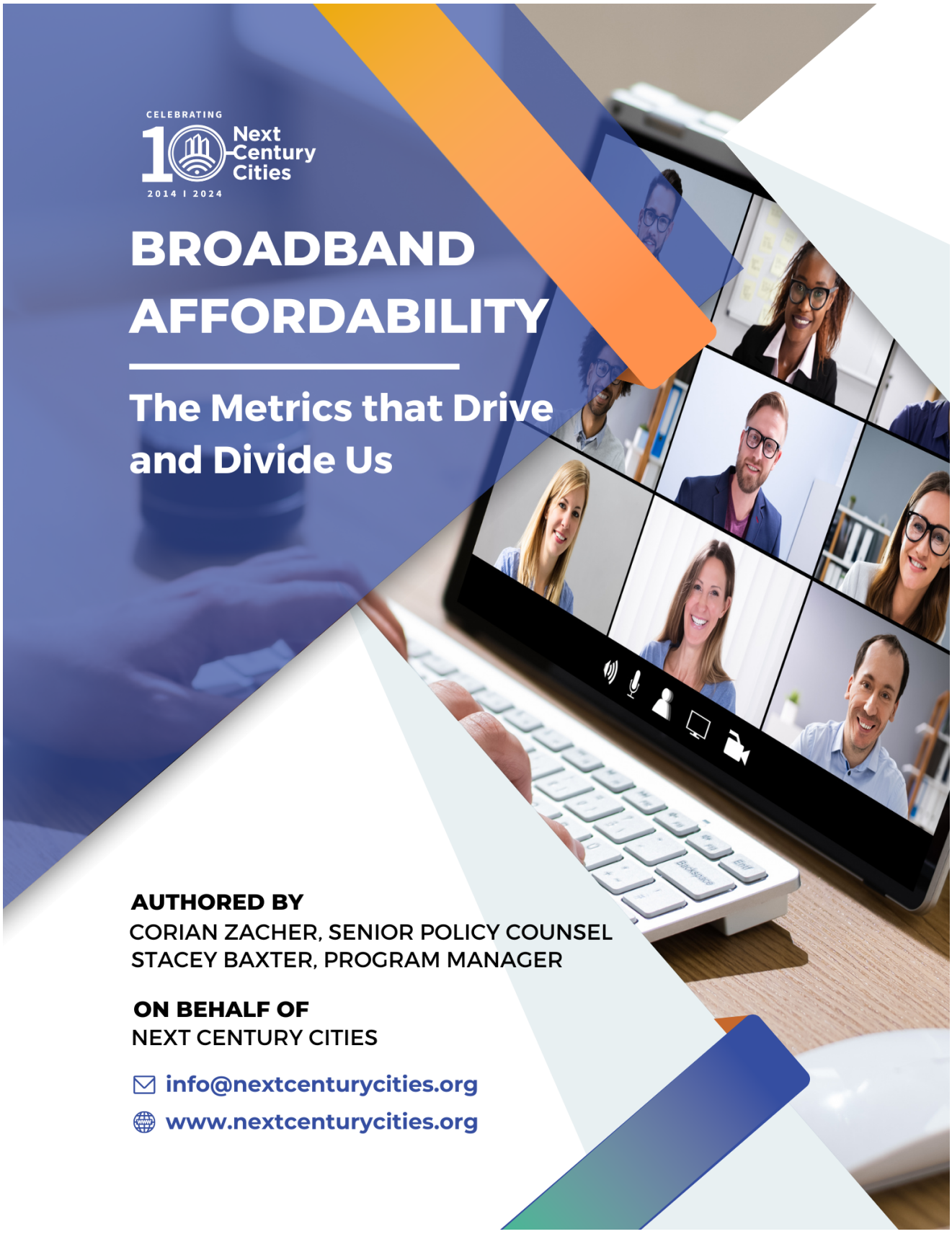
CELEBRATING
10
Next Century Cities
2014 | 2024
BROADBAND AFFORDABILITY
The Metrics that Drive and Divide Us
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Abstract

In 2021, Congress allocated billions of dollars to the Affordable Connectivity Program (ACP), extending the Emergency Broadband Benefit past its classification as a COVID-19 response policy. Since ACP's inception, over 23 million, or one in six, American families enrolled in the program to offset the price of broadband service and devices. This represents just over half of urban and a third of rural households who were eligible for the program. Earlier this year, the FCC announced that April 2024 would be the last fully-funded month of ACP. Despite considerable bipartisan support, the ACP was fully depleted in May 2024.

Community advocates and local leaders persistently cite affordability as the main reason that residents do not have home broadband subscriptions and adequate devices. This connection inspired our research examining the relationship between broadband access and poverty levels across all fifty states, D.C., Puerto Rico, American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam.

In anticipation of billions of dollars in broadband funding across the US, we collected statewide statistics from states and territories eligible for the BEAD Program as community-level data from five selected municipalities and counties, where available. Selected communities include a range of population sizes, from 82 to 1.5 million residents, and include a sample of communities investing in different types of broadband and digital inclusion initiatives to compare the local programs' impact on local adoption rates. Out of a survey of data points from all fifty states, six territories, and 278 communities, we noticed considerable support for our thesis that poverty and Internet access are highly correlated, a finding supported by literature.

Along with American Community Survey (ACS) data, we compiled publications describing state programs and community initiatives. We plan to cross-reference this information with the data collected to better understand outliers in our findings. Additionally, we offer suggestions for policymakers to improve the Internet and device adoption data collection process.

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Methodology

Researchers used a combination of ACS data for fifty states, D.C., and Puerto Rico, and 2020 Census data for American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands. In particular, we observed the correlation between population, percent of population in poverty, percent of residents without an Internet subscription, and percent of residents without a computing device.

We collected statewide statistics as well as community-level data from five selected municipalities and counties. Communities selected include a range of population sizes, from 82 to 1.5 million residents. Additionally, we collected a sample of communities investing in different types of broadband and digital inclusion initiatives to compare the local programs' impact on local adoption rates. For territories eligible for the BEAD Program, we collected the most granular data available. In several cases, including Guam, American Samoa, the District of Columbia, and the Northern Mariana Islands, territory-wide 2020 Census data was the most comparable information.

After examining ACS data on poverty and broadband adoption rates in a diverse range of communities, we found significant correlation between poverty and broadband adoption. For this report, we focused on communities where there was the least correlation between poverty and broadband adoption to better understand the underlying reasons for those outliers.

We observed trends among outliers and identified five categories that are not mutually exclusive: high-poverty areas, cities with a college or university, rural areas, communities with municipal broadband, and U.S. territories. For each of these groups, we found a differentiation of greater than 10% between the percent of residents in poverty and the percent of residents without an Internet subscription.

Based on our findings, we recommend investing in community-owned broadband and middle-mile networks, expanding resources for local leaders, and providing additional funding for the Affordable Connectivity Program. Additionally, we offer suggestions for policymakers to improve the Internet and device adoption data collection process for future research.

Contributions to Communications Policy

Prior studies have explored the relationship between poverty and gaps in Internet and device adoption. Research by John Horrigan shows the growth in Internet and device adoption between 2019 and 2021, finding strong wireline growth in cities with high poverty and an increase in computer ownership, partially attributed to the ACP.[1] Likewise, community leaders have invested in local research in cities including Baltimore, Maryland; Philadelphia, Pennsylvania; and Oakland and Fresno, California, with similar findings about broadband and device affordability.[2]

[1] John Horrigan, Broadband Benefit Programs are Helping to Close the Digital Divide Four Lessons for Policymakers (2022), https://www.benton.org/sites/default/files/FourLessons.pdf.

[2] Abell Foundation, Baltimore's Digital Divide: Gaps in Internet Connectivity and the Impact on Low-income City Residents (2020), https://abell.org/publication/baltimores-digital-divide/; City of Philadelphia, Pennsylvania, 2021 Internet use Survey (2021),

Our research expands on existing research by comparing communities nationally that are investing in broadband access and adoption. With the inevitable wind-down of the ACP, our analysis will include observations about whether state and local interventions may offset the anticipated impacts of the eliminated subsidy for households living below the federal poverty line.

Literature Review

For many years, experts have examined factors that influence the digital divide. However, since the onset of the COVID-19 pandemic, research has significantly expanded in order to understand what elements contribute to so many Americans living without access to broadband services and connected devices, when broadband access is such an integral part of today's world.[3] Through widespread data collection that spans over many years and many countries, researchers have continued to draw the same conclusion that lower-income households have less access to the Internet,[4] and that affordability is a main factor contributing to their lack of access.[5]

The link between those who live below the poverty line and those who do not have access to home broadband service and/or devices, is undeniable.[6] Data pre and post pandemic illustrate that lower

https://www.phila.gov/media/20211019110414/Connecting-Philadelphia-2021-Household-Internet-Assessment-Survey.pdf; Vinhcent Le & Gissela Moya, On the Wrong Side of the Digital Divide (2020), https://greenlining.org/publications/on-the-wrong-side-of-the-digital-divide/.

[3] Press Release, The White House, Remarks by President Biden on Broadband Investments (June 26, 2023), (hereinafter "The White House Remarks") https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/06/26/remarks-by-president-biden-on-broadband-investments/#:~:text=And%20for%20millions%20more%2C%20their,with%20the%20American%20Rescue%20Plan; Internet For All, Why Internet Matters, https://www.internetforall.gov/why (last visited Aug. 1, 2024); Javier Valentin-Sivico, Casey Canfield, Sarah A. Low, Christel Gollnick, *Evaluating the Impact of Broadband Access and Internet Use in Small Underserved Rural Community,* 47(4) National Library of Medicine (2023). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9836830/

[4] Office of the Assistant Secretary for Planning & Evaluation, U.S. Department of Health & Human Services, People in Low-Income Households Have Less Access to Internet Services - 2019 Update (2021), (hereinafter "Office of the Assistant Secretary for Planning & Evaluation 2021") https://aspe.hhs.gov/sites/default/files/private/pdf/263601/internet-access-among-low-income-2019.pdf; Emily A. Vogels, *Pew Research Center,* Digital Divide Persists Even As Americans with Lower Incomes Make Gains in Tech Adoption (June 22, 2021), https://www.pewresearch.org/short-reads/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/.

[5] Federal Communications Commission, ACP Consumer Survey (June 3, 2024), https://www.fcc.gov/acp-survey; Pew Research Center, Internet, Broadband Fact Sheet (Jan. 31, 2024), https://www.pewresearch.org/internet/fact-sheet/internet-broadband/?tabId=tab-2ab2b0be-6364-4d3a-8db7-ae134dbc05cd.

[6] *See* Office of the Assistant Secretary for Planning & Evaluation 2021.

income households continue to have less access to the Internet and digital devices.[7] In examining Census Bureau data from 2018 through 2021, researchers evaluated Internet access and individuals in poverty against several over variables including geographic area, race, and age. Concluding that lower-income households have less access to the Internet, across all three variables, reporting that more than one in six people in poverty had no access to the Internet in 2019.[8] This lack of access increased for further marginalized communities including people living in rural areas, communities of color, and older populations.[9] This information provides additional understanding as to the elements that are, and are not, contributing to the overall lack of broadband access and devices.

Given the existing research describing the correlation between individuals in poverty and a lack of in-home access to broadband service, it can be concluded that a significant factor in the lack of access is the cost of broadband service on a household budget. Worldwide telecommunications experts suggest that access to the Internet is considered affordable when it accounts for less than five percent of the household monthly budget.

Leading broadband advocates urge researchers and consumers to understand that this definition is based on a national average income - GNI per capita, which does not account for the effects of gender inequality, the extreme lack of wealth distribution,[10] and other factors such as inflation and the cost of living. These other disregarded elements are crucial to understanding that for individuals living below the poverty line, spending five percent of their budget on broadband service is not feasible.

