

# Study of the impact of COVID-19 on HIV testing, diagnosis, and treatment in the United States

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## Executive Summary

Since the COVID-19 pandemic hit the United States in early 2020, access to healthcare services has been widely impacted. In an effort to slow the spread of COVID-19 in 2020, the U.S. Centers for Disease Control and Prevention (CDC) released guidance to delay nonessential procedures, postpone routine clinical visits, and utilize telemedicine when possible.<sup>1</sup> These delays impacted diagnosis and treatment across many disease states. In the case of communicable diseases like human immunodeficiency virus (HIV), reduced access to testing and treatment can have a prolonged impact on overall HIV transmission and management.

In this report, we compare rates of HIV testing, diagnosis, treatment, and HIV pre-exposure-prophylaxis (PrEP) utilization before and after the start of the COVID-19 pandemic, using claims data. Our findings indicate that:

- HIV testing declined sharply across the United States at the beginning of the pandemic when COVID-19 cases were increasing and access to care was limited. Through the end of 2021, testing remained below 2019 levels. Throughout 2020 and 2021, HIV testing was on average 11% below the 2019 average level.
- New HIV diagnoses dropped sharply in early 2020 and remain at rates below pre-COVID-19 levels as of the end of 2021. Throughout 2020 and 2021, the rate of new HIV diagnoses was on average 15% below the 2019 average.
- Newly diagnosed individuals starting treatment for HIV for the first time also declined steadily throughout 2020 and continued to lag behind pre-COVID-19 levels at the end of 2021. Throughout 2020 and 2021, new treatment starts were on average 17% below the 2019 average, even at times when HIV diagnoses approached 2019 levels.
- Utilization of HIV pre-exposure prophylaxis (PrEP) remained steady through the course of the pandemic. However, prior to the pandemic, PrEP utilization was growing. In 2021, PrEP utilization increased significantly.
- The impact of the pandemic on HIV testing, diagnosis, and treatment metrics varies by location. The HIV testing, diagnosis, and treatment rates in some localities have recovered more slowly than others, with levels of HIV testing, new diagnoses, and new treatment starts continuing to remain below pre-COVID-19 levels as of October 2021.
  - As of October 2021, all regions except for the Midwest remained below their 2019 averages for HIV testing and new diagnoses. All regions but the Northeast remained below their 2019 averages for newly diagnosed individuals starting HIV treatment.
  - Both the South and the West regions have lower levels as of October 2021 compared to 2019 averages across all three categories: HIV testing, diagnosis, and treatment initiation.
  - State: As of October 2021, there were 15 states with HIV testing levels at least 20% lower than their 2019 averages, 15 states with HIV diagnosis levels at least 20% lower than 2019 averages, and 11 states with new HIV treatment initiation levels at least 20% lower than 2019 averages. As of October 2021, there were 17 states that have lower current HIV testing, diagnosis, and treatment initiation levels compared to their 2019 averages.
  - Metropolitan statistical area (MSA): Of the 37 MSAs with a minimum of 10,000 HIV tests in 2019, as of October 2021 there were 13 MSAs with HIV testing levels that were at least 20% lower than their 2019 averages, 13 MSAs with HIV diagnosis levels at least 20% lower than 2019 averages, and 10 MSAs with new HIV treatment initiation levels at least 20% lower than 2019 averages.

Our study findings confirm that the COVID-19 pandemic had a negative impact on HIV testing, diagnosis, and treatment initiation metrics across the United States. Through October 2021, our results show that all three of these metrics remain lower than their respective pre-pandemic averages at the national level. Viewing these metrics at the state and regional level reveals that there are some areas of the country that have returned to pre-pandemic levels, while other areas remain below historical testing rates. Our results do not show a consistent pattern of recovery to pre-pandemic levels by region or state across the different metrics (testing, new diagnoses, new treatment starts). We did not study other factors that could have an impact on HIV testing, diagnosis, and treatment such as benefit coverage changes, HIV policy coverage changes, or changes in price, among other potentially confounding factors.

Consistent HIV testing is key to the early diagnosis of new HIV cases and initiation of treatment. Prolonged reductions in HIV testing, diagnosis, and treatment may have a significant impact on HIV transmission, as well as the health outcomes of people living with HIV who are not on treatment.<sup>2,3</sup> The results of this analysis may be used, supplemented by local data and community input, to help inform where to focus efforts, particularly in states and regions in the United States that have been hit harder by the pandemic and have shown slower rebounds in HIV testing and treatment. The federal government has set a goal to end the HIV epidemic in the United States by 2030, but the COVID-19 pandemic may slow the progress made, particularly in areas of the country that have been most impacted by both HIV and COVID-19.

## Background

### OVERVIEW OF HIV

HIV is a chronic and potentially life-threatening viral infection that attacks the body's immune system, making it difficult to fight off infections. HIV is primarily transmitted through sexual contact or sharing of needles with a person who is living with HIV. In the first two to four weeks following HIV acquisition, most people experience flu-like symptoms, which is the body's natural response to the rapidly multiplying virus. Once these symptoms subside, people move into the clinical latency stage of HIV, also known as chronic HIV. During this stage, the virus multiplies much slower, and most people do not experience any symptoms. Without treatment, most people stay in this stage for 10 to 15 years and will eventually progress to acquired immunodeficiency syndrome (AIDS). Progression to AIDS indicates that the immune system is severely damaged, making one susceptible to potentially deadly opportunistic infections.<sup>4</sup>

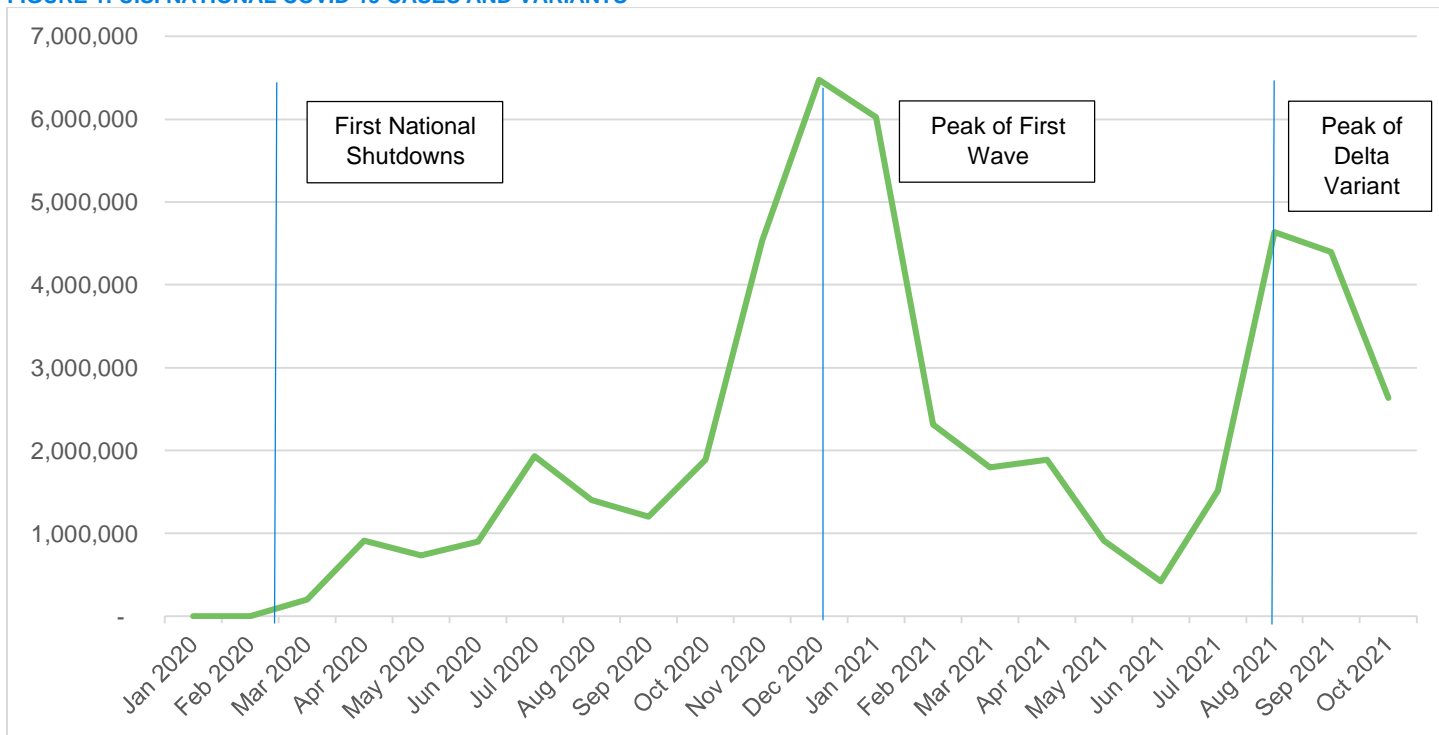
While there is currently no cure for HIV, treatment with antiretroviral medications can control disease progression and prevent the transmission of HIV to others. As a result of advances in HIV therapies, the life expectancy of people with HIV who start treatment early is similar to the general population.<sup>5</sup> People living with HIV who achieve and maintain an undetectable viral load—the amount of HIV in the blood—by taking antiretroviral therapy (ART) daily as prescribed cannot sexually transmit the virus to others, a concept referred to as Undetectable=Untransmittable (U=U).<sup>6</sup> Early diagnosis and treatment initiation, as well as regular monitoring for those already receiving treatments, are key in controlling communal viral load. The CDC recommends HIV testing for everyone age 13 to 64 at least once, and annual HIV testing for those at higher vulnerability for contracting HIV.<sup>7</sup> Diligent testing helps identify new cases of HIV earlier and helps to prevent transmission to others. For people who are living with HIV and are receiving treatment with ART, additional testing is recommended every three to six months to monitor levels of the virus and status of the immune system.<sup>8</sup>

Also important to the prevention of HIV transmission is pre-exposure prophylaxis (PrEP), which refers to medicines taken by those at risk for HIV to prevent contracting HIV. PrEP significantly reduces the risk of getting HIV from sex and, according to the CDC's Clinical Practice Guidelines for PrEP, all sexually active adults and adolescents should be informed about PrEP for prevention of HIV acquisition.<sup>9</sup> A number of risk assessment tools are available to help providers identify individuals who may be appropriate for PrEP therapy. Once individuals who may benefit from PrEP are identified, they must then receive an HIV test to ensure they do not already have HIV.<sup>10</sup> Then individuals taking PrEP are recommended to follow up with their providers and receive an HIV test every three months to ensure they remain HIV-negative.

