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## Rural HIV Prevalence and Service Availability in the United States: A Chartbook

Katherine Ahrens PhD

*University of Southern Maine, Muskie School of Public Service*

Amanda Burgess MPPM

*University of Southern Maine, Muskie School of Public Service, Maine Rural Health Research Center*

Louisa Munk

*University of Southern Maine, Muskie School of Public Service, Maine Rural Health Research Center*

Erika Ziller PhD

*University of Southern Maine, Muskie School of Public Service, Maine Rural Health Research Center*Follow this and additional works at: [https://digitalcommons.usm.maine.edu/population\\_health](https://digitalcommons.usm.maine.edu/population_health)Part of the [Health Policy Commons](#), and the [Health Services Research Commons](#)

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# Rural HIV Prevalence and Service Availability in the United States

## A CHARTBOOK

February 2021



Maine  
Rural Health  
Research Center

**R H R C**

**Rural Health Research  
& Policy Centers**

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## **A Chartbook**

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[www.ruralhealthresearch.org](http://www.ruralhealthresearch.org)

Maine Rural Health Research Center  
Muskie School of Public Service  
University of Southern Maine

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# Table of Contents

## SECTION 1: HIV Prevalence 2016

### 1.1 State-Level HIV Prevalence

- Figure 1: Map of HIV Prevalence, by State 1
  - Jurisdictions with the Highest HIV Prevalence
  - Jurisdictions with the Lowest HIV Prevalence
- Figure 2: HIV Prevalence, by Census Region

### 1.2 County-Level HIV Prevalence

- Data Availability 2
  - Figure 3: Percentage of Counties with Suppressed HIV Prevalence Data in AtlasPlus, by Rurality
  - Figure 4: Percentage of Counties with Suppressed HIV Prevalence Data in AtlasPlus, by Rurality and Census Region
- Estimated HIV Prevalence by County 3
  - Figure 5: HIV Prevalence, by Rurality
  - Figure 6: Map of HIV Prevalence, by Rurality
  - Figure 7: State Rank of HIV Prevalence, by Rurality 4

## SECTION 2: HIV Services 2019

### 2.1 Availability of HIV-Related Services in the National Prevention Information Network Database

- HIV-Related Service Availability 5
  - Figure 8: Percentage of Counties with One or More HIV-Related Service Available, by Rurality
  - Figure 9: Percentage of Counties with One or More HIV-Related Service Available, by Rurality and Census Region
  - Figure 10: Map of Counties with One or More HIV-Related Service Available
- HIV Service Availability 6
  - Figure 11: Percentage of Counties with One or More HIV Service Available, by Rurality
  - Figure 12: Percentage of Counties with One or More HIV Service Available, by Rurality and Census Region
  - Figure 13: Map of Counties with One or More HIV Service Available
- HIV Testing Services 7
  - Figure 14: Percentage of Counties with HIV Testing Service Availability, by Rurality
  - Figure 15: Percentage of Counties with HIV Testing Service Availability, by Rurality and Census Region
  - Figure 16: Map of Availability of HIV Testing Services
- HIV Rapid Testing Services 8
  - Figure 17: Percentage of Counties with HIV Rapid Testing Service Availability, by Rurality
  - Figure 18: Percentage of Counties with HIV Rapid Testing Service Availability, by Rurality and Census Region
  - Figure 19: Map of Availability of Rapid Testing Services
- HIV Prevention Education 9
  - Figure 20: Percentage of Counties with HIV Prevention Education Available, by Rurality
  - Figure 21: Percentage of Counties with HIV Prevention Education Available, by Rurality and Census Region
  - Figure 22: Map of Availability of HIV Prevention Education
- PrEP Service Availability 10
  - Figure 23: Percentage of Counties with PrEP Services Available, by Rurality
  - Figure 24: Percentage of Counties with PrEP Services Available, by Rurality and Census Region
  - Figure 25: Map of PrEP Service Availability



## SECTION 2: HIV Services 2019 (continued)

### 2.1 Availability of HIV-Related Services in The National Prevention Information Network Database

HIV/AIDS Medical Treatment Service Availability 11

- Figure 26: Percentage of Counties with HIV/AIDS Medical Treatment Service Available, by Rurality
- Figure 27: Percentage of Counties with HIV/AIDS Medical Treatment Service Available, by Rurality and Census Region
- Figure 28: Map of HIV/AIDS Medical Treatment Service Availability

## SECTION 3: Conclusion

Conclusion 12

## SECTION 4: Technical Notes

### 4.1 HIV Prevalence 2016

HIV Prevalence Technical Notes 13

### 4.2 HIV Services 2019

HIV Services Technical Notes 15

Endnotes

Appendix A

Prepared by

**Katherine Ahrens, PhD**  
**Amanda Burgess, MPPM**  
**Louisa Munk, MPH**  
**Erika Ziller, PhD**

of the

**Maine Rural Health Research Center**  
Muskie School of Public Service  
University of Southern Maine



## Introduction

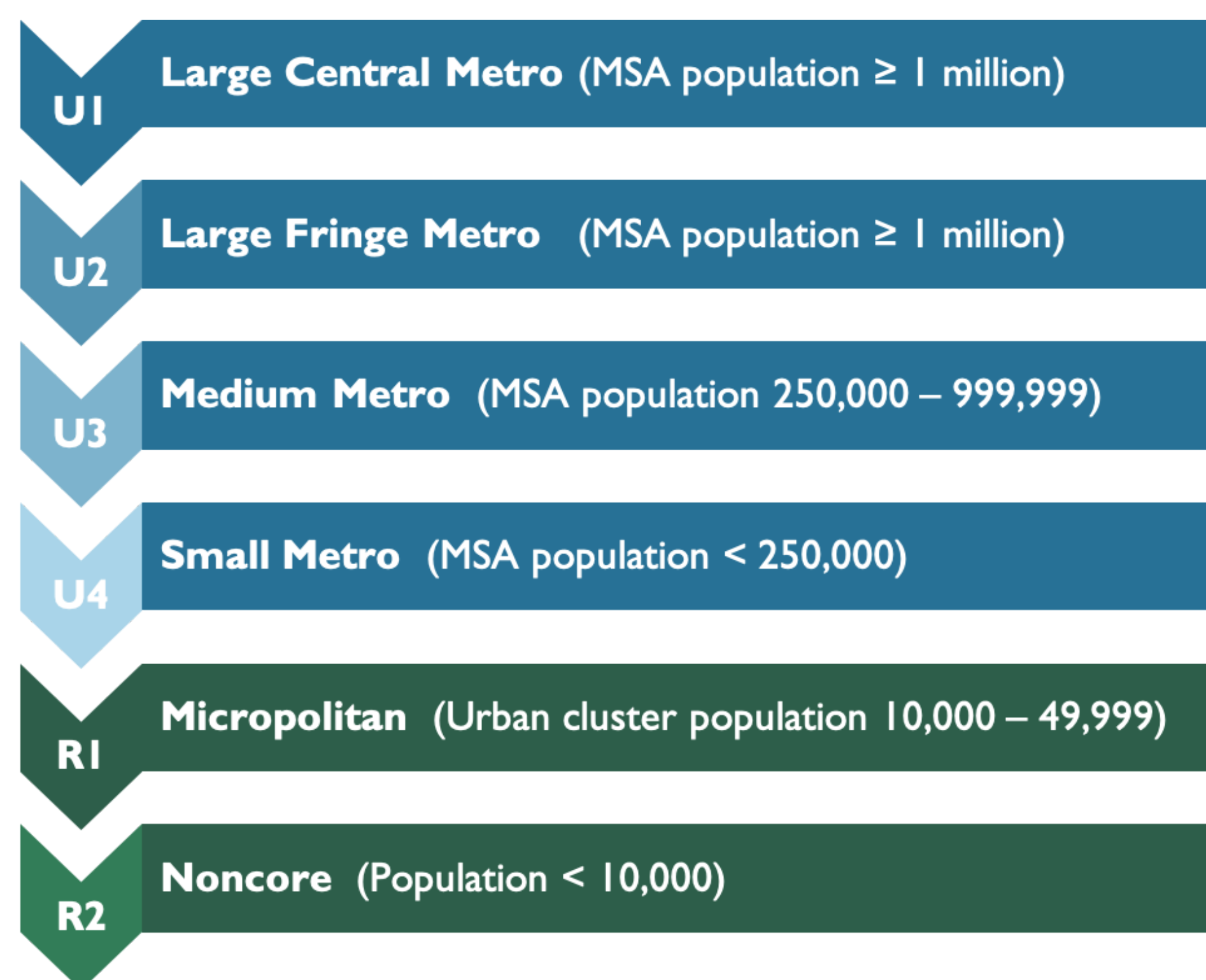
The Centers for Disease Control and Prevention (CDC) estimates that at the end of 2016, 1.14 million people in the United States were living with HIV, including an estimated 162,500 individuals who were not yet diagnosed.<sup>1</sup> HIV prevention, diagnosis, and treatment are a national public health priority. In 2019, the US Department of Health and Human Services launched *Ending the HIV Epidemic: A Plan for America*, a cross-agency initiative to leverage scientific advances in HIV prevention, diagnosis, treatment, and outbreak response.<sup>2</sup> The initiative aims to decrease HIV infections in the United States by 75 percent by 2025 and 90 percent by 2030. The first phase of the initiative focuses on areas of the United States that are most impacted by HIV, including 48 counties, Washington DC; San Juan, Puerto Rico; and seven states the CDC has identified as having a substantial rural HIV burden (Alabama, Arkansas, Kentucky, Mississippi, Missouri, Oklahoma, and South Carolina).

This chart book provides an update to the South Carolina Rural Health Research Center's 2013 report *HIV/AIDS in Rural America: Prevalence and Service Availability*, which examined rural-urban HIV prevalence in 2008 and availability of Ryan White medical providers. The research found that HIV prevalence for rural counties was highest in southern states; but within these states, rates were higher in urban counties than rural. The report also found lower availability of Ryan White providers in rural compared with urban counties.<sup>3</sup>

### Urban-Rural Classification Scheme for Counties:

County-level rurality was defined using the National Center for Health Statistics (NCHS) 2013 Urban-Rural Classification Scheme for Counties, which categorizes counties into six mutually exclusive groups: large central metro (**U1**), large fringe metro (**U2**), medium metro (**U3**), small metro (**U4**), micropolitan (**R1**), and noncore (**R2**).<sup>4</sup>

Throughout this chartbook, analyses are presented across the NCHS six-level rurality classification scheme, and by an aggregated two-level urban/rural variable.



This chart book examines 2016 HIV prevalence and the availability of HIV prevention, testing, and treatment services across the rural-urban continuum and by US Census region. Publicly available county-level HIV prevalence data from the CDC and state-produced HIV surveillance reports were used to estimate HIV prevalence across the rural-urban continuum. HIV prevalence data include all diagnoses of HIV infection, with or without a stage 3 (AIDS) diagnosis. Geocoded data on organizations that provide prevention, testing, and treatment services related to HIV were obtained from the National Prevention Information Network (NPIN).

### The primary research questions investigated in this chartbook are:

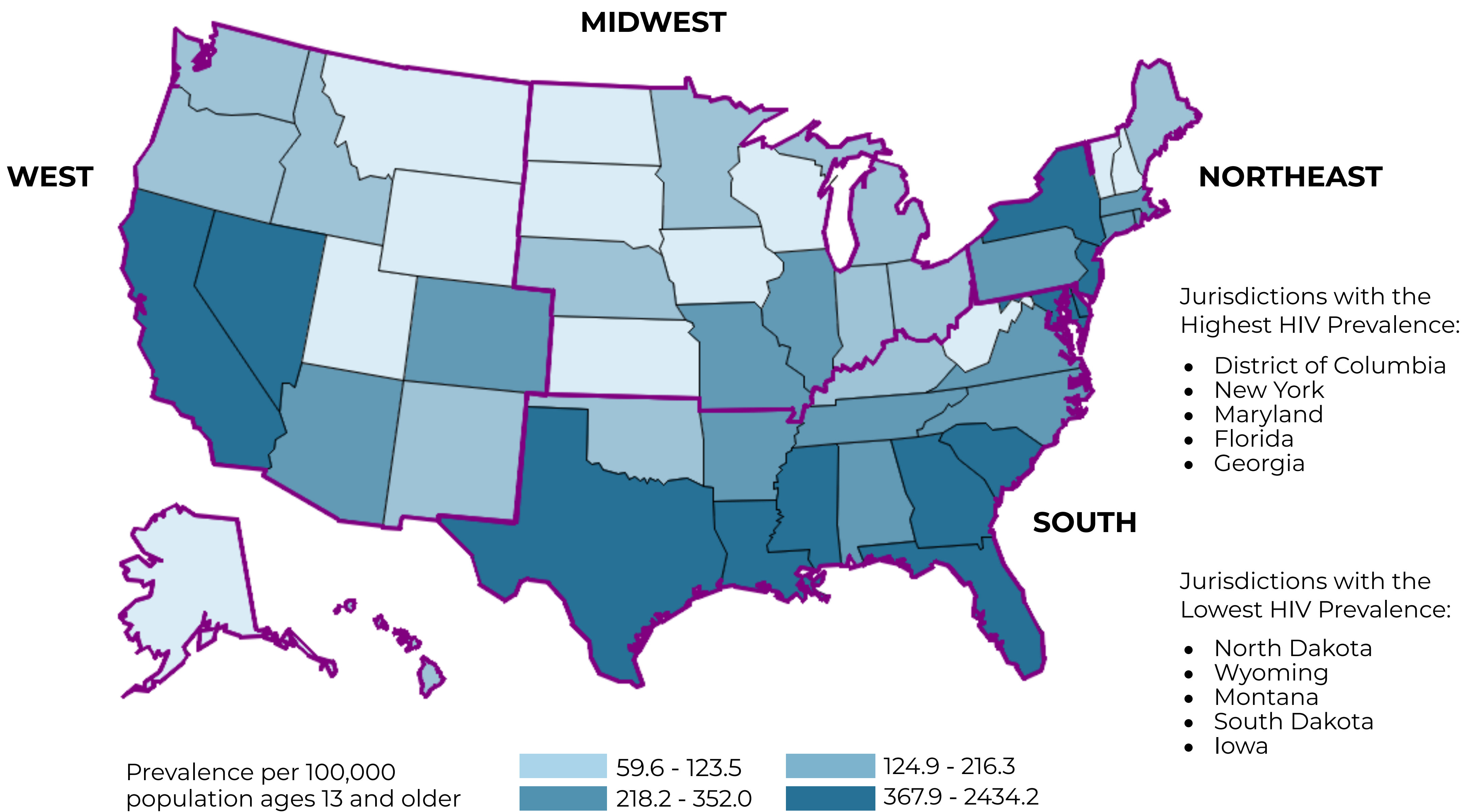
1. What is the prevalence of HIV by rurality of county and US Census region?
2. What is the availability of HIV prevention, testing, and treatment services by rurality of county and US Census region?



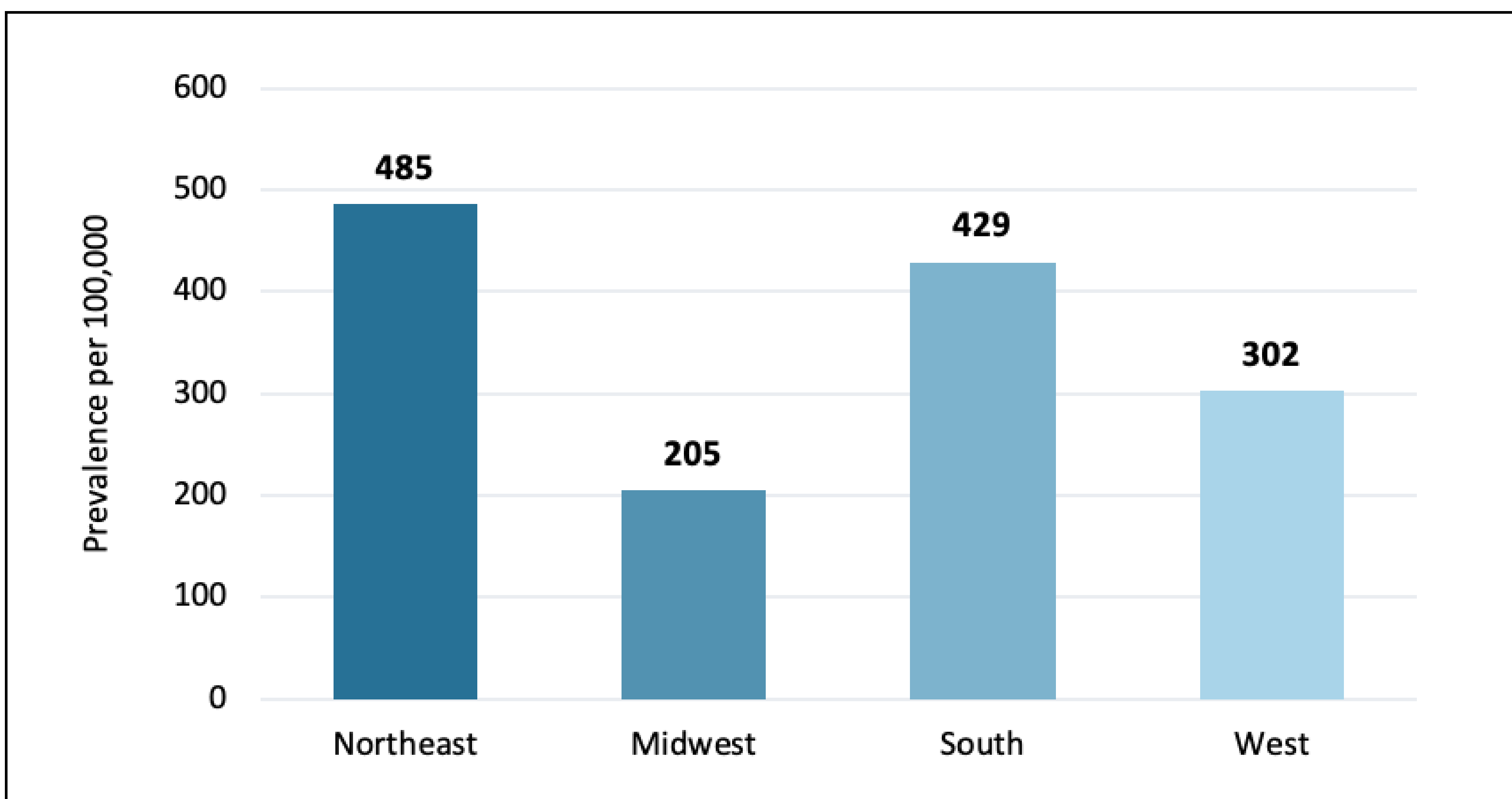
1.1 State-Level HIV Prevalence

Data on state-level HIV prevalence in 2016 from the CDC’s AtlasPlus database show variation across US states and Census regions. HIV prevalence ranges from 60 per 100,000 population in North Dakota to 2,434 per 100,000 population in Washington, DC. Four of the five jurisdictions with the highest HIV prevalence in 2016 are located in the southern Census region. Across the US Census regions, HIV prevalence is highest in the Northeast (458 per 100,000 population) and lowest in the Midwest (205 per 100,000 population).