For example, as of 2024 in the United States, a family of four is considered to be living in poverty if they make less than $31,199 a year, which equates to approximately $2,599 a month, and five percent of this monthly budget would be approximately $129 a month, as suggested. The problem with this analysis is that given the cost of living in today's world, it is estimated that for a family of four to maintain a modest yet adequate standard of living in a high poverty area, where 20% of the population is living below the poverty line,[11] it would cost approximately $7,188 a month.[12] This is further compounded by the fact that this analysis does not include a monthly budget item for

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[7] *See* Office of the Assistant Secretary for Planning & Evaluation 2021; Kendall Swenson & Robin Ghertner, People in Low-Income Households Have Less Access to Internet Service (April 2020), https://aspe.hhs.gov/sites/default/files/private/pdf/263601/Internet_Access_Among_Low_Income.pdf.

[8] *See* Office of the Assistant Secretary for Planning & Evaluation 2021

[9] *Id*.

[10] Alliance for Affordable Internet, Affordability Report 2015/16 (2016), https://www.itu.int/en/Lists/consultationOct2016/Attachments/44/Combined%202015-Affordability-Report+Womens%20Rights%20Online%202015%20report.pdf

[11] U.S. Department of Agriculture, Economic Research Service, https://www.ers.usda.gov/data-products/poverty-area-measures/background-and-uses/#:~:text=%22High%20poverty%22%20is%20defined%20as,Official%20Poverty%20Measure%20(OPM) (last visited Aug.1, 2024).

[12] Economic Policy Institute, Family Budget Fact Sheet, https://www.epi.org/resources/budget/budget-factsheets/# (last visited Aug. 1, 2024).

broadband service, and broadband is not explicitly stated in the "other necessities" category either, suggesting that this estimated budget does not even include the monthly costs of broadband service, which could be an additional $40 to $100 a month depending on service.[13] Broadband service is simply not affordable for impoverished United States residents.

Unfortunately, given society's cost of living, broadband affordability is also a concern for the average American living at or above the poverty line. For example, here are some of the average monthly costs of basic needs for a family of four in the United States:

- Average monthly rent for 2023: $1,372 (for 2023)[14]
- Average monthly rent for 2024: $1,536 (for 2024)[15]
- Average monthly cost of groceries in 2024: $1,000[16]
- Average monthly payment for one used car: $533[17]
- Average monthly cost of family care center for one child: $920[18]
- Average monthly cost of daycare for one child: $1,284[19]
- Average monthly cost of family health insurance: $1,619[20]

[13] Bobbi Dempsey, U.S. News & World Report Internet Cost, Speed, and Value Consumer Survey 2023 (Sept. 19, 2023), https://www.usnews.com/360-reviews/services/internet-providers/internet-cost-speed-value-survey

[14] Josh Patoka, Forbes Advisor (Nov. 15, 2023), https://www.forbes.com/advisor/mortgages/average-rent-by-state/; Doxo, 2024 U.S. Household Bill Pay Report (2024), https://www.doxo.com/w/insights/2024-us-household-bill-pay-report/.

[15] Apartments.com, Rent Trends in the United States, https://www.apartments.com/rent-market-trends/us/ (last visited Aug.1, 2024).

[16] United States Census Bureau, Household Pulse Survey Data, https://www.census.gov/programs-surveys/household-pulse-survey/data.html (last visited Aug.1, 2024).

[17] Maggie Davis, Average Car Payment and Auto Loan Statistics 2024 (June 20, 2024), https://www.lendingtree.com/auto/debt-statistics/; Rebecca Betterton, Average Car Payments in 2024 (Jan. 1, 2024), https://finance.yahoo.com/news/average-auto-loan-payments-expect-174817148.html.

[18] Care.com, This is How Much Child Care Costs in 2024 (Jan. 17, 2024), https://www.care.com/c/how-much-does-child-care-cost/#:~:text=Average%20weekly%20nanny%20cost%3A%20%24766,%25%20from%20%24179%20in%202022).

[19] *Id.*

[20] Les Masterson, How Much Does Health Insurance Cost in 2024 (July 22, 2024), https://www.forbes.com/advisor/health-insurance/how-much-does-health-insurance-cost/; HealthCare.gov, See Plans & Prices, https://www.healthcare.gov/see-plans/#/ (last visited Aug.1, 2024).

The median household income in the US as of 2022 is $74,755,[21] which is approximately $6,229 per month. For those households, this necessity-based budget vastly exceeds the monthly income, without accounting for any emergency, miscellaneous costs or savings, or the price of broadband service.

In the last two years, Congress made a giant step in addressing the affordability of broadband service and digital devices, knowing how imperative it is to have access to the internet in the twenty-first century.[22] With the passing of the Infrastructure, Investment and Jobs Act (IIJA), the Affordable Connectivity Program was created in order to bring more Americans online. A program that was launched in December of 2021 helped over 23 million US families receive monthly broadband subsidies and one-time help with a digital device[23] that enabled them to work, study, attend telehealth appointments, apply for jobs, and much more, and in some cases bringing individuals and families online for the very first time.[24]

Despite so many Americans enrolling in this program and sharing the importance of the support that was provided by the ACP, the program was not refunded by Congress and therefore ran out of funding in May of 2024, resulting in the end of the Affordable Connectivity Program.[25] Millions of Americans benefited from this program, including some of the most vulnerable and marginalized populations in the county. Nearly half of ACP enrollees were military families; four million enrollees were seniors and 10 million individuals were over the age of 50; 25% of all enrollees were African American families and 25% Latino families; and over 320,000 enrolled households were on Tribal Lands.[26]

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[21] United States Census Bureau, Tables, https://data.census.gov/all (last visited Aug.1, 2024).

[22] *See* White House Remarks.

[23] Federal Communications Commission, 20 Million + Households Enrolled in the ACP (2023), https://docs.fcc.gov/public/attachments/DOC-396000A1.pdf; The White House, Fact Sheet: As Affordable Connectivity Program Hits Milestone of Providing Affordable High-Speed Internet to 23 Million Households Nationwide, Biden-Harris Administration Calls on Congress to Extend its Funding (Feb. 6, 2024), (hereinafter "The White House Fact Sheet") https://www.whitehouse.gov/briefing-room/statements-releases/2024/02/06/fact-sheet-as-affordable-connectivity-program-hits-milestone-of-providing-affordable-high-speed-internet-to-23-million-households-nationwide-biden-harris-administration-calls-on-congress-t/?utm_campaign=Newsletters&utm_medium=email&utm_source=sendgrid; Universal Service Administrative Company, ACP Enrollment and Claims Tracker, https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/ (last visited Aug.1, 2024).

[24] Cox, Affordable Internet Improves Lives According to Recent Survey, https://newsroom.cox.com/2022-12-01-Affordable-Internet-Improves-Lives-According-to-Recent-Survey (last visited Aug.1, 2024).; *See* The White House Fact Sheet.

[25] Federal Communications Commission, Affordable Connectivity Program Has Ended Frequently Asked Questions (FAQs), https://www.fcc.gov/sites/default/files/ACP-FAQs-Post-ACP-Ending.pdf (last visited Aug.1, 2024).

[26] *See* The White House Fact Sheet.

Research indicates that with the ending of the ACP, low-income families were affected the most. In accounting for the loss of economic opportunities due to lack of access to the Internet, low-income Americans will lose over $20 billion annually, including losing access to jobs, educational opportunities, and the inability to attend telehealth appointments providing individuals with no other option than to resume in-person appointments,[27] which are on average $93 more expensive.[28]

It is clear that there is a correlation between individuals who live below the poverty line and those who do not have access to the Internet. In the current report, additional research is examined to increase understanding of why some areas seem to live above this correlation, and look further into the areas where this correlation is exacerbated.

Results

After examining adoption and poverty rates in fifty states, five territories, the District of Columbia, and 278 additional municipalities and counties ("communities"), we found a considerable correlation between those who lack access to broadband and digital devices and individuals who fall below the poverty line. Prior research has examined the relationship between poverty and Internet access. Using poverty rates as a reference point also enabled research about other factors causing the digital divide.

[27] Universal Service Administrative Company, Additional ACP Data, https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/additional-acp-data/ (last visited Aug. 1, 2024).

[28] John Horrigan, New Analysis Finds Benefits of Consistent Internet Access Far Outweigh ACP's Costs by Nearly 2 to 1 (March 15, 2024), https://www.benton.org/blog/affordable-connectivity-program-creates-162-billion-annual-benefits-subscribers.

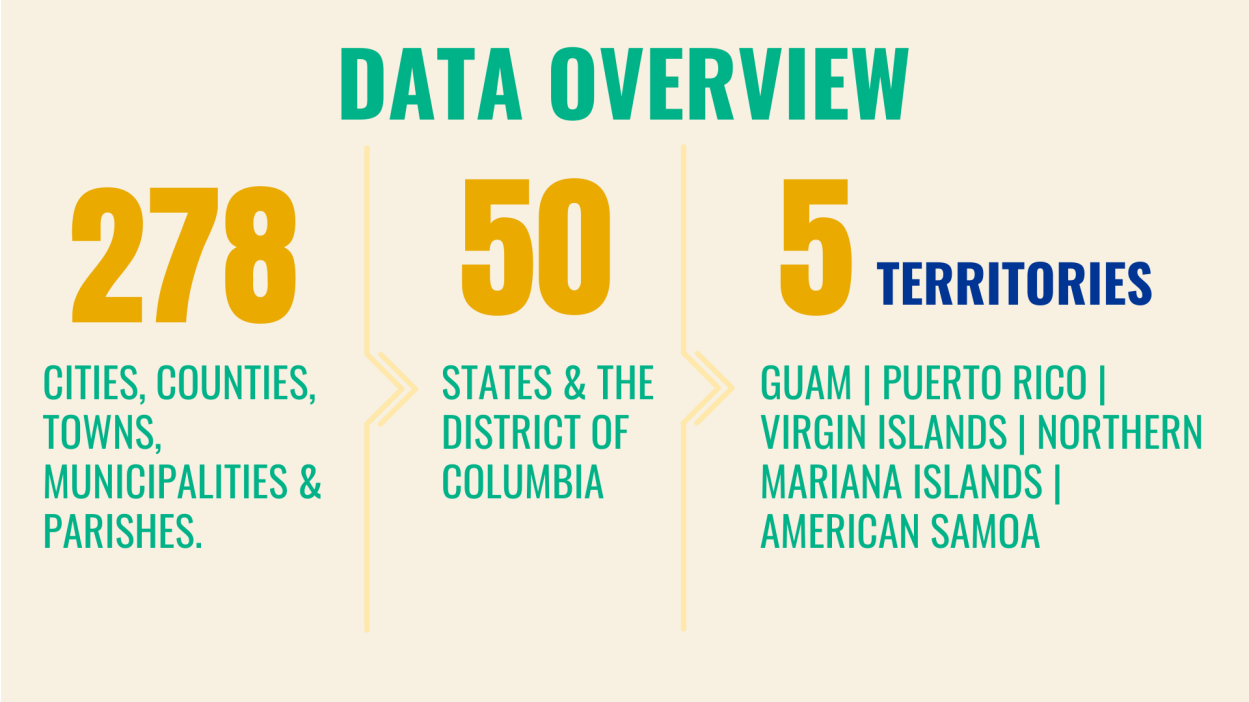

Figure 1: Data Overview

On average, the percentage of residents in poverty in a community is greater than the percentage of residents without Internet access by one and a half percent. In about 64 percent of communities included in the data set, we found a less than five percent difference in the percent of residents in poverty and residents without Internet access. An additional eighteen percent had between a five and 10 percent difference. For 36 of 278 communities, we observed a 10 percent difference between residents in poverty and residents without broadband.

% POP IN POVERTY - % POP W/O INTERNET

	MUNI & COUNTY	STATES	TERRITORIES
MEAN	1.5	1.5	14.48
MEDIAN	.6	0	13.7
MODE	0	0	NA
WITHIN 2%	32%	46	20%
WITHIN 5%	64%	50	20%
WITHIN 10%	87%	100%	20%
OVER 10%	13%	0	4

Figure 2: Highlights

Taking a closer look at the 36 communities with a more than 10 percent difference between poverty and Internet access, we identified several trends. Among communities where access far exceeded poverty, we found that either the poverty rate was substantially high, as in several communities where the percent of residents in poverty exceeded 20 percent, or the town features a major university. For communities where poverty far exceeded access, we found that communities were geographically remote, either rural or within a US territory. We discuss each category of outliers in more detail below.

