FEDERAL RESERVE BANK of NEW YORK

COMMUNITY DEVELOPMENT

DIGITAL EQUITY IN THE U.S. NORTHEAST, PUERTO RICO, AND THE U.S. VIRGIN ISLANDS

Ambika Nair
Belicia Rodriguez

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Introduction

High-speed internet is a necessity for employment, healthcare, financial services, and community building. This became more apparent during the COVID-19 pandemic. However, not all Americans have access to it. About 12.2% of Americans did not have access to high-speed internet in 2021. Of those who did, 11% did not have a computer and 23% did not subscribe to an internet service.[1] Legislation, such as the 2021 Digital Equity Act (DEA), aims to close this digital divide, with a particular focus on populations who have had less access to the internet, such as rural communities and aging populations.

This report uses publicly available data to detail broadband access, speed, and affordability at the regional level in the U.S. Northeast, with a particular focus on the covered populations defined by the DEA. The content in this report was presented to the broadband teams of the U.S. Northeast (Maine, New Hampshire, Vermont, New York, Massachusetts, Connecticut, Rhode Island, Pennsylvania, New Jersey, and Delaware), Puerto Rico, and U.S. Virgin Islands (USVI) as they prepared DEA and Broadband Equity, Access, and Deployment (BEAD) program plans for submission to the National Telecommunications and Information Administration (NTIA).

Key Takeaways

- Internet speeds reported by internet service providers (ISPs) are consistently higher than the speeds reported by users who conduct speed tests. This discrepancy is largest for Puerto Rico and the USVI.
- Almost all states experience faster speeds in urban areas than in rural areas.
- Internet prices can be a financial burden for lower income households and the most expensive utility for some households to pay.
- Rural, lower income, and tribal communities are most impacted by lack of broadband access, quality, and affordability.

[1] Census Bureau ACS

Acknowledgments

We thank the New York Fed Community Development team, especially the digital divide team (Otho Kerr, Claire Kramer Mills, Carmi Recto, and Talor Crawford), for their feedback and support. We also thank our external reviewers, Roberto Gallardo and Aaron Schill, for sharing their guidance and expertise, and the U.S. Northeast state and territory broadband office teams who provided feedback during earlier presentations of this report.

Background

Why Is Broadband Essential?

Broadband is the technology or infrastructure that allows users to access the internet; cable, fiber, and satellite are examples of wired and wireless technologies that provide this connectivity.[2] Having broadband is essential to accessing and participating in services across many industries. For example, internet access is crucial for academic success, and health services are now being delivered online for easier access to care. Jobs, government, commerce, and communities are increasingly moving online, as outlined in the table below.

Education	*Health*	*Work*	*Government*	*Commerce*	*Community*
Homework; tutoring; group projects; online classes; online degrees; material distribution	Telehealth; health monitoring; public health awareness; increased healthcare usage and capacity; social connection	Work flexibility; emailing and scheduling; presentations, events, conferences; online job applications; VR training	First-responder communication; benefit enrollment; public alerts; voter registration; smart grid applications	Home business; access to non-local markets; shopping; advertising and growth; customer service; real-time metrics	Communication with family and friends; social media; cultural activities; church services; neighborhood coordination

Source: Benton Institute

[2] https://www.fcc.gov/consumers/guides/getting-broadband-qa

About the Report's Coverage

This report's focus is on the U.S. Northeast, Puerto Rico, and the U.S. Virgin Islands. All maps and populations discussed will be limited to the northeastern region and will include the islands if data is available. Additionally, we include disaggregated information about the "covered populations," as defined by the DEA program. While the Census Bureau's American Community Survey (ACS) provides information on almost all covered populations, there is no information on incarcerated populations. Hence, this covered population will be the only one not included in our analysis.

Coverage	Details
State and Islands	U.S. NORTHEASTERN STATES: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Pennsylvania, Vermont, Delaware ISLANDS: Puerto Rico, US Virgin Islands
Covered Populations	INCLUDED: Rural populations, aging populations (65+), low-and-moderate income households, individuals with disabilities, individuals with language barriers, racial and ethnic minorities, tribal communities, veterans NOT INCLUDED: Incarcerated population

About the Report's Data and Maps

This report's data comes from the FCC's National Broadband Map (as of 6/2023), the Ookla speed tests (as of 7/2023), the MarkUp (2022), Broadband Now (2021), the Census Bureau American Community Survey (2020 5-year estimates), and Census Bureau 2020 shapefiles (see "Available Data" in the Appendix for more details on each dataset). For the program study on the American Connectivity Program (ACP), the data comes from the Universal Service Administration Co. ACP Enrollment and Claims Tracker (as of 8/2023). Maps in this report will be aggregated to different geographical levels based on data and shapefile availability and map visibility. For example, maps using Ookla data are aggregated to the tract in order to increase the sample size of speed tests for each geographical unit, and FCC maps are aggregated to the block group level since smaller geographies are more difficult to see on a map. All geographical information is noted on each map.