In 2019, the federal government launched an initiative to end the HIV epidemic in the United States by 2030, as defined by reducing the number of new HIV infections in the United States by at least 90% by 2030, fewer than 3,000 new infections per year (there were 34,800 new HIV infections in 2019).<sup>11,12</sup> The initiative focuses on four key strategies: 1) Diagnosing all individuals with HIV as early as possible after infection, by expanding access to HIV testing. 2) Treating people with HIV as soon as possible after diagnosis to reach sustained viral suppression. 3) Preventing new HIV transmissions by using proven interventions like PrEP. 4) Responding quickly to potential HIV outbreaks. The first phase of the initiative is focused on 48 counties, Washington, D.C., and San Juan, Puerto Rico, where more than 50% of HIV diagnoses in the United States occurred in 2016 and 2017, and an additional seven states with a substantial number of HIV diagnoses in rural areas.<sup>12</sup>

### COVID-19 AND HIV

In early 2020, the United States began to see the effects of the COVID-19 pandemic, with the first wave of cases peaking in December 2020. Nationwide shutdowns coupled with the fear of spreading COVID-19 in public places resulted in broad impacts to healthcare access. In an early effort to slow the spread of COVID-19, the CDC released guidance encouraging healthcare facilities and their patients to delay nonessential procedures, postpone routine clinical visits, and utilize telemedicine when possible.<sup>1</sup> While these precautions helped to slow the spread of COVID-19, they also reduced access to healthcare services across the country.<sup>13</sup> A second wave of cases, due to the Delta variant, peaked in August 2021. The third peak (the Omicron variant) and largest wave of cases to date occurred in late 2021 and early 2022.<sup>14</sup> This wave is only partially reflected in our study data. While the Delta and Omicron variants may continue to impact the availability of healthcare services, particularly for acute respiratory incidents and inpatient stays, our study focuses mostly on the impacts of the initial pandemic and corresponding shutdowns. Figure 1 shows the U.S. national count of COVID-19 cases from January 2020 to October 2021.

**FIGURE 1: U.S. NATIONAL COVID-19 CASES AND VARIANTS<sup>14</sup>**

A number of studies have evaluated the impact of COVID-19 on healthcare utilization in other countries around the globe, finding that HIV testing rates declined during the pandemic.<sup>15,16,17</sup> The Global Fund's 2021 Report found that, globally, there was a 22% decrease in the number of people tested for HIV in 2020 compared to 2019.<sup>18</sup>

Few studies have evaluated this impact in the United States, however. One U.S. study evaluated the changes in HIV testing and treatment from 2019 to 2020 in four metropolitan areas, finding a 68% to 97% reduction in weekly HIV tests during each state's stay-at-home order period compared to before the stay-at-home periods began.<sup>19</sup> This study also found that testing remained low after states transitioned to advisory phases, and that HIV positivity rates increased in all areas except one. A number of smaller studies in the United States have reported similar findings related to testing.<sup>20,21,22</sup> Most recently, the CDC published its 2020 HIV Surveillance Report, which revealed that there was a 17% decrease in new HIV diagnoses in 2020 compared to 2019, attributing the decrease to disruptions in clinical care, patient hesitancy in accessing care, and shortages in testing materials.<sup>23</sup> While these sources tell an important story about what occurred during the pandemic, there remains a need to evaluate a broad set of metrics using more current data to determine how they have rebounded as the pandemic has slowed.

## REPORT OBJECTIVES

The goal of this report is to summarize the impact of the COVID-19 pandemic on HIV across the country. We analyzed claims data to assess changes in HIV testing, diagnosis, and treatment metrics during the COVID-19 pandemic compared to a pre-pandemic baseline. The pre-pandemic baseline is defined as the average of 2019 levels, and data during the pandemic includes claims from March 2020 through December 2021. We excluded data points after October 2021, as many of the metrics studied require a runout period. This analysis is then used to determine how HIV testing, diagnosis, treatment, and PrEP utilization rates have rebounded in different parts of the United States as COVID-19 rates have slowed and to identify areas that may require additional resources to bring rates back to pre-pandemic levels.

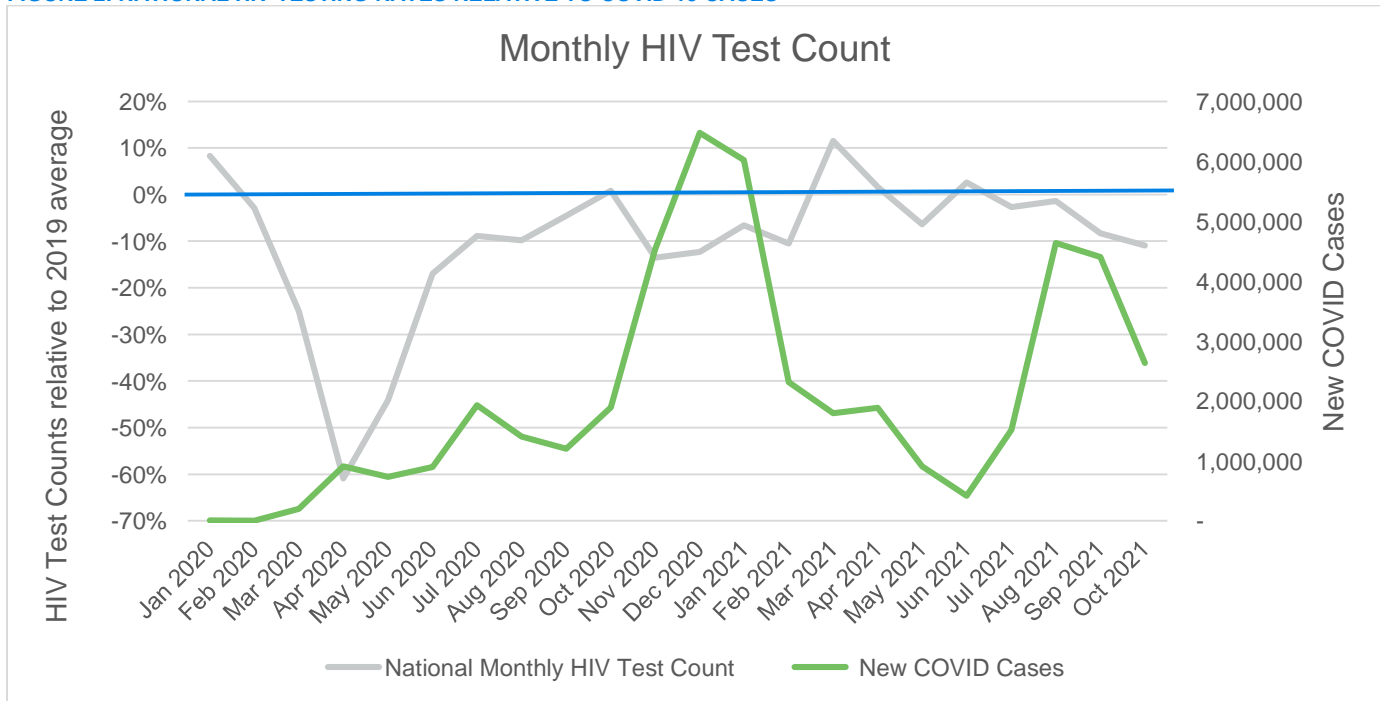
## National results

### HIV TESTING

Regular HIV testing is necessary to diagnose people living with HIV who are not aware of their status. Additionally, regular HIV testing is an important component of ongoing PrEP use to confirm that the PrEP user continues to be HIV-negative.

Figure 2 shows HIV testing over time as a percentage change from the 2019 average. This figure reveals that testing declined sharply across the United States at the beginning of the pandemic when COVID-19 cases were increasing and access to care was limited. Through the end of 2021, testing remained below 2019 levels.

**FIGURE 2: NATIONAL HIV TESTING RATES RELATIVE TO COVID-19 CASES**



Specifically, testing for HIV reached its lowest level during the earliest part of the pandemic (in April 2020), slowly recovered to near 2019 levels, and then decreased again at the initial peak of cases (November 2020 to January 2021). When COVID-19 cases dropped sharply, HIV testing recovered to pre-pandemic levels. In late 2021, however, as COVID-19 cases were again increasing, testing rates declined. On average, between March 2020 and October 2021, HIV testing was roughly 11% below the 2019 average testing levels.

### HIV DIAGNOSIS AND TREATMENT INITIATION

HIV diagnoses and treatment initiation, while related to the testing metrics, tell a slightly different story compared to the testing data described above.

Figure 3 shows that the rate of new HIV diagnoses dropped sharply in March 2020 and reached the lowest point in April 2020, consistent with the lack of testing taking place at that time. In March 2021, when testing was at its recent highest point, the rate of new HIV diagnoses was similarly at the highest level in our study period and was the only time since February 2020 the diagnosis rate was similar to 2019 averages, represented by a value close to zero on the y-axis.

