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## Capacity of Rural Counties to Address an HIV or Hepatitis C Outbreak

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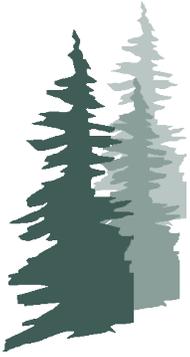
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# Capacity of Rural Counties to Address an HIV or Hepatitis C Outbreak

Jennifer D. Lenardson, MHS, Jaclyn Janis, MPH, Amanda R. Burgess, MPPM, Karen B. Pearson, MLIS, MA, Martha Elbaum, MPA, Erika Ziller, PhD

## BACKGROUND

HIV and hepatitis C (HCV) are major public health concerns in the United States and are a focus of significant federal health policy attention. One component of the federal HIV response is the U.S. Department of Health and Human Services initiative Ending the HIV Epidemic.<sup>1</sup> Launched in 2019, the initiative is an interagency collaboration to end the HIV epidemic in the United States within 10 years by leveraging advances in HIV prevention, diagnosis, treatment, and outbreak response.<sup>2</sup> The initiative is focusing resources on 57 jurisdictions with high rates of HIV transmission, including seven states with a substantial rural HIV burden. One of the cornerstones of the initiative is ensuring that HIV outbreaks are responded to quickly and effectively, using the best available science and technology. However, the Centers for Disease Control and Prevention (CDC) notes that not all US communities have the capacity to respond to a potential outbreak.<sup>3</sup>

Rural persons who inject drugs (PWID) report behaviors that place them at higher risk for acquiring HIV or HCV, including high-risk injection<sup>4,5</sup> and sexual practices.<sup>6</sup> Growing rural prevalence of opioid misuse and injection drug use (IDU) suggests that rural communities are at risk of IDU-related HIV or HCV outbreaks. In 2014, a notable IDU-related HIV outbreak occurred in Scott County, Indiana, a small community of 4,200 people. During the outbreak, 215 people were diagnosed with HIV, with the majority co-infected with HCV.<sup>7,8</sup> Other isolated outbreaks of HIV or HCV have occurred in rural communities throughout the U.S. in recent years.<sup>9-12</sup> Of 220 counties identified as vulnerable to an HIV and HCV outbreak as a result of IDU, most counties were rural, and over half (56 percent) were located in Appalachian Kentucky, Tennessee, and West Virginia.<sup>13</sup>

Limited public health capacity in rural areas may contribute to increased risk for HIV/HCV outbreaks. Rural public health departments have significantly fewer staffing and financial resources than their urban counterparts.<sup>14</sup> Staff recruitment and retention are challenged by a lack of funding and support from elected officials.<sup>15</sup> One result of this lack of resources is that community health assessment and health improvement planning activities, which are required for public health agency accreditation, are often not performed in rural areas.<sup>16</sup> Small health departments often lack emergency management services<sup>15</sup> and are also less likely to have an emergency plan or train public health staff in emergency preparedness.<sup>17</sup>

Access to services for opioid use disorder (OUD) and HIV/HCV are more limited in rural areas. Service shortages, stigma, high costs, and a lack of integrated services, transportation, clinician diversity, and technology contribute to OUD treatment gaps in the rural South.<sup>18</sup> Barriers to accessing HIV care in rural areas include lack of services,<sup>19,20</sup> HIV-related stigma,<sup>21</sup> lack of knowledge or awareness of HIV at the community level, confidentiality concerns, few substance use disorder treatment facilities willing to work with people living with HIV/AIDS,<sup>22,23</sup> as well as distance and travel time.<sup>20,24</sup> Rural PWID with HCV face challenges in seeking and receiving treatment, including limited access to treatment, insurance restrictions, and clinician reluctance to treat patients who inject drugs.<sup>20</sup> Additionally, individuals may not perceive a need for treatment, fear side effects, or lack knowledge of their HCV status.<sup>25</sup>

## Key Findings

- Local health departments (LHDs) located in rural counties in at-risk states are less likely to offer services that may help detect or address an HIV or Hepatitis C (HCV) outbreak, including HIV testing, HIV services, infectious disease surveillance, and substance use services.
- Rural LHDs are less likely to report a history of partnerships with community-based organizations that may be important resources during an HIV or HCV outbreak, including community health centers and faith-based organizations.