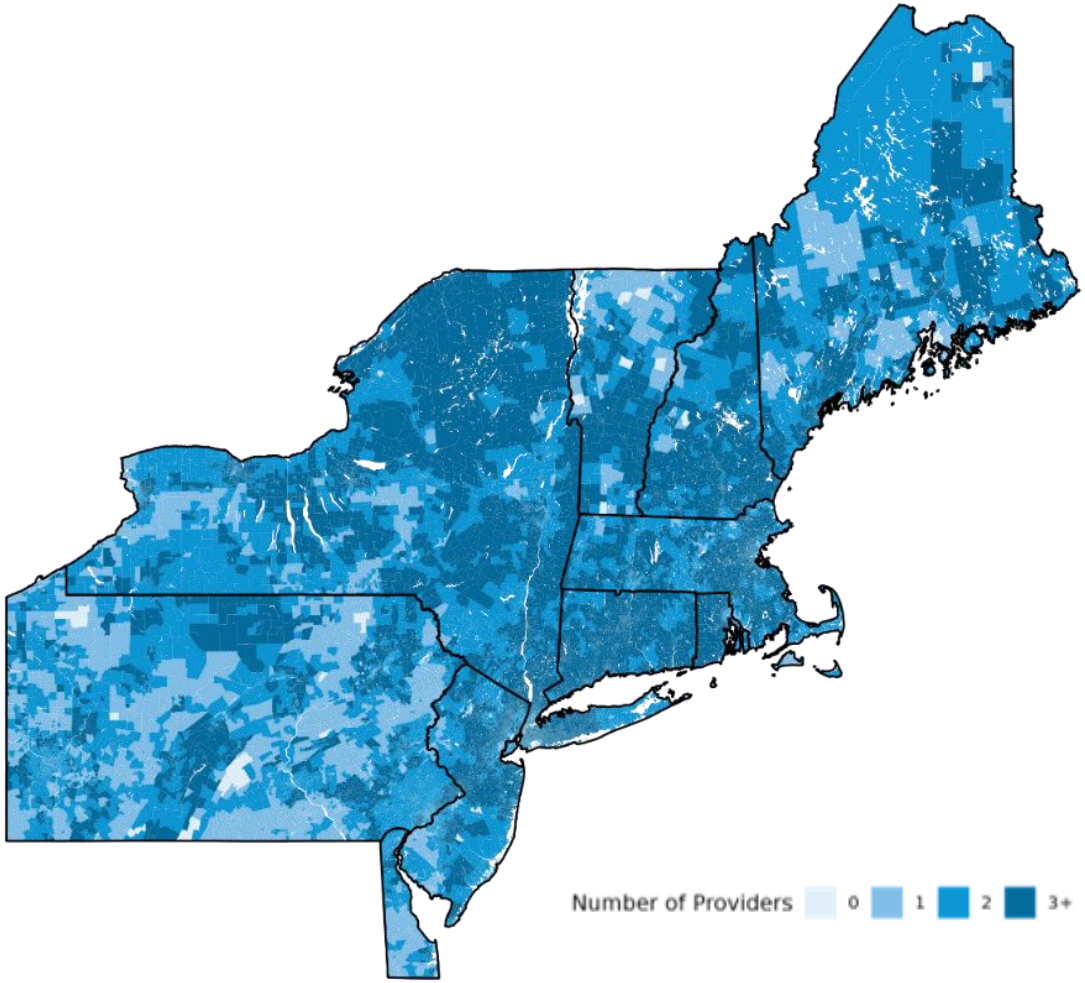
Broadband Availability

U.S. Northeast

Internet Service Providers

Number of ISPs offering speeds of at least 100/20 Mbps

- Data from the FCC Broadband Map shows that many areas are serviced by more than three providers offering 100/20 Mbps. However, these areas are somewhat concentrated along the east coast, where there is a higher concentration of metropolitan areas.
- A large proportion of rural areas are experiencing more instances of one or two providers offering higher speeds of 100/20 Mbps.

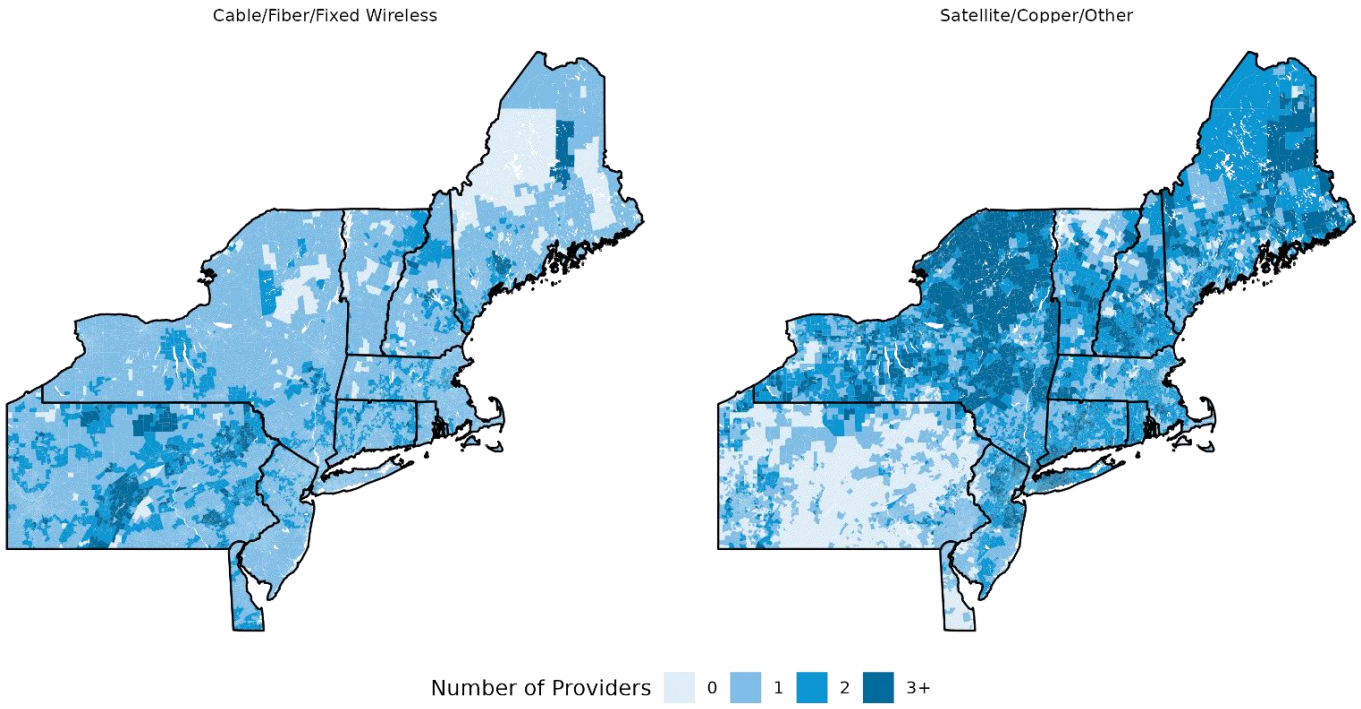


Source: FCC; Census Bureau
Note: Aggregated to block group level.

Internet Providers by Broadband Technology

Number of ISPs offering speeds of at least 100/20 Mbps

- Cable, fiber, and fixed wireless are less present throughout the region, although these technologies offer very high broadband speeds (some as fast as 1000/1000 Mbps) and are thought to deliver more reliable and consistent internet service.
- Satellite, copper, and other technologies also promise higher speeds, although their reputation for meeting such speeds is less consistent. Satellite promising at least 100/20 Mbps has a larger presence in the northern regions of New York, potentially due to a new satellite option that promises to deliver high-speed internet to remote parts of the country but at a high-premium cost.