**Figure 1: Map of HIV Prevalence, by State**



**Figure 2: HIV Prevalence, by Census Region**





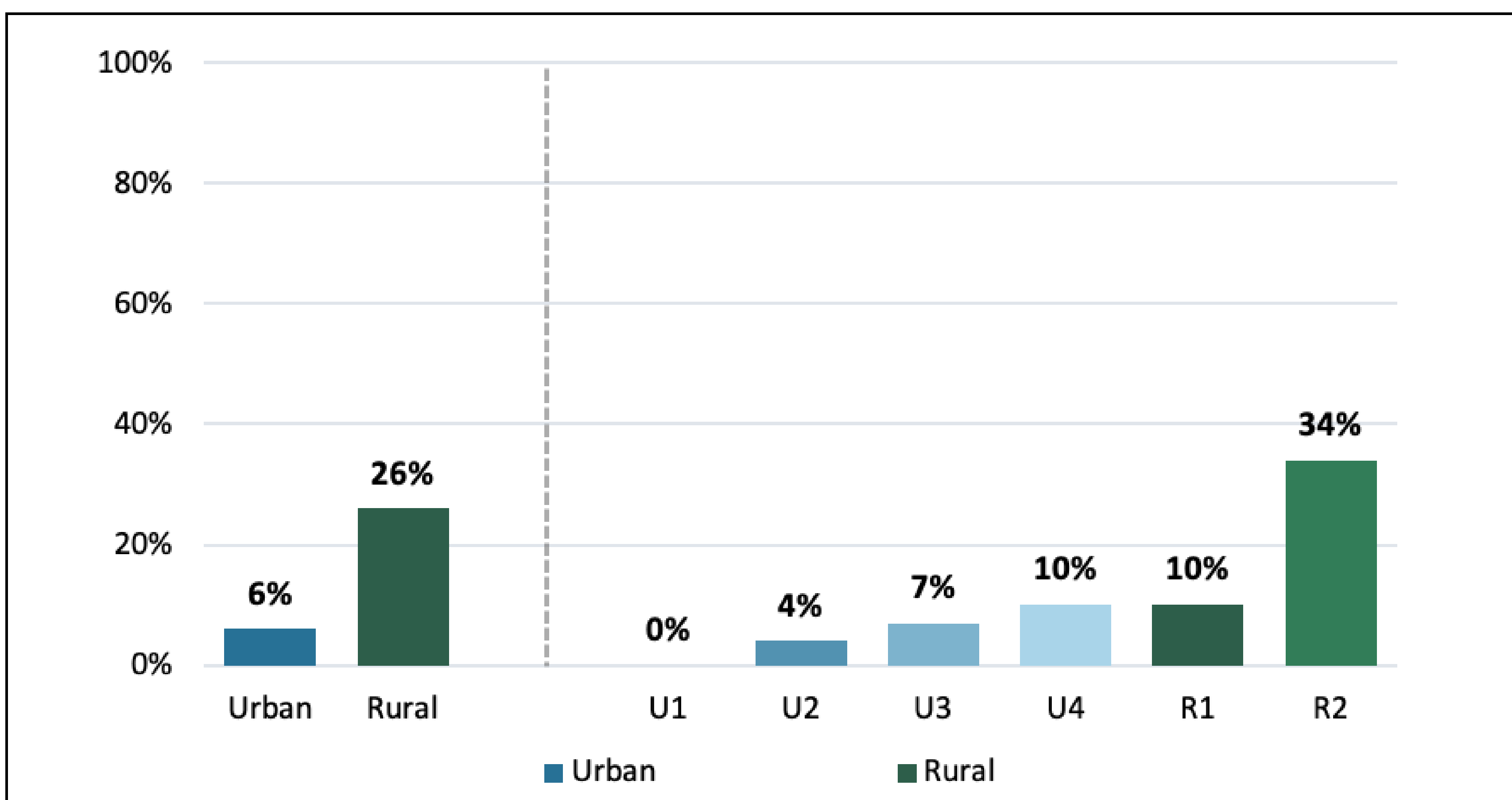
### Methods

We used data from the CDC's AtlasPlus database to estimate HIV prevalence by county and county-level rurality. For counties with suppressed or incomplete AtlasPlus HIV prevalence data, we used state HIV surveillance reports to fill in missing county-level data. See technical notes and the Appendix for additional information.

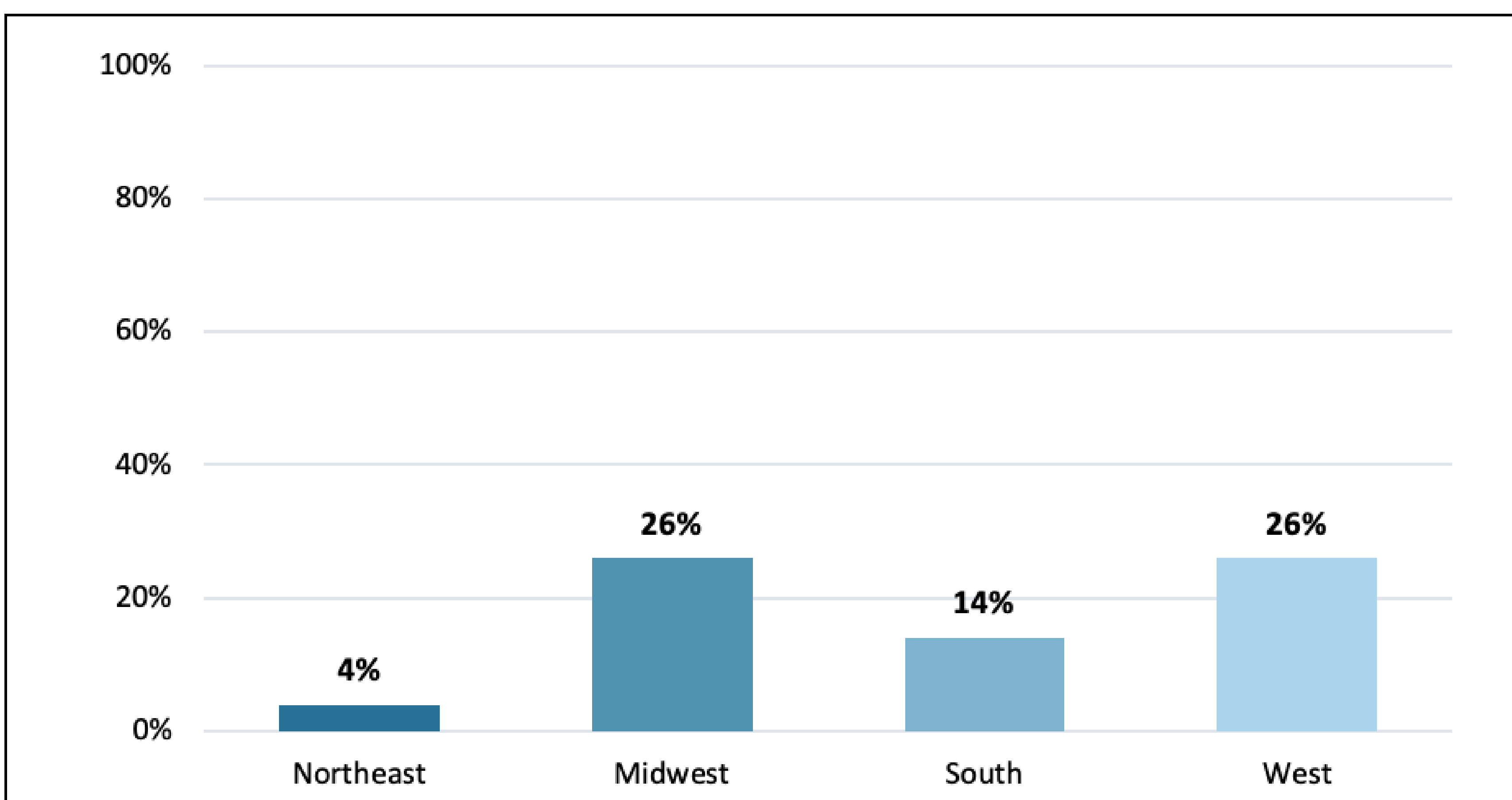
### Data Availability

County-level HIV prevalence data were suppressed in AtlasPlus for 593 counties across 37 states (20 percent of counties in the US) in 2016, in accordance with data sharing agreements. In many cases, data were suppressed because there were fewer than five identified persons living with HIV in the county. Compared with urban counties, a greater proportion of rural counties had HIV data suppressed (26 percent of rural counties compared with 6 percent of urban counties). Across the US Census regions, the West and Midwest had the largest proportion of counties with suppressed HIV prevalence data in AtlasPlus.

**Figure 3: Percentage of Counties with Suppressed HIV Prevalence Data in AtlasPlus, by Rurality**



**Figure 4: Percentage of Counties with Suppressed HIV Prevalence Data in AtlasPlus, by Census Region**

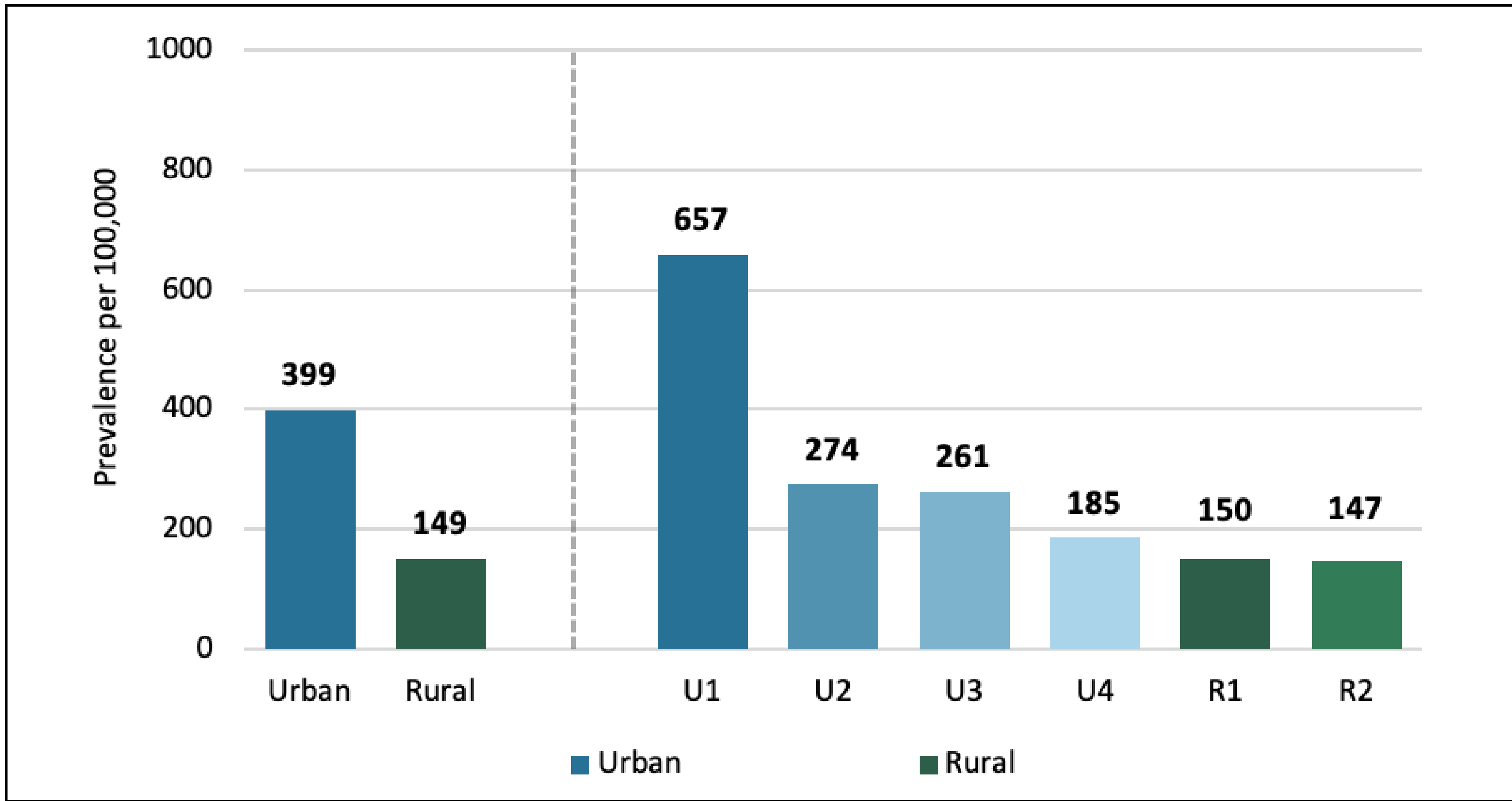




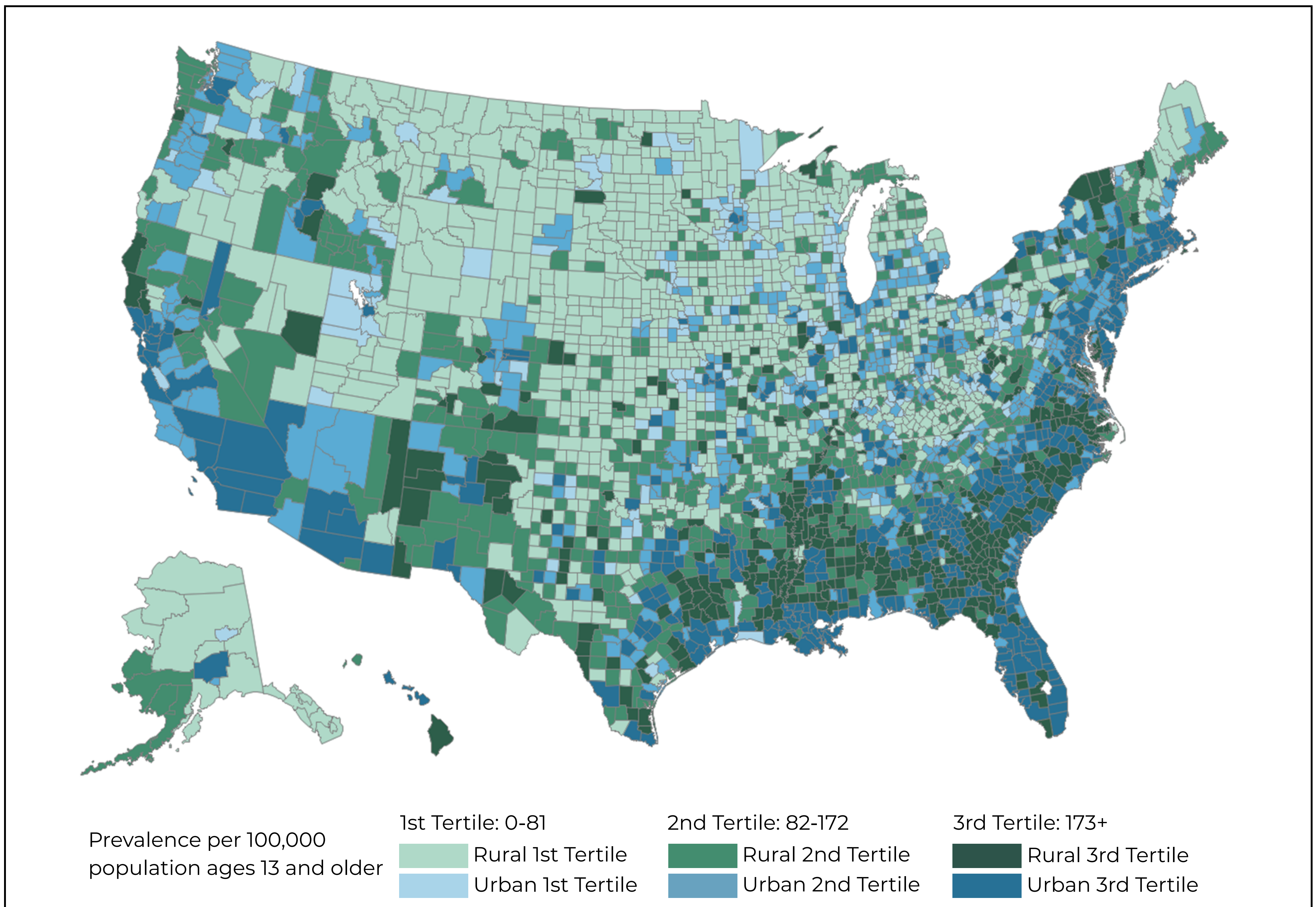
**Estimated HIV Prevalence, by County**

HIV prevalence was higher among urban counties (399 per 100,000) than rural counties (149 per 100,000), with prevalence decreasing with increasing rurality. Rural and urban counties in the top tertile of HIV prevalence (above 173 per 100,000) were primarily located in the South.

