# Viral Hepatitis and Injection Drug Use in Appalachian Kentucky: A Survey of Rural Health Department Clients

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# **SYNOPSIS**

**Objectives.** We identified correlates of exposure to hepatitis B and C viruses among health department clients in Appalachian Kentucky, a rural region noted for high poverty and low education. Additionally, we investigated risk factors for transmission, and the frequency of use of preventive measures.

**Methods.** Patients screened for hepatitis B or C at four county health departments in Appalachian Kentucky were administered a routine prescreening questionnaire and an additional survey designed to obtain detailed personal and behavioral risk factor data. These data were linked to produce a more comprehensive dataset for analysis, including test results, which were attached to the prescreening questionnaire.

**Results.** In total, 92 health department clients participated in the study survey. Of these, test results were available for 80 of the clients. Very few subjects who enrolled in this study tested positive for hepatitis B. Twelve out of 80 participants (15%) tested positive for previous exposure to hepatitis C. No participants reported having human immunodeficiency virus.

**Conclusions.** Transmission of hepatitis C in these rural Appalachian communities is predominantly due to injection drug use. Patients with hepatitis C exposure are similar in their demographic and risk profiles as those seen in urban areas and, despite small numbers, can have a serious impact on small, rural public health systems.

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Infection with hepatitis B virus (HBV) and/or hepatitis C virus (HCV) is a serious risk factor for chronic liver disease, including liver cancer and cirrhosis. An abundance of research addresses the prevalence and transmission of these pathogens in highly urbanized contexts, especially among injection drug users (IDUs) and those with human immunodeficiency virus (HIV).<sup>1-4</sup> We investigated the transmission of these viruses in a rural region.

Cases of HBV and HCV infection identified by the Kentucky Department for Public Health, and subsequently reported to the Centers for Disease Control and Prevention's National Notifiable Disease Surveillance System, together with clinical and epidemiologic observations from local health departments, suggest a relatively recent increase in the incidence of HBV and HCV infection in some areas of eastern Kentucky. In 2003, the reported incidence of acute HBV infection was 17.5 per 100,000 in the Kentucky River Area Development District (ADD), which is located in the rural Appalachian region of the state, while the statewide rate was only 2.3 per 100,000. Similarly, acute HCV incidence was 6.7 per 100,000 in the Kentucky River ADD, but only 0.6 per 100,000 statewide.<sup>5,6</sup>

We collected demographic, socioeconomic, and behavioral risk factor data from patients who were screened for HBV and/or HCV at four local health departments within the Kentucky River ADD. We implemented a confidential, self-administered survey that was linked to an existing prescreening questionnaire administered by the health departments.

# **METHODS**

# **Study location**

The Kentucky River ADD comprises seven counties and borders Virginia toward the southeast. All of these counties are among the 51 in central and eastern Kentucky that are designated as Appalachian by the Appalachian Regional Commission, a federal body created to enhance the economy, infrastructure, and health of Americans who live in the greater Appalachian region, which stretches from New York to Mississippi. Like much of Appalachia, the Kentucky River ADD is very rural. The city of Hazard, Kentucky—the largest in the region—had a population of 4,867 in 2006.<sup>7</sup> This sparsely populated and geographically isolated region is also marked by very high poverty and unemployment rates.<sup>8</sup>

The four health departments that participated in our study were selected because they had received grants to fund free or low-cost HBV and/or HCV screening, and because they are within the area boasting high rates

of HBV and HCV. All sites are part of the Kentucky River District Health Department (which includes all counties in the Kentucky River ADD except one), a collaborator in this research.

### **Data collection**

Data collection activities specific to this study consisted of a survey instrument that was self-administered by participating subjects. This survey was linked to a prescreening questionnaire routinely administered at the health departments to anyone receiving HBV or HCV testing, and which becomes part of their medical file at each health department. The health department's prescreening questionnaire included questions designed to capture basic demographic and risk factor data. This study's survey was designed to collect additional personal and risk factor data in a highly confidential manner, including more detailed information about sexual practices and drug use not available in the prescreening questionnaire. The survey also inquired about participants' HIV status.