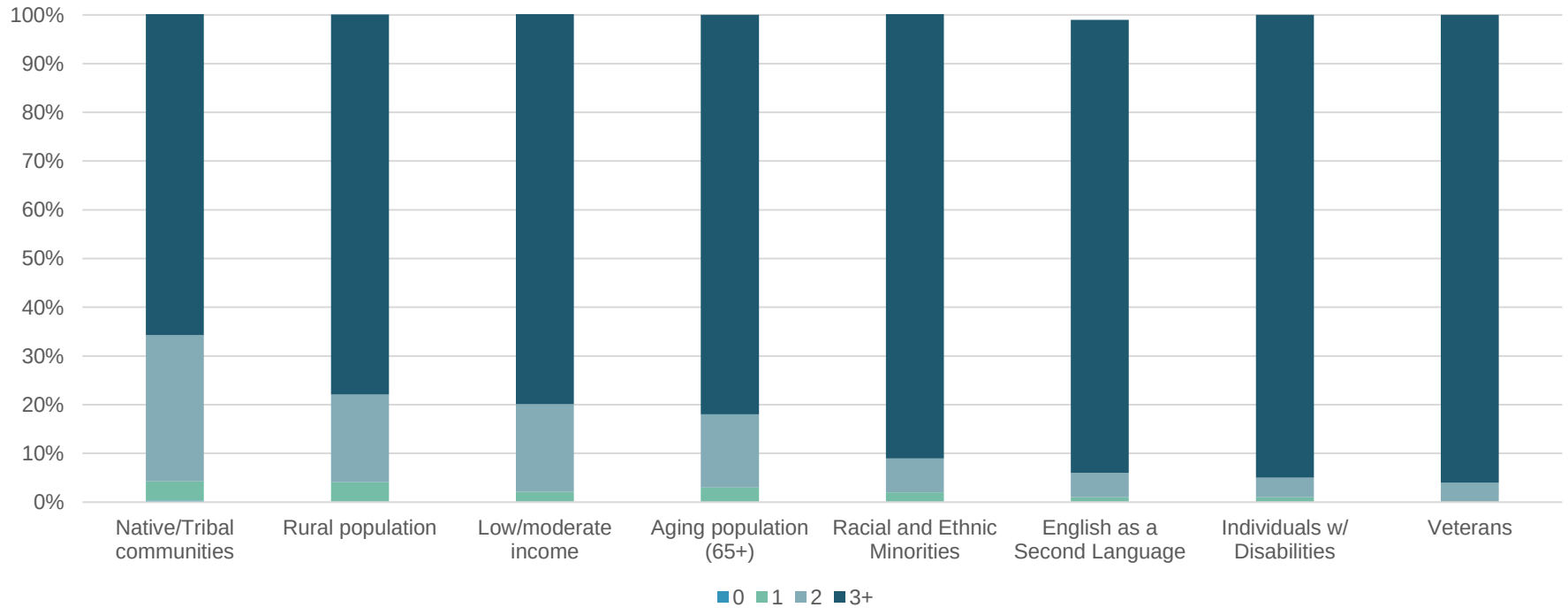


Source: FCC; Census Bureau
Note: Aggregated to block group level.

Internet Providers by Covered Populations in the U.S. Northeast

Shares of population with access to at least three providers offering speeds of at least 100/20 Mbps

- Tribal communities, rural populations, lower income communities, and aging populations make up the lowest shares of populations living in areas with access to three or more providers offering speeds of at least 100/20 Mbps. The implication is that these populations may have the least amount of access to higher speeds.
- Regardless of the amount of access seen at the regional level, there may be discrepancies in access on a neighborhood level that cannot be captured through the data.



Source: FCC; Census Bureau
Note: Procedure for assigning providers to covered populations can be found in the methodology section.

Puerto Rico and the U.S. Virgin Islands

Internet Service Providers

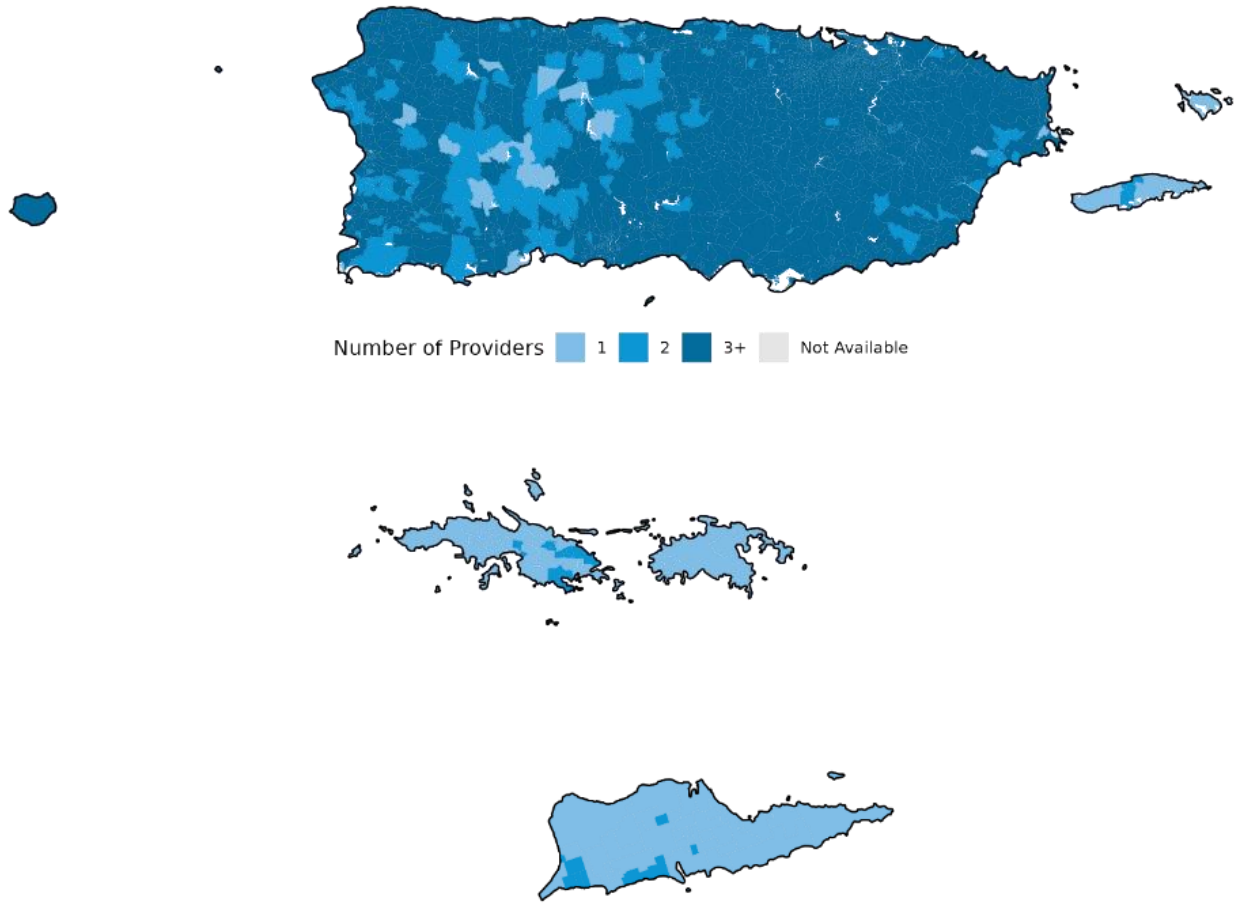
Number of ISPs offering speeds of at least 100/20 Mbps

Puerto Rico

- According to the FCC, Puerto Rico has coverage for almost all of the eastern half of the island, in terms of the quantity of areas having three or more providers offering high-speed internet (mainly San Juan and surrounding areas).
- The western half of the island is more limited, with more areas having only one or two providers.

U.S. Virgin Islands (USVI)

- USVI has no areas with three or more providers offering high-speed internet.
- USVI is largely considered underserved.



Source: FCC; Census Bureau
Note: Aggregated to block group level.