**Figure 5: HIV Prevalence, by Rurality**



**Figure 6: Map of HIV Prevalence, by Rurality**

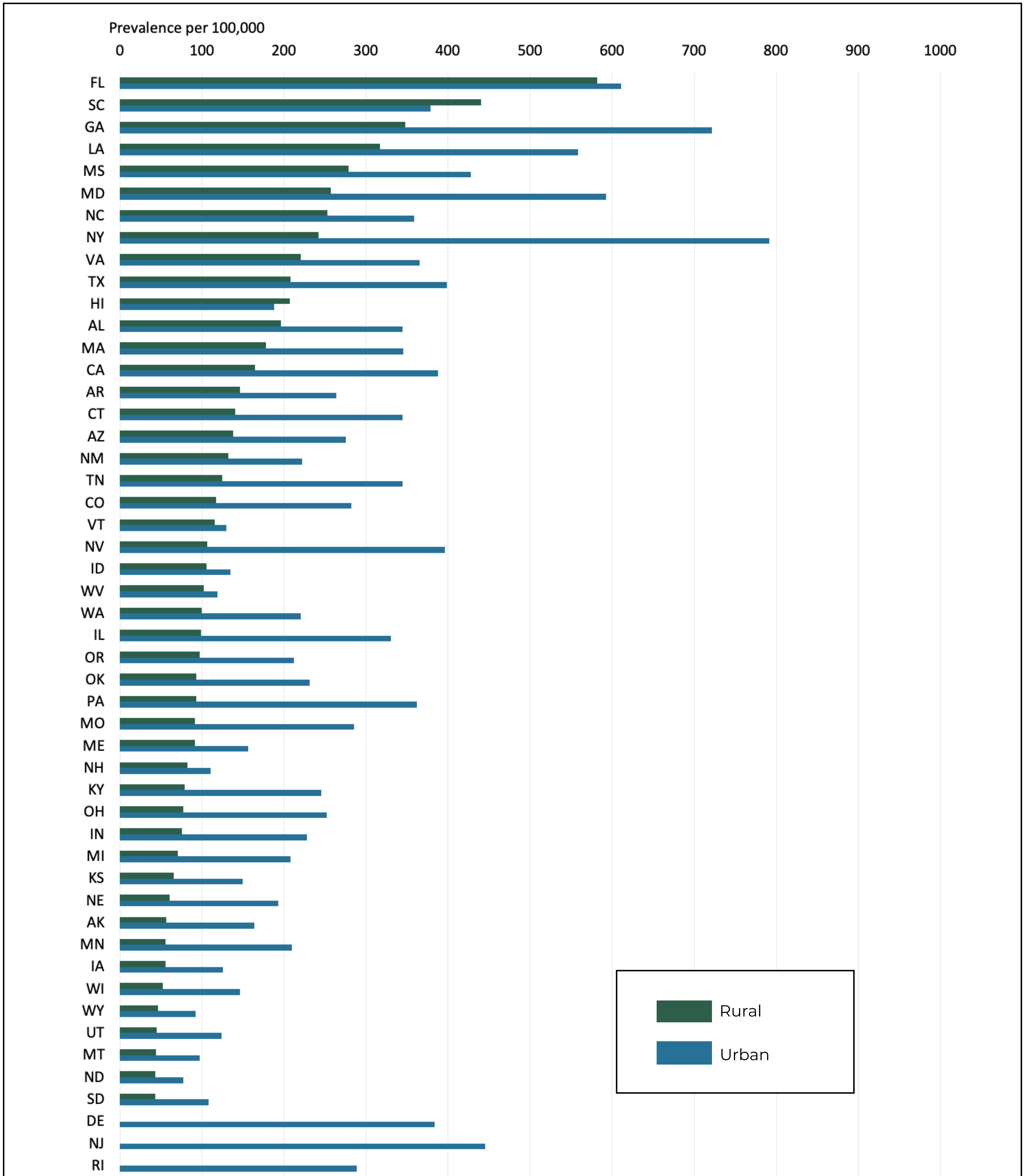




**Rural and Urban HIV Prevalence, by State**

The five states with the highest rural HIV prevalence were located in the South (Florida, South Carolina, Georgia, Louisiana, and Mississippi). Urban HIV prevalence was higher than rural county-level HIV prevalence in all but two states (South Carolina and Hawaii).

**Figure 7: Rural and Urban HIV Prevalence, Ordered by Rural HIV Prevalence**



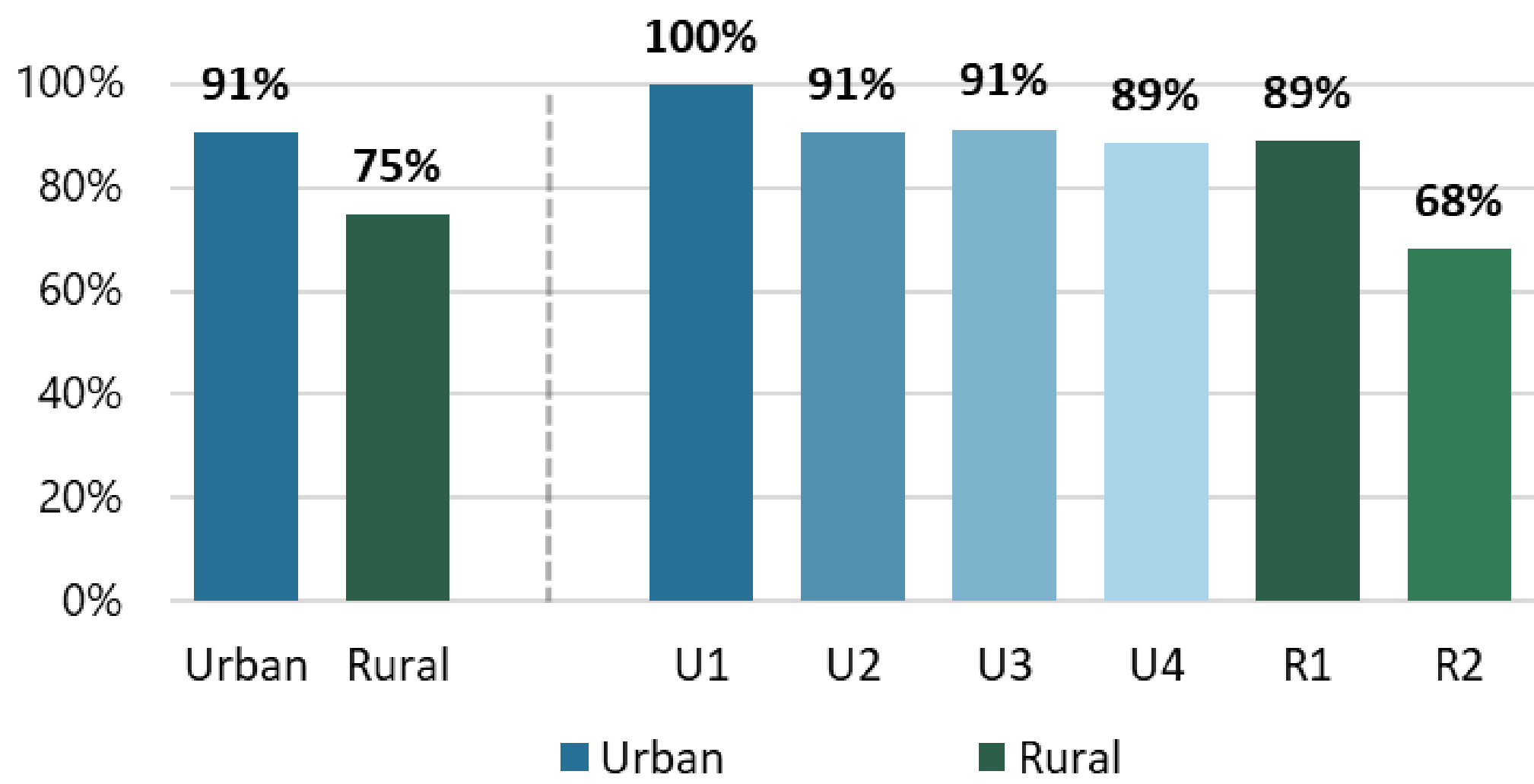
\*Figure excludes Washington, DC, which was classified as an urban area and had an HIV prevalence of 2,445 per 100,000 population.



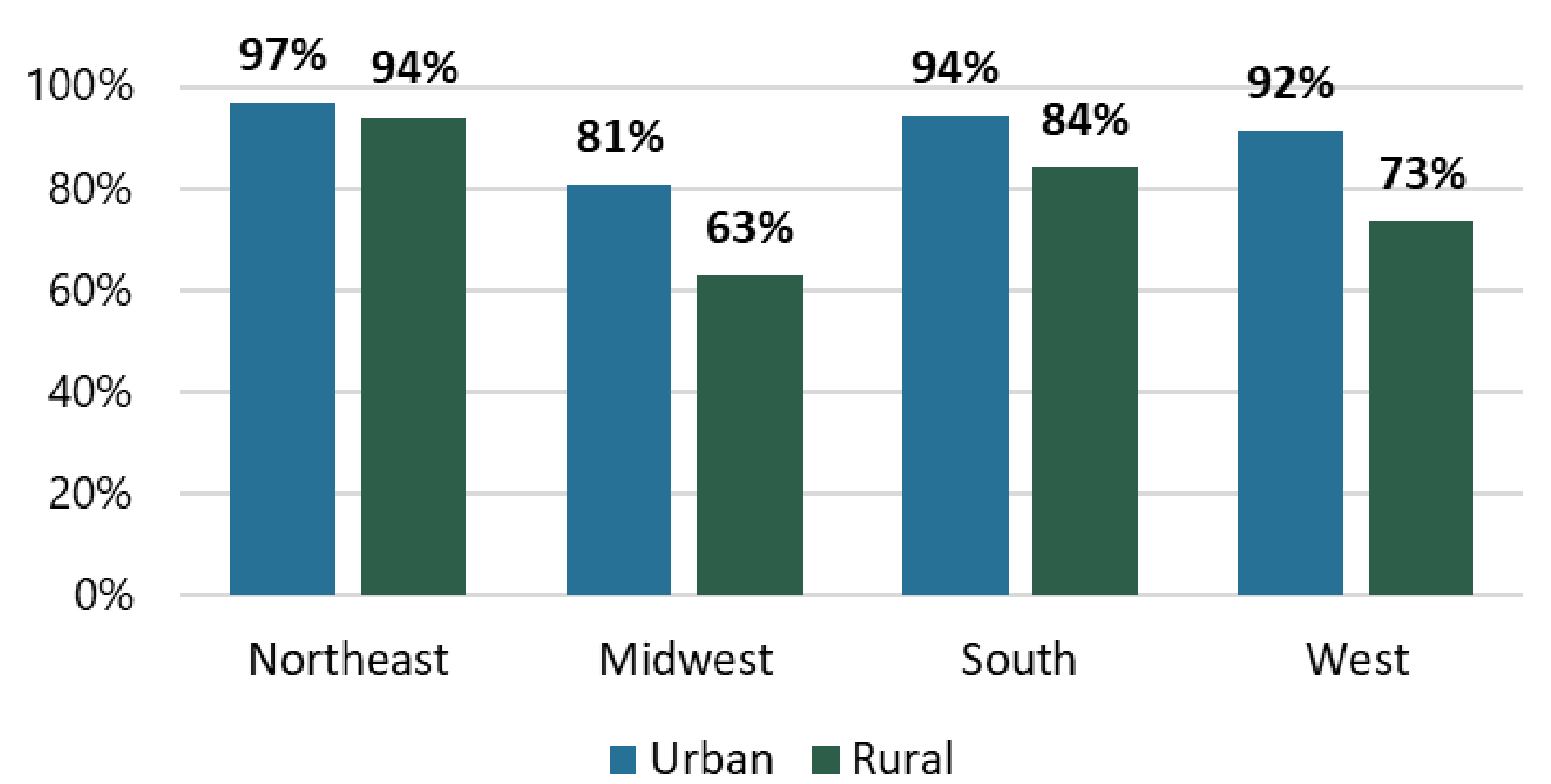
**HIV-Related Service Availability**

The 16 HIV-related services included in this analysis were: conventional blood HIV testing, rapid blood HIV testing, conventional oral HIV testing, rapid oral HIV testing; testing services for chlamydia, gonorrhea, syphilis, herpes, and HCV; HIV prevention education, hepatitis prevention education, Pre-Exposure Prophylaxis (PrEP), Post-Exposure Prophylaxis (PEP), PrEP navigation and support services, HIV medical treatment, and hepatitis C virus (HCV) treatment and care. Counties were categorized as having one or more HIV-related service available if any of the 16 services were offered in that county by an organization listed in the National Prevention Information Network Database.

**Figure 8: Percentage of Counties with One or More HIV-Related Service Available, by Rurality**



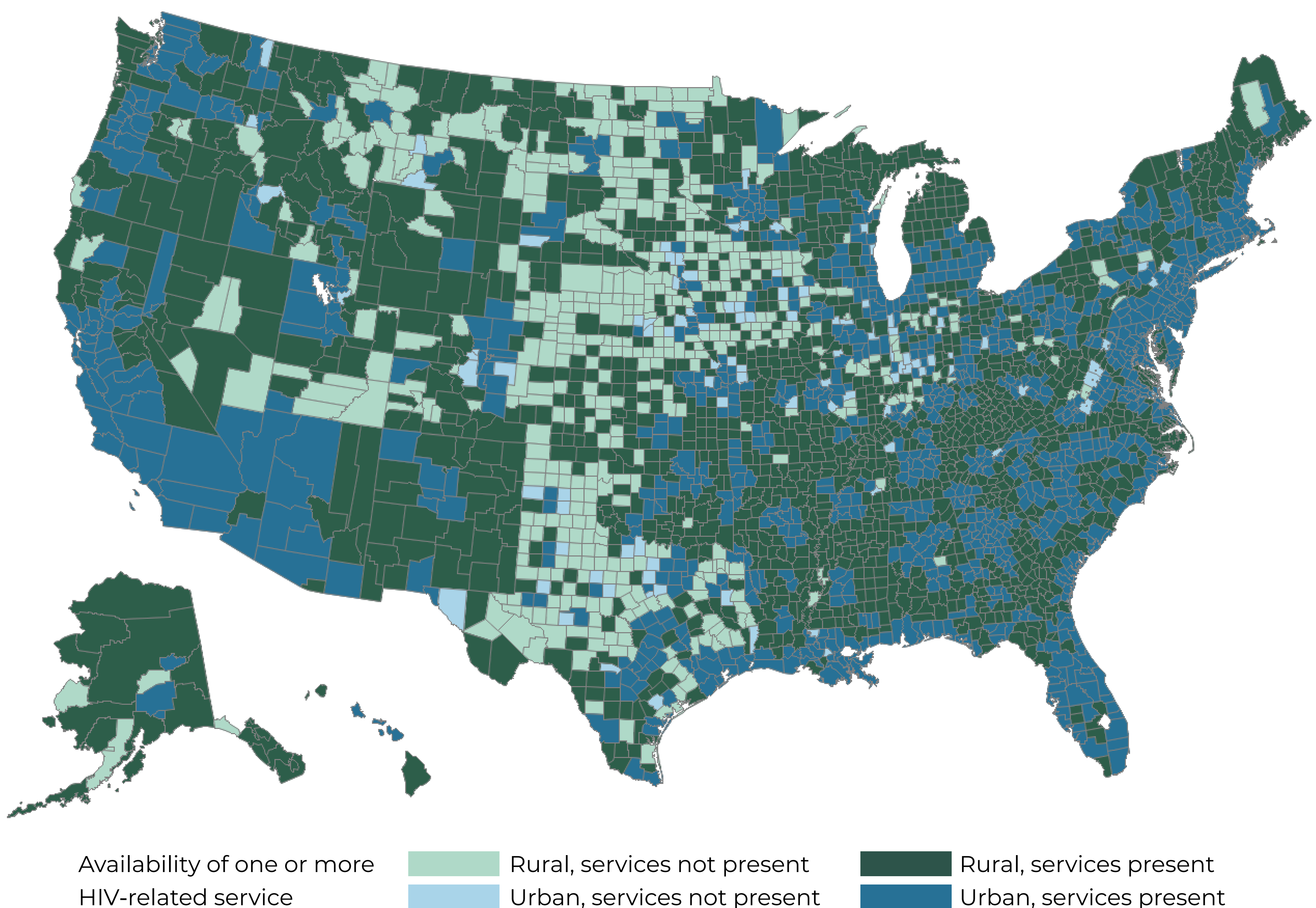
**Figure 9: Percentage of Counties with One or More HIV-Related Service Available, by Rurality and Census Region**



**KEY TAKEAWAYS:**

- Compared with urban counties, a smaller proportion of rural counties had organizations in the county that provided one or more HIV-related service.
- Compared with urban counties in the same Census region, a smaller proportion of rural counties in the Midwest, South, and West had organizations in the county that provided one or more HIV-related service.

