



Research Study

**Beyond Access: Broadband
Affordability & Adoption**

November 2025

Study conducted in collaboration with
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How to read this report

This report is organized into seven sections:

- The **executive summary** provides a brief synthesis of the key findings and recommendations from the report;
- **Key concepts** provides definitions for important terms used throughout the report;
- The **introduction** provides an overview of the topic and explains its relevance to policy and policy makers;
- **Policy landscape** gives an overview of federal and state policy on affordable broadband;
- **Methodology** describes how this report was compiled;
- The **findings and discussion** section presents key takeaways from an analysis of broadband pricing in Virginia and interviews with subject matter experts;
- The **policy recommendations** section sets out several policy considerations and recommendations for lawmakers.

The report can be read as a continuous document, or readers can skip to sections of interest.

Executive Summary

Broadband is now essential infrastructure—fundamental to education, work, healthcare, and civic participation. Yet across Virginia, the cost and accessibility of broadband services remain major barriers for low- and moderate-income households. This report presents a data-driven analysis of broadband affordability and plan accessibility across ten representative Virginia localities, using the University of California, Santa Barbara’s, Broadband-Plan Query Tool (BQT)—an automated system that simulates how consumers search for broadband plans online.

A Representative and Diverse Sample

The study analyzed 62,000 address-level samples across roughly 900 census block groups in ten diverse localities, spanning both urban and rural regions and representing ten major wired and fixed wireless internet service providers (ISPs). The affordability distribution in these localities closely mirrors that of the Commonwealth overall, confirming that results generalize well statewide.

Key Findings

- *Affordability Benchmark*
 - Using the 2% income threshold for the 20th percentile of disposable income, broadband priced at \$30/month is affordable for roughly 93% of Virginia’s population—a threshold that aligns with the federal Affordable Connectivity Program (ACP).
 - Raising the cap to \$50/month leaves about half of the population with unaffordable plans, while lower thresholds expand affordability coverage statewide.
- *Rate Regulation and Policy Target*
 - Regulating low-cost broadband at \$30/month for a minimum 100 Mbps plan would provide a clear, equitable affordability standard across Virginia.
 - This price point ensures affordability for most Virginians without major distortion of provider incentives, while remaining administratively simple for state implementation.
 - For a small subset of communities, complementary local subsidies or bridge programs (such as the one in Albemarle) would still be needed to reach full affordability.
- *State of Broadband Offerings*
 - Most ISPs offer *low-cost plans* above the \$30 target.
 - Xfinity is the most affordable provider in roughly 80% of census block groups, yet its entry-level plan starts at \$50/month.
 - AT&T and Verizon Fixed Wireless have extensive coverage but are the cheapest provider in only about 7.37% and 0% of census block groups, respectively.
 - Verizon (wired) shows the largest variation in low-cost pricing, ranging from \$60–\$85 per month.
- *Accessibility of Low-Cost Plans*
 - Even when affordable options exist, they are often difficult to find or unavailable on ISP websites.
 - Earlier, Comcast’s *Internet Essentials* plan was not listed alongside standard options—though this has now been corrected. In contrast, Riverstreet and Verizon require users

to call customer service to learn about affordable options, creating friction for low-income and digitally limited households.

- Cox stands out as a positive example, listing affordable offerings prominently and transparently.

- *Market Competition*

- The majority of studied areas are competitive markets (three or more ISPs), but competition has little impact on affordability.
- ISPs rarely adjust *low-cost plan* prices based on competition.

- *Fixed Wireless Access (FWA)*

- FWA services have not improved affordability in most markets. In 90% of census block groups where both wired and FWA providers are present, FWA is \$10–\$60 more expensive with lower average speeds (typically 85–300 Mbps).

Policy Recommendations

- **Require mobile-responsive websites** for essential, publicly funded services to ensure universal accessibility.
- **Mandate visibility and accessibility** for low-cost internet plans on all ISP websites.
- **Establish a statewide requirement** that ISPs offer a basic 100 Mbps (download speed) plan for \$30/month.
- **Provide targeted tax credits** or bridge programs to close residual affordability gaps.
- **Create a dedicated grant program** to replace lost BEAD and Digital Equity Act funding.
- **Require independent, longitudinal data collection** on broadband prices, speeds, and service availability using tools, such as the Broadband-Plan Query Tool, to inform future policymaking.

Together, these measures can close Virginia’s remaining digital divides—ensuring that broadband is not only available but affordable and accessible to every household across the Commonwealth.

Key Concepts

Access: Broadband access refers to the existence of the infrastructure needed to have a high-speed connection to the internet that is always available. Access may be enabled by a variety of different delivery technologies, such as DSL, cable, fixed wireless, fiber optic cable, satellite, or 5G.¹

Accessibility (of broadband plans): Accessibility in this context refers to how easily people can find and enroll in affordable plans through reasonable means of searching and shopping for broadband, such as visiting ISP websites.

Adoption: Broadband adoption refers to residential subscribership to high-speed internet access. The National Digital Inclusion Alliance further defines adoption as subscription to internet access at speeds, quality and capacity necessary to accomplish common tasks with the digital skills necessary to participate online, and on a personal device and secure, convenient network.²

Affordability: Broadband affordability refers to the ability to afford the costs associated with accessing broadband Internet, including for service, devices, and fees, ensuring everyone can access reliable, high-speed internet at a reasonable cost that meets their long-term needs. The International Telecommunication Union (ITU), the FCC, and the Information Technology and Innovation Foundation (ITIF) have used 2 percent of a household's income as a benchmark for affordability.³

Affordability threshold: The affordability threshold used throughout this study is 2% of disposable income, determined based on American Community Survey 2019-2023 data. The 2% threshold is widely used in research on the digital divide and was suggested by the FCC in 2016 to serve as “a clear yardstick for charting changes” to its Lifeline program.⁴

American Community Survey (ACS): The ACS is an official source of detailed information about the nation's people and housing, conducted by the U.S. Census Bureau since 2005. It collects detailed social, economic, housing, and demographic information from a sample of households across the 50 states, the District of Columbia, and Puerto Rico. Researchers and federal agencies use

ACS data to evaluate the extent of access to, and adoption of broadband, with a focus on underserved areas.

Broadband: As of March 2024, the FCC raised its benchmark for high-speed fixed broadband to download speeds of 100 megabits per second and upload speeds of 20 megabits per second (100 Mbps/20 Mbps). The previous benchmark had been set in 2015 at 25 Mbps/3 Mbps. Broadband enables the transmission of digital information in the form of “bits” (data).⁵

Broadband-Plan Query Tool+ (BQT): An automated data-collection framework that emulates a human user’s experience when shopping for broadband service at a specific street address, to independently verify plan availability, pricing, and advertised speeds at scale.

Broadband Facts Label: A standardized consumer disclosure mandated by the FCC that requires ISPs to present essential information about each broadband plan in a consistent, easy-to-read format—similar to nutrition labels on food packaging. Each label lists the plan’s base monthly price (excluding temporary promotions), typical download and upload speeds, data allowances, and additional fees such as equipment or installation charges. These labels, implemented in 2024, are designed to improve price transparency and help consumers compare available broadband plans across providers.

Carriage value: Carriage value is the Mbps that an ISP advertises to carry per-dollar, per-month basis. For example, if an ISP advertises a 100 Mbps plan to consumers at a rate of \$100 per month, the carriage value of that plan would be computed to be \$1 per Mbps per month. Carriage value offers a standardized approach for comparing the value offered by different, sometimes competing, broadband plans, and is a metric used by both scholars and industry for comparing plans.