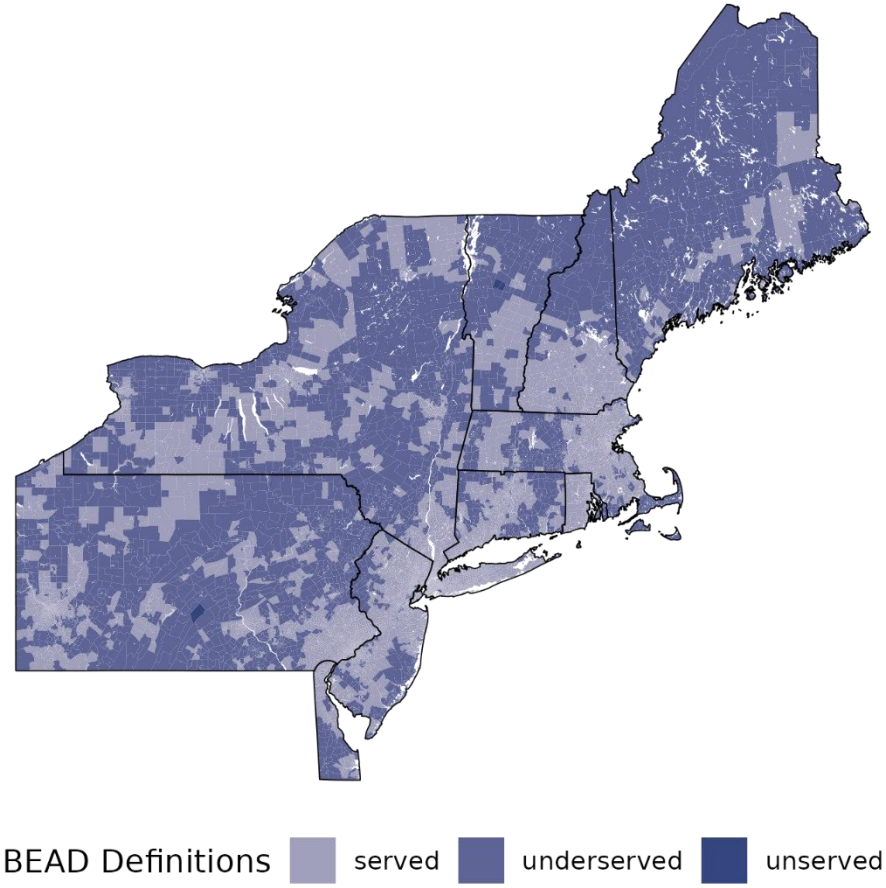
Access to High-Speed Internet

U.S. Northeast

Speed Tests

BEAD program definition

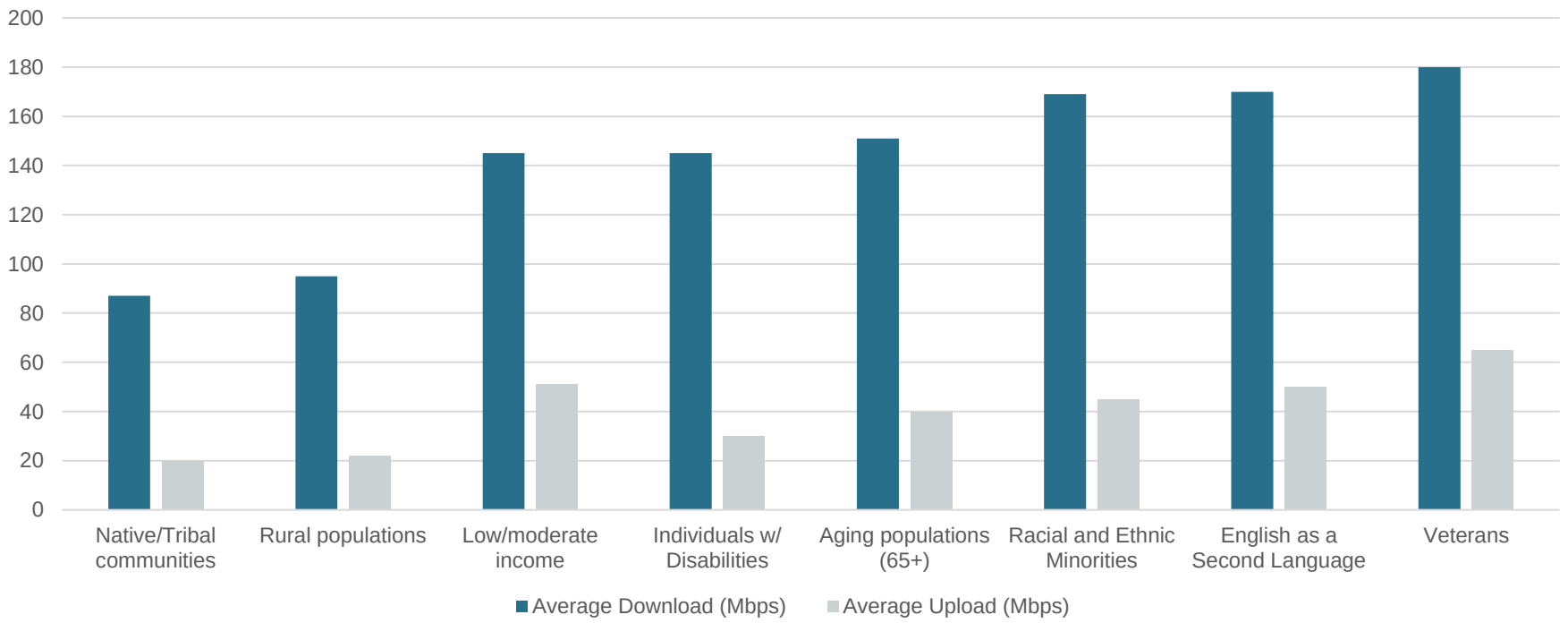
- Ookla speed tests reveal a clear urban-versus-rural divide in the download and upload speeds experienced by communities across the region. More urban areas than rural areas are served at speeds of at least 100/20 Mbps. (Only a few places in rural areas are considered unserved.)
- Rural areas in the Northeast are largely underserved, experiencing speeds between 25/3 Mbps and 100/20 Mbps. This suggests that in many rural areas, internet speeds may not be consistently fast enough for households to access services such as telehealth and online education.



Source: Ookla; Census Bureau
Note: Aggregated to tract level. Served is defined as having speeds faster than 100/20 Mbps, unserved is defined as having speeds less than 25/3 Mbps, and underserved are all other places.

Speed Tests by Covered Populations in the U.S. Northeast

Average speeds



Source: Ookla; Census Bureau
Note: Procedure for assigning providers to covered populations can be found in the methodology section.

- Tribal lands and rural areas are the most adversely impacted in terms of download and upload speeds. These communities face average upload speeds of 20 Mbps. Average download speeds for these populations are also quite low: about 85 Mbps and 95 Mbps for tribal and rural communities respectively.
- Although the average speeds may seem higher for the other covered populations, it is unclear to what extent they are actually able to adopt broadband options at these speeds at the neighborhood level.