Nurses administered prescreening questionnaires at the health departments in face-to-face interviews, prior to drawing blood for tests or asking about clients' interest in study participation. The test results were subsequently recorded in the same document. In contrast, the subjects completed the survey questionnaires in a private room, after the blood draw, and after the patient had consented to participate in the study. The study survey was also provided on compact disc, along with the required audio equipment, for subjects with limited literacy. This option was made available to all subjects, but nurses were not present during the time the survey was completed and did not observe or record whether the audio version was used.

All answers were recorded on the printed version and, once completed, were returned by the participants in a sealed envelope to the health department nurse. The survey did not contain any personal identifiers, but had a numerical code that was also recorded in the prescreening questionnaire for subsequent matching of the data from both instruments. The sealed study survey was then mailed to the investigators, together with a copy of the prescreening questionnaire stripped of the patient's personal identifiers. These procedures ensured double confidentiality: the health department personnel did not see the individual study survey responses, and the investigators remained blinded to the identity of all study subjects.

The surveys were administered from September 2006 to April 2007 in Counties A, B, and C, and from May 2007 to July 2007 in County D. Only patients 18 years of age or older who were being tested for HBV

and/or HCV during these intervals, and at one of the four specified health departments, were allowed to participate in the study.

This study was approved by the University of Kentucky Medical Institutional Review Board (IRB), as well as the Kentucky Cabinet for Health and Family Services IRB. In addition, we obtained a Certificate of Confidentiality from the National Institutes of Health to ensure the confidentiality of subjects' responses vis-à-vis law enforcement, given the sensitive nature of many questions on the study survey.

# Screening tests

The local health departments where this research was conducted generally used an HCV antibody (anti-HCV) screening test to detect exposure to HCV. Because this test only measures previous exposure to HCV, positive results should not be construed as evidence of active HCV infection. Previously cleared HCV infections, as well as active acute and chronic infections, might be indicated by a positive anti-HCV test result.

The hepatitis B surface antigen (HBsAg) test was most often employed in three of the four counties (Counties A-C) to detect exposure to HBV. Unlike the anti-HCV test, the HBsAG test checks for current infection (acute or chronic) with HBV.

### **Analysis**

Due to the observational nature of this study and the relatively small number of participants, we focused the data analysis on descriptive statistics to show the prevalence of demographic, socioeconomic, and behavioral risk factors in the study group. For this analysis, we recoded some variables related to hepatitis transmission on the basis of risk. Thus, those who always used a condom during sex were compared with those who never, sometimes, and mostly used condoms. Variables recoded in this manner (i.e., always vs. never/sometimes/mostly) also included use of a new syringe when injecting drugs, and condom use during sex with IDUs. Similarly, those who did not have tattoos were combined with those who received tattoos in licensed parlors for comparison with those who received tattoos from friends, while in prison, or in some other setting. Thus, responses were dichotomized to form a low-risk category (no tattoos at all, or only tattoos received from a professional) and a high-risk category (tattoos likely to have been received from amateurs using nonsterile equipment). Body piercing was handled in an identical fashion.

Statistical analysis included summary statistics and cross-tabulations with Chi-square and Fisher's exact tests. We conducted these analyses using Stata® Version 10.0.9

# **RESULTS**

During the study period in which the surveys were administered, approximately 2,500 patients were seen for any reason at the four health departments. Health department staff estimated that fewer than half of these patients were adults. Of the adults, 123 were screened for HBV and/or HCV and 92 agreed to complete the study survey, resulting in a 74.8% participation rate. Among these 92, however, there were four women who completed surveys, but for whom we could not locate prescreening questionnaires. These four cases were excluded from analysis of test results, as these data were obtained from the prescreening questionnaires. Men were only slightly more likely than women to participate (78.6% vs. 72.8%, respectively), as were subjects older than 30 years of age. Furthermore, fewer participants tested for anti-HCV were found to be positive (15.0%) compared with those who did not participate in the study (25.9%).