For more information about this study, contact Erika Ziller, PhD  
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The Ryan White HIV/AIDS Program (RWHAP) is an important health resource for rural and urban people living with HIV (PLWH) and research indicates that those accessing RWHAP services in rural places maintain service use at the same rate as their urban counterparts.<sup>26,27</sup> However, these programs are not universally available to rural residents and the research did not examine rural-urban disparities in initial access to services.

According to the CDC and others, preventing an HIV/HCV outbreak among PWID involves multiple ongoing activities including testing for infection, partner services and contact tracing, community education, treatment for mental health and substance use disorders, treatment for HIV/HCV, and harm reduction services such as syringe service programs (SSPs) and medication assisted treatment.<sup>28-33</sup> This study used multiple sources of secondary data to examine the extent to which provision of these services, particularly by local health departments, differs by rural-urban location.

## METHODS

This brief reports on secondary data analyses that are part of a larger mixed-methods study designed to better understand the ability and resources of rural counties in at-risk states to address an HIV or HCV outbreak. We compared rural and urban states with high rates of problem opioid use on indicators of state and county health system capacity and sociodemographic and economic characteristics. Additional findings from interviews with state, county, and local administrators, community-based organizations, and clinicians about their capacity to respond to rural outbreaks are available in a companion article.<sup>34</sup>

For the quantitative component of the study, we addressed the following research questions:

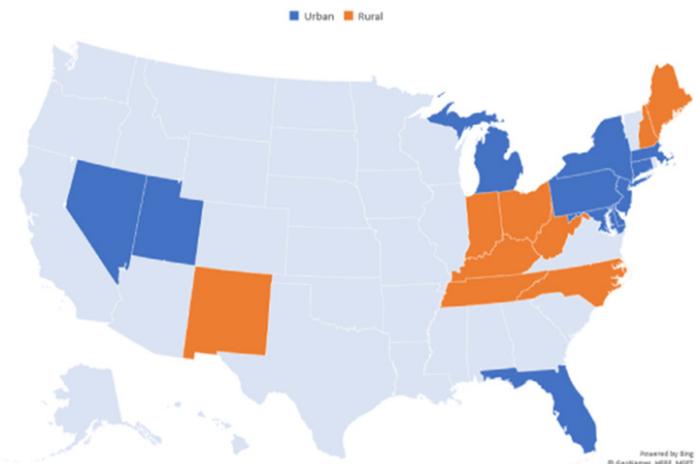
1. Do states with a higher proportion of rural residents differ in their efforts to perform infectious disease surveillance, provide prevention services, and collaborate with partners and stakeholders compared with more urban states?
2. What activities are local health departments (LHDs) engaged in that may be considered preparation for an HIV/HCV outbreak and is there a rural-urban difference in these activities (e.g., services, advocacy)?
3. What socioeconomic characteristics are present in counties at potential risk, and what health professionals and health facility resources are available in the event of an outbreak?

## State Selection

Because the opioid crisis and IDU differ across regions and states, we focused our analyses on 20 states that we identified as potentially at risk for an HIV/HCV outbreak. To select these states, we ranked all 50 states using a composite of three indicators related to IDU, HIV, and HCV. The first indicator was new HIV cases attributable to IDU (rate per 100,000 population)<sup>35</sup> because baseline IDU-related HIV rates provide a marker of future risk potential. Rates of new HIV cases attributable to IDU were collected from AIDSvu and are based on 2015 data.<sup>35</sup> The second indicator was acute HCV rate in 2016 (per 100,000 population)<sup>36</sup> based on a previous study<sup>13</sup> that used the measure as a proxy for IDU. Acute HCV rates were obtained from the CDC Surveillance for Viral Hepatitis website.<sup>36-39</sup> The third indicator, opioid overdose death rate, was selected to show opioid-related burden in a state. Opioid overdose death rates were obtained from the National Institute on Drug Abuse (NIDA) from 2018, reflecting 2016 rates (per 100,000 population).<sup>40</sup>

