Drug and Alcohol Dependence 188 (2018) 239–250

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Review

Injection drug use, HIV/HCV, and related services in nonurban areas of the United States: A systematic review

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ARTICLE INFO

Keywords:
Nonurban
Rural
HIV
HCV
IDU
PWID

ABSTRACT

Background: Injection drug use (IDU) in nonurban areas of the United States is a growing public health concern, but there has been no comprehensive assessment of existing research on injection-related HIV and hepatitis C (HCV) in nonurban communities. We conducted a systematic review to assess the current literature and identify knowledge gaps.

Methods: We systematically searched six databases for relevant articles published between January 1990 and June 2016 and screened, extracted, and analyzed the resulting data. Studies were included if they reported original findings from the nonurban U.S. related to 1) IDU and its role in HIV/HCV transmission, and/or 2) HIV/HCV services for people who inject drugs (PWID).

Results: Of 2330 studies, 34 from 24 unique research projects in 17 states met inclusion criteria. Despite increasing HCV and high vulnerability to injection-related HIV outbreaks in nonurban areas, only three studies since 2010 recruited and tested PWID for HIV/HCV. Twelve reported on sharing injection equipment but used varying definitions of sharing, and only eight examined correlates of injection risk. Nine studies on syringe access suggest limited access through syringe exchange programs and pharmacies. Only two studies addressed HCV testing, none addressed HIV testing, and three examined behavioral or other interventions.

Conclusions: Despite growing concern regarding nonurban IDU there are few studies of HIV/HCV and related services for PWID, and the existing literature covers a very limited geographical area. Current research provides minimal insights into any unique factors that influence injection risk and HIV/HCV service provision and utilization among nonurban PWID.

1. Introduction

Injection drug use (IDU) is a risk factor for HIV, hepatitis C virus (HCV), and other blood-borne infections. In the United States, six percent of new HIV diagnoses are attributed to IDU and another three percent to men who have sex with men (MSM) and inject drugs (Centers for Disease Control and Prevention, 2015a). While the overall number of newly diagnosed HIV cases among people who inject drugs (PWID) decreased between 2010 and 2014 nationally, cases of acute hepatitis C almost tripled between 2010 and 2015 – an increase largely attributed to increases in IDU in nonurban areas (Centers for Disease Control and Prevention, 2015b) that are generally underserved by syringe access programs (Wejnert et al., 2016). Highly sensitive rapid tests are available to diagnose both HIV and HCV, yet the Centers for Disease Control and Prevention (CDC) estimates that 14% of all HIV-positive individuals and as many as half of those with chronic HCV are unaware of their infection (Hall et al., 2015; National Academies of Sciences, Engineering, and Medicine, 2016). Early diagnosis of these infections is critical, as there are effective antiviral medications available that manage and cure HIV and HCV, respectively, and prevent onward transmission.

The growth of illicit drug use in U.S. nonurban areas over the past two decades has been covered extensively by the popular press but addressed in only a few peer-reviewed studies. These studies detail increases in methamphetamine use in nonurban areas in the early 2000 s (Gruenewald et al., 2010; Gruenewald et al., 2013) and more recent increases in illicit prescription opioid and heroin use (Cicero et al., 2014; Meiman et al., 2015; Paulozzi and Xi, 2008; Rossen et al., 2013), but do not focus on IDU specifically. An HIV outbreak in Indiana received national attention as the first outbreak of its kind in a rural

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https://doi.org/10.1016/j.drugalcdep.2018.03.049
Received 30 October 2017; Received in revised form 24 March 2018; Accepted 27 March 2018
Available online 08 May 2018
0376-8716/

Table 1
Search terms and subject headings used.

Word group 1	Word group 2	Word group 3
Search terms		
suburb*, rural, exurb*, non-urban, nonurban, urban fringe, *peri*-urban, periurban, region*	syringe*, injecti* drug use, needle exchange, syringe exchange, needle sharing, syringe sharing, intravenous injecti*, intravenous drug us*, intravenous drug abus*, IDU, IVDA, PWID	HIV, HCV, hep* C, human immunodeficiency virus, AIDS, acquired immunodeficiency syndrome, acquired immune deficiency syndrome
MeSH Headings		
Rural Health Services, Suburban Health Services, Rural Nursing, Suburban Population, Rural Population	Needle-Exchange Programs, Needle Sharing, Injections, Needles, Syringes, (Substance Abuse, Intravenous)	HIV Infections, Hepatitis C
PsycINFO Headings		
Rural Environments, Suburban Environments	Needle Sharing, Needle Exchange Programs, Intravenous Injections, Injections, Intravenous Drug Usage	HIV, HIV Testing, AIDS Prevention, AIDS, Hepatitis
CINAHL Headings		
Rural Population, Rural Health Services, Rural Health Nursing, Rural Areas, Rural Health, Suburban Areas, Suburban Population, Suburban Health	Needles, Needle Sharing, Needle Exchange Programs, Syringes, (Injections, Intravenous), Injections, (Substance Abuse, Intravenous), Intravenous Drug Users, (Administration, Intravenous)	HIV-Infected Patients, HIV Infections, HIV Education, Hepatitis C, (Hepatitis C, Chronic)