Census Block Group (CBG): A census block group is the smallest geographical unit for which the Census Bureau publishes sample data, composed of clusters of blocks within the same census tract that have the same first digit of their four-digit census block number.⁶

Churn: The number of customers discontinuing their relationship with a company or service provider. Churn rate, sometimes known as attrition rate, is the rate at which customers stop doing business with a company over a given period of time.

Covered populations: Defined in the Digital Equity Act, “Covered Populations” include: individuals who live in covered households (defined as households with income from the most recently completed year of not more than 150% of the poverty level); aging individuals; veterans; individuals with disabilities; incarcerated individuals other than those in Federal correctional facilities; individuals with a language barrier including English learners and those with low levels of literacy; individuals who are members of a racial or ethnic minority group; and individuals who primarily reside in a rural area.⁷

Digital divide: The digital divide is the gap between those who have affordable access, skills, and support to effectively engage online and those who do not. As technology constantly evolves, the digital divide prevents equal participation and opportunity in all parts of life.⁸

Digital exclusion: Digital exclusion refers to the lack of digital access, digital use, digital confidence, or digital skills, resulting in an inability to participate fully in the digital world and in many everyday activities that rely on digital connectivity.⁹

Digital inclusion: According to the National Digital Inclusion Alliance, digital inclusion refers to the activities necessary to ensure that all individuals and communities, including the most disadvantaged, have access to and use of Information and Communication Technologies (ICTs). This includes 5 elements: 1) affordable internet; 2) internet-enabled devices that meet users’ needs; 3) digital literacy; 4) quality technical support; and 5) applications and online content designed to enable and encourage self-sufficiency, participation and collaboration.¹⁰

Digital opportunity: The condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. It is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services.¹¹

Digital Subscriber Line (DSL): An internet delivery technology that utilizes a two-wire copper telephone line to allow users to simultaneously connect to and operate the internet and the telephone network without disrupting either connection. Although DSL can deliver broadband speeds (100 Mbps), it is limited in its capacity to deliver higher speeds.¹²

Fixed Wireless: A form of wireless broadband that uses wireless devices/systems to connect two fixed locations, such as offices or homes. The connections occur through the air, rather than through fiber, resulting in a less expensive alternative to a fiber connection.¹³

Label price: The standard, undiscounted monthly cost of the plan as disclosed on the Broadband Facts Label by an internet service provider.

Non-deployment: Defined in the Broadband Equity Access and Deployment program, “non-deployment” refers to BEAD program activities that do not involve building broadband infrastructure, but instead focus on adoption, affordability, digital literacy, and related initiatives.¹⁴

Promotional/discounted price: The price for a broadband plan that is subject to additional offers, such as bundling with other services (mobile, telephone, etc.) and may apply for limited periods or to certain consumer groups who qualify.

Wireline connection: Fixed wireline internet refers to wire-type technologies including fiber, cable and DSL. They are generally faster and more reliable than other technologies for internet delivery.¹⁵

Satellite broadband: A form of wireless broadband, satellite broadband has been deployed predominantly for serving remote or sparsely populated areas. Downstream and upstream speeds depend on several factors, however, including the provider and service package purchased, the consumer’s line of sight to the orbiting satellite, the orbit of the satellite (low earth orbit vs. geosynchronous) and the weather.¹⁶

Subscription vulnerability: An affordability barrier for people when they find it very difficult to fit their monthly service fee into their budgets, often a condition of living at or near the poverty line. People may terminate service as a result of life circumstances that put a strain on household budgets.¹⁷

Introduction

Virginia has demonstrated sustained commitment to closing the digital divide over the last decade, recognizing that meaningful digital equity requires more than infrastructure deployment alone. This understanding is reflected in the state’s Digital Opportunity Plan, which acknowledges that bridging the divide demands a holistic approach encompassing not only network access but also affordability and adoption. As a national leader in addressing the digital divide in broadband access, Virginia has made significant investments in broadband infrastructure with the goal of ensuring these investments translate into real-world outcomes for all residents.

However, recent shifts in the federal funding landscape have placed digital opportunity initiatives—those programs beyond pure infrastructure deployment—in an increasingly precarious position. In today’s unavoidably digital world, where essential services, economic opportunities, education, and civic participation increasingly occur online, ensuring that all Virginians can access and afford these opportunities is critical. Whether termed digital inclusion, digital equity, digital opportunity, or non-deployment initiatives, these efforts are essential, alongside infrastructure expansion, to translate internet access into meaningful outcomes in people’s lives. To ensure all Virginians can benefit from the digital world, all the dimensions of the digital divide must be tackled together, simultaneously.

This report examines affordability as a key catalyst for digital opportunity—having internet access that fits people’s household budgets and adequate devices to engage in everyday digital tasks. The following sections will discuss the critical role of affordability in closing the digital divide, examine the current state of broadband affordability in Virginia using a novel, bottom-up data collection and analysis methodology, and provide recommendations for tackling affordability alongside access.

The Digital Divide

The concept of the “digital divide” gained recognition in a series of reports issued by the National Telecommunications and Information Agency (NTIA) in the 1990s titled “Falling Through The Net.”¹⁸ At the time, the internet was beginning to transform work, education, commerce, and everyday

life as more organizations adopted computing technology and a growing number of families were able to purchase personal computers for home use. The divide was characterized as a gap between internet “haves” and “have-nots”—those with access to the new technology, and those without. It captured a realization that the benefits of this connectivity revolution were unevenly distributed due to structural, social, economic, and geographical barriers that might not be overcome without policy interventions to incentivize universal access.

In 2025, the digital divide persists, despite efforts in the intervening decades at national, regional, state, and local levels to address it. Indeed, the digital divide has arguably become more consequential. Although the statistical gap between haves and have-nots has narrowed, the divide has deepened along several dimensions due to the widespread integration of digital technologies into everyday life.¹⁹ Digital connectivity and skills are no longer optional—they underpin almost every aspect of modern life, from communication to banking to healthcare to schooling and beyond. Over the years, scholarship has found that digital connectivity has largely lived up to its initial promise of transformational societal impacts. It is associated with higher employment rates, economic development, and the cultivation of human capital.²⁰ But as digital technologies have advanced, closing the gap has become harder. The basic requirements for types of internet connections and speeds have increased, and the foundational knowledge and skills people need to navigate the digital world have become more complex.²¹ Falling through the net today means that people are excluded from full participation in society, and the targets for closing the digital divide are constantly shifting as technology and its applications advance. The latest technological innovations, like artificial intelligence (AI), depend on connectivity, data, and digital literacy.

The COVID-19 pandemic in 2019 shed new light on the digital divide and its stubborn persistence.²² In order to protect people from contracting a highly contagious and deadly virus, governments worldwide issued social isolation guidance, and overnight, everyday life shifted almost wholly online. Offices, clinics, and schools shuttered, and for most people, the internet became the sole conduit to health care, education, socialization, and employment. This shift revealed longstanding but also long-invisible digital inequalities—nuanced gaps between “haves” and “have-nots” that included lack of reliable home internet access, lack of connected devices, lack of skills, lack of digital literacy, and more. The National Bureau of Economic Research reported that people with robust internet connections at home were more likely to social distance,²³ and Common Sense Media reported that nearly a third of K-12 students lacked adequate connectivity to continue schooling at home, leading to a “homework gap.”²⁴

The realization that the problem of digital divide was far from solved led to rapid stop-gap measures to jumpstart digital inclusion, with large federal investments (e.g. the Infrastructure Investment and Jobs Act, the Emergency Broadband Benefit, and the Affordable Connectivity Program), state initiatives (e.g. Virginia’s allocation of federal CARES Act funding toward rapid broadband deployment), and local efforts (e.g. WiFi-enabled buses providing mobile hotspots to communities). Digital connectivity became a matter of life and death, and the pandemic put the digital divide squarely on the policy agenda, where it remains today.