**Figure 10: Map of Counties with One or More HIV-Related Service Available**

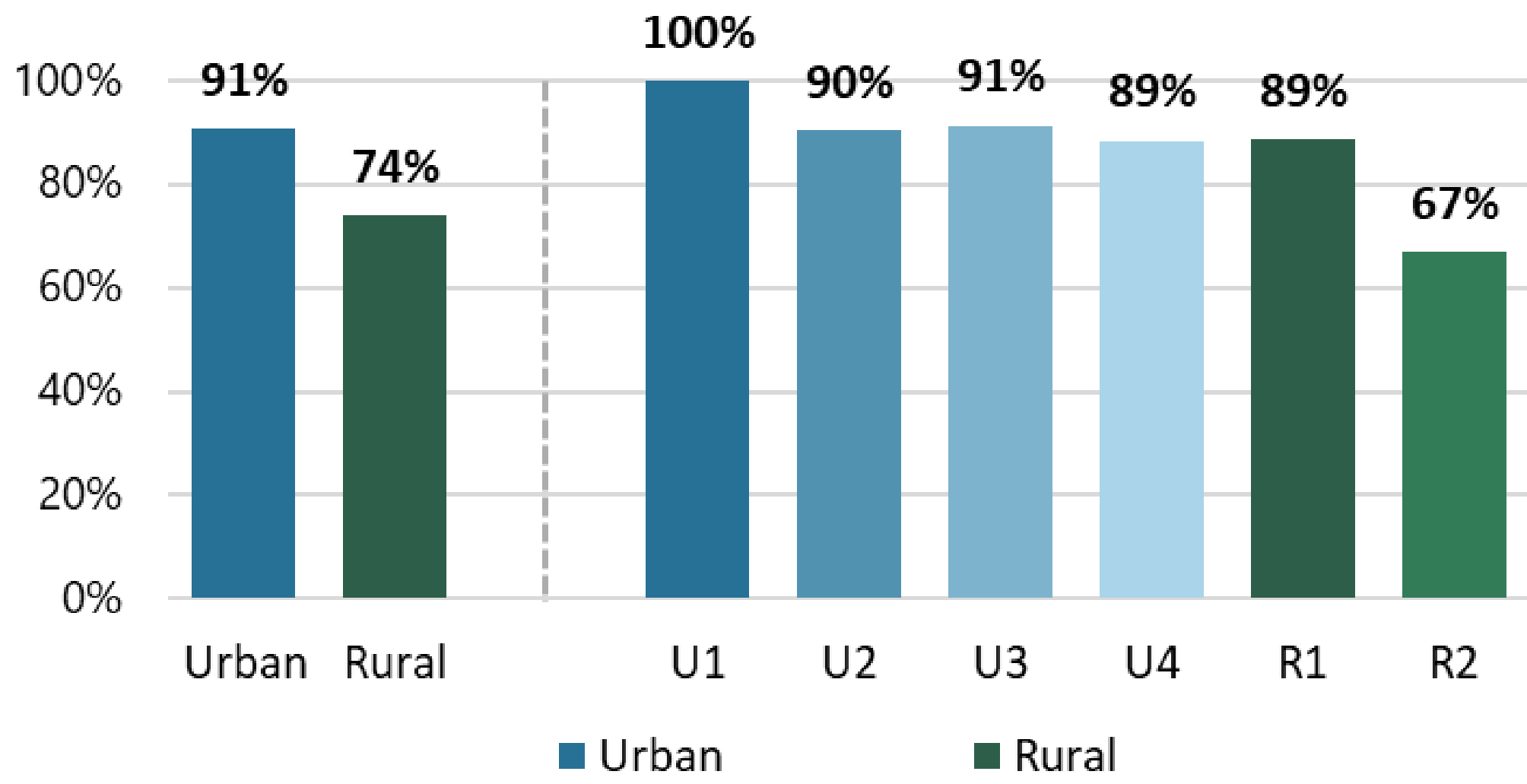




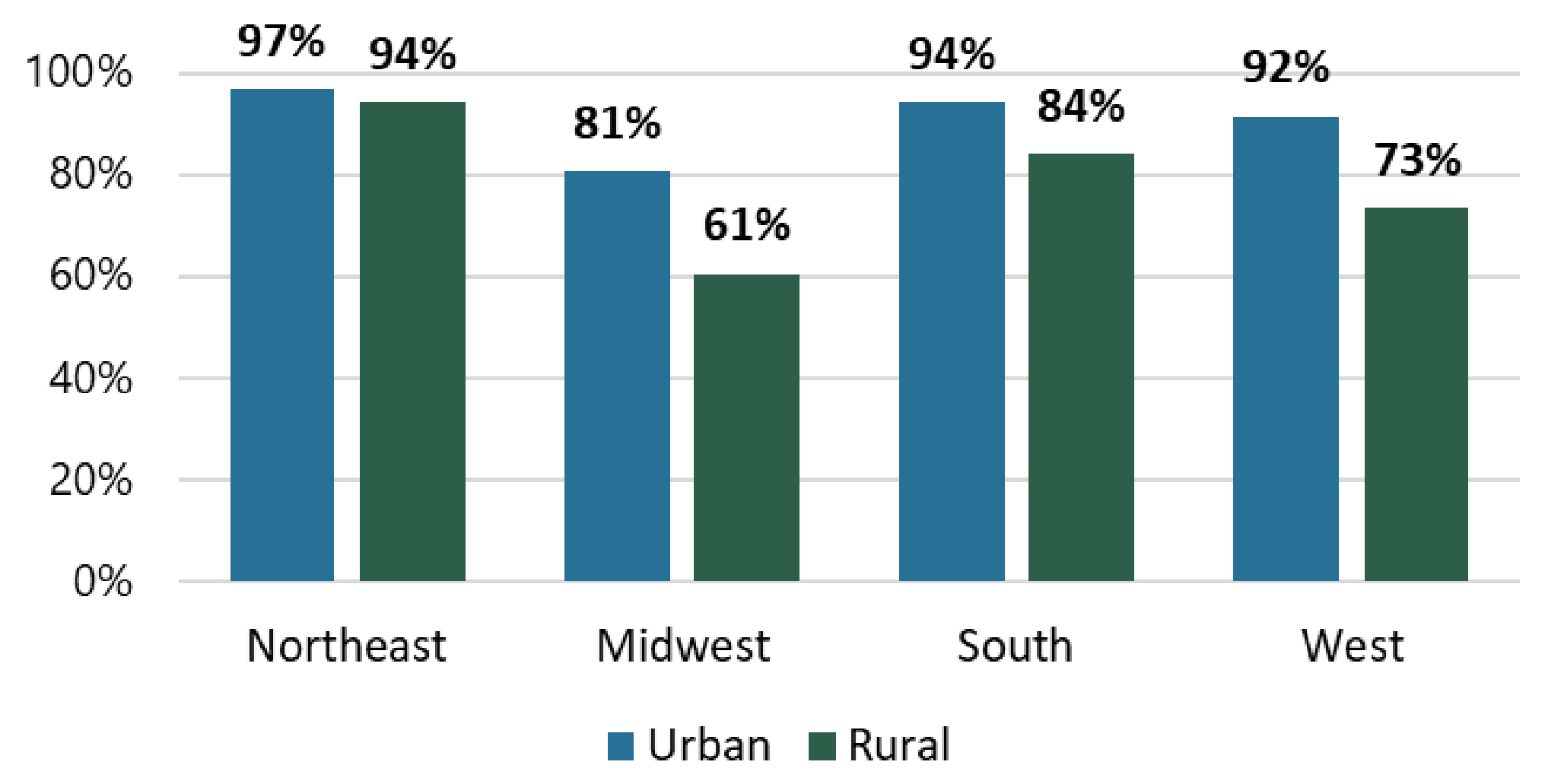
**HIV Service Availability**

The nine HIV services included in this analysis were: HIV/AIDS prevention education, Pre-Exposure Prophylaxis (PrEP), Post-Exposure Prophylaxis (PEP), HIV/AIDS medical services, PrEP navigation, conventional blood HIV testing, conventional oral HIV testing, rapid blood HIV testing, and rapid oral HIV testing. Counties were categorized as having one or more HIV service available if any of the nine services were offered in that county by an organization listed in the National Prevention Information Network Database.

**Figure 11: Percentage of Counties with One or More HIV Service Available, by Rurality**



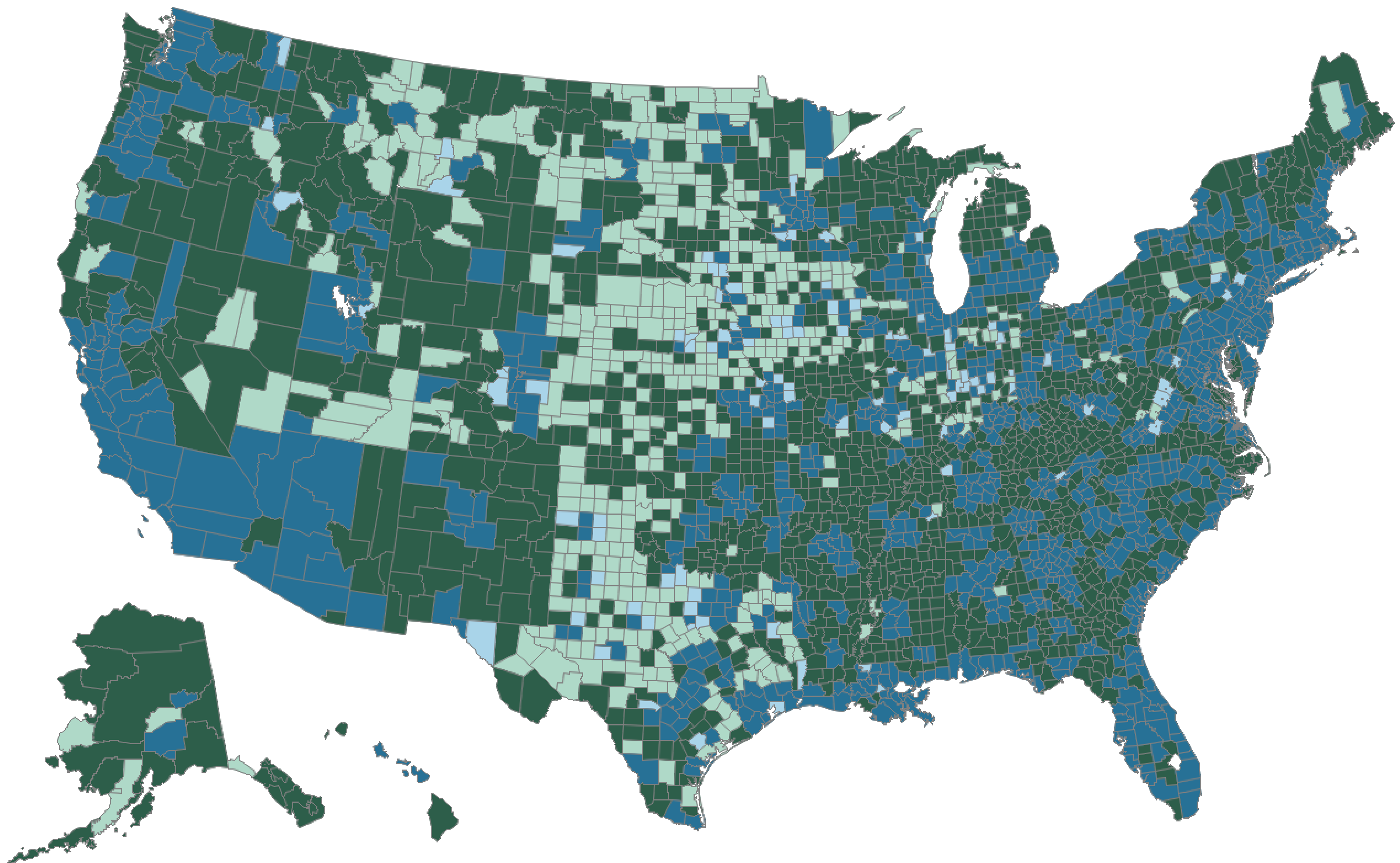
**Figure 12: Percentage of Counties with One or More HIV Service Available, by Rurality and Census Region**



**KEY TAKEAWAYS:**

- Compared with urban counties, a smaller proportion of rural counties had organizations in the county that provided one or more HIV service.
- Compared with urban counties in the same Census region, a smaller proportion of rural counties in the Midwest, South, and West had organizations in the county that provided one or more HIV service.

**Figure 13: Map of Counties with One or More HIV Service Available**



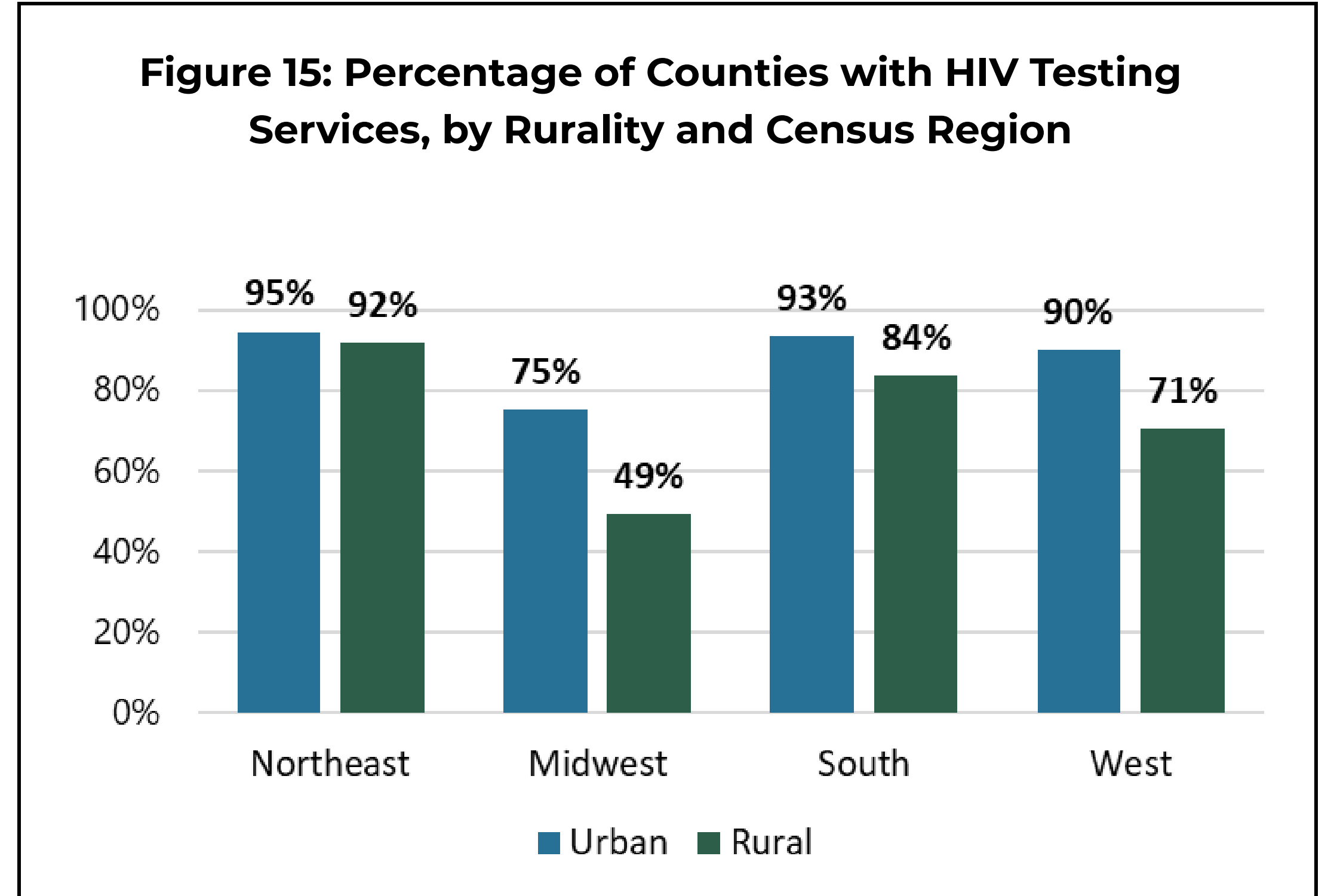
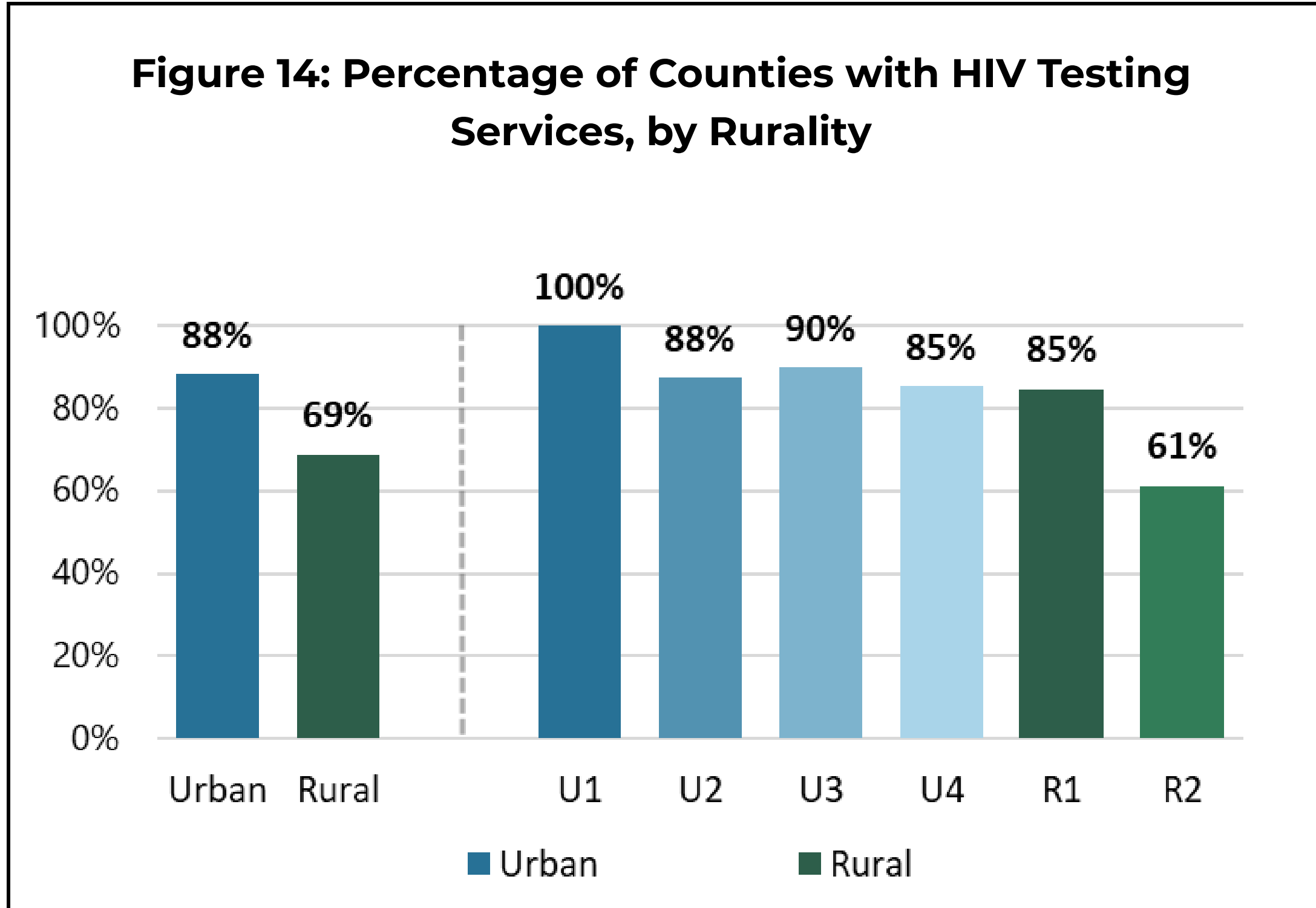
Availability of one or more HIV service