Puerto Rico and the U.S. Virgin Islands

Speed Tests

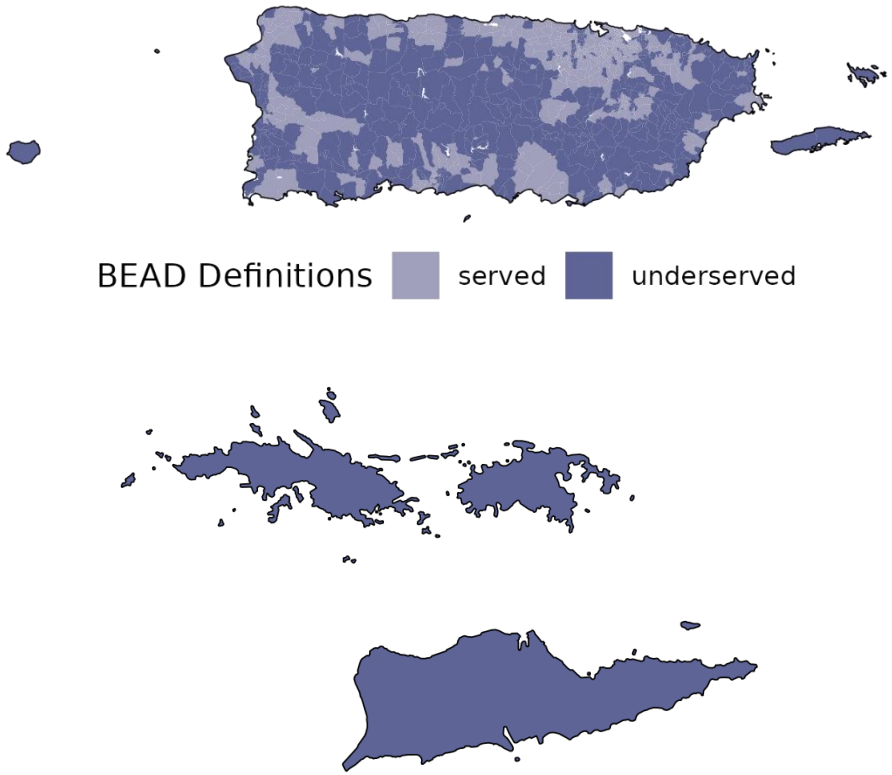
BEAD program definition of served and unserved

Puerto Rico

- The majority of Puerto Rico is unserved. Those areas that are served appear to be closer to urban areas, while areas that are rural are largely underserved.

U.S Virgin Islands (USVI)

- The vast majority of the USVI is underserved, with most experiencing internet speeds of below 100/20 Mbps.
- Compared to the U.S. Northeast, there is a larger gap for the islands between what the ISPs are reporting to the FCC and the speeds communities are experiencing.



Source: Ookla; Census Bureau
Note: Aggregated to tract level.

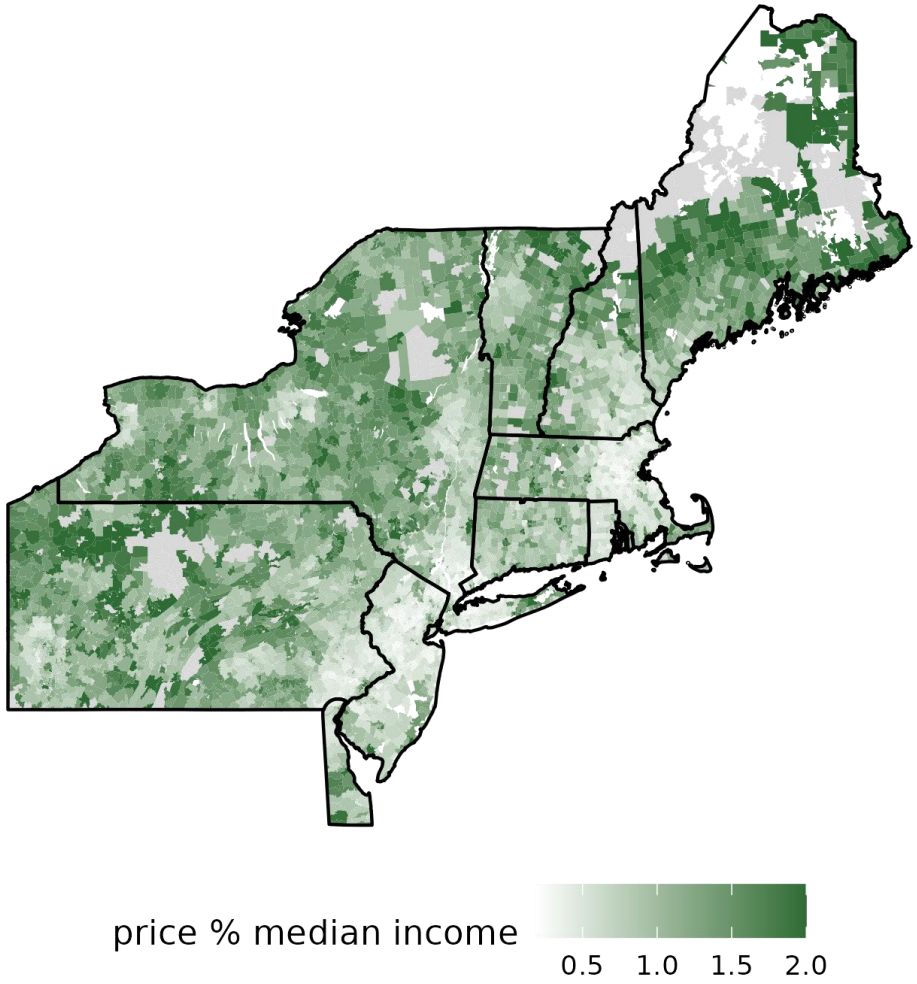
Broadband Affordability

U.S. Northeast

Broadband Price as a Share of Median Income

Lowest available broadband price for 25/3 Mbps as a % of Median Income[3]

- Prices appear to be a smaller burden on median incomes in areas that are more urban and populated. Meanwhile, less populated, more rural areas can see shares as high as 2%.
- Considering this metric is the lowest available price, a 2% share is significant.
    - In general, households spend roughly 3% of their income on utilities.
    - Lower income households likely make trade-offs in their financial decision-making between broadband and other monthly utilities.