**FIGURE 3: NATIONAL HIV DIAGNOSIS RATES RELATIVE TO 2019 LEVELS AND COVID-19 CASES**

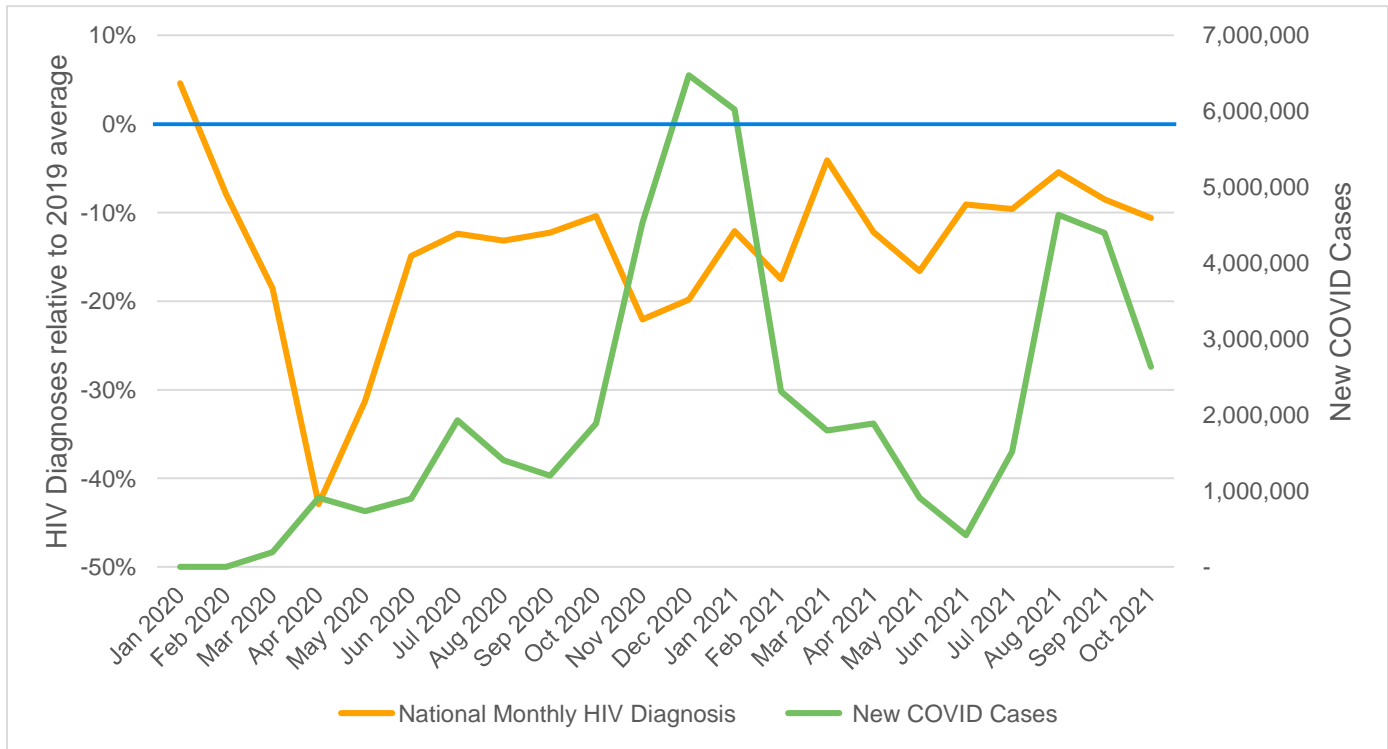
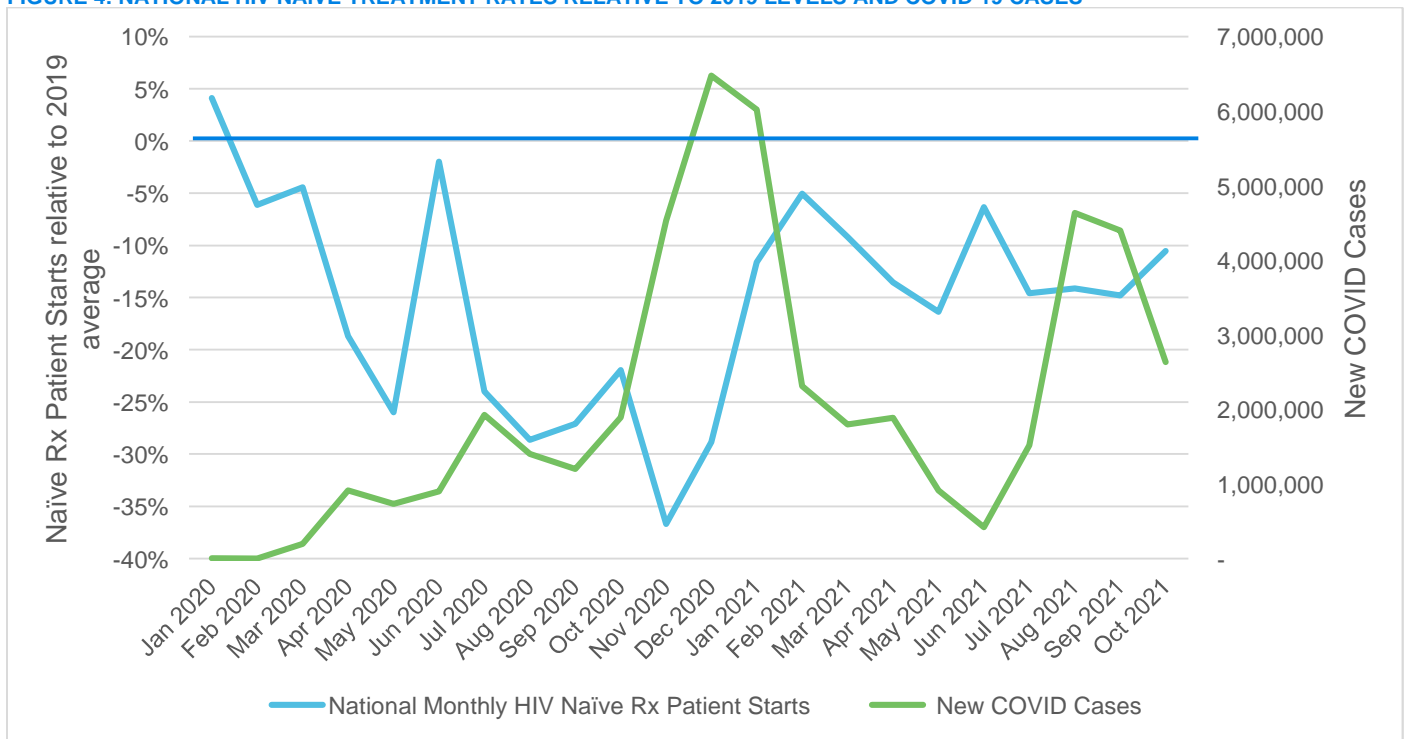


Figure 4 shows the rate of individuals starting HIV treatment for the first time following diagnosis, also known as naïve starts. Throughout 2020 and 2021, new HIV diagnoses were on average 15% below 2019 levels, and people were not starting treatment for HIV at the 2019 rate. Throughout 2020 and 2021, naïve treatment starts were on average 17% below 2019 rates even at times when HIV diagnoses approached 2019 levels.

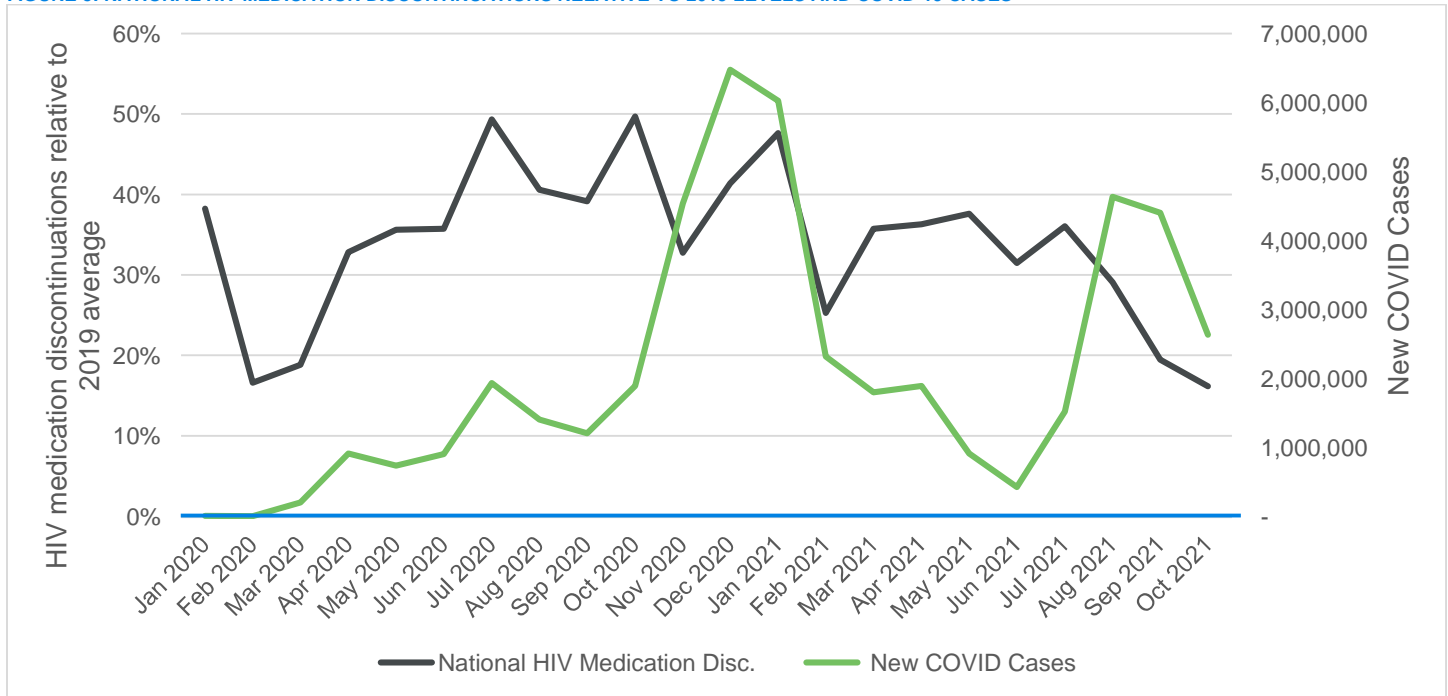
**FIGURE 4: NATIONAL HIV NAÏVE TREATMENT RATES RELATIVE TO 2019 LEVELS AND COVID-19 CASES**



## MEDICATION DISCONTINUATIONS

Figure 5 shows medication discontinuations for HIV treatment, defined as individuals without medication for at least 60 days after their last script ended. Script end is defined as the date an individual is assumed to be out of medication based on the days' supply submitted with the last claim. A patient may discontinue treatment due to lack of resources, medication side effects, death, or other reasons. Discontinuations were higher than average 2019 levels throughout 2020 and most of 2021.