<span style="color: #90EE90;">■</span> Rural, services not present	<span style="color: #006400;">■</span> Rural, services present
<span style="color: #ADD8E6;">■</span> Urban, services not present	<span style="color: #00008B;">■</span> Urban, services present



**HIV Testing Services**

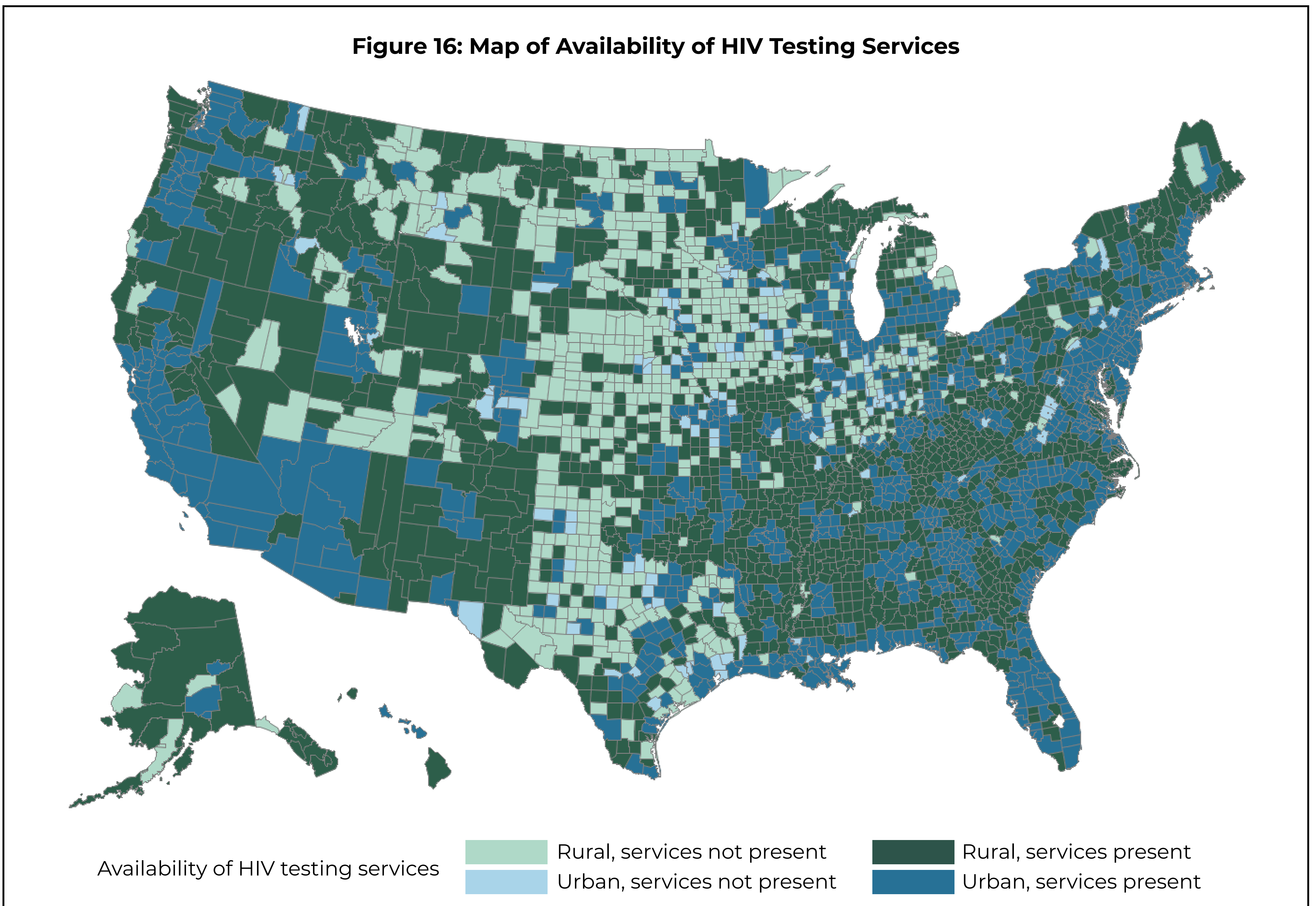
The CDC and the US Preventive Services Task Force recommend screening adolescents, adults, and all pregnant women for HIV.<sup>56</sup> HIV testing services include conventional blood testing, conventional oral testing, rapid blood testing, and rapid oral testing.



**KEY TAKEAWAYS:**

- Compared with urban counties, a smaller proportion of rural counties had organizations that provided HIV testing services.
- Compared with urban counties in that Census region, a smaller proportion of rural counties had an organization that provided HIV testing services in the Midwest, South, and West.

**Figure 16: Map of Availability of HIV Testing Services**

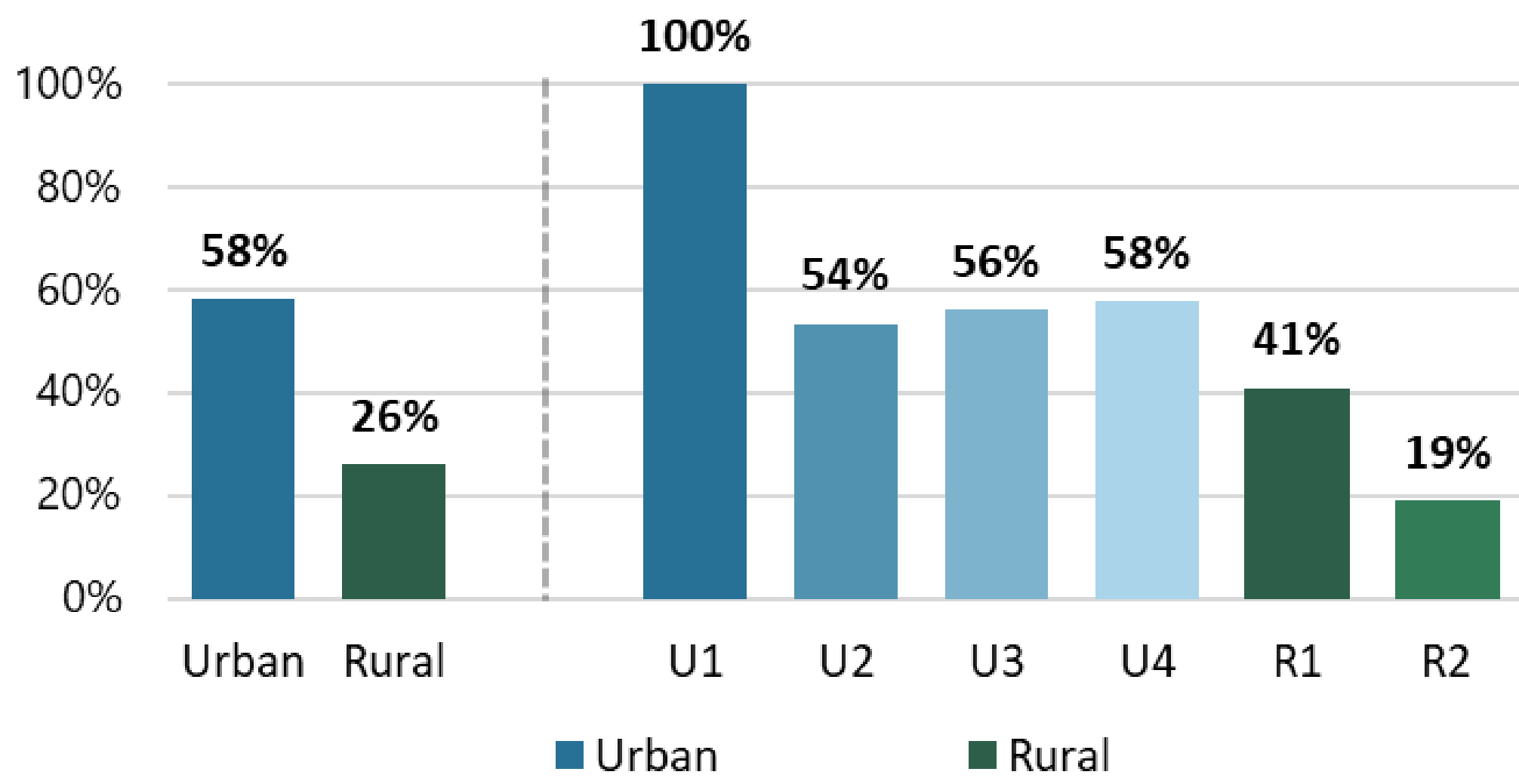




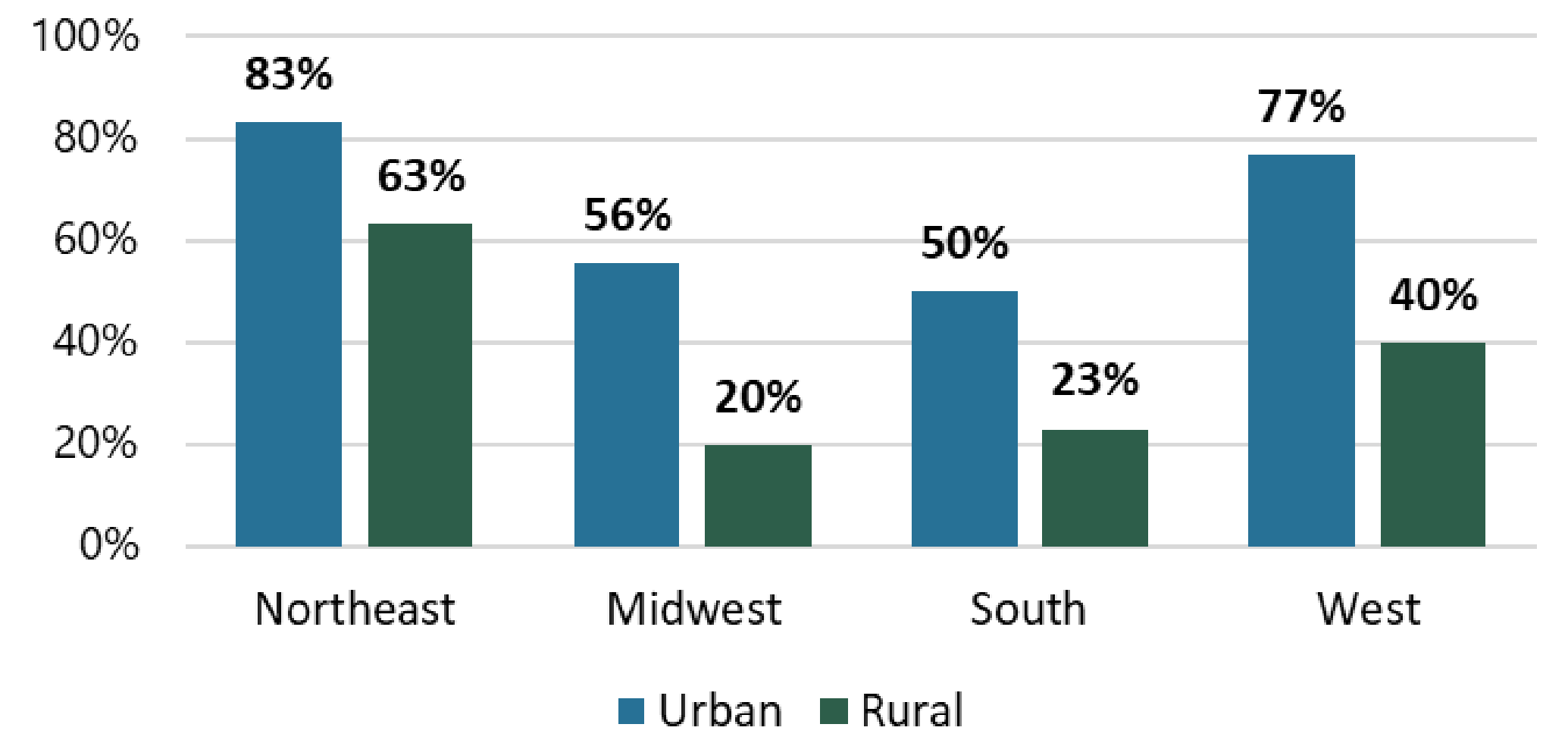
### HIV Rapid Testing Services

Rapid tests have a quicker run time than conventional HIV tests, can be processed outside a laboratory, and allow individuals to receive test results at the point of care.<sup>7</sup> Rapid tests using a fingerstick or oral fluid may be used in nonclinical community settings that are not equipped to conduct venipuncture.<sup>8</sup>

**Figure 17: Percentage of Counties with HIV Rapid Testing Service Availability, by Rurality**



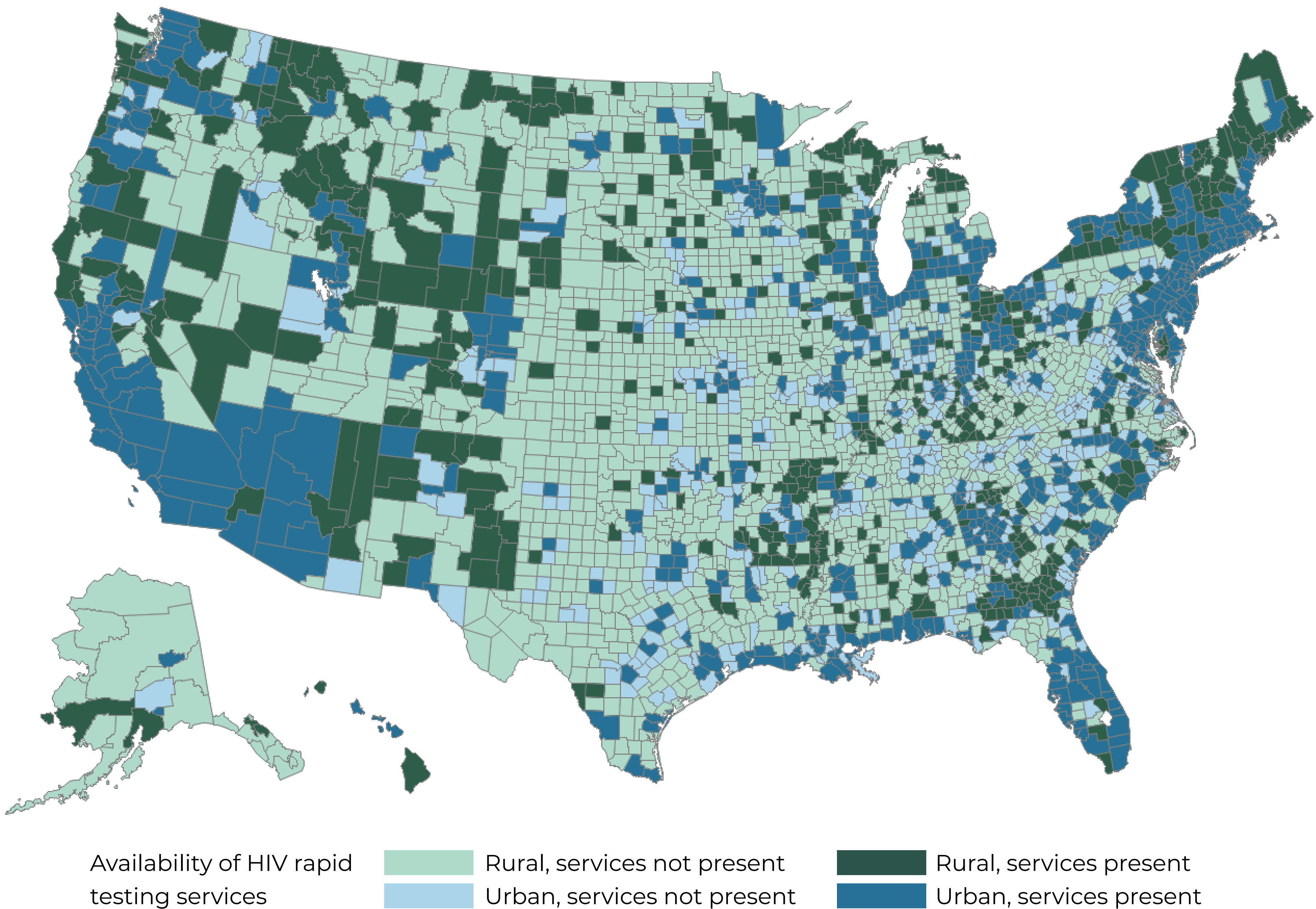
**Figure 18: Percentage of Counties with HIV Rapid Testing Service Availability, by Rurality and Census Region**



#### KEY TAKEAWAYS:

- Across all Census regions and rural classifications, a smaller proportion of rural counties had an organization that provided HIV rapid testing services compared with urban counties.