From Luxury to Necessity

The pandemic may have exposed the extreme life or death stakes of digital connectivity, but it also drew attention to what some scholars and policy agencies had long documented: that digital connectivity and its associated technologies had gone from luxuries, adopted and embraced in specialized corners of the knowledge economy—to necessities, integrated and normalized into the most basic functions of everyday life.²⁵ This transition is particularly important because it has raised the stakes of the continuing digital divide, with important policy implications. Digitization has transformed every sector, such that most communication channels, workflows, tools, and services in middle- and high-income countries are underpinned by digital technologies and information processing. This evolution toward “digital-by-default” has itself been a policy priority in many countries in an effort to make services more efficient, accountable, and inexpensive.²⁶

The effect of this widespread digitization of services has resulted in notable achievements, such as improving medical record-keeping and providing patients access to their records, enabling e-government services, and facilitating secure digital banking. But it has also rendered digital connectivity and literacy a prerequisite to benefiting from these technological advances. In many cases, digital methods are the primary port-of-call for essential services, such as utilities, banking, insurance, or healthcare.²⁷ And in some cases, digitization is posited as a way to overcome other inequalities in access to services. Telehealth offers an illustrative example, as a service that has the potential to expand access to healthcare to areas that are underserved by clinics. But, as Virginia’s state telehealth plan acknowledges, the success of such interventions depends on closing the digital divide.²⁸ When people are digitally excluded, they may struggle to access these services, so the digital divide has become a key determinant of social and economic outcomes.²⁹ A great deal of research has shown that digitization has created new inequalities, with older adults,³⁰ people with disabilities,³¹ and people living in poverty³² encountering unique barriers to full participation in the digital world.

Closely related to the digital divide is an increasingly pertinent data divide. Today, an individual's "digital footprint"—meaning the data records they create by using the internet and related digital services—is often used for identity verification or for screening access to additional services or benefits.³³ For example, credit scores depend on digital data about individuals to assess creditworthiness,³⁴ and employment background checks often rely on digital data trails.³⁵ The digital divide means that some people are becoming increasingly invisible to services that depend on data, what is sometimes called "data poverty."³⁶ With the emergence of AI, these inequalities will take on a new significance. AI relies on vast quantities of digital data, and as AI is applied to more domains and sectors, the lingering effects of a persistent digital divide may result in various AI "divides" between organizations that can harness and benefit from AI due to their digital connectivity and data repositories and those that cannot, between people or communities for whom large amounts of high quality data exist and those for whom it does not, and between those with high levels of digital literacy and those without.³⁷

In recent years, the tenuous distinction between the digital world and the physical world has been all but eliminated. The world is digital, and the digitization of daily life has rendered digital inclusion a policy imperative, leading to calls for digital connectivity to be considered a utility in line with services like electricity and water.³⁸ As digitization has become more pervasive and unavoidable, the digital divide has also become much more complex than the binary gap between digital "haves" and "have-nots."

Beyond Access

A longstanding but misguided assumption among many policymakers, Internet Service Providers (ISPs), and even members of the public that digital connectivity is a luxury, rather than a necessity, has contributed to slow and uneven expansion of digital connectivity in the United States. Today, between 5.9% (almost 20 million people) and 7.8% (26 million people) cannot access broadband internet, which the Federal Communications Commission (FCC) defines as an upload speed of 100 Mbps and download speed of 20 Mbps.³⁹ There is a pronounced rural-urban divide, with around 64.4% of rural American households having broadband access compared to around 98% of urban households,⁴⁰ and many tribal lands have been left behind, with 23% of people lacking access to fixed broadband as of 2024.⁴¹ As a result, ensuring basic access to broadband remains an important policy issue and an essential step in closing the digital divide. Most of the significant investments that have been made at the state and federal levels in recent years have focused on this aspect of the digital divide, prioritizing infrastructure expansion to reach every property (more detail on these initiatives in Policy Landscape).

Despite national improvements in access year-on-year, digital inequalities still exist, with real ramifications for people's quality of life. Scholars have attempted to capture the nuances of why the

digital divide cannot be solved by access alone by referring to different “levels” of the digital divide. Generally, research focuses on three levels: access, literacy and skills, and outcomes. Access refers to the physical availability of connections and devices and often encompasses whether devices and connections are affordable and reliable or consistent. Literacy and skills refer to the capabilities needed to make use of connectivity and devices, such as the ability to navigate digital platforms and the motivation to engage with digital technologies. Finally, outcomes refer to the ability to translate digital usage into meaningful social and economic advantages, such as employment, education, or self-determination.⁴² Together, these levels comprise digital inclusion—being able to take full advantage of digital technologies and participate fully in a digital society.

Each of these levels of the digital divide has received a great deal of attention in academic research, and some versions of these different dimensions of inclusion have also been integrated into policy at various levels. The National Digital Inclusion Alliance, for example, defines digital inclusion as encompassing all of these components—“1) affordable, robust broadband internet service; 2) internet-enabled devices that meet the needs of the user; 3) access to digital literacy training; 4) quality technical support; and 5) applications and online content designed to enable and encourage self-sufficiency, participation and collaboration.”⁴³ Importantly, although the levels provide a helpful taxonomy of factors that contribute to digital inequalities, they are neither self-contained and mutually exclusive, nor indicative of a unidirectional progression from access to full inclusion. In other words, the levels do not constitute a ladder that leads inevitably upward. People can move in and out of digital inclusion due to factors such as changing life circumstances (e.g. loss of income due to unemployment), changes in technology (e.g. new devices like touchscreens), the influence of lived experience (e.g. exposure to scams), or market conditions (e.g. rising prices in monopoly-served areas).