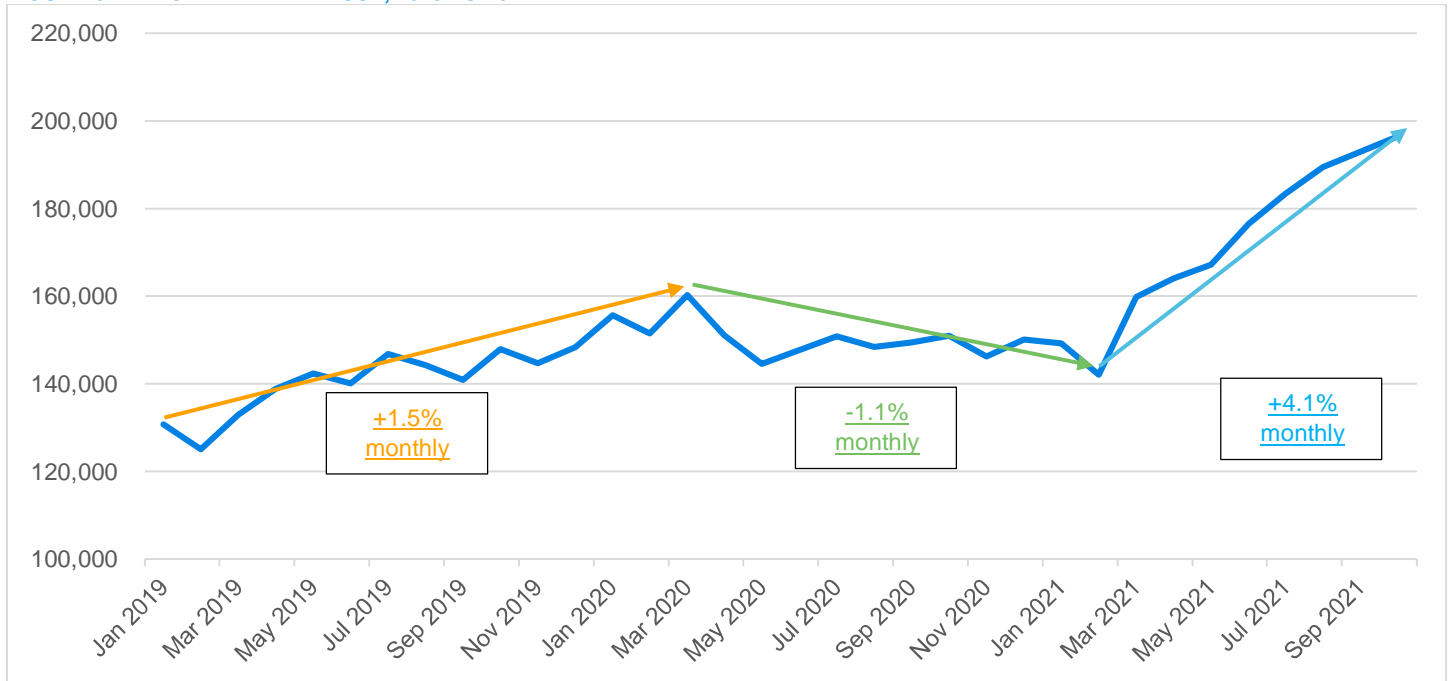
**FIGURE 5: NATIONAL HIV MEDICATION DISCONTINUATIONS RELATIVE TO 2019 LEVELS AND COVID-19 CASES**



## HIV PRE-EXPOSURE PROPHYLAXIS (PREP)

Figure 6 shows that actual utilization of HIV pre-exposure prophylaxis (PrEP) grew by over 20% between January 2019 and March 2020, an average of 1.5% per month. PrEP use decreased slightly from March 2020 to February 2021 and increased through the remainder of 2021.

FIGURE 6: NATIONAL HIV PREP USE, 2019 TO 2021





## Regional and state analysis

In this section, we report on the comparisons of HIV testing, diagnoses, and naïve treatment initiations across four regions (Midwest, Northeast, South, and West) in the United States and highlight metrics on a statewide level, which may differ from the aggregate region. We note that 12 states (Alaska, Delaware, Hawaii, Idaho, Kansas, Montana, Nebraska, Oklahoma, South Dakota, Utah, Vermont, and West Virginia) had less than 500 unique individuals who tested for HIV per month in 2019, on average. Year-over-year variation in reported metrics may be impacted by smaller populations and these small states will be indicated with an asterisk (\*) throughout the discussion in the sections to follow as a reminder of their variability in results. Appendix A includes a summary of select metrics for all regions and states in the United States. For purposes of this report, we reviewed Washington D.C., both as a state and an MSA.

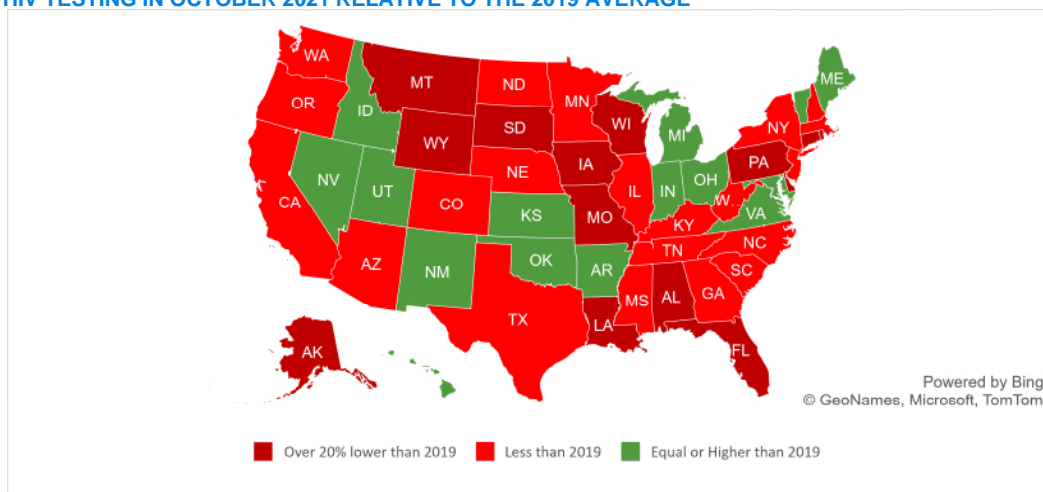
### HIV TESTING

Compared to each region's 2019 average, current HIV testing levels as of October 2021 remain below the 2019 testing average in the South, Northeast, and West. The only region that has recovered to 2019 testing levels is the Midwest.

Figure 7 shows each state's October 2021 HIV testing rate compared to its 2019 average.

- Fifteen states have current HIV testing levels at least 20% lower than their 2019 average testing levels. Those states include Alaska\* (-33%), Alabama (-68%), Connecticut (-20%), D.C. (-36%), Delaware\* (-20%), Florida (-23%), Iowa (-32%), Louisiana (-37%), Missouri (-39%), Montana (-33%), Pennsylvania (-21%), Rhode Island (-34%), South Dakota\* (-53%), Wisconsin (-30%), and Wyoming (-32%).
- Interestingly, while these states have not seen HIV testing levels return to 2019 levels, four of them (Delaware,\* Louisiana, Missouri, and Wyoming) have higher new diagnosis levels in October 2021 compared to 2019.
- Further, two of the states with low testing rates (Iowa and South Dakota\*) have higher HIV naïve treatment initiations compared to 2019 levels.
- Of the 17 states in the South region, 13 (Alabama, D.C, Delaware,\* Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and West Virginia\*) have lower HIV testing levels compared to their 2019 averages.
- Nationally, 16 states had lower HIV testing levels than their 2019 averages in all months from March 2020 through October 2021 (Alaska,\* Colorado, D.C., Delaware,\* Georgia, Iowa, Illinois, Louisiana, Mississippi, New Hampshire, New York, Pennsylvania, Rhode Island, South Carolina, South Dakota,\* and Wisconsin).

**FIGURE 7: STATE HIV TESTING IN OCTOBER 2021 RELATIVE TO THE 2019 AVERAGE**



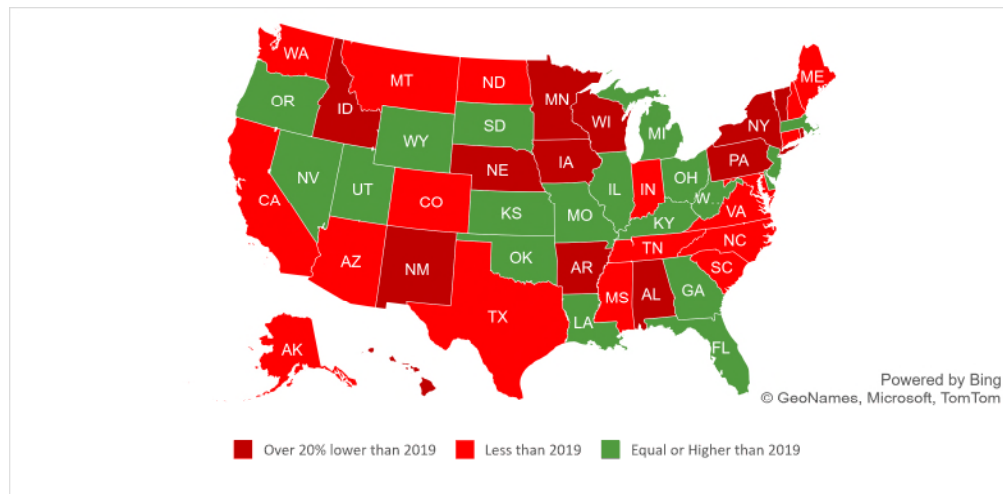
### HIV DIAGNOSES

Of all of the regions, only the Midwest has October 2021 HIV diagnosis levels that meet 2019 diagnosis levels. Figure 8 shows each state's diagnosis rate as of October 2021 compared to their 2019 average.