**Figure 19: Map of Availability of Rapid Testing Services**

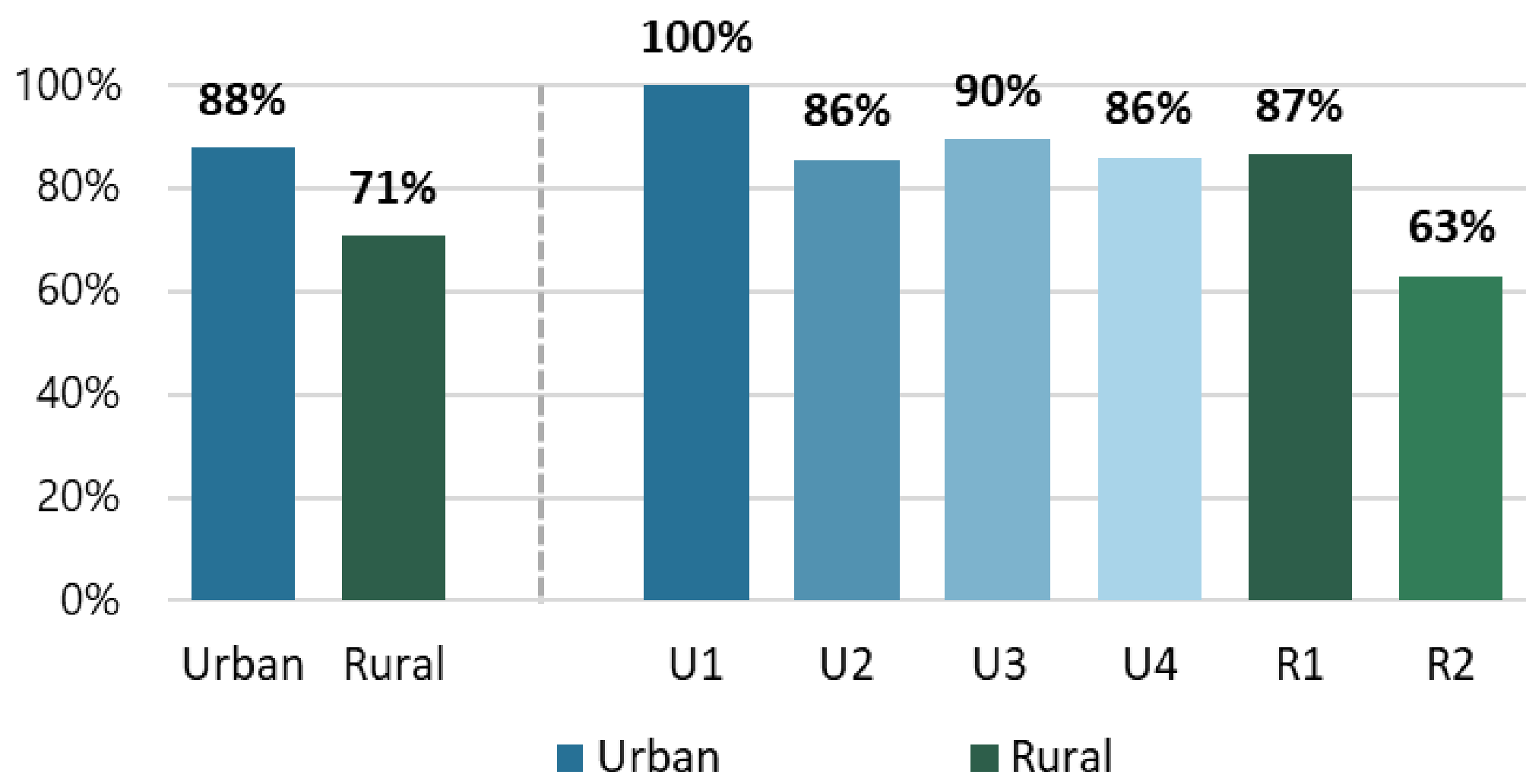




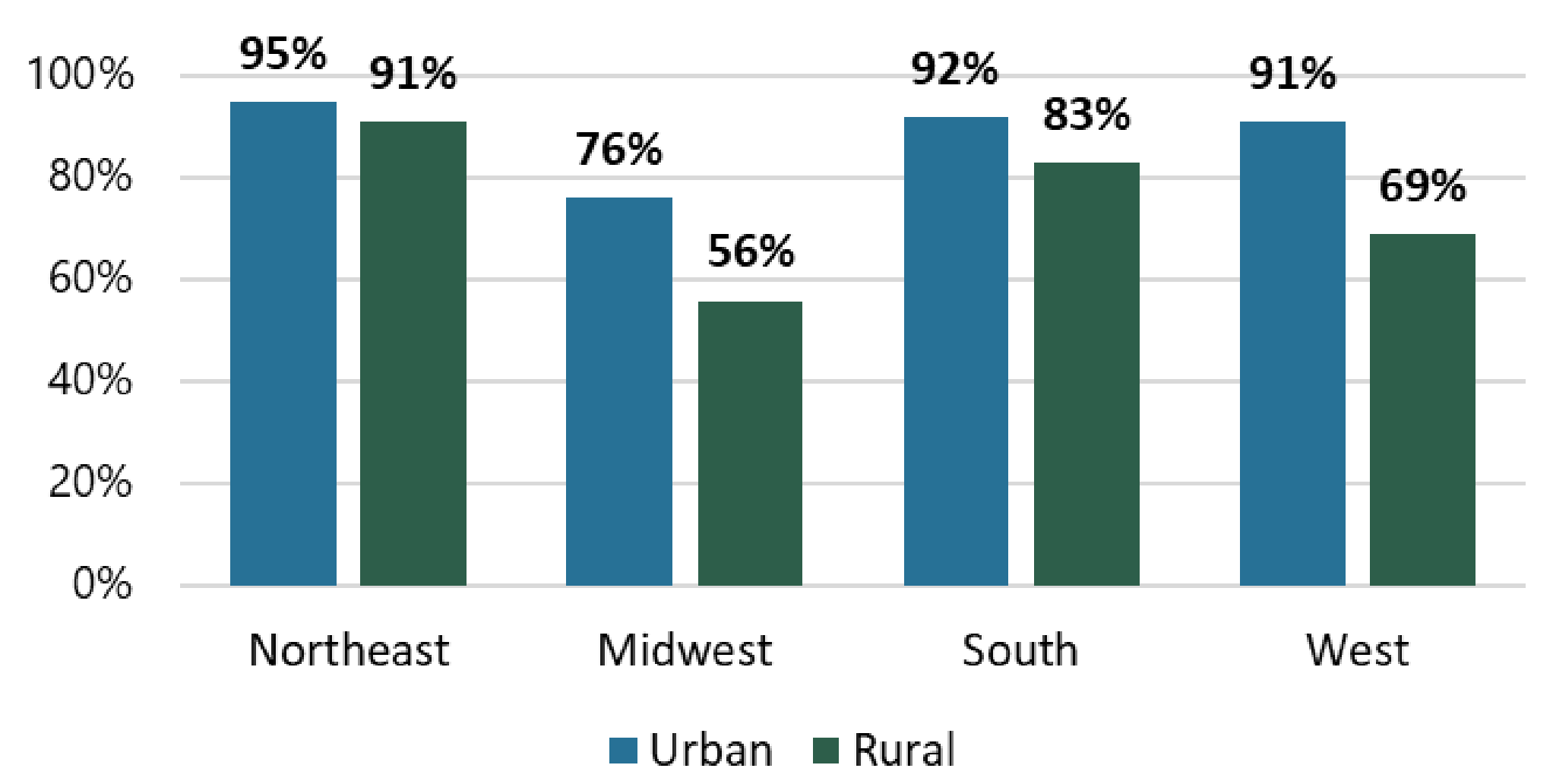
**HIV Prevention Education**

HIV/AIDS prevention education aims to reduce HIV transmission by educating individuals on actions they can take to protect themselves, how to engage in less risky behaviors, how to use risk reduction tools, and how to access HIV preventive services in health care settings.

**Figure 20: Percentage of Counties with HIV Prevention Education Available, by Rurality**



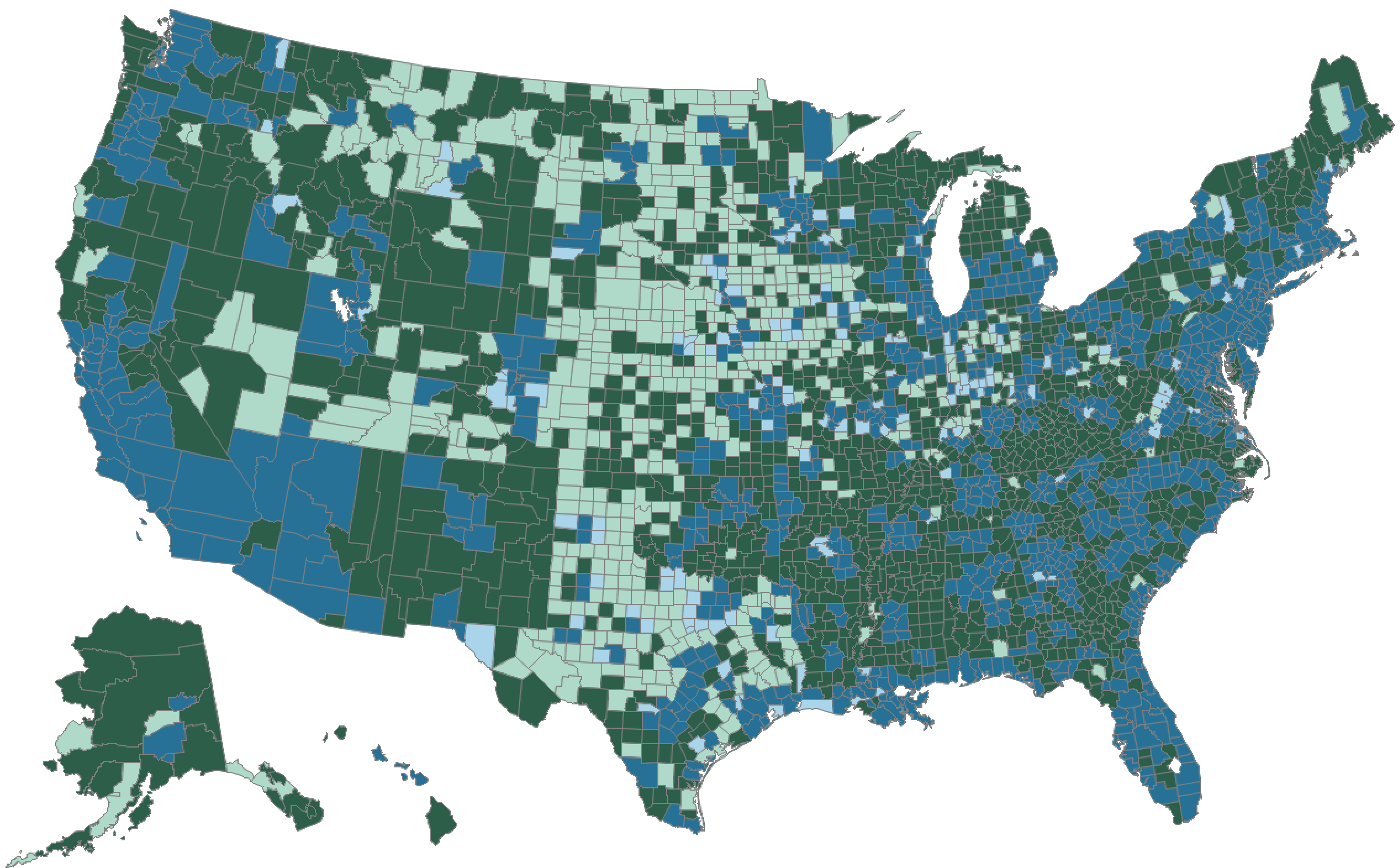
**Figure 21: Percentage of Counties with HIV Prevention Education Available, by Rurality and Census Region**



**KEY TAKEAWAYS:**

- Compared with urban counties, a smaller proportion of rural counties had an organization that provided HIV prevention education.
- Compared with urban counties in the same Census region, a smaller proportion of rural counties in the Midwest, South, and West had an organization providing HIV prevention education.

**Figure 22: Map of Availability of HIV Prevention Education**



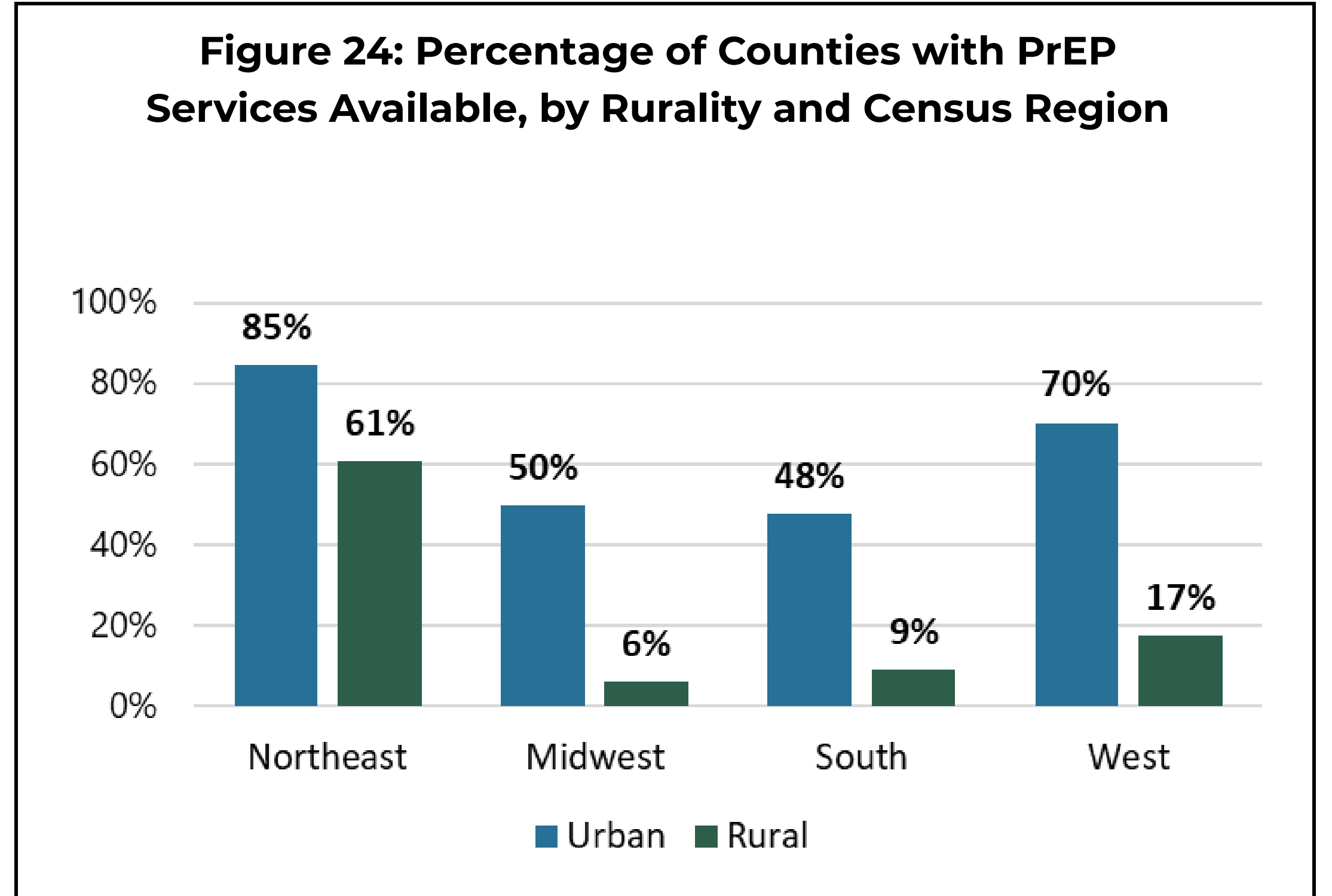
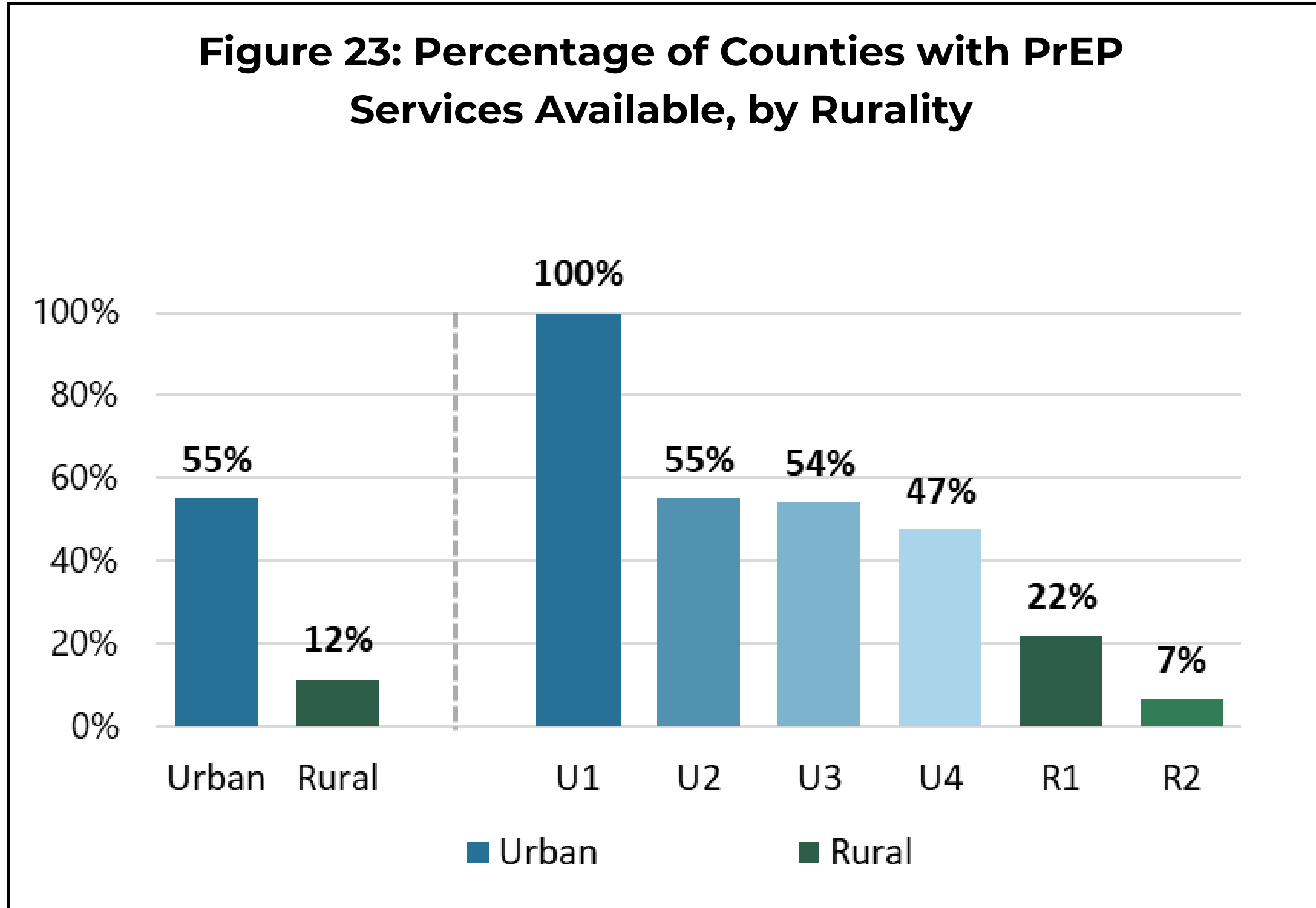
Availability of HIV/AIDS prevention education