The Interconnected Levels of the Digital Divide

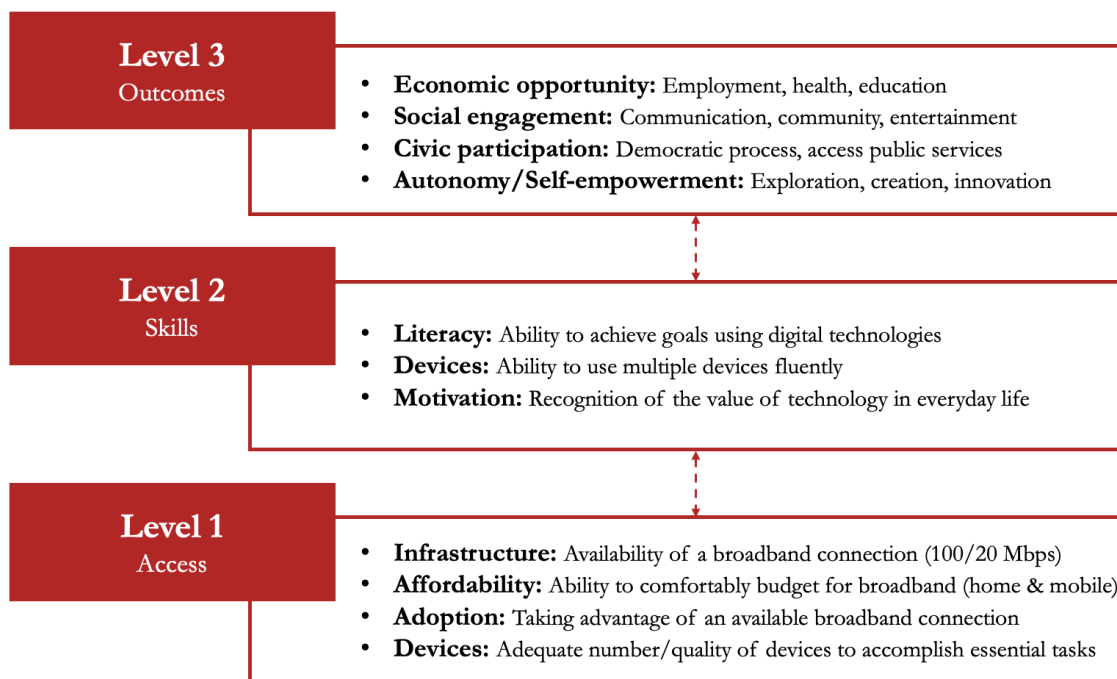


Figure 1: The Levels of the Digital Divide

Thinking about the digital divide in terms of different levels has enabled a more multidimensional understanding of inequality in the digital age, and it demands more nuanced policy solutions. Rather than thinking about the “divide” as a strict distinction between connected and unconnected, research in this domain has conceptualized the divide as more of a sliding scale, where being “under-connected”—without, for instance, enough devices for the whole family to work online simultaneously—might contribute to digital exclusion in significant ways.⁴⁴ To return to an earlier point in this introduction, the COVID-19 pandemic made these nuances of the digital divide more apparent than ever. The human stories that surfaced during that time painted a picture of digital inequality characterized by divides in more than access—children doing online homework in fast food restaurant parking lots, people struggling to write cover letters using only a smartphone, families deciding whether to pay for broadband or for dinner.

Most importantly for this study, this body of literature highlights the value of considering access alongside other factors that contribute to the digital divide. Even when access is available, the social and economic benefits of internet connectivity cannot be realized without all three levels of digital inclusion. Making broadband available is a foundational step, but closing the digital divide—especially in an

already pervasively digitized society—depends on tackling the multidimensional aspects of digital exclusion simultaneously.

Broadband Affordability and Adoption

As noted above, a substantial portion of the country’s population still lacks access to broadband internet. But even when broadband connectivity is available, affordability remains a leading barrier to uptake and adoption of digital technologies.⁴⁵ At the most basic level, the price of broadband plans can be prohibitive, especially for low-income individuals and families. In 2016, the FCC suggested a threshold for broadband affordability at 2% of a household’s disposable income.⁴⁶ Although this threshold is not statutory law, it has become a common benchmark in research and policy on affordability. A recent study on BEAD-eligible areas in four states (California, Michigan, Oklahoma, and Virginia) found that 65% to 86% of representative plan prices exceeded this 2% income benchmark for low-income households.⁴⁷

Statistical analyses of affordability, largely based on survey data, have also surfaced other insights that point to affordability as a key adoption issue. For example, low-income households are more likely to rely solely on mobile broadband and forgo home internet subscriptions. According to Pew Research Center, 95% of adults with an annual household income of at least \$100,000 say they have a broadband subscription, compared to just 57% of adults in households that make less than \$30,000 per year. This latter group is also more likely to have limited device options, often owning only a smartphone for internet access, for example. The same Pew study reports that 28% of Americans in households earning less than \$30,000 per year rely only on a smartphone for internet access, compared to just 4% of people in households earning over \$100,000.⁴⁸ As discussed above, these affordability issues have implications for digital inclusion and adoption at other levels of the digital divide. For example, being unable to afford to use multiple devices at home may result in limited digital literacy—high proficiency in smartphone use but lower proficiency on other devices needed for everyday tasks and skill development, like using a laptop to produce a well-formatted word processing document.⁴⁹

Additionally, research on affordability has found persistent spatial dynamics to broadband pricing. It is well-known that there are geographical and spatial dynamics that have long influenced broadband infrastructure deployment and access. The rural-urban broadband access divide is largely attributed to factors such as challenging terrain and sparse populations in rural locales, making the cost of building infrastructure prohibitively expensive. These challenges lead to market failure, where commercial ISPs avoid low return-on-investment (ROI) areas, often in favor of over-building more densely populated,

higher-income areas. Solutions to this market failure usually come in the form of federal and state governments subsidizing build costs.⁵⁰ But access is not the only dimension of the digital divide that demonstrates pronounced spatial dynamics. Broadband affordability, too, shows persistent inequities strongly correlated with factors such as geography, income, and race, reflecting underlying structural inequalities that have long manifested in the spatial distribution of resources, including utilities like water and sewage.⁵¹

While rural and tribal areas often experience higher subscription prices (sometimes over 30% more than urban counterparts),⁵² affordability issues also affect some urban areas. In U.S. cities, low- and moderate-income communities pay a disproportionately high share of their income for connectivity, typically 2.43% compared to 0.51% in wealthier areas, often exceeding the 2% affordability benchmark mentioned above.⁵³ Some reports attribute disparities to “digital redlining,” where ISPs’ profit incentives lead to fewer investments in competitive broadband services in low-income urban neighborhoods.⁵⁴ Pricing can also be influenced by the type of technology deployed to achieve access across different geographies. Although fiber optic cable is considered the gold standard in broadband connectivity and ultimately offers the best carriage value,⁵⁵ it is expensive to deploy, especially across long distances. For harder-to-reach places, alternative solutions, like Fixed Wireless Access (FWA) and satellite connections can fill the gap and may offer high speeds and low latency. But they are often more expensive for consumers, especially in the case of satellite—and suffer from quality and reliability issues, as wireless technologies can be subject to interference from weather and physical obstructions, like trees.⁵⁶

Finally, market conditions can also result in affordability barriers. Over a third of the U.S. is served by a monopoly carrier or no provider at all,⁵⁷ meaning that residents have limited choice of broadband providers in their area. In some instances, this is by design: Policy programs aimed at ensuring universal access to broadband will sometimes offer subsidies to a single provider to induce it to offer connectivity in an unserved region, entrenching monopoly markets. Without oversight, these publicly subsidized providers may abuse their monopoly status and charge runaway prices. Some academic research shows this lack of competition results in significantly higher charges for slower speeds.⁵⁸

These findings point to a complicated relationship between access and affordability, where challenges in infrastructure deployment may lead to higher costs. But these infrastructural challenges alone cannot explain the price disparities across incomes and geographies, and they also fail to capture the nuances of people’s lived experience of barriers to affordable connectivity. For example, reports by the Institute for Local Self Reliance and Consumer Reports find that many consumers find shopping for broadband confusing. It can be difficult to understand the difference between various plans (prices and speeds) and

identify the lowest cost options, and there can be hidden fees or contract terms.⁵⁹ Dark patterns, which describe interfaces that intentionally confuse, mislead, or deceive users so that they make choices that may not be in their best interest, contribute to the challenges people face shopping for broadband.⁶⁰ Internet deals, bundled packages (for mobile and home broadband, for instance), or even low-cost offerings may be hard to find or sign up for. In recognition of some of these challenges, the Infrastructure Investment and Jobs Act (IIJA) recommended a consumer broadband label—a policy solution first introduced by the FCC in 2015—to standardize the presentation of important information, including prices, speeds, and fees. In addition, research has shown that people experience “subscription vulnerability” when households struggle to maintain consistent internet service due to difficulty paying bills or as a result of precarious or changing life circumstances and may cancel their service.⁶¹ A pandemic-era survey identified as many as 43% of low-income households facing subscription vulnerability.⁶² Studies estimate that the elimination of the Affordable Connectivity Program, which subsidized a \$30 discount for qualifying low-income households, led hundreds of thousands of families to terminate their broadband connection.⁶³ The combination of access and affordability barriers risks reinforcing cycles of poverty and curtailing economic opportunity.