Residents without Internet access exceeds poverty level

Among communities where the percentage of residents without Internet access far exceeds the percent of residents living in poverty, we observed a trend in remoteness. Communities are either in a rural area of a rural state or situated in a US territory.

Rural areas

We found rural outliers where the percent of residents without Internet access exceeded the percent of residents living below the poverty threshold by more than ten percent. All areas are non-metropolitan, with three representing micropolitan communities and five that are not micropolitan communities.[29]

Figure 3: Among Most Disconnected | All eight communities with the most disconnected residents relative to poverty also rank among the thirty most disconnected communities out of 278 included in our data set. Catron County, New Mexico; Georgetown, South Carolina; Gainesville, Texas; Franklin Parish, Louisiana; Liberty County, Montana; Windham County, Vermont; Walsh

[29] USDA Economic Research Service, Rural Classifications (March 26, 2024), https://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural/, (Micropolitan communities are defined as "nonmetro labor-market areas centered on urban areas of 10,000-49,999 persons").

County, North Dakota; and Huron County, Michigan.

AMONG MOST DISCONNECTED

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
CATRON COUNTY NEW MEXICO	3,827	40.2%	19.8%	20.4%
GEORGETOWN SOUTH CAROLINA	8,556	33.8%	15.5%	18.3%
GAINESVILLE TEXAS	17,912	29.3%	13.1%	16.2%
FRANKLIN PARISH LOUISIANA	19,308	39.9%	24%	15.9%
LIBERTY COUNTY MONTANA	1,972	32.4%	18%	14.4%
WINDHAM COUNTY VERMONT	45,842	24.5%	10.9%	13.6%
WALSH COUNTY NORTH DAKOTA	10,438	22.1%	10.7%	11.4%
HURON COUNTY MICHIGAN	31,248	23.1%	11.8%	11.3%

Access alone does not seem to be the issue. Looking at historical access data, many communities are shown to have ubiquitous high-speed access connections on the map.[30] When looking deeper, many do not have ubiquitous fiber access.[31] This suggests that in rural communities, where satellite Internet is the most widely available, the cost of a broadband connection is noticeably prohibitive even for households above the poverty threshold.

[30] Addendum C.

[31] *Id.*

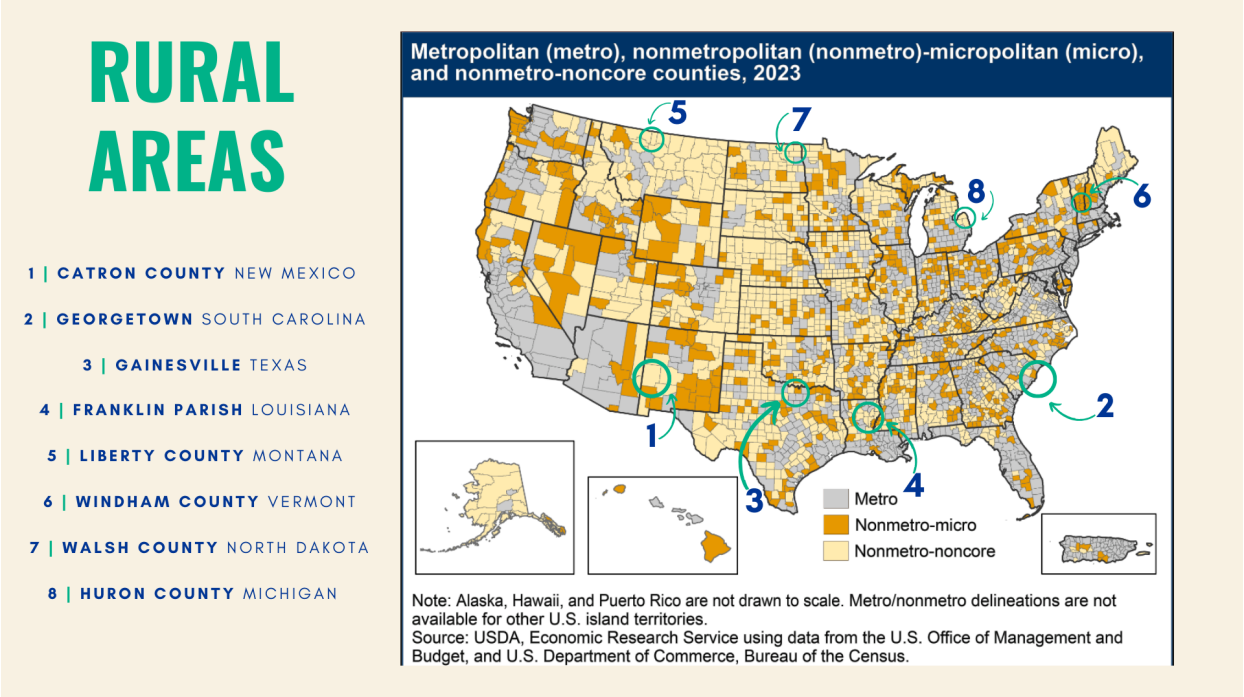

Figure 4: The communities who had the most residents without a broadband subscription relative to residents in poverty are all considered non-metropolitan areas. Three are in micropolitan areas and five are in non-micropolitan areas. When overlaid with a map by the USDA Economic Research Service, these communities all appear to be relatively more rural, often in counties on the outer border of their state.

Research from Mike Conlow comparing ACS and FCC data found that 36 percent of rural residents do not have access to 100/20 Mbps broadband.[32] Despite significantly less broadband access than urban and suburban communities, rural residents have higher adoption rates relative to their peers.[33]

[32] Mike Conlow, Comparing Broadband Access to Adoption (Jan 26, 2023), https://mikeconlow.substack.com/p/comparing-broadband-access-to-adoption.

[33] *Id.*

U.S. Territories

U.S. TERRITORIES

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
AMERICAN SAMOA	49,710	31%	54.6%	23.6%
COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS	47,329	16%	38%	22%
PUERTO RICO	3,220,113	28%	41.7%	13.7%
GUAM	153,836	9.1%	20.2%	11.1%
VIRGIN ISLANDS	87,146	20.8%	22.8%	2%

Figure 4: US Territories have among the highest poverty rates in the dataset as well as percent of residents without an Internet subscription. The difference between percent of residents in poverty and percent of residents without an Internet subscription was also notably higher when compared to states.

% POP IN POVERTY - % POP W/O INTERNET

	MUNI & COUNTY	STATES	TERRITORIES
MEAN	1.5	1.5	14.48
MEDIAN	.6	0	13.7
MODE	0	0	NA
WITHIN 2%	32%	46	20%
WITHIN 5%	64%	50	20%
WITHIN 10%	87%	100%	20%
OVER 10%	13%	0	4

Figure 5: Among communities included in our dataset, U.S. territories stood out as among the most disconnected and impoverished areas. Relative to US states, where Internet adoption and poverty are closely correlated, territories had among the most residents in poverty who do not have an Internet subscription.

Residents in poverty > without Internet access

University Communities

Among communities with the highest connectivity rate compared to poverty, 24 of 26 communities have a college or university. Universities often have wireless networks that cover the campus, and sometimes also provide service to surrounding neighborhoods. Several communities included in this set also have municipal broadband networks.

Nearly all (24 of 26) communities with significantly higher connectivity rates compared to poverty have a public or private university or community college. Of these, 14 communities are home of a public state university; 6 include private universities; two feature military colleges; one has a community college; and another with private technical schools.

Looking at municipal broadband projects, eight of 26 communities have a municipal fiber or wireless network. An additional eight communities have actively worked toward improving broadband through pilot projects, public-private partnerships, or other efforts. In ten communities, we did not find publications about municipal broadband projects.

UNIVERSITY COMMUNITIES

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
BURLINGTON VERMONT	44,595	12.5%	23.6%	11.1%
ROCHESTER NEW YORK	209,352	17%	27.9%	10.9%
HARTFORD CONNECTICUT	120,686	16.7%	26.9%	10.2%
JACKSON MISSISSIPPI	145,995	13.1%	25.9%	12.8%
GAINESVILLE FLORIDA	145,214	14.8%	29%	14.2%
STARKVILLE MISSISSIPPI	24,168	14.5%	30.6%	16.1%
DAHLONEGA GEORGIA	7,461	10.4%	29.5%	19.1%
CARBONDALE ILLINOIS	21,717	13.7%	37.9%	24.2%

UNIVERSITY COMMUNITIES

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
COLUMBIA SOUTH CAROLINA	139,698	13.1%	24.2%	11.1%
CHAMPAIGN ILLINOIS	89,241	11.9%	23.6%	11.7%
GULFPORT MISSISSIPPI	72,236	14.7%	26.6%	11.9%
MARTINSBURG WEST VIRGINIA	18,953	11.9%	24.7%	12.8%
NEW HAVEN CONNECTICUT	138,915	11.5%	25.3%	13.8%
BLOOMINGTON INDIANA	79,107	13%	31.1%	18.1%
FAIRBURN GEORGIA	16,956	5.2%	23.4%	18.2%

Figure 5: University Communities. Ann Arbor, Michigan; Fort Collins, Colorado; Bloomington, Indiana; Boulder, Colorado; Starkville, Mississippi; Dahlonega, Georgia; Carbondale, Illinois; Columbia, South Carolina; Champaign, Illinois; Gulfport, Mississippi; Martinsburg, West Virginia; New Haven, Connecticut; Bloomington, Indiana; and Fairburn, Georgia.

- **Burlington, Vermont |** Chittenden County's locally operated fiber optic network.[34] Burlington Telecom offers student packages for $45 a month for 50 Mbps.[35] Other residential packages range from $58 for 150 Mbps service to $73 for Gigabit service.[36]
- **Rochester, New York |** Greenlight Network's Innovation Square is a fiber-based broadband amenity provided to six nearby colleges: The Rochester Institute of Technology, the University of Rochester, St.John Fisher College, Nazareth College, SUNY Brockport, and SUNY Geneseo.[37]
- **Hartford, Connecticut |** East Hartford FiberCity is a fiber optic network throughout East Hartford being built citywide, including each home and business.[38] Internet service is

[34] *See generally* Burlington Telecom, https://www.burlingtontelecom.com/ (last visited Aug. 1, 2024).

[35] Burlington Telecom, Residential Rates, https://www.burlingtontelecom.com/rates/ (last visited Aug. 1, 2024).

[36] *Id.*

[37] Brad Randall, Innovation Square Lights Up Fiber-Based Broadband for Students, Businesses in Rochester, New York (May 15, 2022), https://bbcmag.com/innovation-square-lights-up-fiber-based-broadband-for-students-businesses-in-rochester-new-york-4/.

[38] SiFi Networks, East Harbor, Connecticut, https://sifinetworks.com/residential/cities/east-hartford-ct/ (last visited Aug. 1, 2024).

provided by Flume Internet.

- **Dahlonega, Georgia |** The Ellijay Telephone Company (ETC) is one of the oldest independently owned telephone companies in the state.[39] In addition to offering residential service, ETC has a dozen free WiFi access points for Fannin, Gilmer, Pickens, and Polk Counties. The University of North Georgia Dahlonega offers Internet Connection Resources, including a list of public wireless locations.[40] Students also have access to an academic WiFi cooperative program that allows students to use other universities' networks. The Lumpkin County Broadband Infrastructure Project includes a partnership with a broadband provider as well as investment from local, state, and federal grant funding.[41] North Georgia Network Co-Op also offers high speed Internet services in Dahlonega.[42]
- **Fairburn, Georgia |** Georgia Military College has a campus-wide mesh network to ensure that connectivity is not an issue for students.[43]

[39] Georgia Encyclopedia, Ellijay Telephone Company, ETC, https://www.georgiaencyclopedia.org/articles/business-economy/ellijay-telephone-company-etc/.

[40] University of North Georgia, Internet Connection Resources, https://ung.edu/information-technology/remote/connectivity-resources.php (last visited Aug. 1, 2024).