According to the 119 prescreening questionnaires available, 53 patients were self-referrals with reported risk factors, 21 were self-referrals without reported risk factors, and 15 were screened while primarily at the health department for some other service. Two participants reported symptoms of acute hepatitis, and three were referred by another medical provider. Those remaining either did not give a specific reason or were being retested.

Table 1 shows the characteristics of the 92 respondents based on their answers to the study survey, presented for men and women separately, and for the group overall. Almost 45.0% of respondents were aged 18-29 years, and almost as many (43.5%) were aged 30-49 years. Regarding education, almost a third did not complete high school, and none of the respondents had completed a four-year college degree. About 63.0% of participants received government assistance of some kind (e.g., Social Security Income or Women, Infants and Children), and more than half had no health insurance. Among the 47.8% who reported having health insurance, most selected Medicare or Medicaid as their provider. Less than 20.0% of study participants were employed full-time, and only 7.6% were employed part-time. These figures suggest participants in this study likely had lower incomes than the mean for this region, which already has high unemployment and poverty compared with the U.S. as a whole. County-level unemployment ranged from 6.7% to 9.9% in 2007 for the four counties in which the health departments were located,10 and Census 2000 poverty estimates ranged from 29.1% to 45.4%.7

Table 1 also includes test results for anti-HCV and

Table 1. Characteristics of Kentucky River District Health Department clients who were tested for HBV and/or HCV, 2006–2007

Characteristics         N         Percent         N         Percent         N           Age group (in years)         0         0.0         6         10.2         6           √30         14         42.4         27         45.8         41           30-49         17         51.5         23         39.0         40           ≥50         2         6.1         3         5.1         5           Total         33         100.0         59         100.0         92           Education         Missing         0         0.0         1         1.7         1           Missing         0         0.0         1         1.7         1 <high diploma<="" school="" td="">         22         66.7         39         66.1         61           Total         33         100.0         59         100.0         92           Current employment         22         66.7         39         66.1         61           Missing         1         3.0         1         1.7         2           Unemployed current employment         8         24.2         10         16.9         18           Employed full-time</high>	Both		/omen	Women			
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Yes       9       27.3       10       16.9       19         Living with significant other Total       4       12.1       13       22.0       17         Total       33       100.0       59       100.0       92         Government assistance         Missing       0       0.0       1       1.7       1         No       15       45.5       18       30.5       33         Yes       18       54.6       40       67.8       58         Total       33       100.0       59       100.0       92         Health insurance         No       19       57.6       29       49.2       48         Yes—Medicaid or Medicare       10       30.3       29       49.2       39         Yes—private insurance       4       12.1       1       1.7       5         Total       33       100.0       59       100.0       92         Anti-HCV <sup>a</sup> Negative       25       80.6       43       87.8       68	58.7						9
Living with significant other       4       12.1       13       22.0       17         Total       33       100.0       59       100.0       92         Government assistance         Missing       0       0.0       1       1.7       1         No       15       45.5       18       30.5       33         Yes       18       54.6       40       67.8       58         Total       33       100.0       59       100.0       92         Health insurance         No       19       57.6       29       49.2       48         Yes—Medicaid or Medicare       10       30.3       29       49.2       39         Yes—private insurance       4       12.1       1       1.7       5         Total       33       100.0       59       100.0       92         Anti-HCVa         Negative       25       80.6       43       87.8       68	20.7						
Total     33     100.0     59     100.0     92       Government assistance     Missing     0     0.0     1     1.7     1       No     15     45.5     18     30.5     33       Yes     18     54.6     40     67.8     58       Total     33     100.0     59     100.0     92       Health insurance     No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	18.5						
Government assistance       Missing     0     0.0     1     1.7     1       No     15     45.5     18     30.5     33       Yes     18     54.6     40     67.8     58       Total     33     100.0     59     100.0     92       Health insurance     9     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	100.0						
Missing     0     0.0     1     1.7     1       No     15     45.5     18     30.5     33       Yes     18     54.6     40     67.8     58       Total     33     100.0     59     100.0     92       Health insurance     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	100.0	72	100.0	39	100.0	33	
No     15     45.5     18     30.5     33       Yes     18     54.6     40     67.8     58       Total     33     100.0     59     100.0     92       Health insurance     No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	4.4	4	4.7	4	0.0	0	
Yes     18     54.6     40     67.8     58       Total     33     100.0     59     100.0     92       Health insurance     No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	1.1						9
Total     33     100.0     59     100.0     92       Health insurance     No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	35.9						
Health insurance       No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	63.0						
No     19     57.6     29     49.2     48       Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68	100.0	92	100.0	59	100.0	33	
Yes—Medicaid or Medicare     10     30.3     29     49.2     39       Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCVa       Negative     25     80.6     43     87.8     68							
Yes—private insurance     4     12.1     1     1.7     5       Total     33     100.0     59     100.0     92       Anti-HCV <sup>a</sup> Negative     25     80.6     43     87.8     68	52.2						
Total 33 100.0 59 100.0 92 Anti-HCV <sup>a</sup> Negative 25 80.6 43 87.8 68	42.4		49.2	29	30.3	10	
Anti-HCV <sup>a</sup> Negative  25 80.6  43 87.8  68	5.4	5	1.7	1	12.1	4	Yes—private insurance
Negative 25 80.6 43 87.8 68	100.0	92	100.0	59	100.0	33	Total
							Anti-HCV <sup>a</sup>
	85.0	68	87.8	43	80.6	25	Negative
	15.0	12					
Total 31 100.0 49 100.0 80	100.0			49		31	Total
HBsAq <sup>a</sup>							HBsAa <sup>a</sup>
	96.0	48	96.7	29	95.0	19	
Positive 1 5.0 1 3.3 2	4.0						=
Total 20 100.0 30 100.0 50	100.0						