Based on these three indicators, we calculated a mean rank for each state with tied ranks averaged and selected the top 20 states by mean rank for use in our analyses (Figure 1). The selected states were primarily clustered among Northeast and Appalachian states, with three states located in the Southwest. Of these 20 states, nine had 20 percent or more of the population living in non-metropolitan areas, according to the U.S. Department of Agriculture's Economic Research Service.<sup>41</sup>

**Figure 1. Study Sample of 20 States at Potential Risk for HIV/HCV Outbreak**



Sources: National Institute for Drug Abuse, 2016; AIDSvu, 2015; CDC Surveillance for Viral Hepatitis, 2016.  
NOTE: States selected based on mean rank of a combination of opioid use, HIV and HCV indicators.

## Data and Measures

To understand the state-level resources in at-risk states we analyzed the 2016 Association of State and Territorial Health Officials (ASTHO) Profile Survey for state public health agency activities and the CDC's state 2016 Syringe Exchange Legislation data, comparing states with high rural population (20 percent or more of the total population) to those with a greater proportion of urban residents. At the county level, we used the 2016 National Association of City and County Health Officials (NACCHO) National Profile of Local Health Departments to examine rural-urban differences in LHD activities related to HIV, substance use, and emergency preparedness. Of the 996 counties of interest included in the NACCHO data, 460 (46.2%) were urban counties and 536 (53.8%) were rural counties, including 334 rural adjacent counties (33.5% of total counties) and 202 rural, not adjacent counties (20.3% of total counties). The 2016-17 Area Health Resources File (AHRF) provided data for county-level estimates of population and place characteristics, health professionals, and health facilities. Finally, we used the Rural-Urban Continuum Codes (RUCCs) to classify counties as urban if they were part of a metropolitan statistical area, rural adjacent if they were a non-metropolitan county that abutted an urban county, and rural not adjacent for non-metropolitan counties that did not border an urban county. In some instances, we combined rural adjacent and rural not adjacent counties to create a rural total category.

## Analysis

We used R 3.5.1 (R Foundation for Statistical Computing, Vienna, Austria) to calculate mean rank scores for every state on opioid use, HIV, and HCV indicators to select the

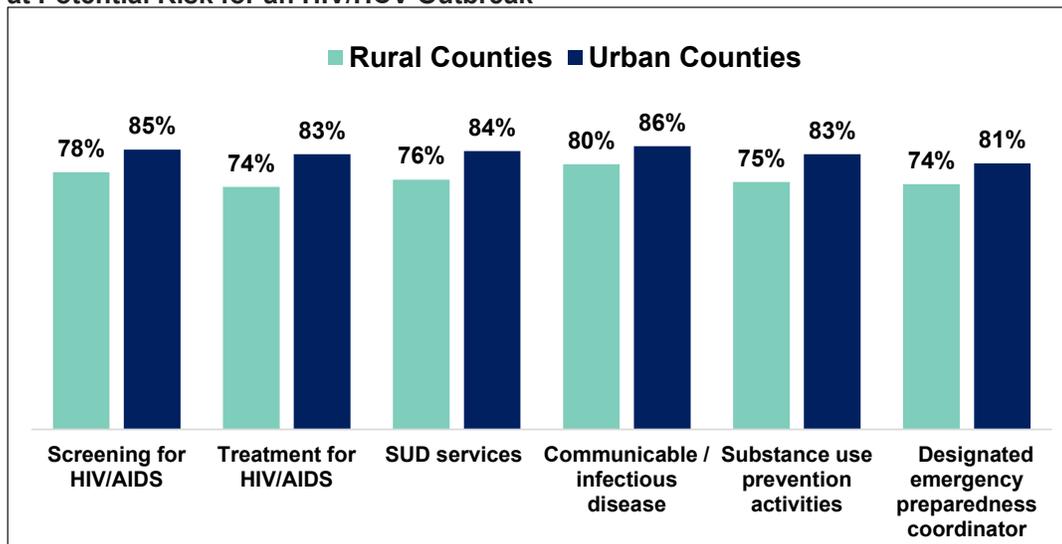
20 states for inclusion in this study. All other statistical analyses were conducted in SAS 9.4 (SAS Institute, Cary, NC). We used bivariate techniques to examine capacity differences across states and counties for the 20 study states, using chi-square tests or t-tests as appropriate.