[41] Press release Lupkin County, Lumpkin County Fiber Fast Internet is Coming Soon!, https://picklumpkincounty.org/lumpkin-county-fiber-fast-internet-is-coming-soon/ (last visited Aug. 1, 2024).

[42] *See* North Georgia Network, High-Speed Internet in Dahlonega, GA, http://ngn.coop/internet-services/dahlonega-ga/ (last visited Aug. 1, 2024).

[43] Georgia Military College Course Catalog (2021), https://web2.gmc.cc.ga.us/catalog/file_lib/FY21%20CAT-FINAL%20020321.pdf.

Community-owned broadband

COMMUNITY-OWNED NETWORKS

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
FAYETTEVILLE ARKANSAS	99,285	10.6%	21.2%	10.6%
PIKEVILLE KENTUCKY	7,358	14.3%	25.1%	10.8%
MOREHEAD KENTUCKY	6,734	8.7%	34.5%	25.8%
SALLISAW OKLAHOMA	8,540	21.1%	35.2%	14.1%
FORT COLLINS COLORADO	169,249	1.9%	16.2%	14.3%
ANN ARBOR MICHIGAN	199,875	7.7%	22.5%	14.8%
BOULDER COLORADO	105,485	6%	22.1%	16.1%
EUGENE OREGON	177,923	2.8%	19.3%	10.9%

Figure 6: Of the 26 communities with the highest connectivity rate compared to the percent of residents in poverty, eight have community-owned broadband networks. An additional eight communities have worked with broadband partners or implemented pilot programs to improve access and adoption. Each of these communities also has a public or private university or community college.

Despite municipal broadband's communitywide benefits, local governments face considerable lobbying opposition.[44]

- **Starkville, Mississippi:** In 2013, Starkville was one of nine Mississippi cities chosen by CSpire for a pilot fiber to the home program. In 2014, CSpire made its first residential connection. MaxxSouth acquired the city's incumbent cable provider in 2014 and in 2015 announced that it would launch a citywide gigabit fiber initiative. In 2017, CSpire received the 2016 Industry of the Year award from the economic development arm of the Greater Starkville Development Partnership.[45]

[44] *See e.g.* Jon Brodkin, Municipal broadband advocates fight off attacks from "dark money" groups (May 21, 2024, https://arstechnica.com/tech-policy/2024/05/how-dark-money-groups-help-private-isps-lobby-against-municipal-broadband/?utm_campaign=Newsletters&utm_medium=email&utm_source=sendgrid.

[45] https://bbcmag.com/c-spire-honored-by-mississippi-economic-development-group/.

- **Morehead, Kentucky |** Kentucky targeted Morehead as the northern ring of its statewide middle-mile network.[46] Additionally, Rowan County, where Morehead is located, conducted a Broadband Study and issued an RFP in 2021 seeking a vendor for infrastructure improvements.[47]

- **Sallisaw, Oklahoma |** In 2002, the City began exploring options for improved video and Internet service and by 2005 launched its municipal broadband service, DiamondNet, as one of the first in the nation.[48] Currently, DiamondNet offers a range of speed and pricing tiers that are publicly available on their website.[49] Prices start at $34.95 for 20/10 Mbps Internet, though DiamondNet offers speeds up to 1 Gb in some locations for 84.95.[50] DiamondNet also offers County wireless packages that start at $29.95 monthly.[51]

- **Jackson, Mississippi |** The City launched a pilot to provide high-speed Internet in a four-block area of downtown Jackson using a buried dark fiber network.[52] Jackson officials cite employment as a motivating need for high-speed Internet.[53] In 2015, CSpire partnered with Belhaven University in Jackson, making it the first college in Mississippi to offer students Gigabit Internet access.[54]

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[46] *See* Kentucky Communications Network Authority, Kentucky Wired FAQ, https://kentuckywired.ky.gov/about/Pages/faq.aspx (last visited Aug. 1, 2024).

[47] *See* Rowan County Broadband RFP, https://www.rcky.us/broadband (last visited Aug. 1, 2024).

[48] *See* DiamondNet, AboutUs, https://www.diamondnetok.com/305/DiamondNet (last visited Aug. 1, 2024).

[49] *See* DiamondNet, Residential DiamondNet Packages, https://www.diamondnetok.com/312/Residential-DiamondNet-Packages (last visited Aug. 1, 2024).

[50] *Id*.

[51] *See* DiamondNet, County Wireless Rates, https://www.diamondnetok.com/319/County-Wireless-Rates (last visited Aug. 1, 2024).

[52] Justin Vicory, There's now free Wi-Fi in parts of downtown Jackson. It's phase one of transition to a tech city (Nov. 12, 2019), https://www.clarionledger.com/story/news/local/2019/11/12/wi-fi-free-city-of-jackson-ms-downtown-tech-project/2509183001/; Gov Launch, Jackson, MS public broadband project improves connectivity for downtown businesses, https://govlaunch.com/fr/projects/jackson-ms-public-broadband-project-improves-connectivity-for-downtown-businesses (last visited Aug. 1, 2024).

[53] *Id*.

[54] Press release Belhaven University, Belhaven First College in Mississippi to Acquire CSpire Fiber Internet (April 6, 2015), https://www.belhaven.edu/news/2015/Belhaven-First-College-in-Miss.html.

High poverty rate communities

The U.S. Census Bureau categorizes communities with more than 20 percent of residents in poverty as high-poverty areas.[55] Of all communities included in our research, those with the highest poverty rate also had among the highest deviation between percent of residents in poverty and those without a home Internet subscription. In most cases, the percent of residents with an Internet subscription far exceeded the percent of residents in poverty.

HIGH POVERTY COMMUNITIES

COMMUNITY	POPULATION	W/O INTERNET	IN POVERTY	DIFFERENCE
STARKVILLE MISSISSIPPI	24,168	14.5%	30.6%	16.1%
BLOOMINGTON INDIANA	79,107	13%	31.8%	18.1%
MOREHEAD KENTUCKY	6,734	8.7%	34.5%	25.8%
SALLISAW OKLAHOMA	8,540	21.1%	35.2%	14.1%
RIO GRANDE PUERTO RICO	45,840	20.1%	36.2%	16.1%
CARBONDALE ILLINOIS	21,717	13.7%	37.9%	24.2%
VEGA ALTA PUERTO RICO	34,786	23.4%	42.3%	18.9%
PONCE PUERTO RICO	132,138	23.4%	50.4%	27%

Figure 7: High poverty communities with notably higher subscription rates relative to percent of residents in poverty.

This finding supports trends identified by other researchers. John Horrigan observed that pandemic response policies positively impacted adoption rates, particularly in communities with among the highest poverty rates.[56] Similarly, research for the Joint Center for Political and Economic Studies on Affordability and Availability found that:

> In the Black Rural South, 38 percent of African Americans report that they lack home internet access. By comparison, 23 percent of white Americans in the Black Rural South, 22 percent of African Americans nationwide, 22 percent of rural residents outside of the South, and 18 percent of all Americans nationwide report that they

[55] USDA Economic Research Service, Poverty Area Measures, https://www.ers.usda.gov/data-products/poverty-area-measures/background-and-uses/#:~:text=%22High%20poverty%22%20is%20defined%20as,Official%20Poverty%20Measure%20(OPM).

[56] John Horrigan, It's No Time to Disarm in the War Against the Digital Divide (Nov. 29, 2022), https://www.benton.org/blog/its-no-time-disarm-war-against-digital-divide.

lack home internet access. Expanding broadband can help improve employment, incomes, education, and healthcare in the Black Rural South.[57]

Recommendations

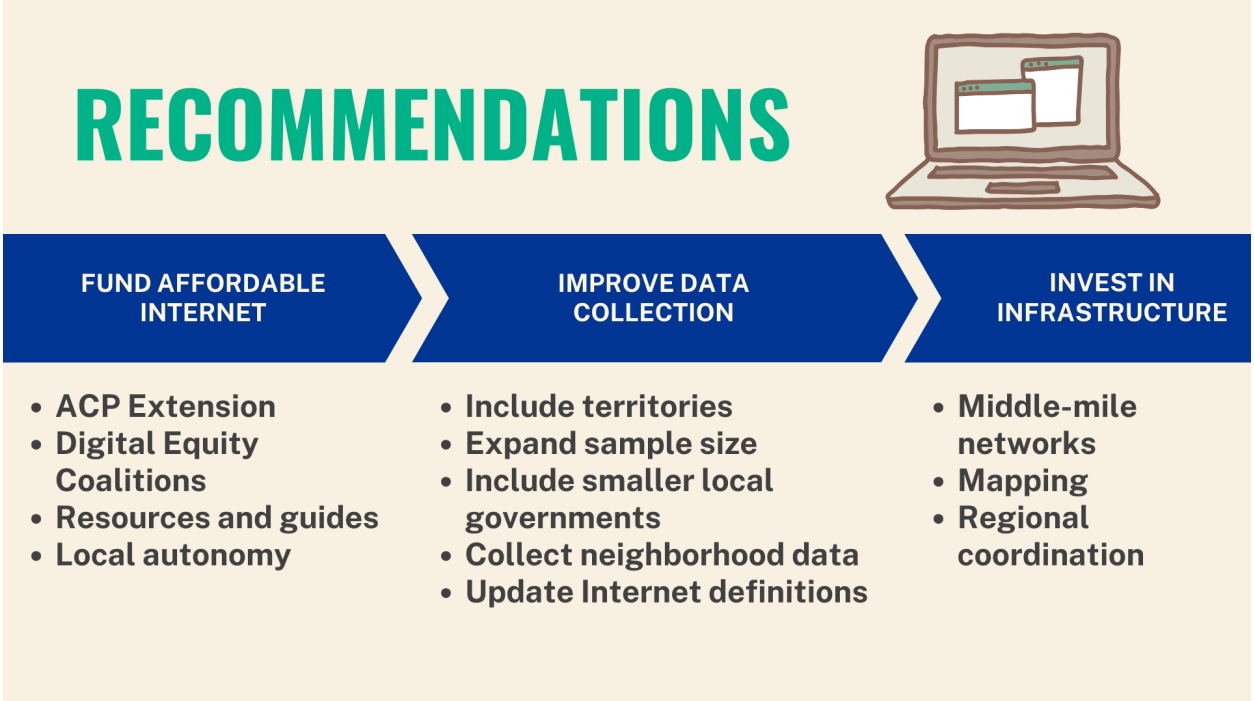

Figure 8: Recommendations

Invest in Affordable Internet.

April 30, 2024 marked the final day of the Affordable Connectivity Program's last fully funded month. After April, many ACP providers offered a lower benefit of $14 for the month of May, while others may simply begin the process of transferring ACP customers to other plans or, in a worst case scenario, disconnecting them altogether. This meant that over 20 million households found themselves paying significantly more for or losing their Internet connections entirely.

Federal Communications Commission Chairwoman Jessica Rosenworcel sent a letter to Congress, stating that "If the ACP ends, we risk reversing the significant progress this program has made towards closing the digital divide. Over the past two years, households have come to rely on the

[57] Dr. Dominique Harrison, Affordability and Availability: Expanding Broadband in the Black rural south (Oct. 26, 2021), https://jointcenter.org/affordability-availability-expanding-broadband-in-the-black-rural-south/.

ACP's monthly benefit to afford reliable and consistent access to broadband services necessary for education, work, and health care among other things."[58]

This potential loss of connectivity for so many households is unacceptable. Fully participating in our ever increasingly digital society requires an Internet connection, for work, education, accessing social benefits, and keeping connected with friends and family. An April 2024 report from Roberto Gallardo and Brian Whitacre that compared 2021 Ookla speed test data to Census Internet adoption data found that in communities with older residents, more rural, and higher poverty, the average download speed decreased.[59]

Empower Community-Centered Solutions

Leaving millions of households without the service they need undermines digital equity efforts that have taken center stage for the last four years. The federal government has relied on trusted local partners in spreading the word about the Affordable Connectivity Program. Thanks to community leaders across the country, nearly half of all eligible households enrolled in the program after just three years.[60] This represents just over half of urban and a third of rural households who were eligible for the program.[61] Renewing the ACP remains vitally important to preserving the trusted relationships developed across local, state, and federal partners.