- Fifteen states have current HIV diagnosis levels 20% lower than their 2019 averages. While HIV diagnosis levels may have been suppressed by the COVID-19 pandemic and lower testing rates, it is also possible that lower HIV diagnosis levels are partially attributed to higher PrEP utilization or less transmissions due to lockdowns.

- There are five states with current HIV diagnosis levels at least 20% higher than 2019 average diagnosis levels (Kansas,\* Kentucky, Michigan, Utah,\* and Wyoming).

**FIGURE 8: STATE HIV DIAGNOSES IN OCTOBER 2021 RELATIVE TO THE 2019 AVERAGE**

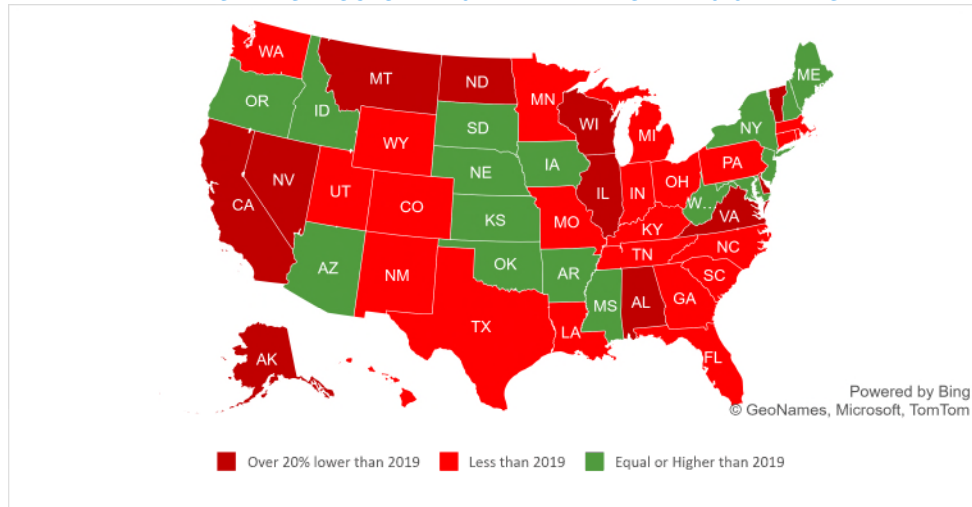


## HIV NAÏVE TREATMENT INITIATION

Across all regions but the Northeast, HIV naïve treatment initiation levels as of October 2021 are lower than their 2019 averages. Figure 9 shows state-level comparisons.

- There are only 16 states that met or exceeded their 2019 averages for HIV naïve treatment initiation levels.
- There are 11 states that have current HIV naïve treatment initiation levels that are 20% below their 2019 averages.
- Alaska\* and Wisconsin are two states that have current HIV naïve treatment initiation levels that are more than 65% below their 2019 averages. Both states have lower current HIV testing levels than 2019 averages (-33% and -30%, respectively) and they also have lower current HIV diagnosis levels than 2019 averages (-8% and -43%, respectively).
- As mentioned above, there are five states with current HIV diagnosis levels at least 20% higher than 2019 average diagnosis levels (Kansas,\* Kentucky, Michigan, Utah,\* and Wyoming). Of these states, all but Kansas\* also have current HIV naïve treatment initiations lower than their 2019 averages. This could indicate that individuals are being diagnosed with HIV and are not receiving necessary treatment. While Wyoming observed 80% higher HIV diagnosis levels than 2019, the HIV naïve treatment initiation levels are 18% lower than 2019 averages.

**FIGURE 9: STATE HIV NAÏVE TREATMENT STARTS IN OCTOBER 2021 RELATIVE TO THE 2019 AVERAGE**



Both the South and the West regions have lower current levels compared to 2019 averages across HIV testing, diagnosis, and treatment initiation.

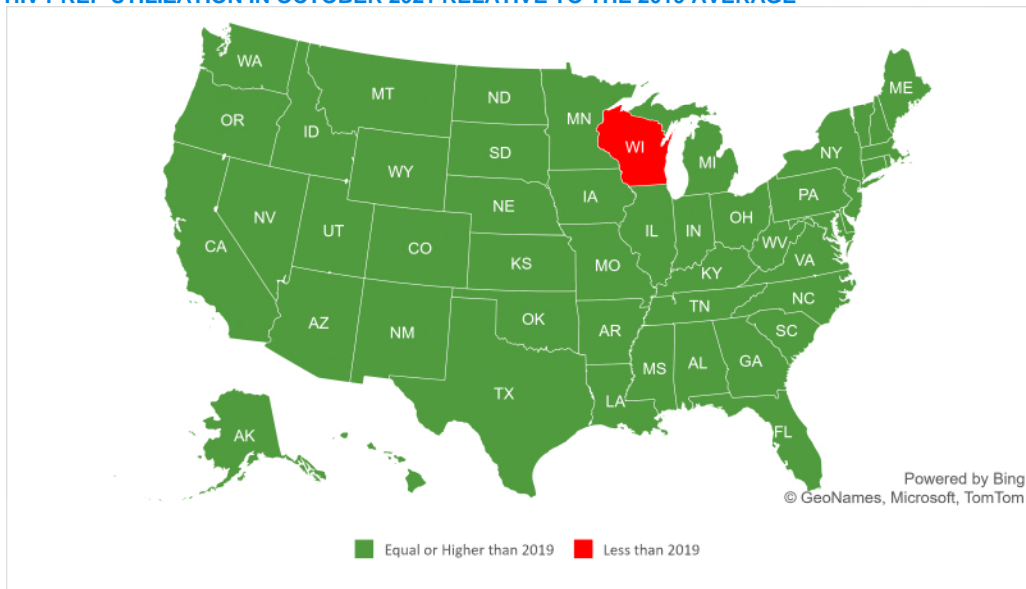
- There are 16 states that have lower current HIV testing, diagnosis, and treatment initiation levels compared to their 2019 averages. The states that have the lowest average current HIV testing, diagnosis, and treatment initiation levels compared to their 2019 averages include Alabama, Alaska,\* Rhode Island, and Wisconsin.

**HIV PREP USE**

As of October 2021, PrEP utilization has exceeded 2019 levels across all regions. The South is the region with the highest PrEP utilization, compared to its 2019 average. Figure 10 shows PrEP utilization changes compared to 2019 average, by state.

- The only state that had lower PrEP utilization compared to their 2019 levels was Wisconsin, which had 16% lower utilization levels compared to 2019 levels. Compared to 2019 levels, PrEP utilization increased more than 100% in Colorado, Florida, Michigan, Nevada, and Tennessee.

**FIGURE 10: STATE HIV PREP UTILIZATION IN OCTOBER 2021 RELATIVE TO THE 2019 AVERAGE**

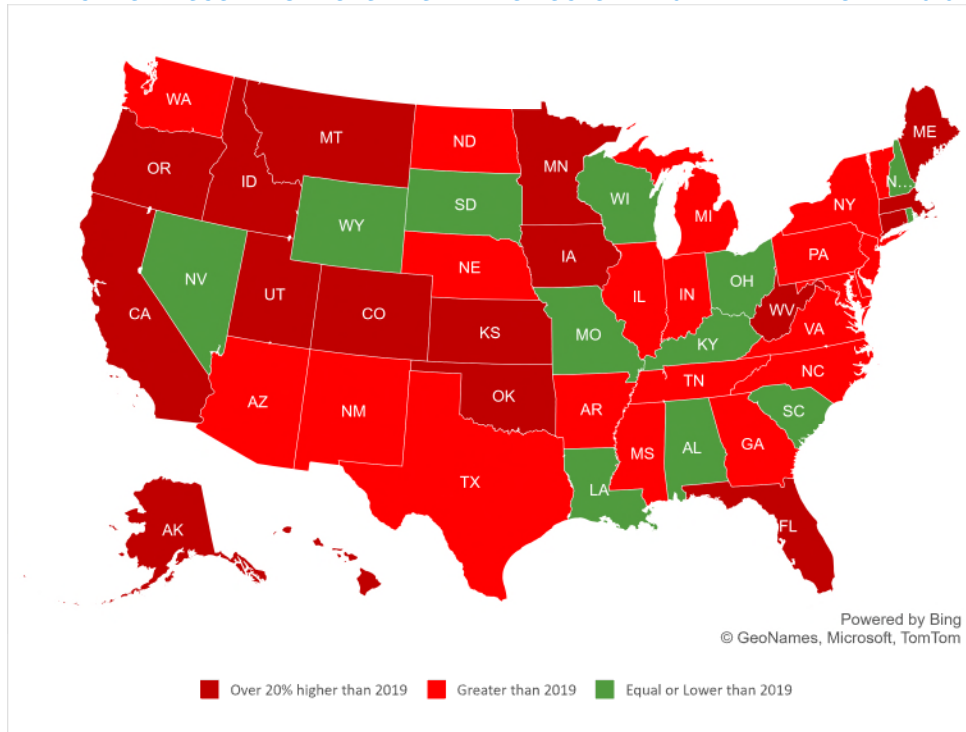


## MEDICATION DISCONTINUATIONS

October 2021 medication discontinuations were higher than 2019 averages in the West region.

- There were 17 states with medication discontinuation more than 20% higher than their 2019 averages.
- The three states with the highest current medication discontinuations relative to their 2019 averages are Maine, Massachusetts, and Oklahoma,\* with all three states exceeding 60% higher medication discontinuations relative to their 2019 averages.