## FINDINGS

### State Provision of Services and Collaboration

Among the 20 states identified as potentially at-risk for an HIV/HCV outbreak, nearly all state public health agencies provided screening for HIV and sexually transmitted infections (STIs) (96 percent of rural states compared with 100 percent of urban states), STD treatment (92 percent of rural states compared with 100 percent of urban states), and infectious disease surveillance (100 percent of both rural and urban states); undertook primary prevention activities for HIV (100 percent of rural states compared with 96 percent of urban states); and facilitated collaboration and information sharing between various agencies and organizations (85 percent and 96 percent of rural states reported collaborating with local public health agencies and hospitals, respectively, compared with 91 and 100 percent of urban states). There were no statistically significant differences observed between states with higher (20 percent or more) versus lower proportions of rural residents on these measures. However, public health agencies located in more rural at-risk states were significantly less likely than their counterparts with a smaller proportion of rural residents to maintain an HCV registry (50 percent of rural states compared with 78 percent of urban states,  $p = .04$ ), to have a law authorizing syringe exchanges to exist within their borders (24 percent compared with 52 percent,  $p = .05$ ), and to collaborate with law enforcement (85 percent compared with 100 percent,  $p = .05$ ).

**Figure 2. LHD Services and Staff among Rural and Urban Counties Within 20 States at Potential Risk for an HIV/HCV Outbreak**



All residence differences significant at  $p < .05$ .

Data: NACCHO 2016 Profile Survey and Area Health Resource File 2016-17.

## County-Level Services and Staff

Among the 20 states in our study, we identified each county that had at least one LHD providing or contracting out public health services and analyzed its data regarding provision of services and staffing. LHDs in rural counties were less likely than LHDs in urban counties to provide (directly or through contract with another organization) services related to HIV/AIDS and other STIs, infectious disease surveillance activities, and mental health and substance use prevention activities (Figure 2). For example, while 85 percent of urban counties had an LHD that provided or contracted out screening services for HIV/AIDS, only 78 percent of rural counties had an LHD that offered screening directly or through a contract with another organization. Additionally, while 81 percent of urban counties had an LHD with a designated emergency preparedness coordinator, only 74 percent of rural counties had an LHD with this type of professional. Within our sample of states, rural not adjacent counties with an LHD were more likely than their urban counterparts to anticipate a reduction in the subsequent year's budget (32 percent vs. 22 percent, data not shown).

## County-Level Partnerships and Collaboration

LHDs were asked to describe collaborations with external organizations during the past year through shared personnel or resources, written agreements, regularly scheduled meetings, or exchange of information. We observed rural-urban differences in these types of collaboration, especially among LHDs located in rural not-adjacent counties (Figure 3). About one-third of urban counties reported that they had some type of

collaboration in the past year with community health centers, the criminal justice system, or local faith communities. In comparison, 11 percent of rural, not adjacent counties had partnered with a community health center and 8 percent had partnered with criminal justice or faith communities. This rate was slightly higher among rural adjacent counties, where about 17 percent had collaborated with these community organizations.