Qualitative research that focuses on capturing the lived experience of digital exclusion through case studies, interviews, and field work adds additional insights to the body of research on affordability and adoption barriers. This body of research that examines digital exclusion “from the ground up” provides greater depth beyond statistics on affordability and uptake. For example, based on their qualitative research in Detroit, Rhinesmith and colleagues argue that typical survey measures such as “willingness to pay” for broadband or “lack of interest” in broadband rarely capture the real reasons people may wind up without a subscription,⁶⁴ which may have more to do with their struggles to afford connections or negative experiences they have had engaging in the digital world.⁶⁵ Studies in other high-income countries outside the U.S. have also shown that a reported lack of motivation to use the internet in surveys may mask more nuanced reasons that people fail to take advantage of digital access, with cost and affordability frequently underlying lack of interest.⁶⁶ Qualitative research reveals the human story of confronting, overcoming, and navigating the digital divide. This perspective consistently confirms the fact that digital inclusion is not necessarily a linear trajectory from access to digitally enabled social and economic outcomes. Nor is digital adoption a singular decision point, where people choose whether they want connectivity or not once access is available. Digital adoption, especially for low-income communities, is a negotiation among different tradeoffs, influenced by people’s social and economic contexts and requiring a more comprehensive, holistic approach to closing the digital divide that anticipates and mitigates the more-than-access barriers people face in their day-to-day lives.

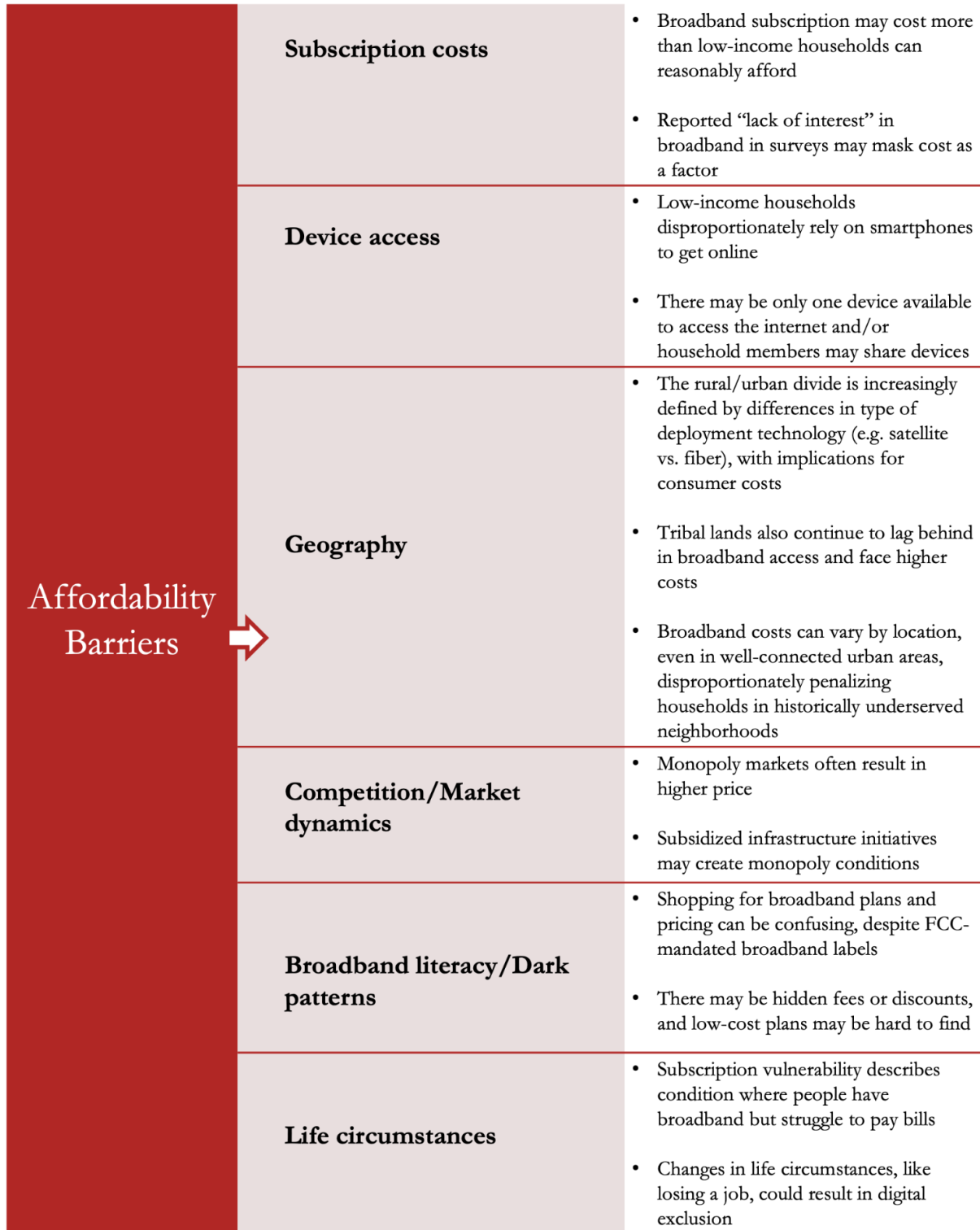


Figure 2: Affordability Barriers

Policy Addressing Affordability

Policy solutions to affordability have primarily relied on federal subsidies and, increasingly, price cap mechanisms that establish thresholds for low-cost plans and for subsidized monopolists. Direct subsidies have alleviated affordability pressures for low-income families, thereby boosting adoption. During the COVID-19 pandemic, the Emergency Broadband Benefit (EBB), established as part of the 2020 COVID relief bill, made over \$3 billion available to help customers cover the cost of broadband. It offered qualifying households a monthly discount of \$50 on broadband subscriptions. Its successor, the Affordable Connectivity Program (ACP), was established by the 2021 Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), and allocated \$14 billion to support subsidies to help customers with their broadband bills. It covered up to a \$30 monthly discount for broadband, or up to \$75 for households on qualifying Tribal lands. Eligible households could also receive up to a \$100 discount on a one-time purchase of a laptop, desktop computer, or tablet.⁶⁷ These subsidies joined the longstanding Lifeline Program, administered by the FCC since 1985 (when it supported subscriptions to telephone services), which provides a monthly discount of \$9.25 on broadband to qualifying low-income households, funded by the Universal Service Fund.⁶⁸ Additionally, the Broadband Equity Access and Deployment Program (BEAD), funded by the IIJA, which allocated over \$40 billion to infrastructure expansion, included requirements for providers to offer low-cost plans. The NTIA issued accompanying guidance that suggested low-cost rates of \$30 per month. Although this rate was a guideline and not a regulated rate, many providers adopted the \$30 threshold because it also aligned with the ACP subsidy.

