

## Pennsylvania Broadband Access: A Speed Test Analysis

February 2022

### Key Findings:

- Among broadband test speed participants in Pennsylvania, those in rural counties experience disproportionately slower download speeds than those in urban counties.
- Areas of the Commonwealth with the most limited access to broadband are generally clustered in three rural geographies: the Central Susquehanna Valley, portions of the Pennsylvania Wilds, and northeastern Pennsylvania.
- More accurate and sub-county data are needed to fully identify broadband need in Pennsylvania.

### Introduction

Access to affordable broadband technology has been a long-standing challenge for many rural Pennsylvanians. In November 2021, the federal Infrastructure Investment and Jobs Act set aside \$65 billion to improve access to high-speed internet across the nation. Part of that act requires states to prioritize projects for those with the most limited access to broadband connections. The Pennsylvania General Assembly passed Act 96 of 2021 shortly after the federal law. Act 96 established the Pennsylvania Broadband Development Authority to improve internet access across the Commonwealth.

Act 96 also established categories of internet speeds to aid in the distribution of federal funds and broadband build-out. Internet speeds can be broken into two categories, upload speed and download speed, and are measured in megabits per second (Mbps). Communities are considered “unserved” if their download speed is less than 25 Mbps and their upload speed is less than 3 Mbps. “Underserved” communities face speeds less than 100 Mbps download and 20 Mbps upload. Areas with speeds outside those bounds are ineligible for dollars from the Broadband Authority.<sup>1</sup>

Since 2003,<sup>2</sup> the Center for Rural Pennsylvania has documented the disparities between rural and urban areas in broadband service. As noted in previous reports,<sup>3</sup> there are significant issues with using current federal

data to ascertain the needs of citizens with regard to broadband. The Federal Communications Commission (FCC) collects information on community broadband service using data from its Form 477. However, the FCC allows providers to identify a census block as “served” if even one user in the block has broadband. This methodology significantly overstates the prevalence of broadband across the Commonwealth.

This report provides estimates of broadband connectivity in Pennsylvania’s rural and urban counties.<sup>4</sup> The Center used Measurement Lab (M-Lab) data to measure the download and upload speeds of internet users throughout Pennsylvania. M-Lab is a consortium of research, industry, and public-interest partners providing verifiable measurement of global network performance.<sup>5</sup> The data in this report came from nearly 3 million upload and download tests taken throughout Pennsylvania in calendar year 2021 and were provided to the Center by a collaboration between Exactly Labs and X-Lab, a non-partisan technology and policy institute at Penn State University. Using these data, the Center identified areas that continue to lack significant access to broadband internet service. These data indicate that, while there is need across Pennsylvania for improved broadband service, the counties most in need (and most eligible for aid under federal programs) are rural.

1. Act 96 (2021), § 6123.d: “Ineligible projects. -- Proposed projects that will result in overbuild in which less than 80 percent of broadband-serviceable locations served by the proposed project are unserved or underserved or are to be managed or operated by a Federal or State entity shall be ineligible to receive a grant from the authority under this section.”