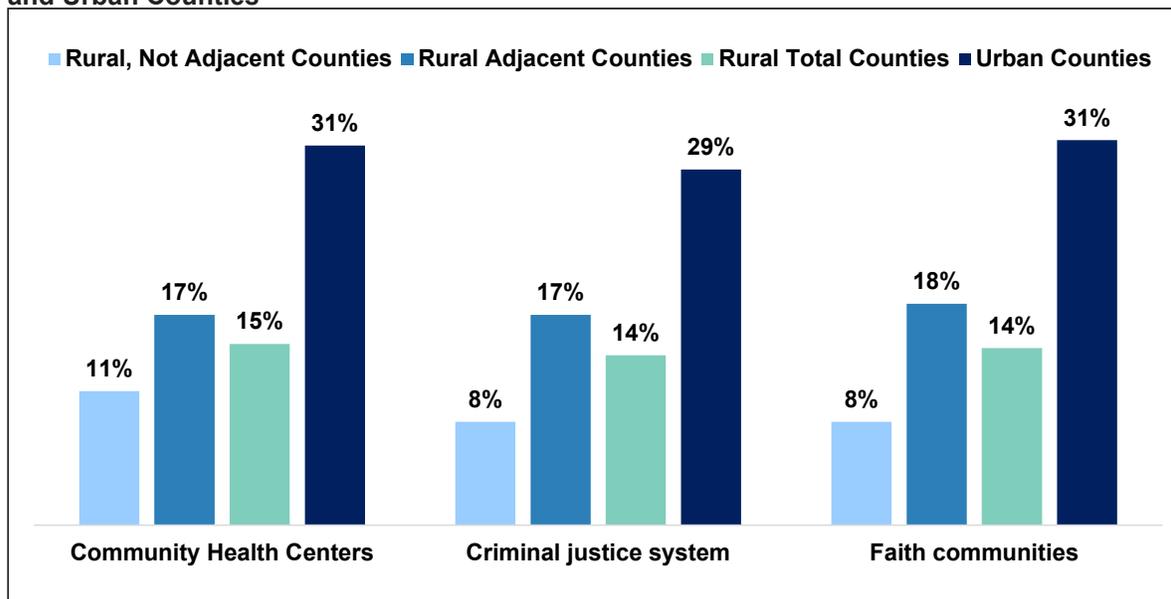
## Population and Place Characteristics

Within at-risk states, rural counties had higher rates of individuals identifying as white or American Indian/Alaska Native and older median age. Rural, not adjacent counties fared worse on indicators of educational attainment, employment, poverty, and household income compared to their rural adjacent and urban counterparts (Figure 4).

## LIMITATIONS

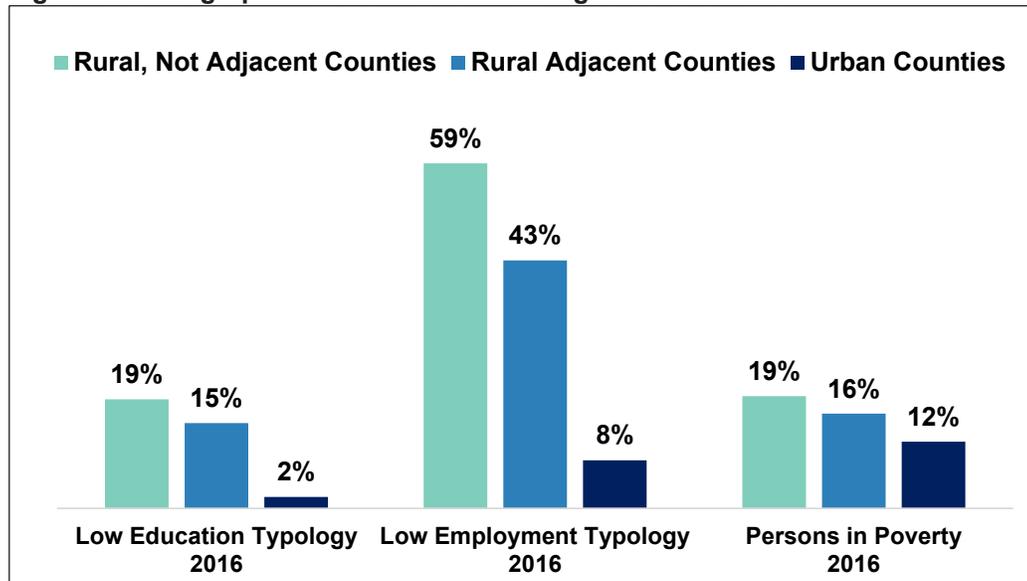
While state overdose death rates indicate significant opioid-related impact, we recognize that this measure does not consider opioid overdoses that did not result in death because of access to naloxone. The NACCHO Profile Survey had a response rate of 76 percent, meaning that some LHDs in our at-risk states were not captured by the survey. For example, only 63 percent of LHDs participated in West Virginia.<sup>17</sup> In cases when there were multiple LHDs in the same county, we considered a service available in that county if any LHD provided that service—we did not capture whether multiple LHDs provided a service. Likewise, if a county did not have an LHD, we did not capture the absence of LHD-provided services. Additionally, these analyses did not