 $<sup>^{\</sup>mathrm{a}}$ Test results are reported only for those who were tested for anti-HCV (n=80) or HBsAg (n=50) and for whom results were known.

HBV = hepatitis B virus

HCV = hepatitis C virus

 $<sup>\</sup>mathsf{Anti}\text{-}\mathsf{HCV} = \mathsf{HCV} \; \mathsf{antibody}$ 

HBsAg = hepatitis B surface antigen

HBsAg screening. Not all study participants received both tests. Among the 80 tested for anti-HCV, 15.0% were positive. Among the 50 tested for HBsAg, only 4.0% were positive, and because of the small numbers of these cases, we limited the remaining analysis to

Cross-tabulations of test results and risk factors for hepatitis transmission are listed in Table 2. A higher proportion of positive anti-HCV test results was evident for almost all potential risk factors for bloodborne virus transmission. Positive test results were significantly associated with injecting drugs, having sex with IDUs, having sex with someone known or suspected to have hepatitis, and having tattoos or body piercings from somewhere other than a tattoo parlor. Other risk factors were more common among participants with positive test results, but these associations were not statistically significant. This might be due to the small number of participants.

### DISCUSSION

This small observational study indicated a strong association between positive HCV test results and injection drug use as a mode of transmission in this rural Appalachian region. Eight of the 14 IDUs for whom we had test results were found to be positive for anti-HCV. Although the numbers are small, they indicate that 57% of IDUs in our sample tested positive for anti-HCV. This percentage is similar to that noted by Weightman et al.,11 who found a 51% prevalence of anti-HCV among primary care patients in Scotland with a history of injecting, and Armstrong et al., 12 who found a prevalence of 48% in a similar population from the National Health and Nutrition Examination Survey.