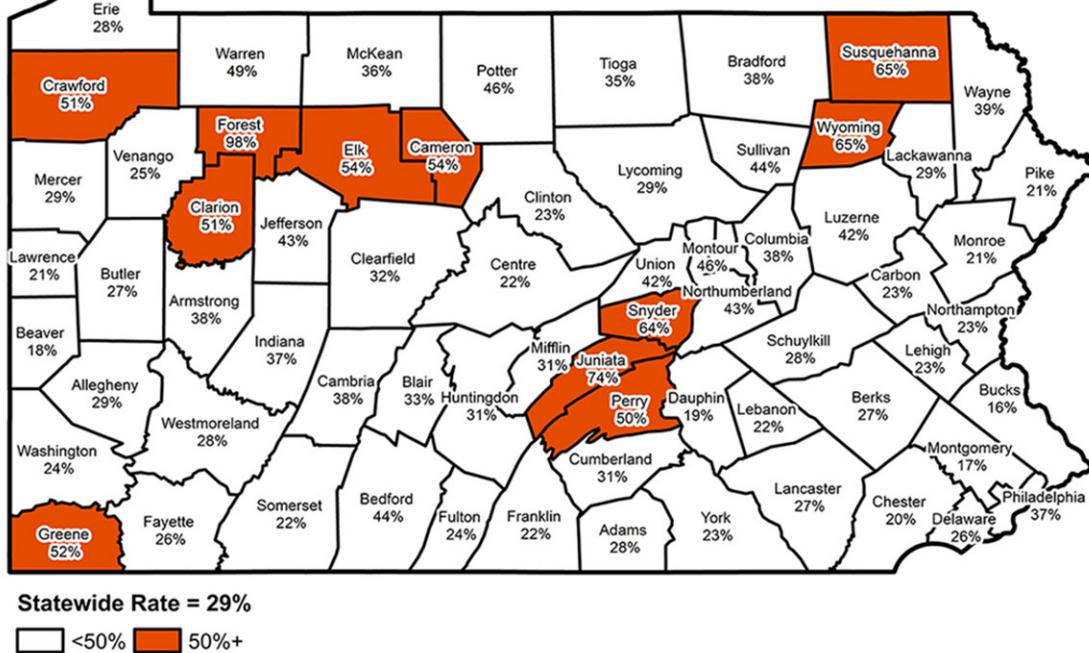
2. Glasmeier, Amy K. and Lawrence E. Wood. 2003. “Broadband Internet Service in Rural and Urban Pennsylvania: A Common Wealth or Digital Divide?” [https://www.rural.pa.gov/download.cfm?file=Resources/PDFs/research-report/archived-report/broadband\\_report.pdf](https://www.rural.pa.gov/download.cfm?file=Resources/PDFs/research-report/archived-report/broadband_report.pdf).

3. Meinrath, Sascha D. et al. 2019. “Broadband Availability and Access in Rural Pennsylvania.” [https://www.rural.pa.gov/download.cfm?file=Resources/PDFs/research-report/Broadband\\_Availability\\_and\\_Access\\_in\\_Rural\\_Pennsylvania\\_2019\\_Report.pdf](https://www.rural.pa.gov/download.cfm?file=Resources/PDFs/research-report/Broadband_Availability_and_Access_in_Rural_Pennsylvania_2019_Report.pdf).

4. The Center’s definition of rural and urban is based on population density, which is calculated by dividing the total population of a specific area by the total number of square land miles of that area. According to the 2020 Census, Pennsylvania’s population density was 291 people per square mile. <https://www.rural.pa.gov/data/rural-urban-definitions>.

5. For more information on M-Lab, see: <https://www.measurementlab.net>.

Map 1 : Percent of Users, by County, with Download Speeds of Less than 25 Mbps, 2021