In order to continue instruction and maintain safety through the COVID-19 pandemic, many school districts distributed mobile hotspots to provide service for people living without a home broadband subscription. Data caps, gaps in mobile Internet availability, and capacity limitations for households with several school-age children made hotspots a stop-gap solution. Local leaders and broadband advocates seeking more sustainable solutions for students without high-quality home Internet have addressed affordability directly through public wireless models. including:

- **Detroit, Michigan |** The Detroit Community Tech Network's Equitable Internet Initiative is a collaboration between the Allied Media Project and Detroit community organizations.[62]

[58] Press release Federal Communications Commission, Chairwoman Final Update to Congress on Affordable Connectivity Program (May 1, 2024), https://www.fcc.gov/document/chairwoman-final-update-congress-affordable-connectivity-program-0.

[59] *See generally* Roberto Gallardo & Brian Whitacre, An unexpected digital divide? A look at internet speeds and socioeconomic groups (2024), https://www.sciencedirect.com/science/article/pii/S0308596124000740#sec4.

[60] Press release The White House, As Affordable Connectivity Program Hits Milestone of Providing Affordable High-Speed Internet To 23 Million Households Nationwide, Biden-Harris Administration Calls on Congress to Extend Its Funding (Feb. 6, 2024), https://www.whitehouse.gov/briefing-room/statements-releases/2024/02/06/fact-sheet-as-affordable-connectivity-program-hits-milestone-of-providing-affordable-high-speed-internet-to-23-million-households-nationwide-biden-harris-administration-calls-on-congress-t/.

[61] Corey Walker, Rural Households Less Likely to Enroll in ACP, Study Claims (Feb. 2, 2024), https://broadbandbreakfast.com/rural-households-less-likely-to-enroll-in-acp-study-claims/.

[62] Detroit Community Tech Network, Equitable Internet Initiative, https://detroitcommunitytech.org/eii.

The project identifies neighborhoods that need connectivity and builds out point to point wireless.[63]

- **Phoenix, Arizona |** Arizona State University's Watts College of Public Service and Community Solutions and the University Technology Office partnered to extend millimeter wave wireless to homes that are in line of sight of Isaac School District schools by placing antennas on the roof of homes that connect with antennas on buildings.[64]
- **Boulder, Colorado |** Boulder Valley School District (BVSD) established a public-private partnership with Livewire Networks called the ConnectME Program.[65] Livewire's network provides the wireline service with backhaul provided by bond-funded fiber owned by BVSD.[66] Local wireless networks connect directly to students' homes.[67] Local leaders cite programmatic hurdles from the Federal Communications Commission as barriers to pursuing all options to connect students.[68]

ACP has also been a catalyst for providers moving into areas previously considered unprofitable, improving competition and expanding consumer choice. Likewise, numerous state Digital Equity Plans across the US cite ACP as a key strategy to addressing affordability.

The ACP Extension Act

Before funding expired, a sixth of households across the country relied on the ACP for affordable Internet. Despite ongoing bipartisan support for ACP, Congress did not approve additional appropriations for the program before funding lapsed in May 2024 , leaving tens of millions of households facing disconnection or lower quality service. On July 31, 2024, the Senate Committee on Commerce, Science and Technology voted to advance the ACP Extension Act as an amendment to the Plan For Broadband Act.[69]

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[63] *Id*.

[64] Aydali Campa, These kids living close to school get reliable internet after months without it (May 12, 2021), https://www.azcentral.com/story/news/2021/05/12/asu-isaac-school-district-partner-bring-reliable-internet-access-families/7352011002/?mc_cid=043e26a95e&mc_eid=81c1b38574.

[65] U.S. Dep't of Ed. Keeping Students Connected and Learning (2021), https://tech.ed.gov/wireless-brief/.

[66] *Id*.

[67] *Id*.

[68] *Id*.

[69] US Senate Committee on Commerce, Science, and Education, Executive Session (July 31, 2024), https://www.commerce.senate.gov/2024/7/executive-session; press release Senator Welch's Affordable Connectivity Program Amendment Advances Out of Commerce Committee (July 31, 2024), https://www.welch.senate.gov/welchs-affordable-connectivity-program-amendment-advances-out-of-commerce-committee/; Senate Bill 2238, PLAN For Broadband Act (Introduced July 11, 2023), https://www.congress.gov/bill/118th-congress/senate-bill/2238/text.

Affordable home broadband connections provide exponential economic impacts for families. Research from John Horrigan found that every $1 in ACP subsidies provides $2 in economic benefits.[70] Further analysis found that ending ACP could mean over $2 billion in lost consumer financial benefit and efficiencies for healthcare providers.[71] Passing the ACP Extension Act would provide the much needed funding for the ACP to remain in effect until the end of 2024. While this is not a permanent solution, it buys ACP recipients and policymakers much needed time to determine how to permanently fund this necessary program.

Five ways that enhanced Census data could improve broadband and digital equity planning.

Broadband data often directly impacts which communities receive funding for infrastructure deployment, school and library connectivity, and telehealth initiatives. Additionally, data helps track whether broadband and digital equity policies have the desired impact, providing a critical reference point for programmatic evaluation.

Each year, the U.S. Census Bureau sends an estimated 3.5 million households the American Community Survey (ACS), which has included three questions about residents' home computer and Internet access since 2013.[72] Following the Digital Equity Act of 2021, the Census Bureau released its Digital Equity Act Population Viewer, which maps ACS Computer and Internet data alongside demographic information.[73]

Compared to broadband availability data, which shows where providers offer broadband service, ACS data reflects whether residents subscribe to broadband as well as whether they have a home tablet or computer. With all 50 states, D.C., and U.S. territories preparing digital equity plans, ACS Computer and Internet data provides an important baseline for understanding community needs. As state leaders have realized, more granular data and qualitative community experiences are necessary to effectively address the range of barriers residents face when getting online.

While ACS and Census data are a helpful start, several limitations make it difficult to understand the nuances of the digital divide's impact on particular communities.

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[70] John Horrigan, The Affordable Connectivity Program Creates $16.2 Billion in Annual Benefits to Subscribers (March 15, 2024), https://www.benton.org/blog/affordable-connectivity-program-creates-162-billion-annual-benefits-subscribers.

[71] John Horrigan, Leaving Money on the Table: The ACP's Expiration Means Billions in Lost Savings (July 24, 2024), https://www.benton.org/publications/acp-expiration-means-billions-lost-savings.

[72] Census Reporter, Computers and Internet, https://censusreporter.org/topics/computer-internet/ (last visited Aug. 1, 2024).

[73] U.S. Census Bureau, The Importance of the American Community Survey and the Decennial Census (March 13, 2024), https://www.census.gov/programs-surveys/acs/about/acs-and-census.html; U.S. Census Bureau, Mapping Digital Equity in Every State (May 13, 2022), https://www.census.gov/library/stories/2022/05/mapping-digital-equity-in-every-state.html.

1. Include U.S. territories in annual ACS estimates.

Puerto Rico is the only U.S. territory that the Census Bureau includes in its ACS data collection. Though Guam, American Samoa, the Virgin Islands, the Commonwealth of the Northern Mariana Islands, and the District of Columbia are eligible entities for NTIA's Digital Equity program, less information is readily accessible about Computer and Internet availability. While other states have ACS estimates from 2021 and 2022 about Computer and Internet access, Computer and Internet information from the 2020 Census was the most current data for territories. Expanding ACS data to include territories will help community leaders better address digital inequities.

2. Expanding municipality data to include smaller communities could inform the local leaders who need it most.

Remote rural communities, particularly in areas with challenging topography for infrastructure deployment, persistently lag behind their urban peers in broadband availability. Likewise, local leaders from the most rural communities, those with populations below 5,000 residents, do not have the same ACS data as more densely populated cities, towns, and villages.

The Census Bureau makes ACS data about all counties available, but only collects municipality-level statistics for communities of 5,000 or more. In more rural states, like Minnesota and Vermont, ACS Computer and Internet data are often not available at the town or city level, leaving local leaders to rely on county-level statistics or collect their own data. Smaller local governments are also less likely to have the staff, budget, and in-house expertise to embark on their own data collection. Incorporating smaller communities in the ACS data collection process could provide a much-needed baseline for researchers, community leaders, local officials, and state policymakers.

3. Collecting neighborhood data could improve digital equity planning in urban communities.

Unlike rural municipalities, which may lack data more granular than the county level, urban communities with large populations and multiple zip codes may face difficulties using the data to pinpoint problem areas. Several communities have investigated the digital divide and found significant disparities between federal datasets and community experiences.

- The Greenlining Institute investigated residents' experience with Internet access in **Fresno and Oakland**, California, finding that the same areas historically redlined by banks now lack high-quality, affordable broadband service.[74] Researchers also found that Latino households were 33% less likely to have home Internet access than white households. Notably, California's wealthiest households were 16 times more likely to have a home Internet connection than the state's lowest income families.

[74] Vinhcent Le & Gissela Moya, On the Wrong Side of the Digital Divide (June 2, 2020), https://greenlining.org/publications/on-the-wrong-side-of-the-digital-divide/

- In 2022, the **City of Philadelphia**, Pennsylvania, released its Internet Use Survey, which revealed that while Internet adoption increased since 2019, when the most recent ACS data was released, over 15% of residents still lacked a home Internet connection. Older residents, those who took the survey in Spanish, and households with annual incomes below $20,000 were disproportionately disconnected from home Internet.[75] The research also revealed that 32% of households were subscription-vulnerable, meaning that they experienced a service disruption during the pandemic for economic reasons and rely on affordable Internet programs to maintain a home connection sustainably.[76]

- The **City of San Antonio**, Texas, works alongside nonprofit, academic, and government partners to pinpoint the areas least connected to broadband and develop targeted policy solutions. In 2019, the City began surveying residents to identify which neighborhoods lacked adequate Internet.[77] The data empowered local leaders to target areas in greatest need when the pandemic pushed most services online and provides a comparison point for measuring programmatic progress over time.[78]

4. Improve Computer and Internet ACS data to reflect minimum standards.

The Census Bureau's definitions of Computer and Internet data differ from the FCC's minimum broadband standard and include devices that most digital equity practitioners do not consider adequate for many Internet uses. According to the Census Bureau's ACS definitions, ""Access" refers to whether or not someone in the household uses or can connect to the internet," including cellular service alongside fixed services.[79] In comparison, the Federal Communications Commission separately maps fixed Internet, meaning wired or wireless in-home connections, from mobile services, which often include data caps and less reliable connections.

Speed testing has become a primary way that residents and local and state leaders understand whether home connections match advertised service.[80] Community-centered speed test projects like

[75] City of Philadelphia, Pennsylvania, 2021 Household Internet Assessment Survey, https://www.phila.gov/media/20211019110414/Connecting-Philadelphia-2021-Household-Internet-Assessment-Survey.pdf.

[76] *Id*.

[77] Lindsey Carnett, Survey: San Antonio's Digital Divide Follows City Council District Lines (June 24, 2020), https://sanantonioreport.org/survey-san-antonios-digital-divide-follows-city-council-district-lines/.

[78] Press release City of San Antonio, Texas, Second Digital Inclusion Assessment Launch (Feb. 3, 2023), https://www.sa.gov/Directory/News/News-Releases/Second-Digital-Inclusion-Assessment-Launch.

[79] *See* US Census Bureau, American Community Survey and Puerto Rico Community Survey 2020 Subject Definitions, at 13-15 (2020), https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2020_ACSSubjectDefinitions.pdf.

[80] *See* Corian Zacher, Engaging with Local, State, and Federal Officials Through Broadband Surveys and Speed Tests (Nov. 19, 2021),

Speed Up America and Citizen Me have sought to empower local leaders with more accurate data about broadband quality.[81] The Markup developed a tool to help broadband researchers and community advocates better understand the digital divide in their communities.[82]

5. Expand the ACS sample size.

While ACS information is available for all counties and many local governments, the sample size includes "over 3.5 million housing unit addresses" interviewed over a 12 month period. In comparison, the Census Bureau collects information from over 330 million residents during the decennial census. While annual ACS data collection from every community may not be feasible, expanding the sample size could help community leaders and state broadband offices paint a more accurate picture of who does and does not have the Internet, skills, and devices necessary to participate in society.

