wouldn't have the depression that people are trying to fix with the drugs." An 18-year old man said: *"Drugs is their [young adults] life…because there's not activities to do. That is a big thing around here. People do drugs, because there is nothing else to do."* A 26-year old man viewed the absence of jobs as a root cause drug use: "*If we could get more jobs here, half the needle problem would go away."*

People who reported severe feelings of depression associated those feelings with "not caring" or "feeling powerless" against acquiring HCV, which in turn led to taking less precautions against not sharing injection equipment even when knowing the risk. As one woman noted, "*People just basically feel down. Feel depressed, and so they don't really focus on injecting safely."*

Poor access to care and drug-related stigma were cited as barriers to accessing services that might alleviate depression and addiction. Participants reported that there were few mental health services in their communities that young adults could use to treat depression. As described by a young man raising a family, who sustained debilitating combat injuries in the military:

> "This town, a lot of people are very depressed, and nothing gets done about it. Whether you are a veteran, or someone whose experienced domestic violence, anything… There's nothing to help around here."

Even when services were available, stigma often prevented participants from accessing them. Participants lamented that many community members held strong, dehumanizing views against people who use drugs, and especially against those who injected; this stigma, in turn, undermined self-esteem and deterred people from seeking support. As a result PWID mostly count on family and each other for support. As a 25-year old woman remarked:

> "Everybody's judgmental, and it just keeps you from reaching out. The only other person you're going to reach out to is the guy that can get you a needle or the drugs you're trying to score."

Countervailing family ties and interfamilial drug use

Economic hardships at the structural level cultivated complex, familial contexts that had countervailing features that both alleviated and exacerbated drug-related harms. Most participants reported having deep roots in Eastern Kentucky that spanned multiple generations, and cited strong familial ties as a buffer against economic adversities. Indeed, family ties were cited as the primary reason that young adults stay in the area, despite its poor economic prospects. A 27-year old-woman struggling to find employment said: *"I just got family and stuff here. That is the only reason I am here."*

Families were central to many participants' lives, and were sources of both support and harm. Reliance on parents, siblings, or cousins for housing, financial support, or childcare was common. One young mother remarked: *"I got a little boy…He is six. He stays with my momma right now, until his momma gets back on her feet…He's my world."* Another woman explained: "*So, my sister just recently moved in, so she could pay the utilities, so that we could concentrate on getting the house payment caught up."*

However, interfamilial drug use was commonly reported, and described as counteracting the protective aspects of strong family ties by reinforcing generational patterns of poverty and addiction. An 18 year-old man who reported injecting heroin with his father and brother reflected on the influence of parental drug use and dealing on his extended family:

> "All three of our dads were drug dealers. So, we'd seen junkies and stuff. [My cousins and I] never wanted to be that. My dad… my life is like his… and my whole life he tried to get me to go on a different path. Somehow I got brought into it."

In sum, results suggest that economic adversity, diminished social enrichment opportunities, and stigma contributed to depression among young adults. With few mental health and drug treatment options in the community, drug use became a common coping mechanism. According to these young adults, while strong family ties mitigated harms of impoverishment and stigma, interfamilial drug use also underlay cycles of addiction and impoverishment among young adults living in rural Kentucky.

REF and HCV RISK

The following section reports first on injection practices among young adults in rural Kentucky that create vulnerability to HCV transmission, and then describes key social-ecological determinants of this vulnerability, as described by participants.

Reported injecting behaviors

Participants described HCV as ubiquitous in their families and social circles. As a 29 year-old man put it:

> "Hepatitis is an epidemic right now. Out of all my friends, there's probably a handful that ain't got it. All three of my cousins have it. My uncle has it. My mom's probably got it. I've got it."