Studies of populations in rural areas at high risk of HCV and/or HBV infection are not common in the literature, perhaps because prevalence is typically higher in urban areas.<sup>11,13</sup> Less common still are such studies from North America. Some examples, however, include Vogt et al.,14 who identified an HBV outbreak among IDUs in Wyoming; Stratton et al., 15 who described the prevalence of HCV on Prince Edward Island, Canada; and Poulin et al.,16 who noted an outbreak of HBV related to injection drug use in rural Nova Scotia, Canada. Furthermore, we are unaware of any studies conducted in the Appalachian region that directly address HCV and HBV infection and risk factors. Havens et al.<sup>17</sup> noted a self-reported prevalence of HCV of 15% among IDUs in a recent study in Appalachian Kentucky, although this was not the focus of their study. Combined with the results of this study, these

data suggest the importance of further research into injection drug use and HCV in Appalachia specifically, and rural America in general.

Almost three out of four participants in this study had sex without a condom in the three months preceding the study, putting them at risk for transmitting HBV (and possibly HCV) as well as other bloodborne viruses. Considering that almost one in three respondents indicated they had sex with an IDU, and more than one in four indicated they had sex with someone they knew or suspected had hepatitis, it seems unusual that more subjects did not test positive for HBsAg. This might be explained, however, by the fact that HBsAg is a marker of current infection, probably chronic, and not previous exposure (unlike the anti-HCV test). If we had tested for hepatitis B core total (immunoglobulin M + immunoglobulin G) antibody (anti-HBc or HBctotal Ab), a marker of previous exposure to HBV, instead of HBsAg, a higher number of individuals probably would have been found to have been previously exposed to HBV.

Because HCV is inefficiently transmitted sexually, 18-20 the risk factors in Table 2 related to sexual behaviors might not be very important for HCV transmission, despite a higher incidence of anti-HCV positive test results among those who did not use condoms. It is likely, however, that these results reflect a tendency for high-risk drug-taking and sexual behaviors to occur together in individuals. For example, of the 18 subjects who reported injecting drugs, 16 (88.9%) also reported they had had sex, without using a condom, with a partner who injects drugs; only 19 of 73 non-IDUs (26.0%) reported the same. Similarly, three out of four women who admitted having sex for drugs or money were IDUs. Thus, our results should not be understood to suggest that risky sexual activity contributed heavily to the transmission of HCV in this population. Rather, we believe the low prevalence of condom use among those who tested positive for anti-HCV indicates a serious potential risk for contracting (or transmitting) HBV and other bloodborne pathogens, particularly HIV.

The prevalence of acquired immunodeficiency syndrome in Kentucky is currently very low compared with the urban settings of other research addressing viral hepatitis infection and drug use. At 70.6 per 100,000, it is less than half of the nationwide rate (174.5 per 100,000).<sup>21</sup> None of the participants in the current study said they were HIV-positive, but two reported never receiving the results of a previous HIV test. Addressing viral hepatitis infection and injection drug use in eastern Kentucky now could help maintain the low rate of HIV infection.

Table 2. Anti-HCV test results and risk factors for transmission among Kentucky River District Health Department clients, 2006–2007

Characteristics	Positive		Negative		
	N	Percent	N	Percent	P-value <sup>a</sup>
Education					
<high school<="" td=""><td>5</td><td>20.8</td><td>19</td><td>79.2</td><td>0.36</td></high>	5	20.8	19	79.2	0.36
≥High school	7	12.7	48	87.3	
Employment <sup>b</sup>					
Full- or part-time	1	4.2	23	95.8	0.09
Unemployed	10	18.5	44	81.5	
Age (in years)					
<30	5	13.2	33	86.8	0.18
30–49	5	13.9	31	86.1	
≥50	2	50.0	2	50.0	
Number of lifetime sex partners <sup>b</sup>					
<10	5	10.6	42	89.4	0.25
≥10	6	20.0	24	80.0	
Recent condom use					
Always	2	10.0	18	90.0	0.72
Never/sometimes/mostly	10	17.2	48	82.8	
Injects drugs					
Yes	8	57.1	6	42.9	< 0.01
No	4	6.1	62	93.9	
Uses new needle <sup>c</sup>					
Always	4	80.0	1	20.0	0.30
Never/sometimes/mostly	4	44.4	5	55.6	
Sex with injection drug user <sup>b</sup>					
Yes	8	36.4	14	63.6	< 0.01
No	3	5.3	54	94.7	
Condom use with injection drug user <sup>c</sup>					
Always	0	0.0	1	100.0	1.00
Never/sometimes/mostly	8	38.1	13	61.9	
Sex for drugs or money					
Yes	2	66.7	1	33.3	0.06
No	10	13.5	64	86.5	
Sex partner with hepatitis	_	00.5			
Yes	6	33.3	12	66.7	0.02
No	6	10.0	54	90.0	
Tattoos	_				
Yes, from prison, friend, other	7	26.9	19	73.1	0.05
Tattoos from parlor or no tattoos	5	9.8	46	90.2	
Body piercing <sup>b</sup>	_		_		
Yes, from prison, friend, other	1	20.0	4	80.0	0.56
Body piercing from parlor or no piercings	10	14.3	60	85.7	