Support Open Access Middle-Mile Network Deployment

Experts generally agree that open access middle-mile networks can offer the critical infrastructure needed for high quality last-mile connections.

Open access networks have been developed by communities and states across the country for many years with varying goals and outcomes. Those experiences can help inform planning processes. Setting a contingency plan can help offset any potential hurdles or pitfalls that may arise as the network develops.

A. Developing a plan for last-mile connections

Though municipal broadband is well-suited for some communities, others are not equipped to provide last-mile connections, even if they manage an open access network of their own. While open access infrastructure is important, additional planning is needed to develop plans that ensure that every community can harness the benefits that the network offers. Learning with communities that have established open access networks through site visits, collaborative planning, and mentorship can help inform future efforts (see appendix of NCC open access networks below).

Nevada County, California, for example, has discussed the challenges they have faced in ensuring that all residents have a last-mile service offering in their area. Though a provider has offered middle-mile infrastructure for over a decade, no last-mile providers have developed connections to

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https://nextcenturycities.org/engaging-with-local-state-and-federal-officials-through-broadband-surveys-and-speed-tests/.

[81] *See e.g.* Speed Up America, https://speedupamerica.com/; Citizen Me, https://www.citizenme.com/.

[82] Aaron Sankin and Leon Yin, Slow Internet? Find Out What Side of the Digital Divide You're On (May 11, 2023), https://themarkup.org/build-your-own-dataset/2023/05/11/slow-internet-find-out-what-side-of-the-digital-divide-youre-on.

homes and businesses in the county.[83] The County recommends a streamlined funding program to support last-mile connections and reduced regulatory barriers for smaller projects.[84]

Network planners should work with communities to identify areas that remain disconnected despite the presence of available infrastructure to develop a plan to build affordable, reliable last-mile connections. As open access networks are developed, ensuring that communities have the resources they need to support last-mile projects will remain critical.

B. Prioritizing connectivity in urban *and* rural areas, and on Tribal lands.

While open access solutions can address statewide disparities, planning must include strategies for connecting communities that face unique challenges to bringing broadband access and adoption within reach.

In states like New Mexico and Colorado, open access middle-mile networks have been effective solutions to boost connectivity in rural areas and on Tribal lands. In areas like Ann Arbor, Michigan, and Eugene, Oregon, open access networks have been similarly successful. At the same time, these differences create unique challenges to expanding connectivity. Building a strategy that recognizes those differences into the planning process can enable all residents with the connectivity they need to get online.

Numerous cities across the US have conducted digital equity studies and developed digital inclusion plans. The results offered in these reports shed light on existing connectivity disparities, which can help inform overall efforts to develop a workable open access network. Understanding the unique challenges that each community faces is a critical step in developing policies to guide network development. The National League of Cities developed a playbook to help local governments across the country create digital equity plans that guide local policymaking.[85]

Communication and partnership are key to ensuring that concurrent deployment projects complement each other, expanding broadband service to everyone who remains disconnected. Working together with Tribal and local governments is a necessary step to ensuring that open access connectivity brings tangible benefits to communities of all sizes and topographies.

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[83] *See* Nevada County's Public Comment on the Draft California Broadband State Action Plan (Nov. 18, 2020), https://www.google.com/url?q=https://broadbandcouncil.ca.gov/wp-content/uploads/sites/68/2020/11/nevada-county_11-18-2020.pdf&sa=D&source=editors&ust=1629307790328000&usg=AOvVaw3VXz7GiQ9eM2x6Cgw2ciFE.

[84] *Id*.

[85] *See generally* National League of Cities, Digital Equity Playbook: How City Leaders Can Bridge the Digital Divide (2021), https://www.nlc.org/resource/digital-equity-playbook-how-city-leaders-can-bridge-the-digital-divide.

C. Developing sustainable, long-term open access policies

During open access network development, organizers should prepare a plan for the possibility that parts of publicly-built networks may ultimately be sold and ensure that open-access policies remain intact.

In some cases, publicly built open-access middle-mile network developments have been acquired by private providers.[86] If a public network is ultimately sold to a private provider, the project managers should ensure that open access policies remain in place.[87] This practice helps ensure clarity and confidence from last-mile providers who rely on the open nature of the network to serve communities, even if the ownership changes hands.

Digital equity initiatives in the last decade reveal that fixed wireless and mesh networks are a crucial component of connectivity in hard-to-serve communities—urban, suburban, rural, and Tribal. At the same time, any networks developed on an open access network would be jeopardized if the network were purchased and tenants were prevented from offering public wireless service. In order to ensure long-term connectivity for the communities the network serves, planning should include assurances that the network remains open access in perpetuity.

Conclusion

Affordability remains a persistent barrier for residents who do not have a home broadband connection. Analyzing trends in poverty and Internet adoption data, we identified several potential solutions for systemic connectivity improvements. Investing in communities through funding and by developing explainers and toolkits are two ways that policymakers at all levels can support counties and municipalities seeking to lower the digital divide for their residents.

[86] *See* If We Build It, Will They Come, Lessons from Open-Access Middle-Mile Networks, 10 (Dec. 2020), https://www.benton.org/sites/default/files/OAMM_networks.pdf.

[87] *Id.*

Appendix

Color Key

Color	Meaning	Interpretation
	0<2% difference between poverty and internet access	Near Average
	2<5% difference between poverty and internet access	Within Avg. Deviation
	5<10% difference between poverty and internet access	Outside Avg.
	>10% difference between poverty and internet access	Outlier

Addendum A: Communities with the highest poverty rate among the data set.

1	% Poverty	Name	State	Population	% W/O Access	Poverty - WO Access	Absolute Valu
59	28.7	Letcher County	KY	20,893	20.4	8.3	8.3
60	28.9	West Monroe	LA	12,635	31.3	-2.4	2.4
61	29	Gainesville	FL	145,214	14.8	14.2	14.2
62	29	East Liverpool	OH	9,765	22.6	6.4	6.4
63	29.5	Dahlonega	GA	7,461	10.4	19.1	19.1
64	29.6	Syracuse	NY	144,451	20	9.6	9.6
65	30.5	Avoyelles Parish	LA	38,751	36	-5.5	5.5
66	30.6	Starkville	MS	24,168	14.5	16.1	16.1
67	31.1	Bloomington	IN	79,107	13	18.1	18.1
68	31.8	Detroit	MI	620,376	24	7.8	7.8
69	32.5	Pharr	TX	80,179	35.6	-3.1	3.1
70	34.2	Socorro	NM	8,443	34.2	0	0
71	34.5	Morehead	KY	6,734	8.7	25.8	25.8
72	35.2	Sallisaw	OK	8,540	21.1	14.1	14.1
73	36.2	Rio Grande Municipio	PR	45,840	20.1	16.1	16.1
74	37.9	Carbondale	IL	21,717	13.7	24.2	24.2
75	39.5	San Juan Municipio	PR	334,776	32.8	6.7	6.7
76	39.9	East Carroll Parish	LA	6990	46.8	-6.9	6.9
77	42.3	Vega Alta Municipio	PR	34,786	23.4	18.9	18.9
78	50.4	Ponce Municipio	PR	132,138	23.4	27	27
79	52.8	Las Marias Municipio	PR	8,705	60	-7.2	7.2
80	NA	Kalawao County	HI	82	12.5	NA	NA

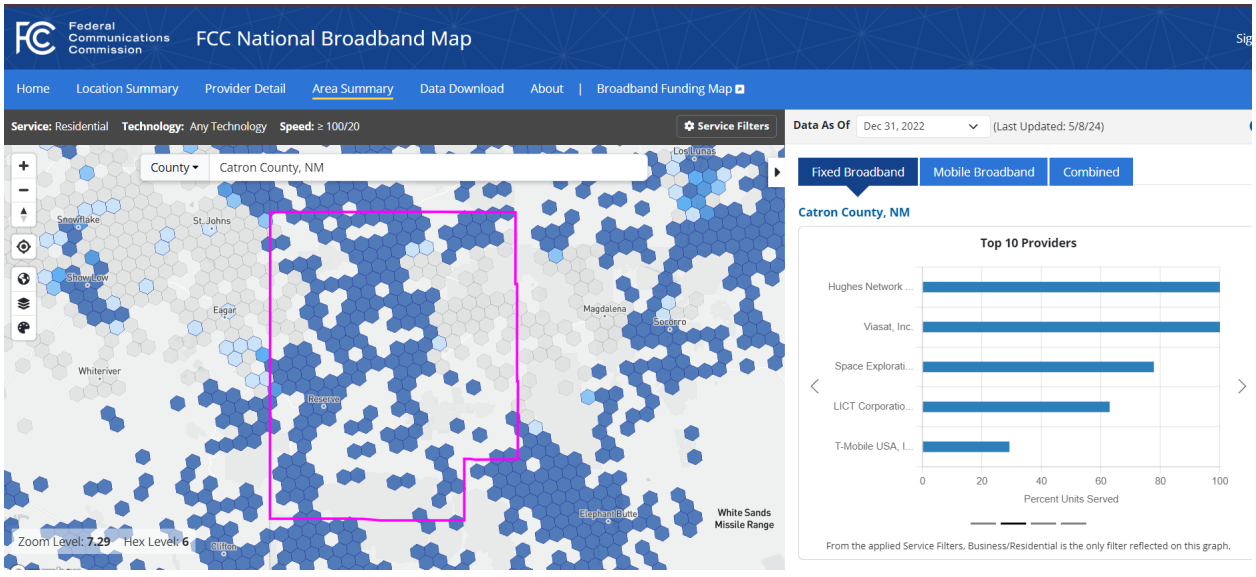
For one community, poverty data was not available.

Addendum B: Communities with the highest percent of residents without an Internet subscription.