Participants reported multiple injection behaviors that created HCV transmission risk. Sharing needles was the most commonly cited HCV risk behavior. Participants also routinely shared other injection equipment. Proximal reasons for sharing syringes and other injection equipment were not carrying personal equipment and resorting to using discarded syringes, rushing to inject in public spaces, stashing syringes in places where others may find them, and pooling resources to buy drugs. In the case of sharing other injection equipment, participants often noted that local PWID were unaware that HCV could be transmitted via sharing contaminated cookers, water, or cotton. One woman indicated that sharing cookers and cottons was common: *"[PWID] share spoons. They share cottons. Well, usually the filter of a cigarette is what most people around here use."* Another woman learned about cottons as a transmission route during an interview, disclosing in a whispered aside: "*I share cotton. I didn't know that you could pass with cotton."* People who were rushing injections described being in situations where they do not have the time to sort equipment or prepare new water and therefore were more likely to share syringes and other equipment. Additionally, participants stated that people who pool money to buy drugs were more likely to share those drugs and any equipment used to inject them, especially within trap houses or settings where fear of police leads to rushing shots. Each of these behaviors was shaped by features of the risk environment, including the political environment governing syringe access; police; and poverty.

Local political opposition underlies barriers to sterile syringes

A systemic shortage of sterile syringes was the most commonly cited reason for syringe sharing, and this scarcity was attributed to local opposition, cost, stigma, and fear of law enforcement. One year prior to the time of data collection, Kentucky passed a law permitting syringe service programs (SSP), and one of the five counties had recently opened an SSP when this study started. Pharmacists were allowed to sell syringes over the counter without a prescription at their discretion, but few participants reported using this source. A woman living in a county without a syringe service program (SSP) reported: "*You know, [community members] argue against [the SSP] and say its proliferating drug use, but… it's an epidemic. You can't stop it… [PWID] are gonna keep using dirty needles, unless you give us clean needles."*

In this context of syringe scarcity, participants reported obtaining syringes from a variety of sources, none of them guaranteed to be sterile. Sources included diabetic friends and family members; dealers, for about $5 per syringe; and on the roadside or other places where people discarded used syringes. A woman who reported injecting heroin and cocaine relied on her mother for clean syringes: "*My mother is a diabetic. And she gets insulin needles, and she shoots up too."* One man spoke of instances where people resorted to injecting with littered syringes: *"I have been with someone that literally picked one [syringe] up off the side of the road and used it. That's so gross. I was like… you are going to catch something for sure.*

Participants also traveled hundreds of miles to reach SSPs: a 27-year old woman remarked, "There is no needle exchange in the county. So, most of the time what people are doing to keep themselves safe is traveling outside the county, several hours, to get hypodermic needles."

To compensate for syringe shortages, participants bleached syringes when they re-used their own syringes, or before sharing with another person. One man noted: "*If you use after somebody, at least bleach it out. Or you're just asking for it."* Another woman wished for Vancouver's safe injection facility, but said she would settle for better access to free syringes: "*That's the main thing. More than anything. Just get us access to needles. If we have a way of getting clean needles for free, we will use them.*

Most participants viewed the one SSP in the study area as a vital resource, but few reported utilizing this new program at the time of these interviews. Participants also indicated that fear of arrest and the SSP's proximity to the police station deterred utilization of SSP services. As a 25-year old man stated:

> "There's a city police station on Main Street, and a sheriff's office a thousand feet from the one [SSP] on Main Street, and then you've got your state police barracks up, like, smack in the middle of town. It could be a setup. They could go in, exchange their needle. You feel like they're going to test it, find residue, call the cops; and they get arrested walking out. A lot of people fear that."

Stigma further discouraged SSP participants. A 25-year old woman said: "people still scared to come to that program [SSP], because they don't believe it is actually confidential."