<span style="color: #90EE90;">■</span> Rural, services not present	<span style="color: #006400;">■</span> Rural, services present
<span style="color: #ADD8E6;">■</span> Urban, services not present	<span style="color: #00008B;">■</span> Urban, services present



**PrEP Service Availability**

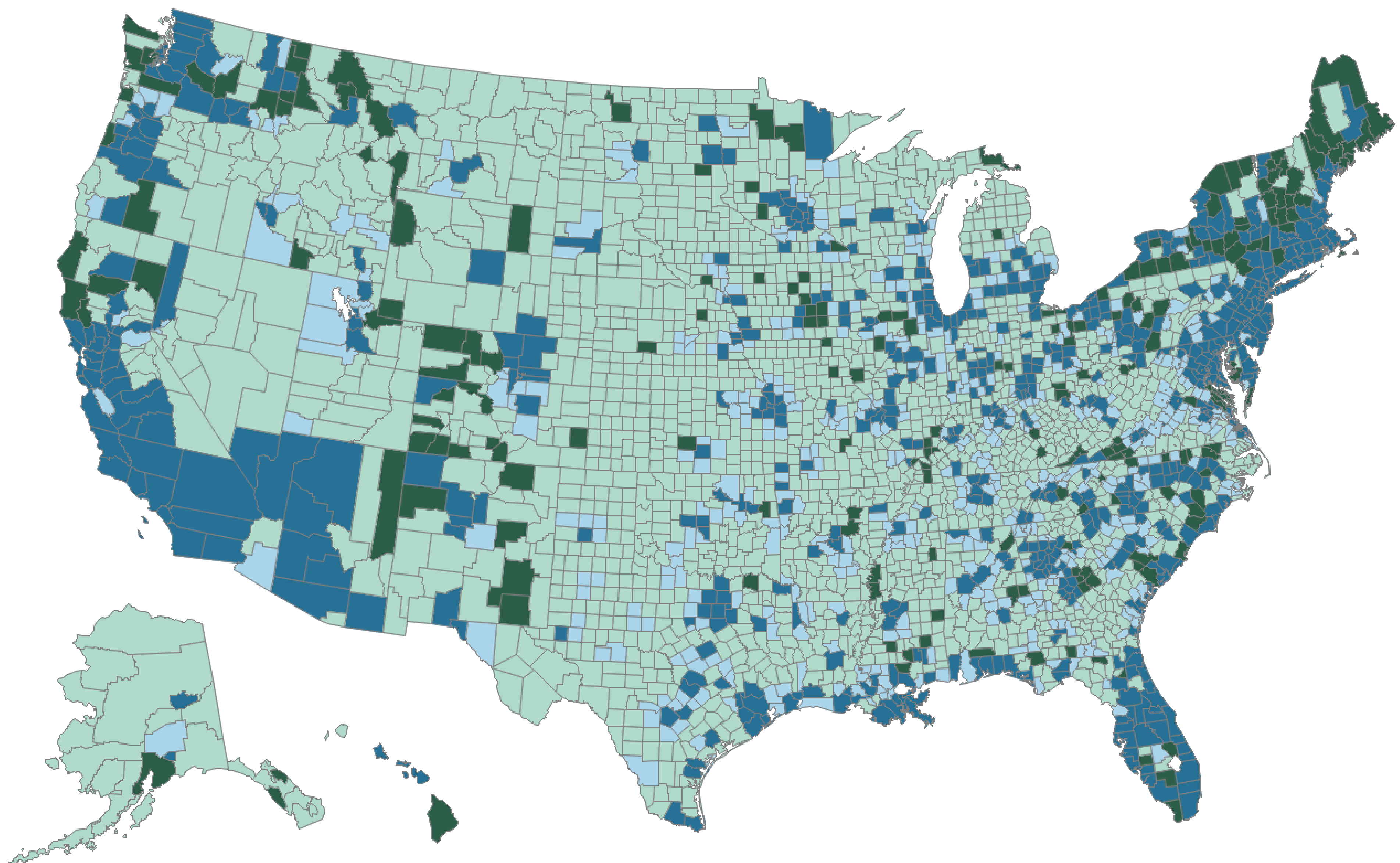
Pre-Exposure Prophylaxis (PrEP) is the use of daily medication to lower the chance of HIV infection. The CDC and the US Preventive Services Task Force recommend providing PrEP to individuals who are not infected with HIV and are at high risk of acquiring HIV from sex or injection drug use.<sup>9,10</sup>



**KEY TAKEAWAYS:**

- Compared with urban counties, a smaller proportion of rural counties had an organization in that county that provided PrEP services.
- Compared with urban counties in that Census region, a smaller proportion of rural counties had an organization that provided PrEP services.

**Figure 25: Map of PrEP Service Availability**



Availability of PrEP services

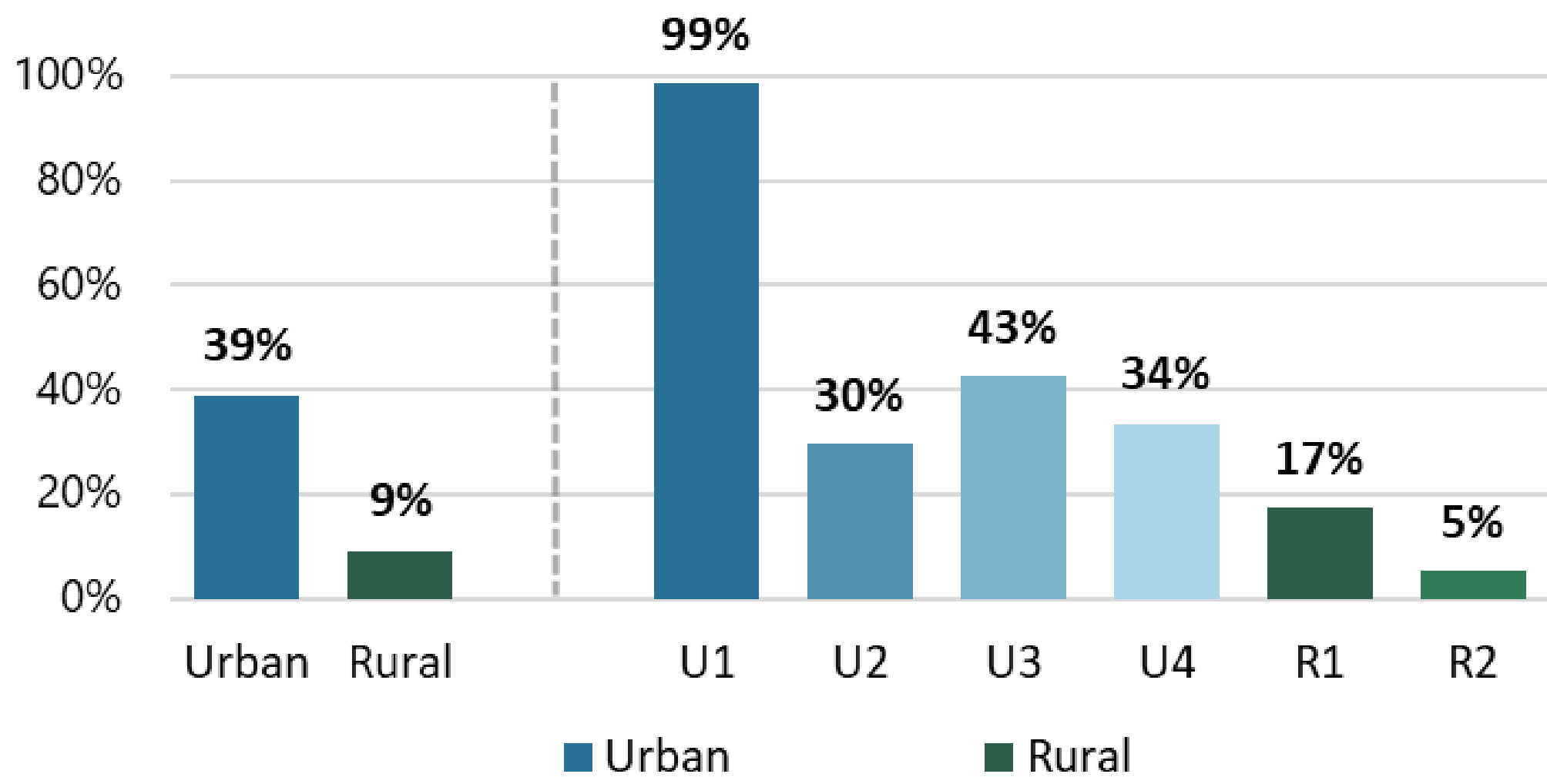
<span style="color: #90EE90;">■</span> Rural, services not present	<span style="color: #006400;">■</span> Rural, services present
<span style="color: #ADD8E6;">■</span> Urban, services not present	<span style="color: #00008B;">■</span> Urban, services present



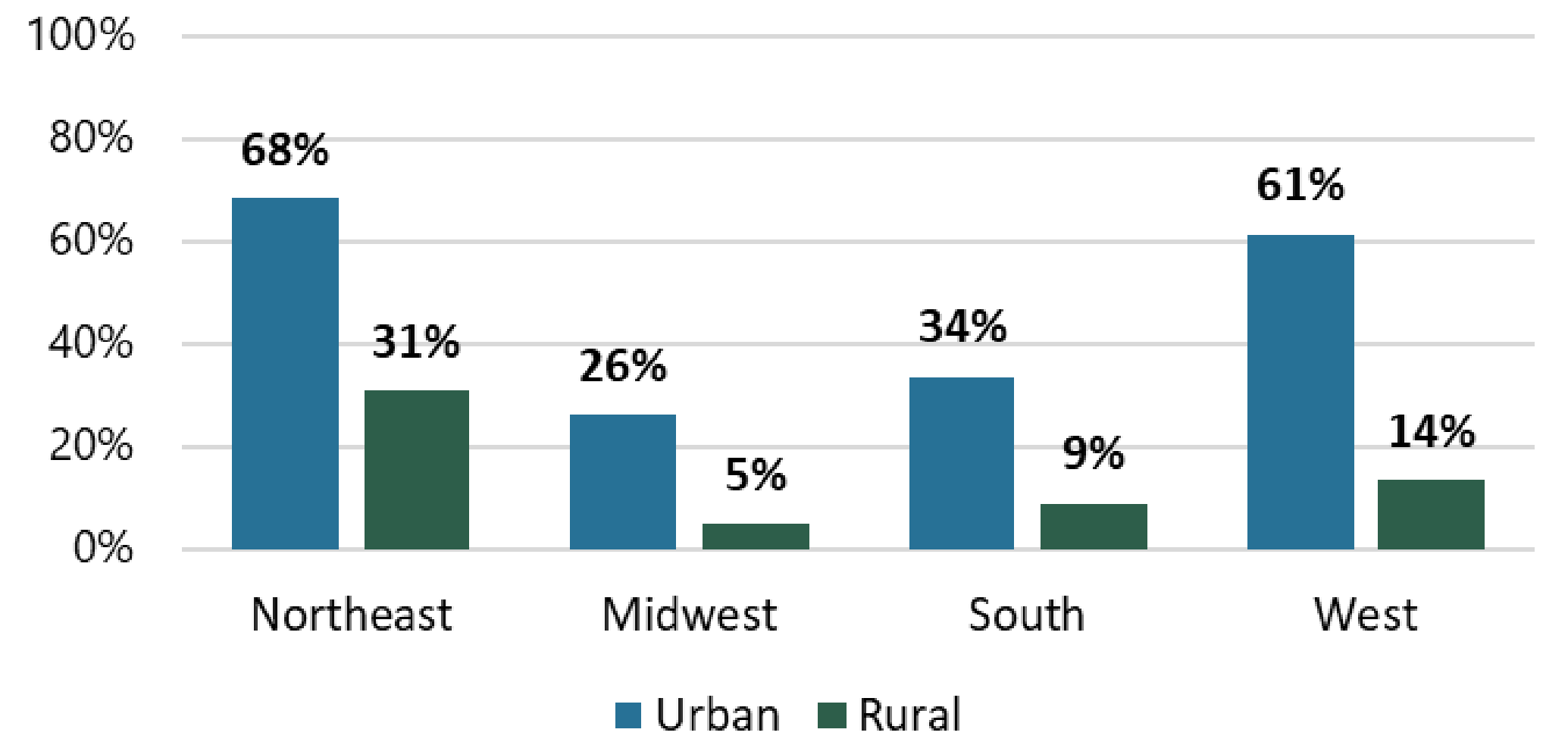
**HIV/AIDS Medical Treatment Service Availability**

HIV/AIDS medical treatment is the provision of clinical services to patients diagnosed with HIV. The services are designed to reduce the level of HIV in the body, keep the immune system as healthy as possible, and decrease complications that may develop.

**Figure 26: Percentage of Counties with HIV/AIDS Medical Treatment Service Available, by Rurality**



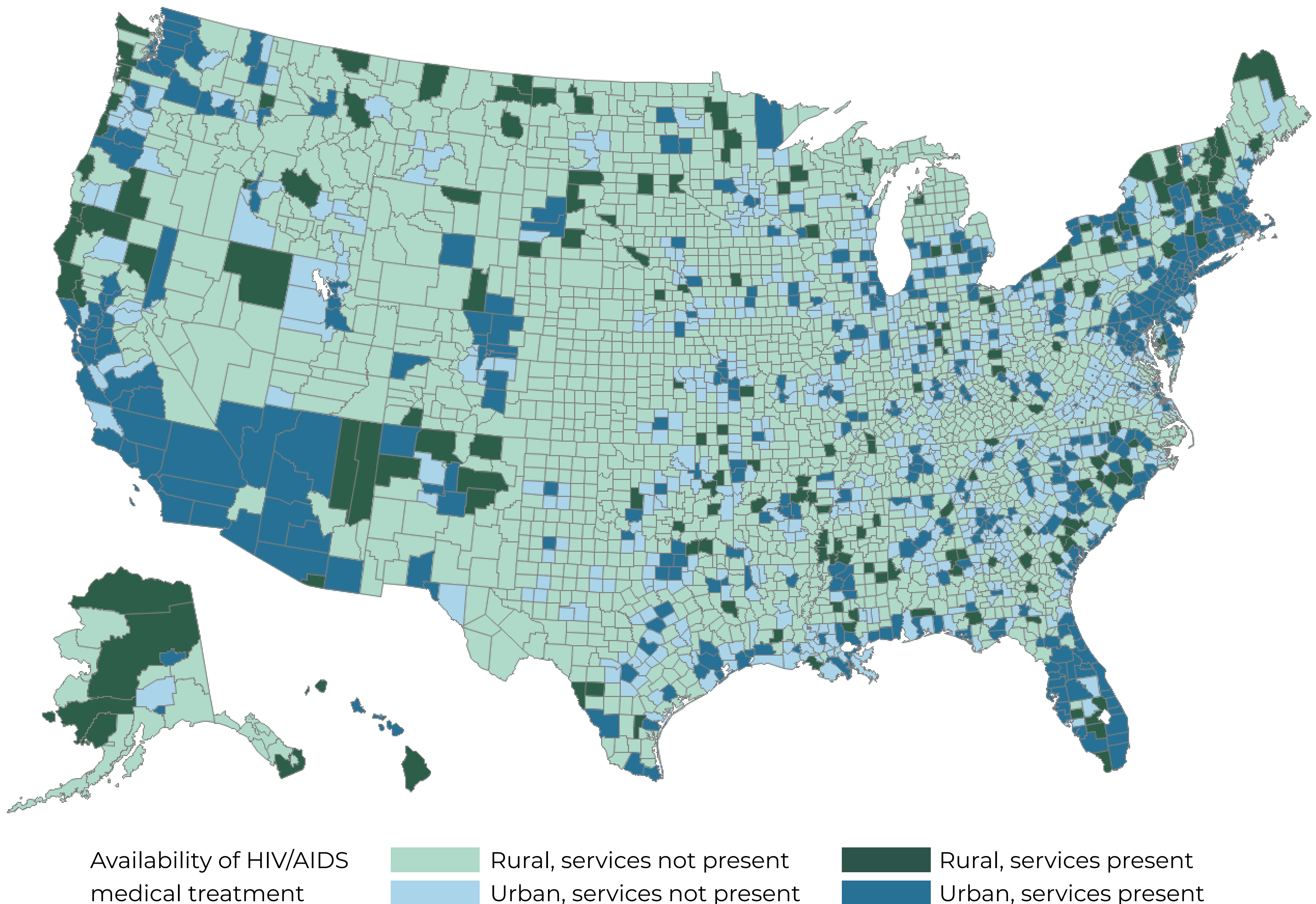
**Figure 27: Percentage of Counties with HIV/AIDS Medical Treatment Service Available, by Rurality and Census Region**



**KEY TAKEAWAYS:**

- HIV/AIDS medical treatment services were available in a smaller proportion of rural counties compared with urban counties.
- In each Census region, a smaller proportion of rural counties had an organization providing HIV/AIDS medical services compared with urban counties.