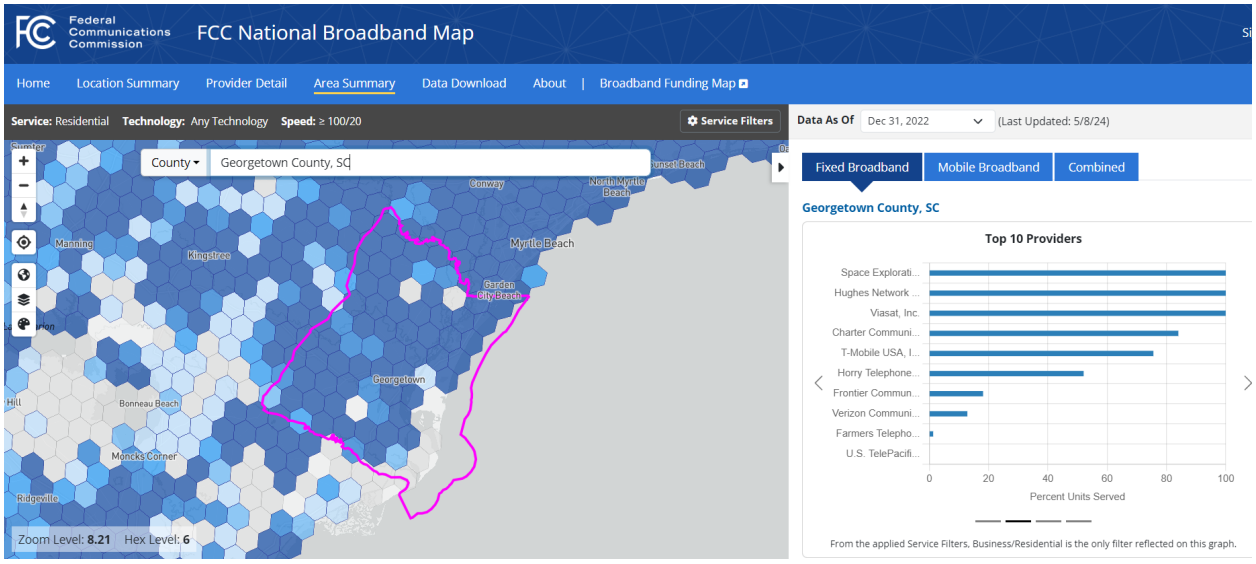
1	% W/O Access	Name	State	Population (2022)	% W/O CPU	% Poverty	Poverty - WO Access
259	23.5	Wayne County	IL	15,872	14.9	13.7	-9.8
260	24	Detroit	MI	620,376	12.4	31.8	7.8
261	24.2	El Dorado	AR	17,063	13.2	22.2	-2
262	24.4	Bamberg County	SC	12,908	13.1	28.4	4
263	24.4	Provo	UT	113,523	2.2	24.6	0.2
264	24.5	Windham County	VT	45,842	7	10.9	-13.6
265	24.6	Tyrrell County	NC	3,365	11.8	19.7	-4.9
266	25.3	Ashland	WI	7,874	12.8	24.8	-0.5
267	28.7	Ames	IA	66,950	3.2	26.8	-1.9
268	29.3	Gainesville	TX	17,912	18.3	13.1	-16.2
269	31.3	West Monroe	LA	12,635	17.4	28.9	-2.4
270	32.4	Liberty County	MT	1,972	13.6	18	-14.4
271	32.7	Pushmataha County	OK	10,769	16.6	22.1	-10.6
272	32.8	San Juan Municipio	PR	334,776	25.5	39.5	6.7
273	33.8	Georgetown	SC	8,556	9.5	15.5	-18.3
274	34.2	Socorro	NM	8,443	25.1	34.2	0
275	35.6	Pharr	TX	80,179	12.4	32.5	-3.1
276	36	Avoyelles Parish	LA	38,751	15.2	30.5	-5.5
277	39.9	Franklin Parish	LA	19,308	21.3	24	-15.9
278	40.2	Catron County	NM	3,827	18.4	19.8	-20.4
279	46.8	East Carroll Parish	LA	6990	32.9	39.9	-6.9
280	60	Las Marias Municipio	PR	8,705	54.3	52.8	-7.2