**Figure 3. LHD Partnerships and Collaboration in Rural, Not Adjacent, Rural Adjacent and Urban Counties**



All adjacency differences were significant at  $p < .05$ . Data: NACCHO 2016 Profile Survey

**Figure 4. Demographic Characteristics among At-Risk Counties**



Residence differences significant at  $p < .001$ . Data: Area Health Resource File 2017-18 linked to data from the US Department of Agriculture's Economic Research Service, National Institute for Drug Abuse, AIDSvU, and CDC Surveillance for Viral Hepatitis.

capture services provided by entities that were not LHDs or contracting with LHDs. For example, in addition to services provided or supported by LHDs, healthcare and community-based organizations may independently offer services such as screening and treatment for HIV/AIDS, and SUD treatment services. The state and LHD activities examined in this brief may not represent all of the HIV, HCV, and OUD-related activities in a county. Additionally, findings may not reflect current activities, as data are primarily from 2016.

## DISCUSSION AND POLICY IMPLICATIONS

Based on indicators of elevated HIV/HCV prevalence and opioid misuse, we classified 20 states as being at elevated risk of an HIV/HCV outbreak. Nearly half of these states had higher than average rural population, most of which were clustered in the Northeast and Appalachia. State-level analyses could not identify whether resources differed between rural and urban areas of an individual state; however, we found that states where at least 20 percent of residents are rural were less likely to have HCV registries or laws authorizing syringe exchange.

Our county-level analyses suggest that rural counties in the 20 higher-risk states may be vulnerable to an HIV/HCV outbreak given that a smaller proportion of rural counties had an LHD that provided services related to HIV/HCV, substance use prevention and treatment, and emergency preparedness. Future research on the availability of HIV/HCV-related services in rural areas may benefit from including the presence of non-LHD entities in analyses—including AIDS service organizations, clinics, hospitals, and social service

organizations—to gain a more complete understanding of rural service availability. Another key finding of our county-level analyses is that a smaller proportion of rural counties had an LHD that reported collaborating with community health centers, the criminal justice system, or faith communities. Further research is needed to explore challenges related to establishing these types of collaborations in the rural context.

While rural communities are generally estimated to have lower rates of HIV than their urban counterparts, we know that an outbreak of HIV can spread rapidly through a small rural community.<sup>7</sup> Our findings are evidence of rural-urban capacity differences in all four focus areas of the Ending the HIV Epidemic initiative: diagnoses, treatment, prevention, and response. They also suggest areas of opportunity for rural public health capacity building, such as fostering collaboration between LHDs and organizations such as community health centers, faith communities, and the criminal justice system. These types of partnerships could support and facilitate HIV/HCV-related activities including community education programs, HIV/HCV testing opportunities, and linkage to medical care. Federal and state investment in funding to promote these partnership developments could be an important first step in helping rural communities to better prepare for any future HIV or HCV outbreaks.