 $<sup>^{\</sup>rm a}\mbox{Results}$  of Chi-square or Fisher's exact tests where cell numbers are  ${<}5$ 

 $<sup>{}^{\</sup>mathrm{b}}\mathrm{These}$  questions were not answered by all 12 respondents who had a positive anti-HCV test.

<sup>&</sup>lt;sup>c</sup>These questions pertain only to those who said they inject drugs or those who indicated having sex with an injection drug user, respectively. Anti-HCV = hepatitis C virus antibody

# Limitations

This study had some limitations. First, participants in the study might differ substantially from those who were tested but elected not to participate. For example, those who participated were generally older (mean age = 32.9 years) than those who were eligible and declined (mean age = 27.9 years). Additionally, 25.9% of those who did not participate tested positive for anti-HCV, compared with only 15.0% of those who did. What these data might suggest, however, is that those who refused participation might have been even more likely to practice risky behaviors than those who enrolled in the study.

Second, study subjects, as a subset of health department patients, might be less educated and poorer than the local community at large. Furthermore, some of the counties in the study area are among the most disadvantaged in the U.S. 8,22 This is an important consideration because some researchers have found higher rates of HCV infection in groups with these characteristics. 12,23 Our intent in this study, however, was only to document that viral hepatitis transmission related to injection drug use exists in rural contexts, in addition to those more commonly reported in urban areas.

Third, the tests used to screen for HBV (HBsAg) and HCV (anti-HCV) measure different things. The anti-HCV detects the response of the host to the infection with HCV and, therefore, is a marker of previous exposure to HCV. A positive anti-HCV test is not an indicator of current infection, and further testing is necessary to confirm active infection. The HBsAg test, on the other hand, detects an actual viral particle and, therefore, is a marker of current infection with HBV. Hepatitis B infection resolves spontaneously in a high percentage of cases, resulting in the loss of the HBsAg viral particle. Thus, our findings should not be understood to indicate the rate of current HCV infection. Rather, our findings indicate a history of exposure to HCV. Conversely, our findings indicate current infection rather than the rate of previous exposure to HBV.

The number of subjects who participated in this study was also very small in absolute terms, but the populations of the rural counties in which the collaborating health department branches were located were also very small—three out of four had populations less than 8,000 in 2007.<sup>7</sup> Thus, even a small number of cases could overwhelm these communities' public health systems, especially given the high levels of poverty in the region.

# **CONCLUSIONS**

While this study cannot estimate the prevalence of HBV or HCV in the local population, it indicates that greater resources might be required to control the spread of these viruses, as well as those with similar modes of transmission, such as HIV, in this region. A recent study funded by the Appalachian Regional Commission found high rates of opiate addiction-related hospital admissions in coal mining regions of Appalachia—including the region we focused on—that continue to rise.<sup>24</sup> The same study noted a need for more substance abuse treatment facilities. This study suggests that, in addition to more treatment facilities, integrating services for hepatitis B and C (and other bloodborne pathogens) with substance abuse treatment should be considered.<sup>25,26</sup>

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