Policy efforts at the state and local levels have also mandated low-cost options to address affordability issues. New York State, for instance, enacted a law in 2021 requiring ISPs to offer a \$15-per-month low-cost service plan for qualifying low-income households.⁶⁹ California has also advanced a similar bill requiring ISPs to offer a \$15-per-month plan.⁷⁰ California's Public Utilities Commission has also received 10-year commitments from providers seeking merger approval, promising to offer broadband connectivity at \$20-per-month to qualifying households. The federal BEAD program requires all grant recipients to offer at least one low-cost service option, but recent changes to NTIA's guidance removed requirements on setting specific price targets, leaving pricing decisions to the network operators.⁷¹

Hence, federal programs offer grants and subsidies to ISPs in exchange for their commitment to both build to designated un- and underserved areas, as well as to offer rates and services to customers that are “reasonably comparable” to those available in urban areas. The Connect America Fund (CAF), administered by the FCC, is one such example. As discussed above, research shows that regulated

monopolists consistently offer better broadband carriage value than unregulated monopolists, and competition is often most effective at improving the carriage value offered by ISPs.⁷²

Virginia's Approach to Access and Affordability

The Commonwealth has been a national leader in closing the digital divide. Over the last decade, Virginia has made an ambitious push toward universal broadband access, with successive gubernatorial administrations committing to connect every household and business to broadband. This effort was spearheaded by the Virginia Telecommunication Initiative (VATI), which launched in 2017 and has invested over \$935 million to connect more than 388,000 homes, businesses, and community anchor institutions, leveraging a total investment of \$1.9 billion.⁷³ With bipartisan executive and legislative leadership, Virginia has developed a comprehensive strategy to close the digital divide, established a dedicated Office of Broadband within the Department of Housing and Community Development (DHCD), published a state broadband map (Commonwealth Connection) that it has used to challenge FCC classifications of underserved locations, and successfully bid for over \$1 billion in federal funding for deployment initiatives (more on these efforts in Policy Landscape below). Thanks to these efforts, of the roughly 400,000 locations in Virginia that still lack access to broadband, two-thirds of these are part of committed deployment projects.⁷⁴

Beyond deployment, Virginia has also recognized that the digital divide is a multi-dimensional issue that encompasses access, affordability, and adoption. In 2022, the General Assembly mandated that DHCD produce the Commonwealth Digital Affordability and Cost Effectiveness Plan, which aimed to guide DHCD in applying for a planning grant from NTIA and accessing subsequent funds under the IIJA. Virginia was due to receive \$18.1 million in Digital Equity Act funds to engage in digital opportunity planning at the state and regional levels, to conduct a digital opportunity case study pilot program, and administer Digital Equity Capacity Grants, which would have funded implementation of the digital opportunity plans. In 2023, DHCD published its Digital Opportunity Plan, which outlined strategies for tackling aspects of the digital divide beyond deployment, with implementation heavily dependent on seeking and leveraging these federal funds. In addition to the state digital opportunity plan, nine regions developed their own digital opportunity plans, and 47 applications totaling \$13 million were made for DHCD-administered grants to support digital literacy, skills, and adoption using Digital Equity Act Capacity Grant funding. Virginia's original BEAD proposal also included roughly \$480 million for non-deployment initiatives to support affordability and adoption. However, the national policy landscape has shifted over the last year, with Digital Equity Act funding cancelled and BEAD non-deployment funds suspended, pending further guidance from NTIA. Following the withdrawal of

federal funding, digital capacity grants have not been awarded, and the fate of the proposed projects is uncertain.

In the process of developing the Commonwealth's Digital Opportunity Plan, DHCD collected input from community organizations and residents through stakeholder engagement, consultation, and surveys that surfaced many additional barriers to digital opportunity beyond access alone, pointing to a need to both study and address these barriers if Virginia is to close the digital divide. The substantial investments in deployment are crucial for achieving universal access, but progress on the additional dimensions of digital opportunity risks stalling without funding and continued research to identify and address digital barriers.

Policy Landscape

The policy landscape on broadband is complex and somewhat fragmented and uncoordinated.⁷⁵ At the federal level, several agencies oversee important programs aimed at closing the digital divide—including, most notably, the Federal Communications Commission (FCC), and the National Telecommunications and Information Administration (NTIA), a bureau of the U.S. Department of Commerce.⁷⁶ These agencies administer funds that, in some cases, states may leverage to address the digital divide within their borders. This section provides an overview of significant investments and initiatives, with particular emphasis on those that have included funding and programming targeting aspects of the digital divide beyond infrastructure expansion. These efforts are often coupled with infrastructure funding, but they aim to tackle additional aspects of the digital divide beyond access alone.

Virginia

Over the last decade, Virginia has invested heavily in broadband expansion and made both executive and legislative commitments to closing the digital divide. These efforts have leveraged federal funding and public-private partnerships to expand broadband infrastructure and bring the Commonwealth closer to universal connectivity. In 2019, over 650,000 homes and businesses reportedly lacked access to broadband in Virginia,⁷⁷ but by 2025, that number has reduced to around 390,000 unserved locations, two-thirds of which are claimed as part of active deployment projects.⁷⁸

In 2018, Governor Ralph Northam committed to a goal of achieving universal broadband connectivity by 2028 and appointed a chief broadband advisor. That commitment led to the Commonwealth Connect strategy, which included funding, mapping, and reporting components to support progress

toward universal coverage. It endorsed the Virginia Telecommunications Initiative (VATI), the development of the Commonwealth Connection state broadband map through a collaboration between the Department of Housing and Community Development (DHCD) and Virginia Tech, and an annual report on deployment. 2018 also saw the formal establishment of the Office of Broadband within DHCD,⁷⁹ which had administered VATI since its establishment in 2017 through state budget legislation.⁸⁰

Spurred by the COVID-19 pandemic, in 2021 Governor Northam announced plans to invest \$700 million in American Rescue Plan Act (ARPA) funding to expedite the deployment of last-mile broadband infrastructure to unserved areas and close the digital divide.⁸¹ After taking office in 2022, Governor Glenn Youngkin continued the commitment to broadband expansion and closing the digital divide, and his administration has supported successful applications for federal funding, bolstered by state funds and public-private partnerships. Since 2022, more than 150,000 locations have gained access to broadband.⁸²

Although the primary focus has been on closing the digital divide in access (infrastructure), several of these initiatives have included plans and programs to address additional dimensions of the digital divide, such as affordability and skills. The following table summarizes recent broadband policies and initiatives and highlights their commitments beyond deployment to address affordability and adoption. Virginia's Digital Opportunity Plan spotlights affordability as a key issue in closing the digital divide, and all ten of the Commonwealth's Regional Digital Opportunity Plans cite affordability as a top concern and priority. Since President Donald Trump took office in January 2025, there have been substantial changes to federal funding for broadband, and these changes have had a direct impact on state plans for addressing the multiple dimensions of the digital divide. These developments are also reflected in the table below.

Policy/Initiative	Affordability/adoption provisions	Status
Virginia Telecommunications Initiative (VATI) VATI provides grants to localities partnered with internet service providers to finance the deployment of high-speed	Does not mandate affordable pricing, but in reducing infrastructure costs for providers may have downstream effects on consumer prices.	Currently underway, with some projects delayed and others re-allocated to BEAD funding.

broadband to locations determined to be “unserved.” A location is unserved if it lacks access to internet speeds of 100 Megabits per second (Mbps) download and 20 Megabits (Mbps) upload. Since 2017, Virginia has invested over \$850 million in state and federal funding to extend broadband infrastructure, plus more than \$1 billion in matching funds from local governments and internet service providers to over 388,000 locations in 80 cities and counties across the Commonwealth.⁸³ Funding: <i>State general funds, ARPA Capital Project Funds, matching funds from private companies and localities</i>		
Line Extension Customer Assistance Program (LECAP) LECAP covers 100% of the cost of extending broadband service to qualifying households based on income eligibility for households where broadband connections are not attainable because their home exceeds an internet service provider's standard connection drop length from a roadway or easement. Funding: <i>American Rescue Plan Act's (ARPA) State and Local Fiscal Recovery Fund (SLFRF) via the Virginia Telecommunication Initiative (VATI)</i>	Addresses affordability by covering the cost of connections in harder-to-reach areas where the distance from a connection to a home is long, and costs often fall on the consumer. Low- and moderate-income households	In effect until December 31, 2026, when ARPA funding ends, but all available funds have been committed.
Broadband Equity, Access, and Deployment Program (BEAD)	Providers must justify their affordability offerings and provide plans to households eligible under	Virginia submitted an updated BEAD proposal in line