**FIGURE 11: CHANGE IN MEDICATION DISCONTINUATIONS BY STATE FOR OCTOBER 2021 RELATIVE TO THE 2019 AVERAGE**



## MEDICAID EXPANSION

According to a 2018 Kaiser Family Foundation study on insurance coverage of individuals living with HIV, 40% receive coverage through Medicaid and 35% have private insurance.<sup>24</sup> As Medicaid is the largest source of insurance coverage for individuals living with HIV, it is important to consider the expansion status of states when reviewing HIV testing, diagnosis, and treatment rates. This is particularly important immediately following the onset of the COVID-19 pandemic, when unemployment increased and many people lost employer-sponsored healthcare coverage.

As of the time of this paper, there are 12 states that have not expanded Medicaid for individuals with incomes below 138% of the federal poverty level (FPL). Most of these states are in the South region, which is disproportionately impacted by the HIV epidemic, making up more than half (53%) of new HIV infections in 2019.<sup>25</sup> Of these 12 states, 11 have lower HIV testing levels than 2019, seven have lower HIV diagnosis levels than 2019, and nine have lower HIV naïve treatment initiation levels than 2019. Alabama, North Carolina, South Carolina, Tennessee, Texas, and Wisconsin have all three levels lower than 2019. We did not take alternative waiver programs into consideration in the definition of Medicaid expansion, which may provide supplemental coverage for HIV testing, diagnosis, and treatment.

## MSA analysis

In this section, we report on the comparisons of HIV testing, diagnoses, naïve treatment initiations, and PrEP use among the top 10 MSAs by 2019 HIV cases—Atlanta, Chicago, Dallas, Houston, Los Angeles, Miami, New York, Orlando, Philadelphia, and Washington, D.C. These MSAs represent 36% of all HIV cases in the United States. With the exception of Philadelphia, all of these MSAs are located in states that rank in the top 10 of highest HIV prevalence rates according to the CDC’s 2020 HIV Surveillance Report.<sup>23</sup> We include a summary of HIV metrics for these MSAs in Appendix B.

### HIV TESTING

All 10 MSAs consistently observed significant decreases in HIV testing between March 2020 and June 2020. Only Dallas and D.C. have current HIV testing levels that exceeded their 2019 averages. Throughout 2021, four MSAs (Atlanta, Chicago, Houston, and Philadelphia) did not have a single month that reached 2019 HIV testing rates. Orlando had the lowest HIV testing rate as of October 2021 relative to 2019, with testing remaining 48% below 2019 averages.

### NEW HIV DIAGNOSES

Consistent with the national rates in Figure 2 above, new HIV diagnoses generally decreased sharply between March 2020 and May 2020 across the MSAs.

- The one MSA that did not follow this pattern was Philadelphia, which remained at or slightly above the 2019 average in April 2020 and May 2020. New York did not reach 2019 HIV diagnosis averages in any month in 2021.

There was variability in the 2021 HIV diagnosis levels compared to 2019 among the MSAs.

- Chicago, Los Angeles, and Miami generally met or exceeded 2019 HIV diagnosis levels as of October 2021.
- While some other MSAs did not return to 2019 average diagnosis levels in 2021, New York diagnosis rates remain 40% lower than 2019 averages. These low diagnosis rates are likely related to low testing rates in 2021 (which remain 10% below 2019 average levels in New York).

### HIV NAÏVE TREATMENT INITIATION

Rates of individuals initiating treatment for the first time following diagnosis, also known as naïve starts, were generally lower in 2020 and 2021 compared to 2019 across the MSAs.

- Eight of the MSAs experienced decreases in treatment initiation in 2021 relative to 2019 levels—only Houston and New York improved over 2019 averages. This could indicate that individuals who were diagnosed with HIV in 2020 or 2021 did not initiate treatment.
- Chicago had the lowest levels of HIV naïve treatment initiation at the end of 2021 compared to its 2019 average. This is inconsistent with the higher rate of HIV diagnoses in Chicago over that time.

### HIV PREP USE

Prior to the onset of the COVID-19 pandemic, all 10 MSAs showed increasing levels of monthly PrEP use, consistent with national levels. However, beginning in March 2020, more distinct differences were observed among MSAs.

- While national monthly PrEP use remained fairly flat or decreased slightly between March 2020 and February 2021, both Miami and Orlando had increases in monthly PrEP use during this time period.
- All of the top 10 MSAs observed an increase in monthly PrEP use as of October 2021, with Dallas, Houston, Miami, and Orlando experiencing the most significant increases in monthly PrEP use compared to 2019 averages.

### OTHER MSAS

We also reviewed HIV testing, diagnosis, and HIV naïve treatment initiation for other MSAs. We focused our review on MSAs with a minimum of 10,000 HIV tests administered in 2019 as a credibility threshold, resulting in an analysis of 37 total MSAs, including the top 10 discussed in the previous section. A summary of metrics for these MSAs is included in Appendix C.

- Of MSAs with a minimum of 10,000 HIV tests in 2019, there were 13 MSAs with October 2021 testing levels that were at least 20% lower than 2019 levels. Only seven of these MSAs had HIV testing levels meet or exceed 2019 levels as of October 2021.

- There were 13 MSAs with October 2021 HIV diagnosis levels that were at least 20% lower than 2019. Rochester, New York, had the lowest October 2021 HIV diagnosis levels relative to 2019, 50% lower than its 2019 average level.
- There were 10 MSAs with October 2021 HIV naïve treatment initiation levels at least 20% lower than 2019.
- There were 14 MSAs with October 2021 levels of all three key HIV metrics (testing, diagnosis, and naïve treatment initiation) less than 2019 average levels:
  - Atlanta-Sandy Springs-Alpharetta, Georgia
  - Baltimore-Columbia-Towson, Maryland
  - Cambridge-Newton-Framingham, Massachusetts
  - Columbus, Ohio
  - Denver-Aurora-Lakewood, Colorado
  - Fort Worth-Arlington-Grapevine, Texas
  - Memphis, Tennessee-Mississippi-Arkansas
  - Nassau County-Suffolk County, New York
  - Philadelphia, Pennsylvania
  - Pittsburgh, Pennsylvania
  - Rochester, New York
  - Sacramento-Roseville-Folsom, California
  - Seattle-Bellevue-Kent, Washington
  - Tampa-St. Petersburg-Clearwater, Florida

## Discussion

Our study findings confirm that HIV testing, diagnosis, and treatment metrics decreased across the United States during the COVID-19 pandemic. As this analysis is limited to claims data, it is unknown whether actual HIV infection rates decreased as well, which would impact some of the metrics studied in this report. Actual HIV transmission rates may have dropped as a result of pandemic-associated lockdowns and social distancing. This study is unable to identify whether this is the case using the data available at the time of this report. Rates of HIV testing and new HIV diagnoses followed similar patterns throughout the course of the pandemic, with the most significant reductions occurring at the beginning of the pandemic (spring 2020). After this time, both metrics increased close to average 2019 levels, but saw decreases at times when COVID-19 variants, such as Delta and Omicron, were on the rise in the United States. Initiation of ART in treatment-naïve individuals also saw declines throughout the pandemic and has remained below 2019 levels since February 2020. Through October 2021, our results show that all three of these metrics are still lower than their respective pre-pandemic averages at the national level.

Viewing these metrics at the state and regional level reveals that there are some areas of the country that have rebounded to pre-pandemic testing, diagnosis, and treatment levels, while other areas have not returned to 2019 levels. Our results do not show a consistent pattern of return to pre-pandemic levels by region or state across the different metrics (testing, new diagnoses, new treatment starts). Additional initiatives may be taken in states with HIV metrics that have yet to return to average pre-pandemic levels, and the results of this analysis may be used as a tool to help inform where to focus efforts, supplemented by additional local data and community input.

Immediately following the onset of the COVID-19 pandemic, unemployment in the United States increased, spiking to 14.8% in April 2020.<sup>26</sup> As many Americans receive health insurance through their employers, many individuals lost healthcare coverage because of the pandemic. While some individuals became eligible for government-sponsored insurance, this did not fully offset the decrease in employer-sponsored insurance. A study of health insurance coverage during the COVID-19 pandemic found that insurance coverage declined by 1.4% over a 12-week period during the spring and summer of 2020.<sup>27</sup> The study also found that the decline in insurance coverage during this period was more pronounced in states that have not expanded Medicaid. Of the 12 states that have not expanded Medicaid at the time of this paper, nine continue to have lower HIV testing levels than 2019, seven still have lower HIV diagnosis levels than 2019, and nine still have lower HIV naïve treatment initiation levels than 2019. Medicaid expansion status plays an important role in healthcare coverage, as Medicaid is the largest insurer for individuals living with HIV.<sup>28</sup> It is possible that this decrease in insurance coverage, coupled with the overall reduced access to care because of the pandemic, contributed to lower HIV testing, diagnosis, and treatment rates, particularly in the spring and summer of 2020.

As previously noted, consistent access to HIV testing is key to the early diagnosis of new HIV cases and initiation of treatment. Prolonged reductions in HIV testing, diagnosis, and treatment may have a significant impact on HIV transmission, as well as the health outcomes of people living with HIV who are not on treatment.<sup>2,3</sup> This is particularly the case if not accompanied by similar decreases in actual HIV infection rates, which is unknown at this time. One change resulting from the initial reductions in testing due to COVID-19 has been the increased availability and accessibility of at-home HIV testing kits and services. Historically, HIV testing has primarily taken place in clinics, but COVID-19 has led to availability of at-home HIV tests for those in need.<sup>29</sup> Another venue for HIV testing is the emergency department (ED), which serves a diverse and often vulnerable patient population, many of whom use the ED as their primary source of healthcare. EDs are effective in testing persons who do not perceive themselves to be at risk and in diagnosing acute HIV infection.<sup>30,31</sup> HIV testing models in EDs that leveraged electronic medical record (EMR) modifications to identify individuals eligible for HIV testing (policy-driven HIV testing) and prompted automatic HIV test orders when other labs were ordered showed resiliency during the pandemic.<sup>32</sup> In Michigan, a study from Henry Ford Health System found that EMR-driven HIV testing in the ED resulted in a similar rate of patients in the pre-pandemic period (35.8% of all patients seen in the ED) who were screened compared to during the pandemic (34.7% of all patients seen), despite changes in ED volumes.<sup>33</sup> These initiatives ensure the U.S. population has access to HIV testing even in times of public health emergency.