Fear of arrest and risky injection locations

Fear of law enforcement not only shaped whether people used the SSP, it was uniformly emphasized as a determinant of the physical places and social contexts where people injected. Most participants preferred injecting in the privacy of their own home, or that of family or friends. They viewed homes as places where they were less likely to share injection equipment or rush shots, because there was access to clean water, personal syringes and cookers, sanitized counter space to prepare shots, and less fear of police encounters. When queried about where he preferred to inject, a 25 year-old man answered: "*Home. First and foremost. That's where [people] feel the most comfortable. Just because they have all of their supplies… and everything set up".*

However, fear of law enforcement often led participants to inject away from homes, in settings that conferred significant HCV risk. According to participants, police, prosecutors, and courts were cracking down on heroin and drug-related crimes in the area. As a 25-year old man explained*: "Everybody's afraid of incarceration, because that's a big charge [heroin possession]. They're cracking down on it."*

To avoid the police, participants reported turning to "trap houses." Trap houses are apartments, trailers, or motel rooms where people gathered to buy and/or inject drugs; they were reportedly abundant in the area. While trap houses solved the problem of how to travel from the location where the participant bought drugs to the location where they used them, they also introduced significant HCV-related harms. Trap houses were filled with people who were using drugs – as 27-year old woman put it succinctly, in trap houses: *"There's people in and out all of the time"* – and these peopled places provided multiple opportunities for HCV transmission. Trap houses were frequent sites of communal drug use between friends, casual acquaintances, and strangers, especially when people pooled resources to buy drugs inside the trap house. In addition, used syringes were strewn around the interior of trap houses, and around the exteriors. One woman spoke about the perils of injecting in trap houses with people she did not know or trust.

> I don't think it's really the place but, it's just the people wherever they might be using with you know, people are bound to want to pick up someone else's thing and use it and put it back, you know to where they don't know if they touched it

People were often experiencing dope sickness when arriving at trap houses, and those without money to buy syringes from dealers resorted to using these discarded syringes. As a 24 year old man described it: *"As soon as they come in to buy it, they are not even leaving before they do it. There's needles laying all over the place. If you get somebody that is really sick, they will just pick it up and use it."* Participants said that women who go to trap houses to exchange sex for drugs were often pressured into sharing needles: "*Most of the time it's women, they go there [trap house] to*

prostitute their selves out, and so when you're prostituting yourself out… you know, you're gonna use someone else's needle"

In addition to turning to trap houses to avoid the police, participants avoided the police by rushing injections in less private places. As a 26-year old man stated:

> "The only thing with [cops], is they make me more paranoid, so therefore I'd be trying to speed up the process of getting high [injecting]."

Some participants reported opting not to carry personal injection equipment when traveling between destinations because they feared police, which increased their odds of being in situation where people resolve to sharing equipment. When asked about people in his social circle, an 18-year old PWID, remarked: *"No one that I know will carry one [syringe] out of the house."* Similarly, a 25-year old woman who reported injecting POs noted: *"People don't want to carry their needles on them if they think they are going to go to jail for it."* However, another man stated that he always carried an extra syringe in the event that a peer did not have a clean one to avoid sharing. *"I always try to carry extra [syringe] with me. That way, if whoever I was with didn't have one, I will give them a clean one."* One participant described how personal encounters with police dissuaded him from carrying syringes due to fear of charges related to accidental needle sticks.

> "And the cop, the first thing they ask is there anything that will stick me or poke me? If you say no, and hope they d..'t find it, then y..'re going to get like wanton endangerment and do a long time [in prison], you know. Nobody is going to say. .'ve got a needle in my back pocket..' because then y..'re getting paraphernalia or whatever, and still wanton endangerment. They still might charge you with it.

Discussion

This exploratory study used REF as a sensitizing set of inter-related concepts to assess determinants of HCV vulnerability among young adults who used opioids to get high in rural Appalachian Kentucky. While preliminary, analysis provide insights into directions for future research and intersectoral interventions in rural settings. Using drugs to get high among young adults was described as closely tied to features of the social and economic environments. At the macro-level, job scarcity and lack of resources for social enrichment for youth contributed to high levels of depression among young adults. People reported that many young adults used opioids and other drugs to get high to cope with depression, in part because they lack access to mental health care and because stigma against people who use drugs deterred them from using available services. These findings signal a need for government and private sector interventions that increase resources for youth and young adult development, provide households financial security, and stimulate economic mobility of young adults in rural Appalachia.