## REFERENCES

- Centers for Disease Control and Prevention, Division of HIV/AIDS Prevention. *Ending the HIV epidemic: A plan for America*. <https://www.cdc.gov/endhiv/>. July 30, 2020. Accessed September 15, 2020.
- Fauci, AS, Redfield, RR, Sigounas, G, Weahkee, MD, Giroir, BP. Ending the HIV epidemic: A plan for the United States. *JAMA*. 2019;321(9):844-845.
- Centers for Disease Control and Prevention. *CDC's role in ending the HIV epidemic: A plan for America*. Atlanta, GA: CDC;2019.
- Havens, JR, Walker, R, Leukefeld, CG. Prevalence of opioid analgesic injection among rural nonmedical opioid analgesic users. *Drug Alcohol Depend*. 2007;87(1):98-102.
- Zibbell, JE, Hart-Malloy, R, Barry, J, Fan, L, Flanigan, C. Risk factors for HCV infection among young adults in rural New York who inject prescription opioid analgesics. *Am J Public Health*. 2014;104(11):2226-2232.
- Crosby, RA, Oser, CB, Leukefeld, CG, Havens, JR, Young, A. Prevalence of HIV and risky sexual behaviors among rural drug users: Does age matter? *Ann Epidemiol*. 2012;22(11):778-782.
- Conrad, C, Bradley, HM, Broz, D, et al. Community outbreak of HIV infection linked to injection drug use of oxycodone - Indiana, 2015. *MMWR Morb Mortal Wkly Rep*. 2015;64(16):443-444.
- Gonsalves, GS, Crawford, FW. Dynamics of the HIV outbreak and response in Scott County, in USA, 2011-15: A modelling study. *Lancet HIV*. 2018;5(10):e569-e577.
- Centers for Disease Control and Prevention. Hepatitis C virus infection among adolescents and young adults: Massachusetts, 2002-2009. *MMWR Morb Mortal Wkly Rep*. 2011;60(17):537-541.
- Evans, ME, Labuda, SM, Hogan, V, et al. Notes from the field: HIV infection investigation in a rural area - West Virginia, 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67(8):257-258.
- Gray, ME, Rogawski McQuade, ET, Scheld, WM, Dillingham, RA. Rising rates of injection drug use associated infective endocarditis in Virginia with missed opportunities for addiction treatment referral: A retrospective cohort study. *BMC Infect Dis*. 2018;18(1):532.
- Havens, JR, Lofwall, MR, Frost, SD, Oser, CB, Leukefeld, CG, Crosby, RA. Individual and network factors associated with prevalent Hepatitis C infection among rural Appalachian injection drug users. *Am J Public Health*. 2013;103(1):e44-52.
- Van Handel, MM, Rose, CE, Hallisey, EJ, et al. County-level vulnerability assessment for rapid dissemination of HIV or HCV infections among persons who inject drugs, United States. *J Acquir Immune Defic Syndr*. 2016;73(3):323-331.
- National Association of County & City Health Officials. *Local health department approaches to opioid use prevention and response: An environmental scan*. Washington, DC: National Association of County & City Health Officials; July 2019.
- Meit, M, Hernandez, N, Kronstadt, J. *Establishing and maintaining rural public health infrastructure*. Bethesda, MD: National Opinion Research Center Walsh Center for Rural Health Analysis;2012.
- Meit, M, Harris, K, Bushar, J, Piya, B, Molfino, M. *Rural public health agency accreditation*. Bethesda, MD: National Opinion Research Center at the University of Chicago; June 2008.
- National Association of County & City Health Officials. *2016 national profile of local health departments*. Washington, DC: NACCHO;2017.
- Browne, T, Priestler, MA, Clone, S, Iachini, A, DeHart, D, Hock, R. Barriers and facilitators to substance use treatment in the rural south: A qualitative study. *J Rural Health*. 2016;32(1):92-101.
- Ohl, ME, Perencevich, E. Frequency of human immunodeficiency virus (HIV) testing in urban vs. Rural areas of the United States: Results from a nationally-representative sample. *BMC Public Health*. 2011;11:681.
- Schranz, AJ, Barrett, J, Hurt, CB, Malvestutto, C, Miller, WC. Challenges facing a rural opioid epidemic: Treatment and prevention of HIV and Hepatitis C. *Curr HIV/AIDS Rep*. 2018;15(3):245-254.
- McAllaster, C, Goodrow, G. *New SASI analysis: In the deep south, significant percentages of people most impacted by HIV live outside large urban areas demonstrating a need for increased federal resources*. Durham, NC: Southern HIV/AIDS Strategy Initiative; December 2018.