**Figure 28: Map of HIV/AIDS Medical Treatment Service Availability**





## Conclusion

The figures in this chartbook show geographic differences in HIV prevalence and the availability of HIV-related services across the rural-urban continuum and Census regions in the United States. HIV prevalence is higher in urban counties than rural counties (399 per 100,000 compared with 149 per 100,000, respectively), with prevalence decreasing with increasing level of rurality. HIV prevalence in urban counties is higher than HIV prevalence in rural counties in all but two states (South Carolina and Hawaii). The Northeast has the highest HIV prevalence (485 per 100,000) followed by the South (429 per 100,000), West (302 per 100,000), and Midwest (205 per 100,000).

Analyses of the availability of HIV-related services show that compared with urban counties, a smaller proportion of rural counties have organizations that provided HIV prevention, testing, and treatment services. For example, organizations that provide HIV testing services are located in 88 percent of urban counties compared with 69 percent of rural counties, and rapid HIV testing services are available in 58 percent of urban counties compared with 26 percent of rural counties. In the Midwest, Southern, and Western Census regions, the availability of HIV-related services in rural counties was lower for each service examined compared with urban counties in the same Census region. In the Northeast, however, rural-urban differences in the availability of services were not found for HIV prevention education, HIV testing, HIV services, and HIV-related services. These analyses of HIV service availability align with three pillars of the *Ending the HIV Epidemic* initiative: prevention, diagnosis, and treatment. These findings may inform the scale up of HIV-related public health efforts in the seven rural states identified by the Initiative as having a substantial rural HIV burden as well as rural counties identified in this study as falling into the upper tertile of HIV prevalence rates. Limited availability of testing, education, and PEP/PrEP in some rural areas of the country may challenge efforts to end the HIV epidemic.

One limitation of the *HIV/AIDS in Rural America* report on which this study is based is the lack of county-level HIV prevalence data for 2008 for 22 states. A contribution of the present analysis is the estimation of HIV case counts and prevalence rates for every county in the country. Both this study and *HIV/AIDS in Rural America* found that HIV prevalence declined with rurality. However, the findings presented in this chart book differ from those of the *HIV/AIDS in Rural America* in several ways. While the analysis of 2008 data found that the South had the highest overall HIV prevalence rate, the present analysis of 2016 data found that the Northeast has the highest HIV prevalence rate. *HIV/AIDS in Rural America* identified South Carolina, Mississippi, and Louisiana as the states with the highest rural HIV prevalence in 2008. The present analysis identified Florida, South Carolina, and Georgia as the states with the highest rural HIV prevalence in 2016. Differences in the findings of the two reports may be due to the differences in data availability and/or changes in HIV prevalence between 2008 and 2016.

The present analysis and *HIV/AIDS in Rural America* used different data sources to assess the availability of HIV-related services. While the South Carolina Rural Health Research Center examined the presence of Ryan White medical providers, the current analysis used data from the NPIN to examine the presence of organizations that provide HIV-related services, regardless of participation in the Ryan White Program. Both studies found that a smaller proportion of rural counties have HIV-related services located in the county.

The present analysis and *HIV/AIDS in Rural America* use different data sources to assess the availability of HIV-related services. While the South Carolina Rural Health Research Center examined the presence of Ryan White medical providers, the current analysis used data from the NPIN to examine the presence of organizations that provide HIV-related services, regardless of participation in the Ryan White Program. Both studies found that a smaller proportion of rural counties have HIV-related services located in the county. A limitation of the analyses presented in this chartbook is the use of counties as the unit of analysis, which may mask heterogeneity of HIV prevalence and access to services within counties.<sup>11</sup>

Studies of HIV prevalence often neglect to analyze and present data by rurality. The findings of this study may help inform policies that augment rural HIV prevention, diagnosis, treatment, and outbreak response efforts.



The primary source of data for 2016 HIV prevalence estimates was the CDC's online AtlasPlus database, which includes surveillance data for HIV, viral hepatitis, tuberculosis, and sexually transmitted diseases.<sup>12</sup> The HIV prevalence data in AtlasPlus are from the National HIV Surveillance System, which aggregates data from all 50 states, the District of Columbia, and six US dependent areas. The AtlasPlus data used in the present analyses include all persons aged 13 and older living with diagnosed HIV or AIDS at the end of 2016. In order to ensure accurate HIV case counts and prevalence rates, the CDC accounts for deaths among persons living with HIV by linking the state-provided HIV surveillance data to the National Death Index. The CDC also de-duplicates data for individuals living with HIV who are reported by multiple states based on their most recent known address as of December 31, 2016.

AtlasPlus HIV prevalence data have several limitations. Data do not include individuals with HIV who have not been tested or those who have received anonymous testing services. The Atlas data also represent minimum HIV prevalence estimates due to incomplete information on a person's clinical, vital, and residence status, which varies across states. CDC estimates that completeness of HIV reporting is at more than 80 percent. Additionally, the CDC suppresses county-level data from the online AtlasPlus database if the population denominator is less than 100, if total case counts are between one and four, or if suppression is required per agreements between the CDC and state/local HIV surveillance programs.

We accessed HIV prevalence data from AtlasPlus on December 11, 2019. For 14 states, AtlasPlus had county-level prevalence estimates for every county in the state (Alabama, Arizona, Connecticut, Delaware, Washington DC, Florida, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, Rhode Island, South Carolina, and Vermont). In the remaining 36 states and the District of Columbia, the CDC suppressed county-level data with varying frequency across states (see Appendix A). In total, data were suppressed for 593 counties (19.9 percent of counties in the US).

In order to fill in missing county-level HIV case counts and prevalence rates, and to account for incomplete reporting in the AtlasPlus database, we searched each state's health department website for 2016 HIV surveillance reports that included information on sub-state level case counts and/or prevalence rates. Our goal was to obtain county-level estimates for each state that summed to within +/-10% of the total AtlasPlus HIV case counts for that state in 2016. We selected the AtlasPlus HIV case counts for each state as the comparison because these cases have been de-duplicated and do not include persons who have died (as described above). We used Statistical Analysis System (SAS)<sup>13</sup> software as our primary tool for data entry and analysis.

We used five different methods to calculate county-level HIV prevalence estimates for the chartbook (see Appendix A):

#### **Level 1: AtlasPlus data only (n=13 jurisdictions)**

For each state and the District of Columbia, we compared the AtlasPlus state case total for HIV to the sum of the AtlasPlus county-level HIV case data within that state. In addition to discrepancies due to county-level data suppression, discrepancies between state-level case counts and the sum of county case counts occurred when case report forms received by the CDC had incomplete county of residence information. When the county information was not available, the CDC assigned the case to the state but was not able to assign it to a particular county within that state. Among the 14 states that had HIV prevalence data for every county within the state, 13 states were within the +/- 10% discrepancy goal. Therefore, for those 13 states we used AtlasPlus provided county-level case counts for all analyses of HIV county-level prevalence (Alabama, Arizona, Connecticut, Delaware, Washington DC, Florida, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, South Carolina, and Vermont).



**Level 2: AtlasPlus data supplemented with data from state surveillance reports and imputations of 1 for suppressed county-level data (n=31 states)**

For the remaining states, we supplemented AtlasPlus county-level data with HIV prevalence data from state surveillance reports and imputed values of 1 for counties with data that were suppressed in AtlasPlus, following an approach used by the South Carolina Rural Health Research Center in *HIV/AIDS in Rural America: Prevalence and Service*. This analysis was possible for 36 states (Rhode Island had no missing county level data in AtlasPlus and Alaska had all counties missing data in AtlasPlus). We found 31 states where the discrepancy using this approach was within the +/-10% discrepancy goal. Therefore, for these 31 states we used Level 2 case counts for all analyses of HIV county-level prevalence (Arkansas, California, Colorado, Hawaii, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Mississippi, Montana, North Carolina, North Dakota, New Mexico, Nevada, New York, Ohio, Oklahoma, Oregon, South Dakota, Tennessee, Texas, Utah, Washington, Wisconsin, West Virginia, and Wyoming).

**Level 3: State surveillance reports and imputations of 1 for suppressed county-level data (n=4 states)**

For four of the remaining states for which we had state-provided HIV prevalence data for each county, we used only state-provided data to calculate county-level data. We found three states where the discrepancy using this approach was within the +/-10% discrepancy goal (Georgia, Pennsylvania, and Rhode Island). For the remaining state, Virginia, the discrepancy was above 10% (13%), but we were unable to improve on this estimate using other methodology, so we used Level 3 case counts for all analyses of county-level HIV prevalence for Virginia.

**Level 4: AtlasPlus data supplemented with data from state surveillance reports using district-level data (n=1 state)**

Three remaining states provided HIV case counts at the public health district (also called regional) level. We distributed district-level cases to counties within the district based on each county's share of the district's population. We found one state where the discrepancy using this approach was within the +/-10% discrepancy goal (Alaska), and therefore used Level 4 case counts for all analyses of HIV county-level prevalence for Alaska.

**Level 5: State surveillance reports using district-level data (n=2 states)**

For the two remaining states we used county-level case counts derived from district-level case counts in lieu of case county counts from AtlasPlus. In both states this approach brought the discrepancy with the AtlasPlus state-level case count within the +/- 10% discrepancy goal (Idaho, and Nebraska). For Idaho, we used the state-provided case total as our comparison instead of the AtlasPlus state case total, due to a discrepancy between the AtlasPlus state case total and the state-provided surveillance data.



In October 2019, we obtained geocoded data from the CDC National Prevention Information Network's (NPIN) Organizations Database for 11,813 organizations that provided at least one of 16 services<sup>14</sup> related to HIV/AIDS, viral hepatitis, and sexually transmitted diseases (STDs). We linked the geocoded data to the 2013 National Center for Health Statistics 6-level urban-rural classification scheme to categorize organizations as located in urban (levels 1-4) or rural (levels 5-6) counties. We also used the geocoded data to determine the U.S. Census region in which organizations were located.<sup>15</sup>

NPIN's Organizations Database, maintained by NPIN staff since 1987, contains information about organizations that provide services and resources related to HIV/AIDS, viral hepatitis, STDs, and/or tuberculosis. To be included in the database an organization must focus their services on HIV/AIDS, viral hepatitis, STDs or tuberculosis or offer specific programs focused on one or more of these diseases. Organizations include AIDS service organizations, clinics, hospitals, public health departments, social service organizations, and others. Private physicians and practices are not included in the Organizations Database because they generally do not focus on HIV/AIDS, viral hepatitis, STDs, or tuberculosis, and often provide services for established patients only. However, commercial clinics are included in the Database if they have a partnership with a state or local health department to offer these services or are located in an underserved or rural area with limited service options.

NPIN staff identify these organizations' services using a variety of strategies including searching the internet and reviewing the websites of organizations that are already in the database. When a new organization is identified as providing relevant services, NPIN staff collect information about the organization and the services they offer by reviewing their website and/or contacting the organization by phone. Organizations can also add or update information about their organization through the NPIN and Get Tested websites. Approximately 15 percent of organizations in the database are added through this self-reporting mechanism. The data for all of the organizations included in the database are verified annually. In addition to annual updates, ad hoc updates are made when NPIN staff learn that information about an organization has changed (for example, the name of the organization changes or a service is discontinued). The NPIN Organizations Database has been used by researchers to examine access to HIV/AIDS care and treatment<sup>16,17,18</sup> and identify organizations eligible to participate in surveys about provision of care.<sup>19</sup>

Inclusion of an organization in the NPIN's Organizations Database is not a recommendation or endorsement by the Centers for Disease Control and Prevention or the CDC National Prevention Information Network.



## Endnotes

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15. The Northeast Region comprises CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest region includes IA, IN, IL, KS, MI, MN, MO, ND, NE, OH, SD, and WI. The Southern region contains AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Western region is made up of AK, AZ, CA, CO, HI, ID, NM, MT, OR, UT, NV, WA, and WY.
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**Appendix A**

County-level HIV prevalence estimation methodology for 50 states and District of Columbia (N=51 jurisdictions) in 2016. Green cells indicate methodology selected for county-level HIV prevalence estimates in chartbook.

HIV case count data availability		Level 1 (n=13)				Level 2 (n=31)		Level 3 (n=4)		Level 4 (n=1)		Level 5 (n=2)	
		AtlasPlus data only				AtlasPlus + state-provided county-level data + imputations of 1		State-provided county-level data + imputations of 1		AtlasPlus + state-provided district-level data		State-provided district-level data only	
State	Total Number of Counties	Counties missing data in AtlasPlus	A. State case total	B. Sum of county case counts	Relative % difference (B vs. A)	C. State case total	Relative % difference (C vs. A)	D. State case total	Relative % difference (D vs. A)	E. State case total	Relative % difference (E vs. A)	F. State case total	Relative % difference (F vs. A)
AK	29	29	690	.	-100.0%	.	.	.	.	768	11.3%	.	.
AL	67	0	12,584	12,449	-1.1%	.	.	.	.	.	.	.	.
AR	75	4	5,418	5,315	-1.9%	5,335	-1.5%	.	.	.	.	.	.
AZ	15	0	15,426	15,278	-1.0%	.	.	.	.	.	.	.	.
CA	58	2	125,142	123,094	-1.6%	123,097	-1.6%	.	.	.	.	.	.
CO	64	13	12,034	11,848	-1.5%	11,886	-1.2%	.	.	.	.	.	.
CT	8	0	10,121	10,068	-0.5%	.	.	.	.	.	.	.	.
DC	1	0	14,383	14,383	0.0%	.	.	.	.	.	.	.	.
DE	3	0	3,141	3,038	-3.3%	.	.	.	.	.	.	.	.
FL	67	0	107,223	106,389	-0.8%	.	.	.	.	.	.	.	.
GA	159	4	50,589	44,930	-11.2%	44,945	-11.2%	54,973	8.7%	.	.	.	.
HI	5	2	2,519	2,168	-13.9%	2,269	-9.9%	.	.	.	.	.	.
IA	99	37	2,543	2,385	-6.2%	2,490	-2.1%	.	.	.	.	.	.
ID <sup>a</sup>	44	17	1,679	533	-68.3%	533	-68.3%	.	.	710	-57.7%	1,679	0.0%
IL	102	24	34,610	31,918	-7.8%	32,051	-7.4%	.	.	.	.	.	.
IN	92	9	10,882	10,521	-3.3%	10,541	-3.1%	.	.	.	.	.	.
KS	105	38	2,917	2,797	-4.1%	2,884	-1.1%	.	.	.	.	.	.
KY	120	104	6,846	5,059	-26.1%	6,453	-5.7%	.	.	.	.	.	.
LA	64	2	19,932	19,759	-0.9%	19,793	-0.7%	.	.	.	.	.	.
MA	14	0	19,979	19,812	-0.8%	.	.	.	.	.	.	.	.
MD	24	0	31,927	28,991	-9.2%	.	.	.	.	.	.	.	.
ME	16	0	1,531	1,478	-3.5%	.	.	.	.	.	.	.	.
MI	83	13	15,237	14,884	-2.3%	15,164	-0.5%	.	.	.	.	.	.
MN	87	24	8,011	7,832	-2.2%	7,900	-1.4%	.	.	.	.	.	.
MO	115	24	12,002	11,769	-1.9%	11,849	-1.3%	.	.	.	.	.	.
MS	82	2	9,237	8,450	-8.5%	8,450	-8.5%	.	.	.	.	.	.
MT <sup>b</sup>	56	22	583	522	-10.0%	544	-7.0%	.	.	.	.	.	.
NC	100	2	30,001	28,154	-6.2%	28,160	-6.1%	.	.	.	.	.	.
ND	53	19	371	328	-11.6%	371	0.0%	.	.	.	.	.	.
NE	93	36	2,072	547	-73.6%	547	-73.6%	.	.	754	-63.6%	2,241	8.2%
NH	10	0	1,166	1,147	-1.6%	.	.	.	.	.	.	.	.
NJ	21	0	34,428	32,772	-4.8%	.	.	.	.	.	.	.	.
NM	33	6	3,275	3,241	-1.0%	3,300	0.8%	.	.	.	.	.	.
NV	17	6	8,949	8,819	-1.5%	8,825	-1.4%	.	.	.	.	.	.
NY	62	2	125,550	123,642	-1.5%	123,712	-1.5%	.	.	.	.	.	.
OH	88	2	21,148	20,890	-1.2%	20,900	-1.2%	.	.	.	.	.	.
OK	77	13	5,915	5,803	-1.9%	5,823	-1.6%	.	.	.	.	.	.
OR	36	5	6,698	6,597	-1.5%	6,613	-1.3%	.	.	.	.	.	.
PA	67	6	35,617	22,337	-37.3%	22,382	-37.2%	35,483	-0.4%	.	.	.	.
RI	5	0	2,404	2,101	-12.6%	.	.	2,596	8.0%	.	.	.	.
SC	46	0	16,405	15,934	-2.9%	.	.	.	.	.	.	.	.
SD	66	38	536	445	-17.0%	514	-4.1%	.	.	.	.	.	.
TN	95	6	16,183	16,087	-0.6%	16,147	-0.2%	.	.	.	.	.	.
TX	254	45	84,680	83,851	-1.0%	83,964	-0.8%	.	.	.	.	.	.
UT	29	6	2,708	2,664	-1.6%	2,678	-1.1%	.	.	.	.	.	.
VA	133	6	21,359	17,133	-19.8%	17,181	-19.6%	24,129	13.0%	.	.	.	.
VT	14	0	656	643	-2.0%	.	.	.	.	.	.	.	.
WA	39	3	12,714	12,532	-1.4%	12,541	-1.4%	.	.	.	.	.	.
WI	72	10	5,999	5,784	-3.6%	5,819	-3.0%	.	.	.	.	.	.
WV	55	7	1,749	1,492	-14.7%	1,738	-0.6%	.	.	.	.	.	.
WY	23	5	310	281	-9.4%	288	-7.1%	.	.	.	.	.	.

a. The Atlas state case total for Idaho (ID) was based on the state case total from the ID state surveillance report because the AtlasPlus state case total (n=1093) was implausible given the state-provided state case total (n=1679) and total district-level data (n=1679).