Decades after the first HIV diagnosis, HIV continues to be a public health concern. Decreased HIV testing and delayed or disrupted access to HIV treatment as a result of the COVID-19 pandemic may impact HIV transmission. HIV testing is a component of both HIV prevention and treatment strategies. According to the CDC, nearly 40% of new HIV infections are transmitted by people who do not know they have the virus.<sup>34</sup> Once someone is diagnosed with HIV, HIV treatment should be started as soon as possible in order to decrease the time to viral suppression, improve clinical outcomes, and reduce the risk of HIV transmission.<sup>35</sup> The results of this analysis may be used, supplemented by local data and community input, to help inform where to focus, particularly in states and regions in the United States that have been hit harder by the pandemic and have shown slower rebounds in HIV testing and treatment. The federal government has set a goal to end the HIV epidemic in the United States by 2030 but the COVID-19 pandemic may slow the progress that has been made, particularly in areas of the country that have been most impacted by both HIV and COVID-19.

## Data, Methodology, and Limitations

### METHODOLOGY

- HIV testing: We identified tests using specific procedure codes and limited tests to one per day per person.
- New HIV diagnoses: We used diagnosis codes and an 11-year lookback period to identify each person's original HIV diagnosis date.
- HIV treatment new starts: We used an 11-year lookback period to identify each person's original HIV treatment start date. We used the database to identify naïve starts in 2019 by eliminating persons with treatments before the study period. We exclude persons on Truvada, Descovy, or generic tenofovir/emtricitabine (TDF/FTC) monotherapy (without other HIV third-agent medications), because these medications taken in isolation indicate PrEP use rather than HIV treatment.
  - We identified HIV medications using Medi-Span. All drugs falling under the Medi-Span class “Antiretrovirals” were included in our analysis.
- Medication discontinuations: We define a discontinuation as an individual who does not show up in the claims data with an approved claim 60 days following their last assumed dose based on the days' supply of their last prescription.

### DATA SOURCES

We relied on IQVIA Longitudinal Access and Adjudicated Data (LAAD) from January 1, 2019, to December 31, 2021, to perform this analysis. LAAD contains national longitudinal medical and pharmacy claims data for private, Medicare, and Medicaid insured individuals. LAAD has 80%+ coverage of the pharmacy claims for the HIV market and 60%+ coverage of the medical claims. COVID-19 case data was accessed from usafacts.org on April 7, 2022. This data was accepted without audit but was reviewed for consistency and reasonability.

### LIMITATIONS

Our analysis and methodology are limited to information available within the data set, and are therefore not able to account for the following:

- Uninsured persons not captured in the data, as well as claims for insured persons who are not submitted to or paid for by their insurance.
- The data does not include claims for all insured people in the United States, therefore our review is only able to focus on trends and comparisons rather than absolute values.
- Differences in capture rates between the IQVIA Rx (pharmacy) and Mx (medical) feeds—i.e., there may be times when a patient has Rx data but not medical data and vice versa.
- Noncontinuous patient IDs for individuals transitioning among coverage types or becoming uninsured. This would particularly affect the medication discontinuation metrics, as well as new HIV diagnoses and new treatment initiation metrics.

Each HIV measure reviewed in this analysis summarizes volume by month. MSA population changes were not considered in this analysis, although changes in population volume in MSAs may have impacted the volume in each measure. In a recent analysis of census data, cities with population sizes over 1 million experienced the most declines in population between July 2019 and July 2020.<sup>36</sup>

We did not normalize or otherwise adjust for changes in the underlying population size over the study period. Changes in population by a specific cohort, such as within a given MSA, may contribute to the results in different ways.



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**Appendix A**  
**State and Regional HIV Metrics - March 2020 through October 2021<sup>1</sup>**

Region	Tests				New Diagnoses				New Treatment Starts	
	Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Estimated Missed Tests Due to COVID <sup>5</sup>	Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Current Relative to 2019 Avg <sup>2</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	
<b>Nation</b>	-11%	80%	-61%	543,470	-11%	100%	-43%	-11%	-37%	
<b>Midwest</b>	10%	20%	-56%	72,345	4%	70%	-46%	-18%	-42%	
<b>Northeast</b>	-13%	95%	-75%	247,918	-26%	100%	-57%	10%	-36%	
<b>South</b>	-10%	80%	-52%	129,577	-7%	80%	-32%	-12%	-38%	
<b>West</b>	-7%	85%	-52%	93,630	-1%	90%	-39%	-19%	-34%	
<b>AK* West</b>	-33%	100%	-79%	457	-8%	80%	-	-71%	-83%	
<b>AL South</b>	-68%	65%	-68%	4,153	-22%	65%	-30%	-26%	-53%	
<b>AR South</b>	76%	15%	-57%	993	-21%	90%	-47%	68%	-37%	
<b>AZ West</b>	-10%	60%	-36%	4,456	-17%	85%	-26%	13%	-11%	
<b>CA West</b>	-6%	75%	-51%	52,667	0%	85%	-41%	-24%	-39%	
<b>CO West</b>	-19%	100%	-57%	9,364	-2%	90%	-46%	-15%	-15%	
<b>CT Northeast</b>	-20%	95%	-70%	4,230	-12%	55%	-29%	-15%	-57%	
<b>DC South</b>	-36%	100%	-75%	5,379	-27%	65%	-40%	-10%	-37%	
<b>DE* South</b>	-20%	100%	-63%	2,472	8%	70%	-63%	-47%	-59%	
<b>FL South</b>	-23%	95%	-45%	19,218	0%	50%	-19%	-17%	-43%	
<b>GA South</b>	-16%	100%	-53%	7,348	3%	30%	-38%	-19%	-35%	
<b>HI* West</b>	9%	20%	-37%	268	-30%	70%	-56%	-12%	-59%	
<b>IA Midwest</b>	-32%	100%	-57%	7,349	-56%	90%	-56%	57%	-13%	
<b>ID* West</b>	60%	20%	-46%	65	-35%	65%	-74%	27%	-32%	
<b>IL Midwest</b>	-14%	100%	-58%	27,611	4%	80%	-51%	-28%	-51%	
<b>IN Midwest</b>	63%	20%	-66%	1,725	-17%	10%	-32%	-19%	-48%	
<b>KS* Midwest</b>	3%	45%	-50%	958	41%	25%	-44%	5%	-60%	
<b>KY South</b>	-9%	65%	-55%	3,393	22%	25%	-32%	-7%	-29%	
<b>LA South</b>	-37%	100%	-72%	19,429	3%	85%	-48%	-19%	-62%	
<b>MA Northeast</b>	-7%	80%	-76%	17,759	8%	55%	-41%	-3%	-44%	
<b>MD South</b>	22%	25%	-65%	2,910	-15%	90%	-35%	5%	-39%	
<b>ME Northeast</b>	72%	75%	-74%	3,104	-17%	90%	-75%	0%	-55%	
<b>MI Midwest</b>	51%	25%	-55%	4,360	69%	75%	-55%	-10%	-49%	
<b>MN Midwest</b>	-1%	80%	-65%	10,560	-30%	100%	-62%	-2%	-37%	
<b>MO Midwest</b>	-39%	90%	-58%	1,957	10%	55%	-49%	-9%	-36%	
<b>MS South</b>	-18%	100%	-67%	3,564	-9%	90%	-55%	76%	-36%	
<b>MT* West</b>	-33%	95%	-59%	1,870	-13%	85%	-63%	-58%	-82%	
<b>NC South</b>	-10%	60%	-56%	13,965	-11%	65%	-49%	-9%	-36%	
<b>ND Midwest</b>	-14%	85%	-63%	908	-20%	70%	-60%	-28%	-59%	
<b>NE* Midwest</b>	-3%	80%	-40%	732	-49%	95%	-61%	41%	-39%	
<b>NH Northeast</b>	-18%	100%	-78%	2,086	-15%	50%	-72%	40%	-65%	
<b>NJ Northeast</b>	-8%	75%	-70%	56,148	9%	70%	-56%	7%	-38%	
<b>NM West</b>	2%	90%	-47%	1,703	-23%	90%	-58%	-15%	-47%	
<b>NV West</b>	6%	65%	-43%	1,293	10%	80%	-49%	-41%	-43%	
<b>NY Northeast</b>	-17%	100%	-81%	137,578	-46%	100%	-68%	27%	-36%	
<b>OH Midwest</b>	34%	15%	-51%	7,339	1%	80%	-35%	-10%	-39%	
<b>OK* South</b>	24%	20%	-44%	281	14%	60%	-48%	21%	-48%	
<b>OR West</b>	-4%	95%	-70%	13,655	13%	35%	-37%	5%	-28%	
<b>PA Northeast</b>	-21%	100%	-59%	22,113	-22%	90%	-26%	-12%	-39%	
<b>RI Northeast</b>	-34%	100%	-75%	3,553	-58%	100%	-58%	-15%	-72%	
<b>SC South</b>	-18%	100%	-63%	5,401	-19%	60%	-39%	-14%	-42%	
<b>SD* Midwest</b>	-53%	100%	-65%	3,493	0%	30%	-67%	57%	-65%	
<b>TN South</b>	-15%	70%	-38%	5,145	-19%	80%	-37%	-9%	-45%	
<b>TX South</b>	-3%	75%	-47%	33,074	-12%	95%	-36%	-6%	-33%	
<b>UT* West</b>	41%	15%	-57%	118	202%	10%	-50%	-2%	-46%	
<b>VA South</b>	39%	20%	-60%	1,114	-12%	45%	-28%	-40%	-47%	
<b>VT* Northeast</b>	16%	70%	-74%	1,347	-88%	75%	-88%	-26%	-75%	
<b>WA West</b>	-11%	75%	-54%	7,597	-13%	100%	-40%	-15%	-32%	
<b>WI Midwest</b>	-30%	100%	-57%	5,354	-43%	95%	-69%	-68%	-81%	
<b>WV* South</b>	-14%	75%	-60%	1,740	1%	75%	-54%	36%	-49%	
<b>WY West</b>	-31%	65%	-47%	119	80%	20%	-	-18%	-	

\*States had less than 500 unique individuals who tested for HIV per month in 2019, on average. Year-over-year variation may be impacted by smaller population size.