BEAD provides federal funding to extend broadband infrastructure to remaining unserved locations without a funded solution for connectivity and designing programs to meaningfully address broadband affordability and adoption. Virginia was allocated \$1.48 billion and submitted a 5-year BEAD plan in 2023, which was approved in July 2024. NTIA published a BEAD restructuring policy notice in June 2025. Resubmission under Benefit of the Bargain rules brought total funding request down to \$613 million in August 2025 (\$200m savings). Funding: Federal IIJA funds (BEAD)	ACP criteria. Virginia established a low-cost plan cap at up to \$75/month for BEAD-funded infrastructure. In its original proposal, Virginia planned to allocate around \$480 million to non-deployment projects to address additional aspects of the digital divide.	with new NTIA guidance in August 2025. NTIA has not issued further information on the allocation of non-deployment funds.
Digital Skills, Literacy and Device (DSLDD) Program A three-year program for eligible applicants to implement new, expand, and/or upscale existing programs related to the advancement of Digital Skills and Literacy, Digital Navigation, Digital Device Refurbishment, and/or Device Distribution. Funding: Federal IIJA funds (Digital Equity Act)	Aimed at addressing adoption barriers by helping residents use broadband effectively and access devices, but did not propose subsidizing service costs.	Suspended due to the cancellation of Digital Equity Act funding.
Virginia Broadband Affordability and Adoption Planning Grant Program (VAAPG) Launched in 2025, the purpose of this program was to conduct needs	Aimed to help local governments assess and plan for broadband affordability and adoption by funding local studies and pilot programs (e.g., digital literacy, public Wi-Fi) to prepare for future	Additional funding to implement planned projects is currently suspended.

assessments, identify priorities, and develop plans with implementation strategies to address and promote digital opportunity in their communities. Funding: Federal IJA funds (BEAD)	affordability initiatives.	
Virginia Digital Opportunity Plan & regional plans As a condition of the State Digital Equity Act Planning Grant Program, Virginia developed a Digital Opportunity Plan, which was approved by NTIA in 2023. The Digital Opportunity Plan assesses the state of the digital divide in Virginia beyond infrastructure, examining affordability, digital literacy, device access, and other barriers to meaningful connectivity. This would have enabled the Commonwealth to apply for Federal broadband funding from the Digital Equity Act Capacity Grant program. Funding: “Internet for All” grants from NTIA; Federal IJA funds (including Regional Digital Opportunity Planning Grant subgrants, Digital Opportunity Case Study Pilot Program, and Digital Equity Act Capacity Grant funding)	Identified affordability as one of three core barriers to digital equity and proposed leveraging federal funds (BEAD, Digital Equity Act) to support low-cost service options and outreach, including encouraging ACP uptake.	Further development of these plans is on hold due to cancellation of DEA funding and lack of BEAD non-deployment guidance.

Federal Policy

Connect America Fund (CAF)⁸⁴ & Rural Digital Opportunity Fund (RDOF)⁸⁵

In 2011, the FCC, through its USF/ICC Transformation Order, converted the Universal Service Fund’s “High-Cost Program” into the Connect America Fund (CAF), which was aimed at expanding broadband to unserved rural areas. The FCC, often through the Universal Service Administrative

Company (USAC), oversees CAF, which has invested over \$10 billion of Universal Service Funds. The program is ongoing, although it is under review, and the FCC has deferred the next deployment term.

- RDOF was established in 2019 as a successor program to CAF Phase II to allocate up to \$20.4 billion over 10 years to provide broadband to unserved rural homes and businesses. RDOF is administered by the FCC through USAC.

Infrastructure Investment and Jobs Act (IIJA), Affordable Connectivity Program (ACP), Broadband Equity, Access and Deployment Program (BEAD), Digital Equity Act (DEA)

Passed by Congress in 2021, the IIJA allocated more than \$65 billion to broadband infrastructure, affordability, and digital equity. It funded the ACP, BEAD, and DEA. However, these programs have been ended or paused indefinitely, as noted below.

- The ACP received \$14.2 billion to provide monthly internet discounts (\$30 or \$75 on Tribal lands) and device subsidies for low-income households. ACP lapsed on June 1, 2024, due to lack of additional Congressional funding. Over 23 million households were enrolled.⁸⁶
- BEAD received \$42.45 billion to roll out broadband infrastructure in unserved and underserved areas, but to date, no deployment funding has been disbursed. In the original BEAD guidelines, states could allocate leftover BEAD funds for “non-deployment” initiatives that supported digital adoption and use, such as digital skills and literacy training or subsidies for broadband bills. However, the NTIA issued restructuring notice in June 2025 that temporarily suspended non-deployment allocations and required states to resubmit their proposals to find cost savings in their deployment plans and adopt a technology-neutral approach.⁸⁷
- DEA was allocated \$2.75 billion to encompass \$60 million for planning grants, \$1.44 billion for capacity grants, and \$1.25 billion for competitive grants to remote digital inclusion and equity for underserved populations, administered by the NTIA.

American Rescue Plan Act (ARPA) & Emergency Connectivity Fund (ECF)

Passed by Congress in 2021, ARPA was a comprehensive economic stimulus package to address the impacts of the COVID-19 pandemic. It included \$10 billion via the Capital Projects Fund (CPF) for broadband infrastructure and digital connectivity projects, with an additional \$8.6 billion was allocated to broadband projects by states and local governments through the State and Local Fiscal Recovery Fund (SLFRF), overseen by the U.S. Department of the Treasury. The act included \$7.171 billion to the Emergency Connectivity Fund to help schools and libraries provide broadband and connected devices to students, staff, and other residents lacking home internet access during the pandemic, administered by the FCC and USAC.

Other States

The Digital Equity Act, established as part of the Infrastructure Investment and Jobs Act (IIJA) in 2021, required states to develop digital equity plans to be eligible for DEA funding. All 50 states participated, and analysis of state plans by Pew Charitable Trusts found that all states identified a lack of affordable broadband as the leading barrier to digital equity.⁸⁸ State plans proposed various solutions to this challenge, such as public WiFi, connectivity hubs, and subsidies to extend or fill the gap left by ACP support. In recent years, states have also put forward legislation addressing affordability. This legislation is listed below, beginning with legislation that has passed, followed by proposed legislation, and finally failed legislation.

New York

Affordable Broadband Act (A6259) - Passed⁸⁹

Effective January 15, 2025, New York's ABA mandates that ISPs with over 20,000 customers offer low-cost broadband plans: \$15/month for 25 Mbps and \$20/month for 200 Mbps. The law was upheld by the 2nd U.S. Circuit Court of Appeals in 2024.

Oregon

HB3148 - Passed⁹⁰

Enrolled in 2025, the bill establishes the Oregon Lifeline plan, which includes differential rates for low-income customers that builds on the Oregon Lifeline program by including a one-time personal computing device benefit of up to \$100 for purchasing new or refurbished Internet-enabled devices like computers or tablets. The Oregon Lifeline program is a federal and state government program that provides a monthly discount on phone or high-speed internet service for qualifying low-income Oregon households: a discount on phone bills of up to \$15.25 per month; a discount on high-speed internet bills of up to \$19.25 per month; or free wireless voice minutes and data service.⁹¹

Tennessee

S0556/H1136 - Passed⁹²

Signed in 2025, this bill prohibits local governments and the Tennessee Public Utility Commission (TPUC) from regulating broadband internet access services or classifying providers as public utilities.

California

AB353 - Proposed

Introduced in 2025, AB 353 is a placeholder bill aiming to establish a statewide broadband affordability mandate. It would require broadband providers to offer internet service at a maximum of \$15 per month for low-income households at speeds of 100 Mbps/20 Mbps.