- Reif, S, Golin, CE, Smith, SR. Barriers to accessing HIV/aids care in North Carolina: Rural and urban differences. *AIDS Care*. 2005;17(5):558-565.
- Schafer, KR, Albrecht, H, Dillingham, R, et al. The continuum of HIV care in rural communities in the United States and Canada: What is known and future research directions. *J Acquir Immune Defic Syndr*. 2017;75(1):35-44.
- Ohl, ME, Richardson, K, Kaboli, PJ, Perencevich, EN, Vaughan-Sarrazin, M. Geographic access and use of infectious diseases specialty and general primary care services by veterans with HIV infection: Implications for telehealth and shared care programs. *J Rural Health*. 2014;30(4):412-421.
- Zeremski, M, Zibbell, JE, Martinez, AD, Kritiz, S, Smith, BD, Talal, AH. Hepatitis C virus control among persons who inject drugs requires overcoming barriers to care. *World J Gastroenterol*. 2013;19(44):7846-7851.
- Klein PW, Geiger T, Chavis NS, Cohen SM, Ofori AB, Umali KT, Hauck H. The Health Resources and Services Administration's Ryan White HIV/aids program in rural areas of the United States: Geographic distribution, provider characteristics, and clinical outcomes. *PLoS One*. 2020;15(3):e0230121. doi:10.1371/journal.pone.0230121
- Chavis NS, Klein PW, Cohen SM, Dempsey A, Hauck H, Cheever LW. The Health Resources and Services Administration (HRSA) Ryan White HIV/aids program's response to the opioid epidemic. *J Infect Dis*. Sep 2, 2020;222(Supplement 5):S477-s485. doi:10.1093/infdis/jiaa230
- Bruggmann, P, Grebely, J. Prevention, treatment and care of hepatitis C virus infection among people who inject drugs. *Int J Drug Policy*. 2015;26(Supplement 1):S22-S26.
- Centers for Disease Control and Prevention. *Managing HIV and hepatitis C outbreaks among people who inject drugs—a guide for state and local health departments*. Baltimore, MD: CDC, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; March 2018.
- Day, E, Hellard, M, Treloar, C, et al. Hepatitis C elimination among people who inject drugs: Challenges and recommendations for action within a health systems framework. *Liver Int*. 2018.
- Hagan, H, Pouget, ER, Des Jarlais, DC. A systematic review and meta-analysis of interventions to prevent hepatitis C virus infection in people who inject drugs. *J Infect Dis*. 2011;204(1):74-83.
- Office of HIV/AIDS and Infectious Disease Policy. *National viral hepatitis action plan 2017-2020*. Washington, DC: U.S. Department of Health and Human Services, Office of the Assistant Secretary for Health; January 2017.
- Rich, KM, Bia, J, Altice, FL, Feinberg, J. Integrated models of care for individuals with opioid use disorder: How do we prevent HIV and HCV? *Curr HIV/AIDS Rep*. 2018;15(3):266-275.
- Elbaum-Williamson, M, Pearson, K, Burgess, A, Lenardson, J, Ziller, E. Voices from the field: A qualitative study of the challenges and promising practices of rural public health in addressing HIV and Hepatitis C. *J Health Hum Serv Adm*. 2021;forthcoming
- Emory University. *AIDSVu*. [Dataset]. <https://www.aidsvu.org>. 2018. Accessed June 13, 2019.
- Centers for Disease Control and Prevention. *Surveillance for viral hepatitis - United States, 2016*. <https://www.cdc.gov/hepatitis/statistics/2016surveillance/>. April 16, 2018, 2018. Accessed April 8, 2020.
- Centers for Disease Control and Prevention. *Surveillance for viral hepatitis - United States, 2011*. Atlanta, GA: CDC;2013.
- Centers for Disease Control and Prevention. *Surveillance for viral hepatitis - United States, 2012*. Atlanta, GA: CDC;2014.
- Centers for Disease Control and Prevention. *Surveillance for viral hepatitis - United States, 2015*. Atlanta, GA: CDC;2018.
- National Institute on Drug Abuse. *Opioid summaries by state*. [Dataset]. <https://www.drugabuse.gov/drugs-abuse/opioids/opioid-summaries-by-state>. 2018. Accessed June 13, 2019.
- United States Department of Agriculture, Economic Research Service. *State fact sheets*. <https://www.ers.usda.gov/data-products/state-fact-sheets/>. 2018. Accessed 13 November, 2018.