Note: Search terms within groups combined with OR. Word groups combined with AND. Date restrictions were set for all searches from 01/01/1990 to 12/31/2016. All searches were conducted on 06/13/2016; date restrictions were set to capture pre-publication results available in online databases.

community, underscoring the importance of addressing IDU in nonurban areas. Between November 2014 and November 2015, more than 180 individuals in Scott County, Indiana (population ~23,000), tested positive for HIV, with most (88%) reporting injection of oxymorphone, a prescription opioid, within the past 12 months (Peters et al., 2016). CDC subsequently conducted a nationwide vulnerability assessment to identify counties at high risk of rapid HIV spread and new or continuing high rates of HCV infection among PWID (Van Handel et al., 2016); the 220 counties identified as most vulnerable were "overwhelmingly rural" (pg. 328). CDC also documented an almost four-fold increase in acute HCV infections among persons aged ≤30 years in Kentucky, Tennessee, Virginia, and West Virginia from 2006 to 2012, noting that IDU was the most commonly reported risk factor and increases were substantially higher in nonurban than urban areas (Zibbell et al., 2015). All of these findings point to a pressing need for research on nonurban IDU, its health impacts, and effective public health responses.

Although there is a wealth of peer-reviewed literature on IDU and HIV/HCV, the vast majority of studies have been conducted in urban areas, and it is unlikely that their findings are broadly generalizable to nonurban areas. Drug-related harms like HIV and HCV are the product of "risk environments" shaped by systemic and social contexts that vary across communities (Rhodes, 2002). For example, drug type and availability differ across geographic regions, resulting in different injection practices and HIV/HCV risk profiles (e.g., powder heroin vs. black tar heroin) (Ciccarone, 2009). The geospatial availability of harm reduction and other health services and access to transportation to reach these services are very different in urban and nonurban areas (Des Jarlais et al., 2015). Social norms and values differ across communities, contributing to variations in the stigma and discrimination that PWID encounter and its impacts on their decisions to seek care as well as their overall mental and physical health (Ahern et al., 2007; Young et al., 2005). Differences in social norms and values can also result in variation in the implementation of laws and policies that govern syringe possession, syringe access, and health services access (Burris et al., 2004; Chiarello, 2016; Pollini, 2017; Strathdee et al., 2015; Taussig et al., 2002). The result is that efforts to understand and address HIV/HCV among PWID should be "locally produced," taking into consideration the specific factors that influence transmission in different communities (Rhodes, 2002).

To date, there has been no coordinated effort to summarize or synthesize the existing research on IDU and HIV/HCV in nonurban areas. Communities across the country are in need of research-based guidance on both the extent of the problem and effective strategies for HIV/HCV prevention, testing, and care in nonurban settings. In addition, research entities would benefit from insights regarding gaps in knowledge that remain to be filled by methodologically sound epidemiological and health services research studies. To address these needs, we undertook a systematic review of research on IDU and HIV/HCV in nonurban areas of the U.S., guided by three specific aims:

- Describe the existing literature on IDU and its role in HIV/HCV transmission in U.S. nonurban areas
- Characterize what is known about HIV/HCV-related services for PWID in U.S. nonurban areas
- Identify priority areas for research to fill current knowledge gaps regarding IDU, HIV/HCV transmission, and HIV/HCV-related services in U.S. nonurban areas

2. Material and methods

Our systematic review was guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (Moher et al., 2009). The PRISMA checklist is included in the supplementary material for this article.

2.1. Search strategy

We developed a detailed protocol and search strategy in collaboration with two librarians, including one who specializes in systematic reviews, and registered our protocol with the International Prospective Register of Systematic Reviews (www.crd.york.ac.uk/prospero; CRD42016035780). We ran searches in six research databases (PubMed, CINAHL, PsycINFO, SCOPUS, CENTRAL, and CDSR) for articles published between January 1, 1990, and the search date of June 13, 2016. Searches used database-specific medical subject headings (e.g., MeSH), as well as Boolean operators, truncation, and wildcards in addition to keywords, when possible (Table 1). We imported database search results into EndNote, recorded results on an Excel spreadsheet, and deleted duplicates.

2.2. Inclusion and exclusion criteria

We included articles reporting original findings related to 1) IDU and its role in HIV and/or HCV transmission in nonurban areas of the U.S., and/or 2) availability of, access to, and/or effectiveness of HIV- and/or HCV-related services for PWID in nonurban areas of the U.S. To be eligible, articles had to report results specific to nonurban areas or populations. Nonurban eligibility was determined by study authors' definition, when available; specifically, articles were eligible if the authors described their sample as "rural" or "nonurban." For articles