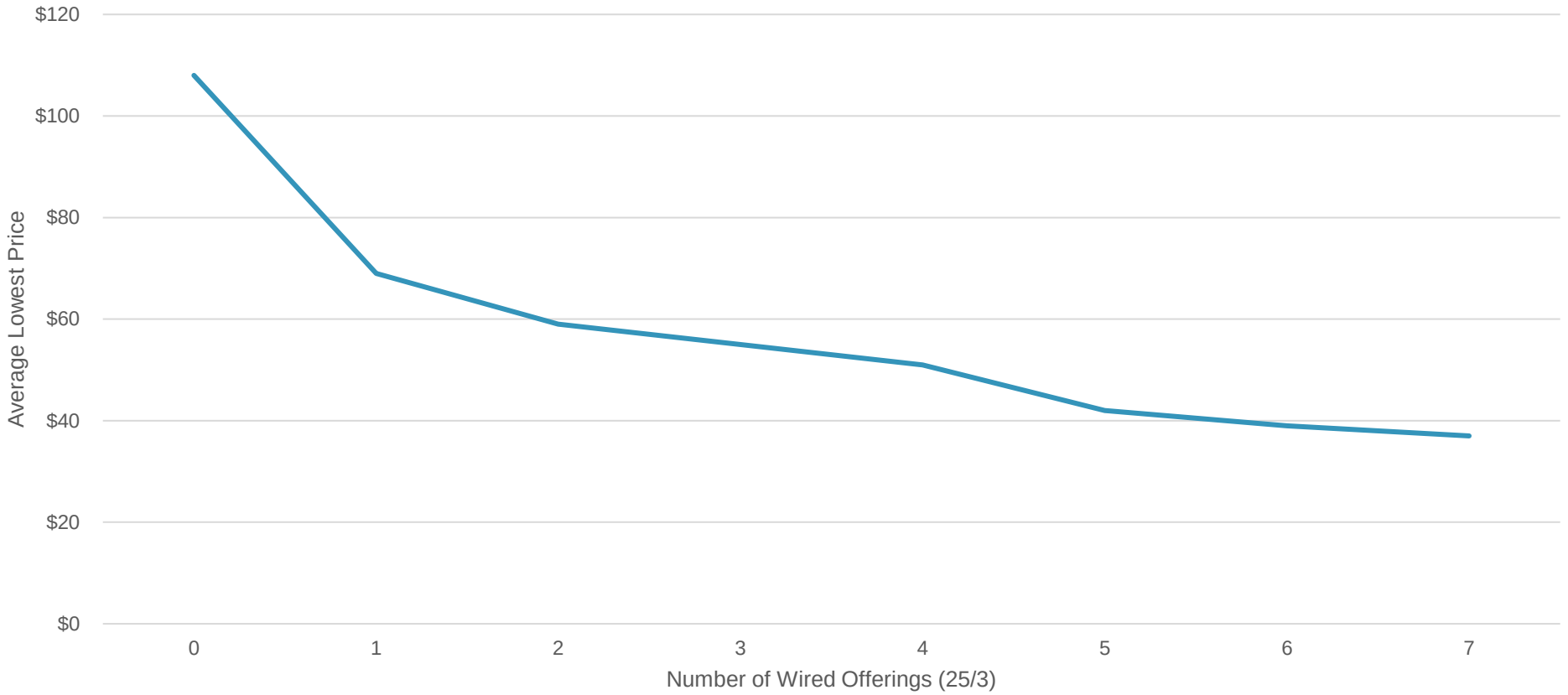


Source: Broadband Now; Census Bureau
Note: Aggregated to zip code level. Percentages capped at 2%.

[3] The Broadband Now dataset only contains information for plans offering speeds of at least 25/3 Mbps, but not 100/20 Mbps.

Broadband Price by Number of Wired Providers

Average lowest available broadband price for 25/3 Mbps plans



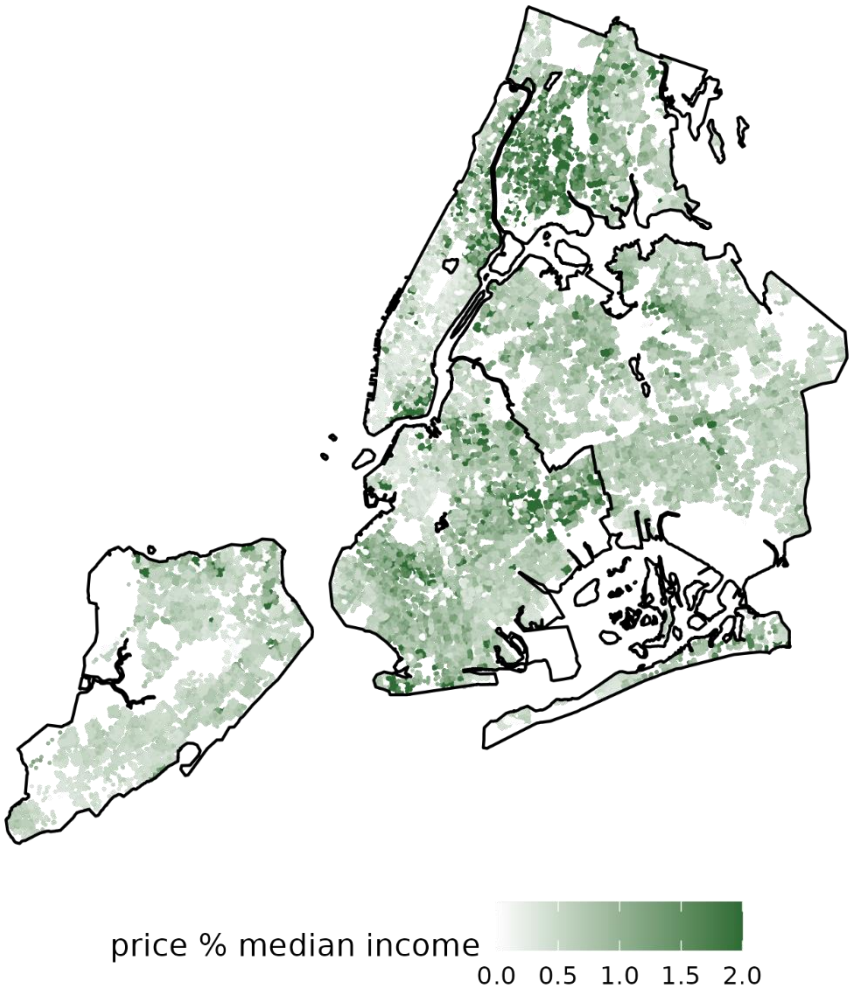
Source: Broadband Now; Census Bureau

- Access to wired broadband connectivity, in particular more options for wired connections in the household, also corresponds with lower average broadband prices.
- Areas with no wired providers see average prices of about $105 per month, while areas with access to one provider see a drop in average price to about $70 per month, with incremental decreases in price thereafter with every additional wired broadband provider available.

Broadband Price Affordability: New York City

Price as a percent of area median income

- In New York City, broadband prices are more of a burden for communities in the Bronx, Upper and Lower East-Side Manhattan, and Eastern Brooklyn. These areas can see broadband prices that are 2% of household median income, or higher.
    - These areas are largely low-and-moderate income communities of color, and immigrant communities.
- MarkUp data for New York City is available only for one provider and is currently limited to households that purchase internet from this specific provider.



Source: The MarkUp; Census Bureau
Note: Pricing data is at the housing unit level, and income data is at the block level. Percentages are capped at 2%.

Broadband Price Affordability: Cities in the U.S. Northeast

Prices from one provider from each city represented in MarkUp database

City	*State*	*Median Price ($)*	*Median Price (as % of income)*	*Technology Most Offered*
Boston	MA	39.99	0.63	Fiber
Bridgeport*	CT	49.95	1.52	Copper
Newark	NJ	39.99	1.34	Fiber
Philadelphia	PA	39.99	1.09	Fiber
Providence	RI	39.99	0.97	Fiber
Wilmington	DE	39.99	1.06	Fiber
New York City Boroughs				
Manhattan	NY	39.99	0.53	Fiber
Bronx	NY	39.99	1.08	Fiber
Brooklyn	NY	39.99	0.82	Fiber
Queens	NY	39.99	0.68	Fiber
Staten Island	NY	39.99	0.55	Fiber

Source: The MarkUp; Census Bureau

- Prices and technology are generally consistent for the fiber ISP provider, but the median price as a percent of income changes from city to city.
- For Bridgeport, The MarkUp reports a copper ISP provider, which offers higher prices for lower-quality broadband. With a population that is low-and-moderate income, this data suggests that residential housing in Bridgeport has not yet seen adequate investments in retrofitting for fiber-optic technology.