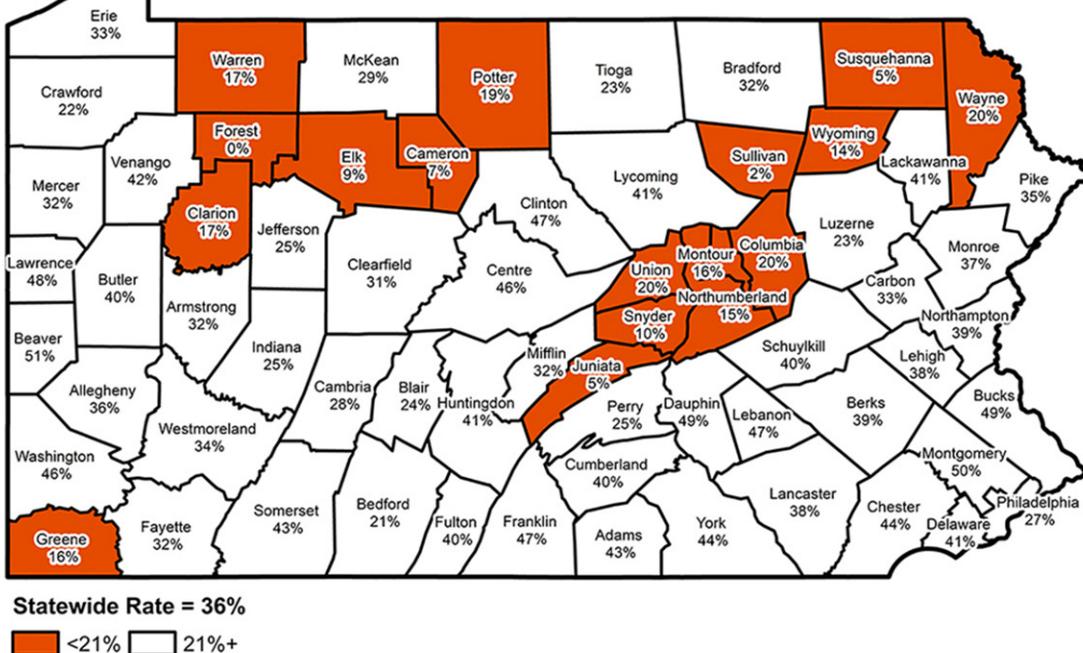


**Data**

Several counties across the commonwealth face significant barriers to meeting the requirements to qualify as underserved (a threshold greater than 25/3 Mbps, but less than 100/20 Mbps). Map 1 shows 11 counties in which more than 50 percent of tested users’ download speeds were measured as “unserved,” according to Act 96 standards (that is, their download speed was

less than 25 Mbps). These counties are concentrated in a few geographic regions: the Central Susquehanna Valley region (Juniata, Perry, and Snyder counties), portions of the Pennsylvania Wilds (Cameron, Clarion, Elk, and Forest counties), and the northeast (Susquehanna and Wyoming counties), as well as Greene County in the southwest and Crawford County in the northwest. Fur-

Map 2: Percent of Users, by County, with Download Speeds of 100+ Mbps, 2021



thermore, many of the nearby counties in these regions closely miss the 50 percent cutoff, with percentages of unserved households in the 40 percent range. All these counties are defined as rural by the Center, highlighting the need for investment in broadband infrastructure in rural areas.

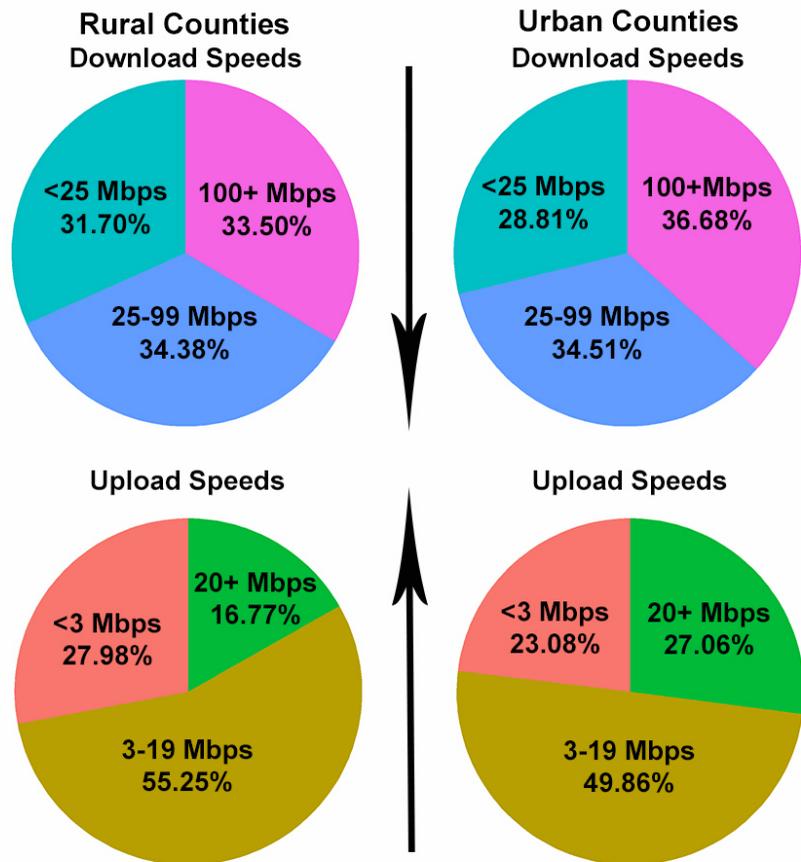
Map 2 shows the percent of users whose median download speed test in 2021 was over 100 Mbps, Act 96’s benchmark for full service. Based on these data, no Pennsylvania county had more than 50 percent of tested users fully served by broadband. Additionally, there were several areas of the Commonwealth that lagged significantly behind in access to full service. Based on M-Lab’s estimates, shaded areas in Map 2 are counties in which 20 percent or fewer of tested users returned download speeds exceeding 100 Mbps. These include nine of the 11 counties that appear in Figure 1, but adds Columbia, Montour, Northumberland, Potter, Sullivan, Union, Warren, and Wayne counties. These counties are all rural and fall into the same geographic regions identified above. Taken together, these tests are a meaningful first step in determining areas in need of significant infrastructural investment.