This study's findings mirror those of recent studies focused on the implications of economic domains on drug-related harms in urban settings (Des Jarlais et al., 2013). For example, McLean (2016) suggest that de-industrialization and population loss in wake of a dwindling steel industry underlies heroin use and overdose mortality in the Monongahela Valley region of Pennsylvania (McLean, 2016). Similarly, in our study setting, drug use and HCV were rooted in economic distress from a stagant job market for young adutls, against the backdrop of a shrinking coal mining industry.

We found that, in this novel rural environment, multiple concepts within REF "[offered] ways of seeing, organizing, and understanding experience" related to place and HCV vulnerability. REF is an impactful framework for developing interventions to slow the tides of drug-related harms in contexts characterized by significant economic decline (Friedman, Rossi, & Braine, 2009). Future studies should continue to explore how historical, sociopolitical, and economic forces at the state and regional level shape trajectories of drug use and its related harms in Appalachia. Additional empirical evidence may prove essential for advancing the political viability of legislative measures that incorporate anti-poverty strategies and remove barriers to unemployment for people with criminal records. These new studies can draw on the methods developed to study REF in urban areas, including geospatial methods to measure physical, social, economic, political, and healthcare service/criminal justice characteristics of places and multilevel models to investigate how these place characteristics might relate to a range of risk and protective behaviors (Cooper et al., 2016; Linton, Cooper, Luo et al., 2016; Linton et al., 2017).

In 2014, Kentucky expanded Medicaid benefits via the Affordable Care Act (ACA) to wider range of young adults, which has provided thousands of previously uninsured residents coverage for behavioral health services (Wen et al., 2017) and HCV treatment for the first time (Wen et al., 2017). Medicaid is also a vital financing stream for supporting the operation of rural hospitals, drug treatment services, and essential healthcare services. However, a pending proposal portends to take away Medicaid coverage from young adults. Thus, research is needed to examine the impacts of Medicaid policy on individuals' access to drug treatment and HCV treatments, and evaluate the implications of restricting Medicaid benefits on the capacities of rural health systems as treatment providers and employers (Sommers et al., 2016; Wright & Vanderford, 2017)

Participants described HCV as pervasive in their families and social networks, and reported a range of injection behaviors that associated with HCV transmission risk. Despite knowledge of risks, sharing needles was the most commonly cited HCV risk behavior. Participants also reported widespread sharing of other injection equipment, and some were unaware that HCV could be transmitted via sharing cookers, water, and cotton. Proximal reasons for sharing equipment included not carrying personal equipment and resorting to using littered syringes, rushing shots, stashing syringes in places where others may find them, and pooling money to share drugs.

Insufficient access to free, sterile syringes was the most prominently cited factor that resulted in risky injection practices. Syringe scarcity prompted many people to depend on an array of sources for accessing injection equipment that may be contaminated. Syringe scarcity, stigma, and fear of police led to multiple proximal risk behaviors, such as not carrying personal equipment and rushing injections that often increase risk of acquiring an HCV infection through sharing equipment. Since Kentucky legalized the operation of SSPs in 2015, local health departments have started 50 programs across the state (Services, 2019). The statutory framework authorizing SSPs, however, provides local officials wide discretion to establish policies and components of each program. Thus, one pressing area for future research is to examine the influence of localized policy environments on the implementation and impact of rural SSPs.

Participants reported having large social circles and strong family ties. Both were cited as a vital sources of support, and a basis for living in rural towns despite dire economic prospects. Yet, social buffers were sometimes counteracted by interfamilial drug use, which contributed to financial insecurity, addiction, and unsafe injecting practices. Adoption of secondary-exchange policies in SSPs is one way to leverage dense social connections to overcome geographic, financial, and psychological barriers to accessing sterile equipment (Brothers, 2016; Snead et al., 2003).