Program Study: Affordable Connectivity Program (ACP)

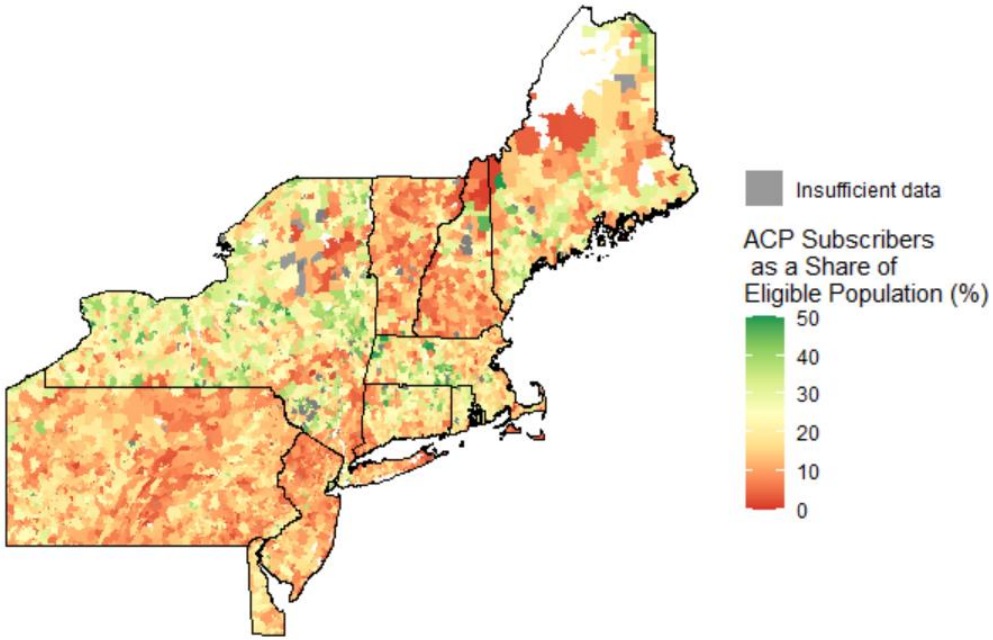
The Affordable Connectivity Program (ACP) provides a discount of up to $30 per month on broadband subscription services for eligible consumers and $75 per month for consumers living on qualifying tribal lands. The data in this map comes from the ACP Enrollment and Claims Tracker maintained by the Universal Service Administrative Company, which provides data on the number of internet subscribers enrolled in the ACP and the dollar amount claimed through the program by county and zip code.

Effective February 8, 2024, the ACP ended due to lack of additional funding from Congress and has stopped accepting new enrollments.

ACP Enrollment

ACP subscribers as a percent of the eligible population

- ACP enrollment seems to differ based on outreach and public awareness efforts, as there is no clear urban/rural divide in enrollment.
- Rural areas in New York, Massachusetts, and Maine see higher shares of ACP enrollment than in rural areas of Pennsylvania, Vermont, and New Jersey.
- New York and Massachusetts have the highest shares of eligible populations overall enrolled in ACP. While this is likely to improve affordability for enrollees in these states, these same enrollees may find difficulties in continuing service now that ACP funding has ended.



Source: USAC (8/2023); Census Bureau
Note: Eligible population defined as those living under the 200% Federal Poverty Threshold

Conclusion

In the U.S. Northeast, Puerto Rico, and U.S. Virgin Islands, many neighborhoods are without access to at least three providers of high-quality broadband offering speeds of 100/20 Mbps.

Lack of access to broadband providers in the U.S. Northeast is acute in rural areas that largely have only one or two providers, suggesting that a lack of market competition may lead to lower speeds and higher prices. This is reflected in the broadband technology types offered throughout the Northeast, with rural areas (excluding those in Pennsylvania and Delaware) seeing lower concentrations of cable, fiber, and fixed wireless providers that offer higher broadband speeds. Tribal communities, rural populations, lower income populations, and aging populations are the least likely to live in areas with access to three or more providers offering internet speeds of 100/20 Mbps. Additionally, tribal lands and rural areas are largely underserved in internet speeds, suggesting that many households in these areas may not have access to the internet quality required for essential online services, such as telehealth and online education.

For Puerto Rico, while the FCC reports that most of the eastern half of the island has access to three or more providers offering speeds of 100/20 Mbps; however, Ookla data shows that the vast majority of the island's households are underserved, experiencing speeds lower than 100/20 Mbps. In the U.S. Virgin Islands, most areas are underserved in terms of access to providers and high-quality speeds. Most areas on the island have access to two or fewer internet providers and internet speeds of less than 100/20 Mbps.

In future studies, the affordability burden of broadband on covered populations should be explored as data on broadband pricing becomes more available. Additionally, the expiration of the Affordable Connectivity Program in February 2024 could influence the extent to which the populations explored in this study lose access to high-quality broadband.

Methodology

Allocating Covered Populations

Shares of the covered population with access to 10/20 Mbps offerings were calculated as follows: the total number of the covered population with 0/1/2/3+ providers in a census tract divided by the total covered population in the census tract.

Covered populations were assigned average download/upload speeds at the census tract level (i.e. all members of a covered population in Census Tract 001 were assigned Census Tract 001's average download and upload speed). The average download/upload speed across census tracts was then calculated for each covered population.

Calculating the ACP-eligible Population

The population eligible to receive ACP benefits is calculated as the population living under 200% of the Federal Poverty Threshold, based on Table B17002: Ratio of Income to Poverty Level from the American Community Survey 2020 5-year estimates. The eligibility for ACP is determined by several factors, including the following:

- Meets the eligibility criteria for a participating broadband provider's existing low-income program;
- Participates in one of several tribal specific programs, such as Bureau of Indian Affairs General Assistance, Tribal TANF, or Food Distribution Program on Indian Reservations;
- Is approved to receive benefits under the free and reduced-price school lunch program or the school breakfast program, including through the USDA Community Eligibility Provision in the 2019-20, 2020-21, or 2021-22 school year;
- Received a Federal Pell Grant during the current award year;
- Has an income at or below 200% of the federal poverty guidelines;
- Participates in certain assistance programs, such as SNAP, Medicaid, Federal Public Housing Assistance, SSI, WIC, or Lifeline.

To simplify our calculations, we used the 200% federal poverty line threshold as the main measure of eligibility, as this threshold encompasses most of the populations that would qualify under the other guidelines listed above.

Appendix

What Is High-Speed Internet?

As a general definition, high-speed internet is capable of providing streaming and applications access to multiple devices simultaneously.[4]

Up until March 2024, the FCC defined high-speed internet as 25/3 Mbps, and then updated the definition of high-speed internet to 100/20 Mbps. The exact measurements needed for fast speeds can vary depending on use; for example, someone who only checks emails and messages may need less speed (minimum 25/3 Mbps) than someone who is streaming HD movies or has multiple household members working from home (minimum 100/20 Mbps). Policies have highlighted the need for at least 100/25 Mbps for users to fully participate in the activities outlined in the previous section. Below are the definitions of unserved, underserved, and served areas as defined by the BEAD program, whose purpose is to increase the number of served internet areas.

	Download Speeds	*Upload Speeds*	*Latency*
Unserved	Less than 25 Mbps	Less than 3 Mbps	Less than 100 ms
Underserved	Between 25 and 100 Mbps	Between 3 and 25 Mbps	Greater than 100 ms
Served	Above 100 Mbps	Above 25 Mbps	Greater than 100 ms

Source: BEAD NOFO

[4] https://broadbandusa.ntia.doc.gov/sites/default/files/2022-12/Introduction_to_Broadband_and_High_Speed_Internet_FINAL_0.pdf

Does Broadband Technology Matter?