Evaluating distributions of speeds across rural and urban counties demonstrates that, while there is need for support in both rural and urban counties, rural speed test participants are more likely to experience severe lack of service. Figure 1 shows the distribution of tests across urban and rural counties in both upload and download speeds for 2021. While the regional analysis above focused on download speeds, it is worth noting that a smaller percentage of users tested in the highest category of upload speeds compared to download speeds. This discrepancy occurred in both urban and rural counties. For both uploads and downloads, rural communities had greater percentages of unserved users and fewer instances of served tests than urban communities.

**Next Steps**

This analysis provides additional documentation and a deeper understanding of broadband service across Pennsylvania. While the nature of the available data limits the Center’s ability to draw statistically significant

**Figure 1: Download and Upload Speeds in Rural and Urban Pennsylvania Counties, 2021**



conclusions (see the Methodology section for more details), these data provide evidence that there is unmet need, particularly in a few distinct rural regions of the Commonwealth. This analysis does not and cannot attempt to provide explanations as to why broadband is limited in some areas compared to others.

To accurately reflect the needs of its citizens in receiving access to high quality internet, Pennsylvania should consider collecting detailed qualitative and quantitative data to identify the specific needs of communities, and how federal dollars can best be spent. Specifically, data will need to be collected at a sub-county level. While the rural counties identified using M-Lab data are likely to face barriers to access, there may be municipalities that already have access to broadband and may not need significant funds. Similarly, there may be municipalities in more connected areas that need infrastructure dollars to access broadband but could be deemed ineligible if county-level data are used as the barometer for access. Collecting accurate, statistically meaningful data will be essential to equitably distributing resources to maximize broadband connectivity.

## Methodology

M-Lab is a nonprofit network, supporting diagnostic tools that provide users with information on their current internet service. When a user runs a test, M-Lab sends a small amount of data to download and then re-upload to its servers and records the amount of time that process takes. The organization then logs those speeds along with the IP address of the user and compiles those data into de-identified data for researchers to analyze. M-Lab provides access to aggregated data through Google's BigQuery data platform. For this study, IP addresses linked to Pennsylvania counties were aggregated to annual categories of unserved, underserved, and served for both download and upload speeds. To control for differences in testing frequency, a median speed was identified per IP address, ensuring that each IP address had only one observation in the annual sample.

There are limitations to the use of M-Lab data for statistical purposes. As a free online service, M-Lab data come only from users who choose to test their internet speeds on M-Lab's website. This self-report bias means that M-Lab data do not represent a randomized sample. Since these estimates are based on internet speed tests, they necessarily exclude anyone lacking internet access altogether. As such, these data may underrepresent areas where even dial-up speeds remain inconsistent. When compared with 2019 American Community Survey results, there was a significant positive relationship between users with a computer and broadband and the percent of M-Lab test results of 100 Mbps download or higher. This suggests that, while these data don't have statistically significant explanatory power, they are in line with more significant findings.

The Center thanks Sascha Meinrath and the staff at both X-Lab and Exactly Labs for their assistance in compiling data aggregated to match Act 96 speed categories.



Scan the QR code for an appendix with detailed information on upload and download speeds for each Pennsylvania county.

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## Center for Rural Pennsylvania Staff

Kyle C. Kopko, Ph.D., Executive Director  
Jonathan Johnson, Senior Policy Analyst  
Christine Caldara Piatos, Communications Manager  
Pam Frontino, Program Manager for Grants  
Linda Hinson, Office Manager  
David W. Martin, Public Policy Data Analyst

---

625 Forster St., Room 902  
Harrisburg, PA 17120  
(717) 787-9555 [www.rural.pa.gov](http://www.rural.pa.gov)