<sup>1</sup> November 2021 through December 2021 are excluded from this analysis to remove the impact of data runout inconsistencies.

<sup>2</sup> Current is defined as the average monthly value in October 2021 and is compared to each group's (e.g., state, benchmark) own 2019 average. Highlighting is used to compare each state/regional value to the 2019 average value for that state or region. Green shading indicates a value above their 2019 average, and red shading indicates a value below their 2019 average.

<sup>3</sup> Percentage of months since March 2020 that are below the 2019 average. The maximum number of months in the denominator is 19.

<sup>4</sup> Value represents the lowest percent decrease from the 2019 average in any pandemic month for that state/region.

<sup>5</sup> Missed Tests due to COVID is calculated as the gross number of tests that would have occurred if the state would have stayed at their 2019 average through the pandemic, based on the information in our dataset. Note, this data may not fully represent the actual total number of tests in the US/each state, therefore actual results will vary.

**Appendix B**  
**Top 10 MSAs HIV Metrics - March 2020 through October 2021<sup>1</sup>**

MSA	Nation	Tests				New Diagnoses			New Treatment Starts	
		Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Estimated Missed Tests Due to COVID <sup>5</sup>	Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Current Relative to 2019 Avg <sup>2</sup>	Low Point % Change from 2019 Avg <sup>4</sup>
	Nation	-7%	75%	20%	520,029	-11%	100%	-43%	-11%	-37%
New York-Jersey City-White Plains, NY-NJ		-10%	90%	-80%	123,770	-40%	100%	-69%	21%	-31%
Atlanta-Sandy Springs-Alpharetta, GA		-13%	100%	-55%	5,821	-5%	45%	-45%	-23%	-37%
Chicago-Naperville-Evanston, IL		-15%	100%	-59%	26,042	8%	80%	-50%	-32%	-54%
Los Angeles-Long Beach-Glendale, CA		-7%	90%	-56%	39,099	13%	60%	-37%	-21%	-42%
Houston-The Woodlands-Sugar Land, TX		-29%	100%	-53%	15,370	-11%	90%	-44%	6%	-32%
Philadelphia, PA		-24%	100%	-73%	13,063	-9%	75%	-34%	-20%	-41%
Miami-Miami Beach-Kendall, FL		-28%	95%	-48%	1,708	24%	65%	-46%	-19%	-50%
Dallas-Plano-Irving, TX		7%	50%	-43%	4,950	-5%	75%	-37%	-20%	-48%
Washington-Arlington-Alexandria, DC-VA-MD-WV		10%	50%	-72%	3,088	-20%	65%	-34%	-18%	-34%
Orlando-Kissimmee-Sanford, FL		-48%	50%	-49%	704	-19%	75%	-36%	-21%	-46%

<sup>1</sup> November 2021 through December 2021 are excluded from this analysis to remove the impact of data runout inconsistencies.

<sup>2</sup> Current is defined as the average monthly value in October 2021 and is compared to each group's (e.g., state, benchmark) own 2019 average. Highlighting is used to compare each state/regional value to the 2019 average value for that state or region. Green shading indicates a value above their 2019 average, and red shading indicates a value below their 2019 average.

<sup>3</sup> Percentage of months since March 2020 that are below the 2019 average. The maximum number of months in the denominator is 19.

<sup>4</sup> Value represents the lowest percent decrease from the 2019 average in any pandemic month for that state/region.

<sup>5</sup> Missed Tests due to COVID is calculated as the gross number of tests that would have occurred if the state would have stayed at their 2019 average through the pandemic, based on the information in our dataset. Note, this data may not fully represent the actual total number of tests in the US/each state, therefore actual results will vary.

**Appendix C**  
**MSAs with >10,000 HIV Test in 2019 - HIV Metrics - March 2020 through October 2021<sup>1</sup>**

MSA	Nation	Tests				New Diagnoses				New Treatment Starts	
		Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Estimated Missed Tests Due to COVID <sup>5</sup>	Current Relative to 2019 Avg <sup>2</sup>	% Pandemic Months below 2019 Avg <sup>3</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	Current Relative to 2019 Avg <sup>2</sup>	Low Point % Change from 2019 Avg <sup>4</sup>	
	Nation	-11%	80%	-61%	543,470	-11%	100%	-43%	-11%	-37%	
Cleveland-Elyria, OH		144%	5%	-38%	702	59%	15%	-16%	-21%	-41%	
Cincinnati, OH-KY-IN		26%	50%	-60%	2,135	8%	70%	-33%	-13%	-54%	
Austin-Round Rock-Georgetown, TX		14%	40%	-42%	6,426	-38%	100%	-38%	14%	-19%	
San Diego-Chula Vista-Carlsbad, CA		11%	15%	-43%	3,306	-31%	95%	-47%	-39%	-42%	
Washington-Arlington-Alexandria, DC-VA-MD-WV		10%	50%	-72%	3,088	-20%	65%	-34%	-18%	-34%	
Dallas-Plano-Irving, TX		7%	50%	-43%	4,950	-5%	75%	-37%	-20%	-48%	
Minneapolis-St. Paul-Bloomington, MN-WI		4%	70%	-65%	7,020	-26%	100%	-58%	-9%	-37%	
Jacksonville, FL		-1%	90%	-49%	2,638	5%	40%	-48%	2%	-46%	
New Brunswick-Lakewood, NJ		-2%	55%	-68%	12,221	48%	20%	-53%	-1%	-49%	
Burlington, NC		-3%	45%	-56%	8,259	-40%	80%	-53%	57%	-100%	
Portland-Vancouver-Hillsboro, OR-WA		-4%	100%	-75%	11,407	32%	25%	-30%	-4%	-22%	
Cambridge-Newton-Framingham, MA		-6%	95%	-71%	8,163	-18%	95%	-51%	-16%	-65%	
Los Angeles-Long Beach-Glendale, CA		-7%	90%	-56%	39,099	13%	60%	-37%	-21%	-42%	
Phoenix-Mesa-Chandler, AZ		-8%	50%	-29%	2,284	-20%	80%	-26%	7%	-18%	
Seattle-Bellevue-Kent, WA		-9%	75%	-55%	5,230	-11%	100%	-32%	-17%	-45%	
Louisville/Jefferson County, KY-IN		-10%	60%	-49%	1,849	7%	35%	-35%	-18%	-42%	
New York-Jersey City-White Plains, NY-NJ		-10%	90%	-80%	123,770	-40%	100%	-69%	21%	-31%	
Pittsburgh, PA		-11%	95%	-57%	3,812	-7%	75%	-45%	-16%	-37%	
Columbus, OH		-12%	40%	-53%	6,220	-30%	100%	-56%	-8%	-47%	
Baltimore-Columbia-Towson, MD		-12%	100%	-70%	7,467	-5%	70%	-45%	-7%	-43%	
Atlanta-Sandy Springs-Alpharetta, GA		-13%	100%	-55%	5,821	-5%	45%	-45%	-23%	-37%	
Chicago-Naperville-Evanston, IL		-15%	100%	-59%	26,042	8%	80%	-50%	-32%	-54%	
Toledo, OH		-17%	95%	-61%	2,777	43%	55%	-75%	59%	-68%	
Sacramento-Roseville-Folsom, CA		-18%	100%	-47%	6,740	-21%	90%	-51%	-29%	-51%	
Memphis, TN-MS-AR		-22%	40%	-29%	2,596	-31%	90%	-55%	-10%	-54%	
Philadelphia, PA		-24%	100%	-73%	13,063	-9%	75%	-34%	-20%	-41%	
Denver-Aurora-Lakewood, CO		-25%	100%	-60%	8,365	-5%	95%	-60%	-27%	-27%	
Nassau County-Suffolk County, NY		-25%	100%	-77%	26,537	-40%	100%	-67%	-10%	-54%	
Tampa-St. Petersburg-Clearwater, FL		-26%	95%	-45%	8,496	-20%	90%	-40%	-13%	-50%	
Boston, MA		-28%	90%	-83%	9,123	39%	30%	-35%	-14%	-43%	
Houston-The Woodlands-Sugar Land, TX		-29%	100%	-53%	15,370	-11%	90%	-44%	6%	-32%	
Rochester, NY		-29%	100%	-69%	4,652	-50%	100%	-88%	-45%	-82%	
Fort Lauderdale-Pompano Beach-Sunrise, FL		-29%	100%	-48%	6,118	15%	40%	-35%	-14%	-50%	
Fort Worth-Arlington-Grapevine, TX		-37%	100%	-73%	8,855	-4%	80%	-37%	-3%	-32%	
Newark, NJ-PA		-43%	100%	-59%	13,314	-11%	100%	-56%	23%	-37%	
New Orleans-Metairie, LA		-67%	100%	-88%	14,020	8%	70%	-45%	4%	-70%	
Montgomery County-Bucks County-Chester County, PA		-83%	100%	-84%	7,544	-37%	90%	-66%	9%	-68%	

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<sup>5</sup> Missed Tests due to COVID is calculated as the gross number of tests that would have occurred if the state would have stayed at their 2019 average through the pandemic, based on the information in our dataset. Note, this data may not fully represent the actual total number of tests in the US/each state, therefore actual results will vary.