Broadband technologies, such as cable, fiber, fixed wireless, and satellite, have varying availability and performance depending on various factors. As of this report, cable and fiber are the preferred technologies due to their service reliability and maximum speeds (which can reach up to 1000/1000 Mbps). However, cable and fiber have a higher upfront installation cost and are less likely to be found in more rural, mountainous areas. Fixed wireless and satellite are more accessible to rural communities but provide less reliable and consistent service, are slower overall (usually 25/3 Mbps), and at times can be more expensive than wired offerings. The wired technologies may not be suitable for the demands of someone using internet for business or internet-heavy applications, but this may change as technology improves and evolves. Wired technologies are also less attractive in mountainous communities.

Broadband Federal Programs

The 2021 Bipartisan Infrastructure Act provided funding for a wide breadth of programs that support high-speed internet planning, infrastructure, and the adoption of programs to achieve digital equity.[5] Below is a table outlining the goals and activities of each program, as well as their allocated funding.

Program Name	*Goals*	*Activities*	*Funding*
Broadband Equity, Access, and Deployment Program (BEAD)	Expand high-speed internet access nationwide.	Fund planning, infrastructure deployment, and adoption programs across the country.	$42.45 billion
Digital Equity Act (DEA)	Promote digital equity and inclusion and ensure that all communities can participate in the digital economy.	Provide funding for states and territories to implement digital equity plans targeting "covered populations."	$2.75 billion
Affordable Connectivity Program (ACP)	Provide a discount on internet service or devices for lower income households.	Provide eligible households with an internet service discount ($30/month, $75/month on qualifying tribal lands) and a discount on devices (up to $100/device). This program ended on February 7, 2024.[6]	$14.2 billion

Source: Internet for All

[5] https://www.internetforall.gov/programs
[6] https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/#enrollment-and-claims-by-zipcode-and-county

Available Broadband Data

Many private and government organizations make their broadband data publicly available for research purposes, and each dataset has its own unique challenges and objectives. Below is a table outlining some of the broadband data available and information on content and smallest available geographic area. Each data source is categorized by overall purpose; for example, the FCC data is mostly on broadband availability and speed, whereas data from Broadband Now focuses on broadband affordability. Data products used in this report are in bold.

Broadband Availability	*Broadband Speed*	*Broadband Affordability*	*Device Access and Internet Use*	*Demographic Information*
FCC Form 477/FCC National Broadband Map --Number of providers --Providers by technology type ---*Smallest Census geographic area available*: FCC tiles, aggregate to Census Block **American Community Survey** --Broadband subscription and type --*Smallest geographic area available*: Census Tract	FCC Form 477/FCC National Broadband Map --Download/Upload Speeds (mbps) --*Smallest geographic area available*: Census Block **Ookla Speed Tests** --Download/Upload Speeds (mbps) --Latency --*Smallest geographic area available*: Ookla tiles, aggregate to Census Block M-Lab Speed Tests --Download/Upload Speeds (mbps) --Latency	**The MarkUp** --City-level pricing data from one or two providers --*Smallest geographic area available*: Census Block **BroadbandNow** --Lowest broadband price offered as a share of household median income --*Smallest geographic area available*: Zip Code **American Connectivity Program** --ACP Enrollment --ACP Claims in $ --*Smallest geographic area available*: Zip Code	NTIA Internet Access Survey --Internet usage (job search, telehealth, education, banking, entertainment, etc.) --Type of device used (laptop, desktop, mobile phone, tablet, etc.) --*Smallest geographic area available*: County **American Community Survey** --Type of device used (PC/Laptop, Smartphone, Tablet, Other) --Device and subscription type --*Smallest geographic area available*: Census Tract	**American Community Survey** --Data on all covered populations at the census, except for incarcerated --*Smallest geographic area available*: Census Block/Tract NTIA Internet Access Survey --Limited data on some covered populations, and additional information on job types/industries --*Smallest geographic area available*: County

Understanding Speed Data

The FCC and Ookla data both contain information on speed in a geographical area, but their measures come from different sources. Data from FCC National Broadband Map comes from the FCC Form 477, which all internet service providers (ISPs) complete. The form outlines where they provide internet services, the technology used, and at what speeds. The Ookla data comes from internet users completing a speed test on the Ookla website. The benefits and disadvantages of using each data source are outlined in the table below.

Data Source	*Description*	*Pros*	*Cons*
FCC National Broadband Map	Provides information about internet services available in individual locations across the county, as reported by ISPs in the FCC's ongoing Broadband data collection.[7]	The data allows for a better understanding of the number of ISP providers in an area and their offerings, including the broadband technology. Data may be challenged by community members through the FCC's National Broadband Map Challenge.	FCC's National Broadband Map Challenge process is ongoing (as of the release of this report). The maps in this presentation may be outdated and more representative data may be available to use from the FCC for mapping as the challenge process is finalized.
Ookla Speed Tests	Ookla collects speed tests worldwide and provides data on average download and upload speeds for geographic tiles, updated monthly.[8]	Highly populated areas are more likely to have precise estimates of speeds by households. Data is also collected and published at higher frequency, nearly real-time.	Underpopulated areas may either overestimate or underestimate speed (given the lower sample of speed tests). Internet users may be likely to take an internet test when their internet is not performing well. Hence Ookla numbers may overestimate poor internet quality. The reason for lower speeds is not always clear. For example, lower speeds could be due to ISP service interruptions, device issues, etc.

[7] https://www.fcc.gov/BroadbandData
[8] https://www.ookla.com/ookla-for-good/open-data

Understanding Price Data

The MarkUp and Broadband Now offer pricing data on an internet subscription at different geographical levels. Recognizing that internet price offerings are highly localized and occasionally differ from house to house, The MarkUp provides internet pricing information about randomly selected houses in a city, as well as demographic information on race and income based on the housing unit's location. In addition to providing pricing data, The MarkUp also created a guide for communities to aggregate addresses in their area and run a web-scraping algorithm that pulls prices for various tiers of internet service from different ISPs.[9] Unlike The MarkUp data, the Broadband Now data includes pricing information for all U.S. zip codes; however, the price is only for 25/3 Mbps, which the BEAD program associates with underserved communities; hence this price may be understating the amount households pay in order to achieve their required internet speeds.

Data Source	*Description*	*Pros*	*Cons*
The Markup	The data contains address-level information about the internet service offered (price, speed, etc.), in addition to aggregated demographic information from the Census Bureau.[10]	The data collected is at the address level (very granular) to ascertain whether there are any differences between housing units.	The data is limited to a handful of U.S. cities. It also only captures information on one provider per city.
Broadband Now	The data contains Broadband Now's proprietary plans and pricing data for more than 4,000 ISPs, in addition to information from the FCC's Form 477.[11]	The data provides trends in pricing across the U.S. at the zip-code level at the lowest price for 25/3 Mbps, which people may be most likely to enroll in.	Price in this data is represented as the lowest in the zip code for 25/3 Mbps internet service, which may provide unusable internet for many people.

[9] https://themarkup.org/build-your-own-dataset/2023/05/11/slow-internet-find-out-what-side-of-the-digital-divide-youre-on
[10] https://github.com/the-markup/investigation-isp
[11] https://github.com/BroadbandNow/Open-Data