Notably, PWID reported relying on each other for social, material, and emotional support due to community stigma. Community organizing of directly-impacted people and coalition building for key stakeholders offer promising strategies for advancing policy reforms and evidence-based programs amidst enduring socioeconomic inequities (Bell, 2008, 2009).

An immense body of research has demonstrated that criminalization, police crackdowns, and other deterrence-based approaches to drug use typically exacerbate rather than mitigate vulnerabilities to bloodborne infections among PWID (Friedman et al., 2011, 2016). This study

bolsters this widely replicated finding. Fear of law enforcement was uniformly cited as a determinant of the physical places and social contexts where young adults injected. Avoidance of arrest was a primary reason for proximal risk behaviors, such as not carrying personal injection equipment and injecting in trap houses that may result in sharing equipment. Moreover, the proximity of SSPs to police stations deterred utilization of program services. Prior studies suggest that training and education on the benefits of SSPs for officer safety and linkages to drug treatment improves police perceptions and buy-in for SSP. Implementing police trainings will likely improve reach and impact of SSPs in Kentucky (Beletsky et al., 2011; Davis et al., 2014). Recent data show that the greatest levels of growth in jail populations is taking place in rural communities, and largely driven by incarceration for drug-related crimes (Kang-Brown & Subramanian, 2017). Examining the public health implications of jail expansion on drug-related harms in rural settings is another important direction for action-oriented researchers.

Limitations

This study has several limitations. In retrospect, data collection and analysis might have been strengthened had we included sensitizing concepts pertaining to *young adult development*. This conceptual expansion could have supported explorations of how various features of the risk environment supported or thwarted the attainment of developmental milestones for young adults, and the pathways through which these experiences in turn might shape HCV vulnerability and resilience. In addition, the five-county area was quite heterogeneous, with significant variations in topographies (e.g., mountainous vs flat with rolling hills) and in the extent of rurality (forests vs. more settled areas). Our guide did not explore these variations, and participants did not discuss them independently, and yet these conditions may shape key experiences (e.g., isolation, access to resources) with implications for HCV risk

Future directions and conclusion

This is one of the first studies of the rural risk environment, a vital arena for inquiry given the geographic shifts in the epidemiology of opioid use and drug-related harms. Answering questions at the intersections of race, class, and geography—that account for structural racism of the drug war—are important for advancing of equitable policy solutions to drug-related harms that target social and economic determinants. The War on Drugs fueled a vast expansion of criminal justice system in the U.S. that is inextricably bound to historical and contemporary structures of racial oppression and discrimination against black men and women (Alexander, 2012). Prior drug epidemics, such as the crack boom in the 1980s and 1990s resulted in hyper-policing and mass incarceration of black communities (Cooper et al., 2005, 2012, 2016). Future research should dive deeper into relationships between policing, incarceration trends, and HCV burden in rural settings. Future research could also explore HCV vulnerability and the REF in older participants, and among the emerging population of people who use methamphetamines to get high. Researchers seeking to build on this study might consider adopting quasi-experimental designs to explore pathways linking upstream determinants, community contexts, individual behaviors, and HCV outcomes. Multi-level modeling and geospatial techniques previously applied to urban and metropolitan risk environments should be extended to rural contexts (Janulis, 2019). Finally, examining the impacts of state laws and regulations on economic distress and capacities of rural communities to adopt and expand SSPs in geographically and socio-politically distinct contexts of rural Appalachia is vital for advancing structural change that is needed.

Author contributions

David H. Cloud led the conceptualization, analysis, and writing for this study with guidance from Dr. Cooper. He also participated in data collection. Dr. Ibragimov and Ms. Prood collaborated on the analysis and provided feedback on manuscript drafts. Drs. Cooper and Young co-lead this research project and mentored each stage of this study.

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