Addendum C: Broadband Mapping the Most Disconnected

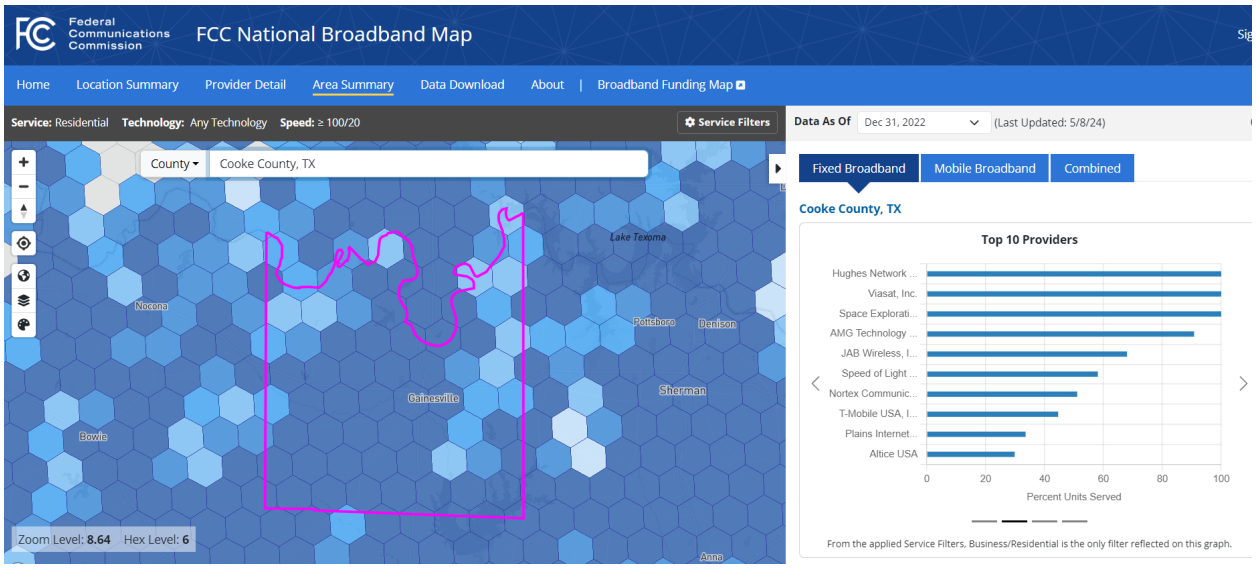
Catron County, New Mexico



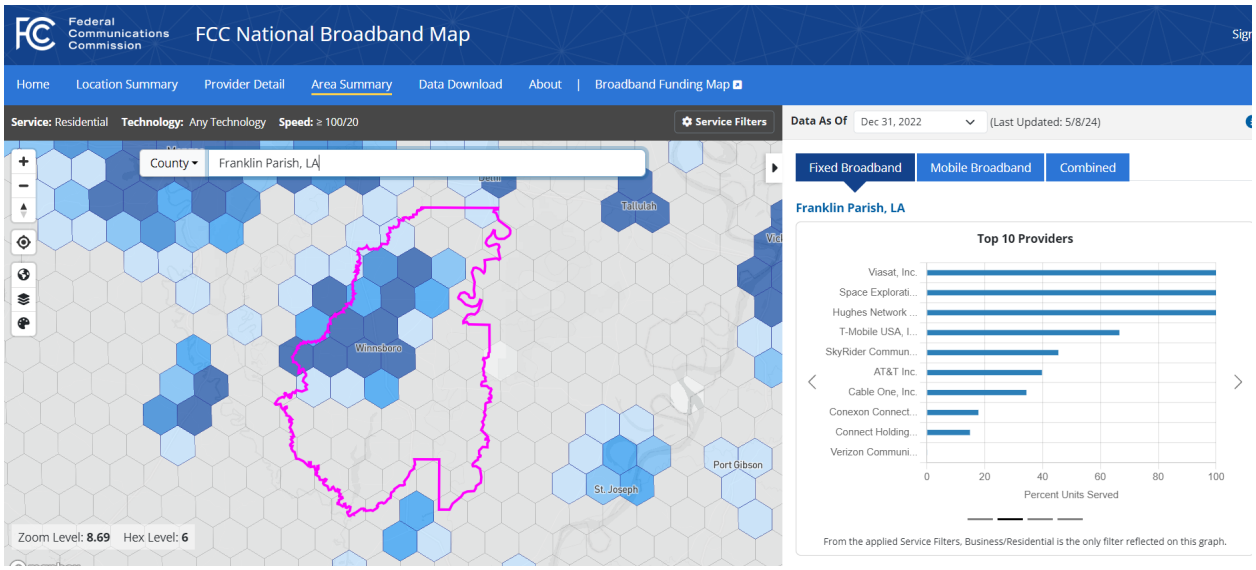
Georgetown County, South Carolina



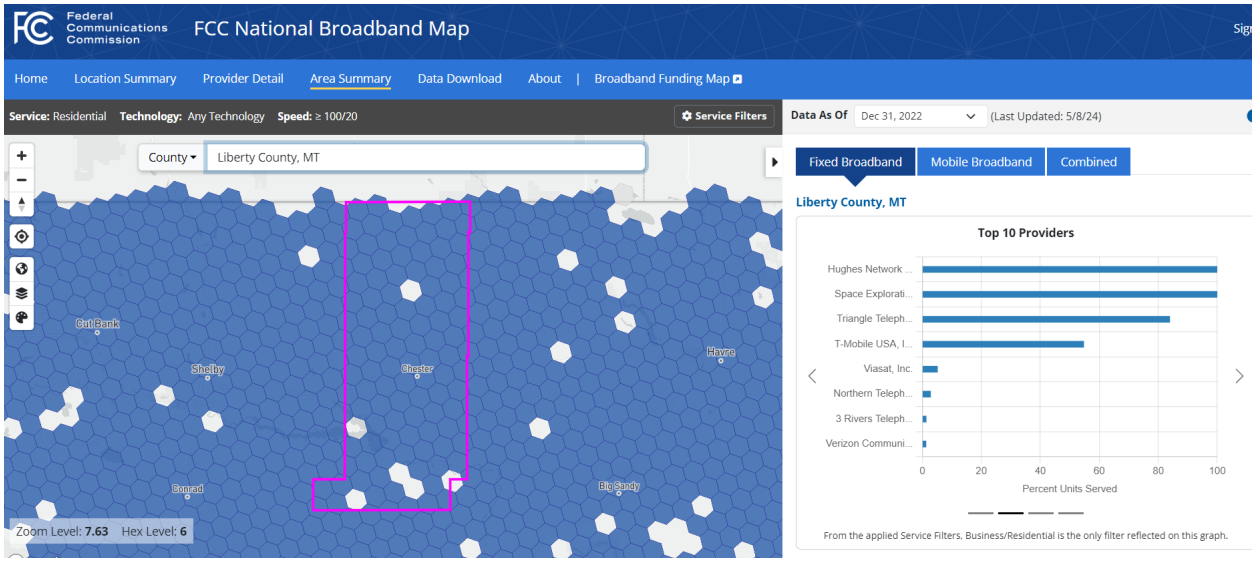
Cooke County, Texas



Franklin Parish, Louisiana

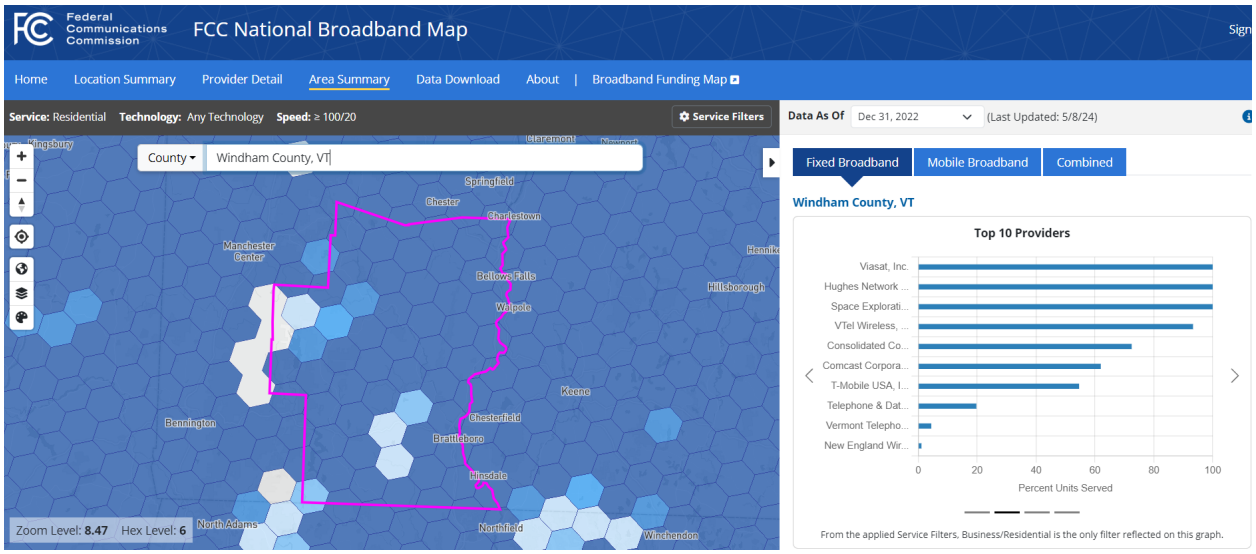


Liberty County, Michigan

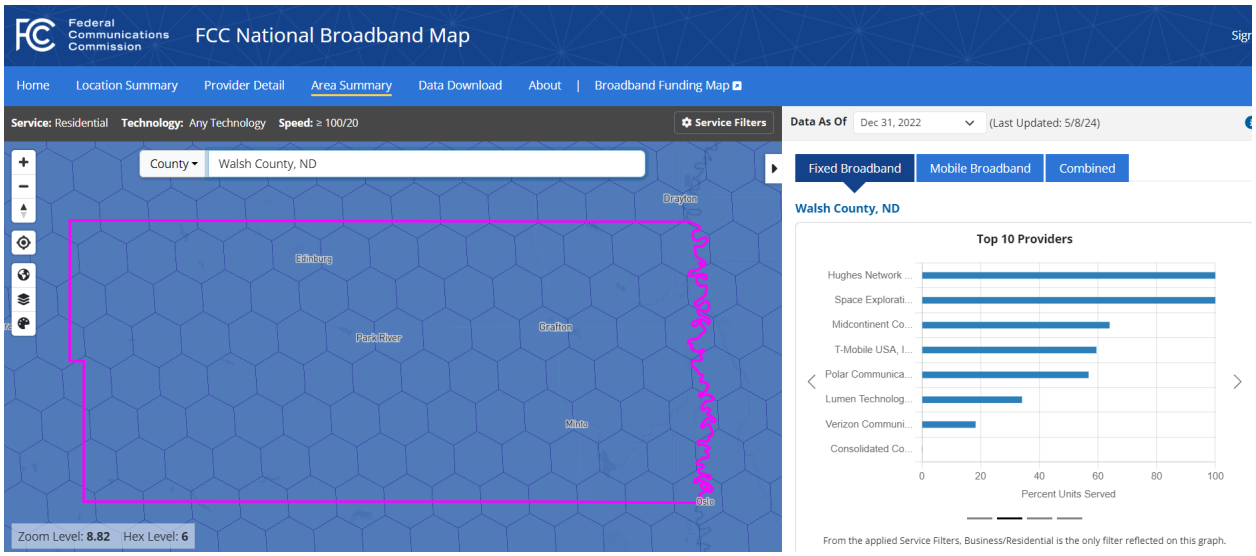


Broadband Affordability: The Metrics that Drive and Divide Us

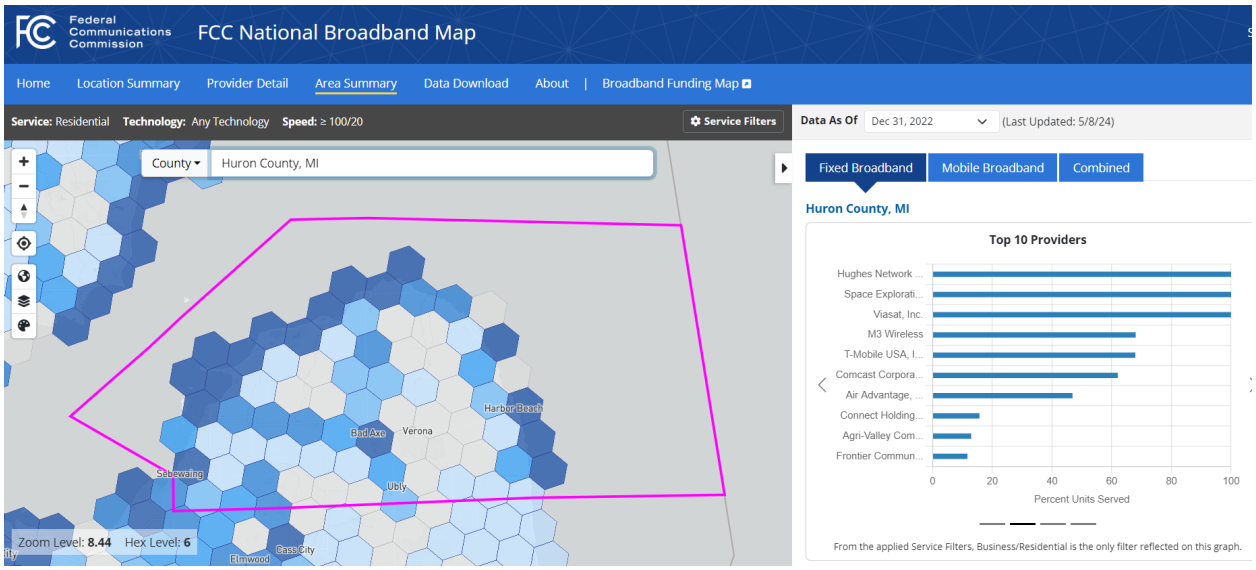
Windham County, Vermont



Walsh County, North Dakota



Huron County, Michigan



Addendum D: Communities most connected in relation to poverty rate often had a public or private university.

1	Poverty - V	Name	Population	% W/O CPU	% W/O A	% Poverty	Absolute Value	State	Rural? (pop <10,000)	Pop 10k-50k	High Poverty? (>20%)	College/Univers
14	10.8	Pikeville	7,358	11.4	14.3	25.1	10.8	KY	Y	N	Y	Y
15	10.9	Rochester	209,352	9.4	17	27.9	10.9	NY	N	N	Y	Y
16	10.9	Eugene	177,923	2.8	8.4	19.3	10.9	OR	N	N	N	Y
17	11.1	Columbia	139,698	3.9	13.1	24.2	11.1	SC	N	N	Y	Y
18	11.1	Burlington	44,595	4	12.5	23.6	11.1	VT	N	Y	Y	Y
19	11.7	Champaign	89,241	3.5	11.9	23.6	11.7	IL	N	N	Y	Y
20	11.9	Gulfport	72,236	7.9	14.7	26.6	11.9	MS	N	N	Y	N
21	12.8	Jackson	145,995	9.2	13.1	25.9	12.8	MS	N	N	Y	Y
22	12.8	Martinsburg	18,953	6.3	11.9	24.7	12.8	WV	N	Y	Y	Y
23	13.8	New Haven	138,915	6.9	11.5	25.3	13.8	CT	N	N	Y	Y
24	14.1	Sallisaw	8,540	9.9	21.1	35.2	14.1	OK	Y	N	Y	Y
25	14.2	Gainesville	145,214	2.7	14.8	29	14.2	FL	N	N	Y	Y
26	14.3	Fort Collins	169,249	1.9	1.9	16.2	14.3	CO	N	N	N	Y
27	14.8	Ann Arbor	119,875	2.3	7.7	22.5	14.8	MI	N	N	Y	Y
28	16.1	Boulder	105,485	2	6	22.1	16.1	CO	N	N	Y	Y
29	16.1	Starkville	24,168	4.6	14.5	30.6	16.1	MS	N	Y	Y	Y
30	16.1	Rio Grande Municipio	45,840	14.7	20.1	36.2	16.1	PR	N	Y	Y	Y
31	18.1	Bloomington	79,107	4.2	13	31.1	18.1	IN	N	N	Y	Y
32	18.2	Fairburn	16,956	2.5	5.2	23.4	18.2	GA	N	Y	Y	Y
33	18.9	Vega Alta Municipio	34,786	16.6	23.4	42.3	18.9	PR	N	Y	Y	N
34	19.1	Dahlonega	7,461	4.2	10.4	29.5	19.1	GA	Y	N	Y	Y
35	24.2	Carbondale	21,717	3.9	13.7	37.9	24.2	IL	N	Y	Y	Y
36	25.8	Morehead	6,734	4.9	8.7	34.5	25.8	KY	Y	N	Y	Y
37	27	Ponce Municipio	132,138	22.5	23.4	50.4	27	PR	N	N	Y	Y

Addendum E: Communities with the most residents without Internet access compared to a relatively lower poverty rate.

	Poverty - W	Name	Population (	% W/O CPU	% W/O A	% Poverty	Absolute Value	State
2	-20.4	Catron County	3,827	18.4	40.2	19.8	20.4	NM
3	-18.3	Georgetown	8,556	9.5	33.8	15.5	18.3	SC
4	-16.2	Gainesville	17,912	18.3	29.3	13.1	16.2	TX
5	-15.9	Franklin Parish	19,308	21.3	39.9	24	15.9	LA
6	-14.4	Liberty County	1,972	13.6	32.4	18	14.4	MT
7	-13.6	Windham County	45,842	7	24.5	10.9	13.6	VT
8	-11.4	Walsh County	10,438	12.3	22.1	10.7	11.4	ND
9	-11.3	Huron County	31,248	13.1	23.1	11.8	11.3	MI
10	-10.6	De Soto	6478	11.4	17.6	7	10.6	KS
11	-10.6	Pushmataha County	10,769	16.6	32.7	22.1	10.6	OK

All have populations below 50,000 residents and are based in more rural areas.

Addendum F: Communities where the percent of residents with an Internet connection exceeds the percent of residents in poverty by greater than 10%.

	Poverty - WO	Name	State	Population	% W/O Internet	% Poverty	Absolute Value	High Poverty?	University
2	10.6	Fayetteville	AR	99,285	10.6	21.2	10.6	Y	University of Arkansas (Public University)
3	10.8	Pikeville	KY	7,358	14.3	25.1	10.8	Y	University of Pikeville (Private University)
4	10.9	Eugene	OR	177,923	8.4	19.3	10.9	N	University of Oregon (Public University)
5	14.1	Sallisaw	OK	8,540	21.1	35.2	14.1	Y	Carl Albert State College (Community College)
6	14.3	Fort Collins	CO	169,249	1.9	16.2	14.3	N	Colorado State University (Public University)
7	14.8	Ann Arbor	MI	119,875	7.7	22.5	14.8	Y	University of Michigan (Public University)
8	16.1	Boulder	CO	105,485	6	22.1	16.1	Y	University of Colorado (Public University)
9	25.8	Morehead	KY	6,734	8.7	34.5	25.8	Y	Morehead State University (Public University)
10	11.1	Burlington	VT	44,595	12.5	23.6	11.1	Y	University of Vermont (Public University)
11	10.9	Rochester	NY	209,352	17	27.9	10.9	Y	University of Rochester (Private University)
12	10.2	Hartford	CT	120,686	16.7	26.9	10.2	Y	University of Hartford (Private University)
13	12.8	Jackson	MS	145,995	13.1	25.9	12.8	Y	Jackson State University (Public University)
14	14.2	Gainesville	FL	145,214	14.8	29	14.2	Y	North Central Texas College (Community College)
15	16.1	Starkville	MS	24,168	14.5	30.6	16.1	Y	Mississippi State University (Public University)
16	19.1	Dahlonega	GA	7,461	10.4	29.5	19.1	Y	The University of North Georgia (Military University)
17	24.2	Carbondale	IL	21,717	13.7	37.9	24.2	Y	Southern Illinois University (Public University)
18	11.1	Columbia	SC	139,698	13.1	24.2	11.1	Y	University of South Carolina (Public University)
19	11.7	Champaign	IL	89,241	11.9	23.6	11.7	Y	University of Illinois Urbana-Champaign (Public University)
20	11.9	Gulfport	MS	72,236	14.7	26.6	11.9	Y	University of Southern Mississippi - Long Beach (Public University)
21	12.8	Martinsburg	WV	18,953	11.9	24.7	12.8	Y	Private Technical Colleges: Martinsburg College; Valley College; Blue Ridge
22	13.8	New Haven	CT	138,915	11.5	25.3	13.8	Y	University of New Haven (Private University)
23	27	Ponce Municipic	PR	132,138	23.4	50.4	27	Y	University of Puerto Rico at Ponce (Public University)

	Poverty - WO	Name	State	Population	% W/O Internet	% Poverty	Absolute Value	High Poverty?	University
21	12.8	Martinsburg	WV	18,953	11.9	24.7	12.8	Y	Private Technical Colleges: Martinsburg College; Valley College; Blue Ridge
22	13.8	New Haven	CT	138,915	11.5	25.3	13.8	Y	University of New Haven (Private University)
23	27	Ponce Municipic	PR	132,138	23.4	50.4	27	Y	University of Puerto Rico at Ponce (Public University)
24	16.1	Rio Grande Mur	PR	45,840	20.1	36.2	16.1	Y	NUC University - Recinto de Rio Grande (Private University)
25	18.1	Bloomington	IN	79,107	13	31.1	18.1	Y	Indiana University Bloomington (Public University)
26	18.2	Fairburn	GA	16,956	5.2	23.4	18.2	Y	Georgia Military College (Public Military Junior College)
27	18.9	Vega Alta Munic	PR	34,786	23.4	42.3	18.9	Y	Caribbean University (Private University)