Massachusetts

H3527/S2318 - Proposed

Similar to the New York ABA, the Massachusetts bills propose capping broadband prices at \$15 per month for qualifying low-income households that participate in certain assistance programs, such as SNAP or Medicaid or have a household income at or below 200% of the federal poverty guidelines.

Vermont

H0121 - Proposed

The 2025 proposed bill requires Internet Service Providers (ISPs) to offer two affordable broadband tiers: 25 Mbps download speed for \$15/month and 200 Mbps download speed for \$20/month, with prices including all taxes, equipment fees, and usage charges. Eligible households are those that qualify for the federal Lifeline program or participants in Vermont's Home Heating Fuel Assistance Program.

Mississippi

Helping Mississippians Afford Broadband Act (HB0217) - Failed⁹³

Proposed in 2025, the bill would have appropriated \$100 million to create a program that offers financial assistance to eligible households to help cover the cost of internet service, providing up to \$15 per month in financial assistance to households that are already approved for federal broadband assistance programs like the Emergency Broadband Benefit (EBB) or Affordable Connectivity Program (ACP).

Methodology

This study is a JCOTS Research Study, which takes 8 to 10 months to complete and comprises a literature review and original data collection and analysis, supported by subject matter expert (SME) interviews. This study is the product of a collaboration between JCOTS staff and researchers at the University of California Santa Barbara (UCSB) and University of California Berkeley (UC Berkeley), compiled between March and November 2025. The goal of the study was to focus on aspects of the digital divide in Virginia beyond access and infrastructure (deployment) alone, with a particular focus on affordability, which is consistently identified as a primary barrier to digital adoption and inclusion.

Aims of the Study

In the last decade, most federal and state policy has prioritized closing the digital divide in access, with a few notable exceptions. The largest investments have gone toward infrastructure expansion in recognition of the fundamental need to close the access and availability divide. But other aspects of the digital divide have also received attention, spurred especially by the pandemic—particularly issues of affordability and adoption.

Given this dual focus on access and affordability at the federal and state level, this study examines some of the nuances of affordability, which is consistently cited as a significant factor in broadband adoption and an important contributor to digital exclusion—even where access is available.⁹⁴ The Virginia Digital Opportunity plan identifies three interconnected dimensions of digital opportunity, which it defines as all residents having “the information technology capacity needed for full societal and economic participation”: access, affordability and adoption.⁹⁵ Together, these three components of the digital divide encompass the levels of the divide identified by scholars and discussed in the Introduction of this report. They include cost of service, devices, literacy, skills, and the ability to translate digital engagement into successful social and economic outcomes. All these aspects of the digital divide deserve attention alongside infrastructure deployment, but this study focuses specifically on *affordability* as a barrier to digital opportunity, with important implications for adoption.

An Emphasis on Affordability

All the state digital opportunity plans developed as part of the Digital Equity Act planning process identified affordability as a primary barrier to digital equity.⁹⁶ In a survey conducted as part of the Commonwealth’s digital opportunity planning process, almost a third of covered population respondents reported not having internet because it was too expensive, and covered populations were more likely to have cancelled internet service due to cost in the last year.⁹⁷ In 2024, a report on broadband deployment by the Joint Legislative Audit and Review Commission (JLARC) found that a broadband subscription would account for more than three percent of monthly income for 10 percent of Virginia households, predominantly those in the Southwest, Southside, and Eastern Virginia regions. The report observes that “even rates that represent a small percentage of income can pose an affordability challenge for low-income households who have not previously had broadband access, as it represents an added expense.” Among other recommendations to address deployment delays, JLARC suggested using BEAD non-deployment funds to develop a pilot program that would require a geographically diverse subset of ISPs to offer a standardized discounted monthly subscription rate subsidized by DHCD.⁹⁸

One aim of this study was to pick up this thread on affordability from the JLARC report to explore what broadband pricing looks like across the Commonwealth and, relatedly, to identify what an affordable threshold for broadband might be.

As discussed above, academic research also identifies affordability as a key barrier to digital inclusion and highlights the limitations of data collected through surveys (which often fail to capture under-connectedness or affordability as an underlying factor in lack of skills or motivation) and through reports or submissions by ISPs (which may not reflect the connectivity quality or pricing options offered to individual consumers). So-called “ground-up” or “bottom-up” perspectives that attempt to capture consumers’ lived experiences of barriers to digital opportunity help to surface the real barriers people face in their day-to-day lives as they attempt to access and make the most of the digital world. Therefore, another aim of this study was to focus on collecting this kind of data—data that more closely approximates the vantage point of consumers as they shop for broadband plans. It supplements these data with perspectives from community anchor institutions that serve people facing barriers to digital inclusion, where people are actively navigating their own way across the digital divide.

By focusing on broadband affordability, the intention of the study is not to divert attention away from the policy priority of access but to encourage a simultaneous conversation about additional dimensions of the digital divide that accompany—and complicate—the anticipated positive outcomes of expanding broadband availability. Examining affordability also sheds light on the nuances inherent in even the first level of the digital divide, where universal availability may mask inequalities in pricing, device access, and quality or reliability of service, with downstream implications for digital skills, literacy, and outcomes. States have made large investments in broadband access, but to fully realize the social and economic returns of these investments, policy needs to anticipate the multidimensional aspects of the digital divide that will remain salient, even when broadband is available.

An Independent, Bottom-Up Approach

Independent verification of broadband service data has become essential to ensuring that public funds and regulatory policies effectively advance universal, affordable access. The growing reliance on ISP self-reported data has created a persistent “ground-truth” problem—what ISPs claim to offer often differs from what consumers can actually buy. This problem is particularly acute at the address level, where small discrepancies in availability reporting can leave entire neighborhoods misclassified as “served,” excluding them from funding eligibility under federal programs such as the Broadband Equity, Access, and Deployment (BEAD) initiative.

The FCC's Broadband Data Collection process requires ISPs to report service availability and speeds twice yearly, mapping these reports onto the Broadband Serviceable Location (BSL) Fabric. Although the BSL Fabric represents a major advance in spatial precision—providing residential and business location points nationwide—it still depends on ISP claims rather than independent verification. As a result, policymakers lack a reliable picture of which communities truly have affordable and competitive broadband access.

This study addresses that gap by employing a direct observation approach through the Broadband-Plan Query Tool, which automatically queries ISP websites at the household level. Hence, for each sampled address, the tool can capture what plans and prices are actually available to consumers at that time. We acknowledge that ISPs sometimes tailor results dynamically, and so some niche plans or limited-time promotions may not be reflected in the dataset. These limitations are intrinsic to any automated, web-based data collection approach, but they do not detract from the central objective—providing a transparent, scalable, and independently verifiable measure of broadband affordability. Moreover, these results can be combined with census-derived income data to compute affordability benchmarks that are both empirically grounded and policy-relevant.

Data Collection and Analysis

The UCSB and UC Berkeley researchers have developed and applied a quantitative data collection method for gathering broadband pricing data called the Broadband-Plan Query Tool (BQT), earlier versions of which have been used to identify broadband price disparities that correspond with specific, historically marginalized neighborhoods,⁹⁹ to evaluate ISP compliance with Connect America Fund (CAF) requirements,¹⁰⁰ and to establish comprehensive baseline measurements of speed and price conditions in BEAD-eligible areas.¹⁰¹ The tool works as an automated data collection platform that collects information about residential broadband plans and pricing by mimicking human user interaction with ISP websites—it captures the information a consumer would see if they entered their address into an internet provider's search tool to see what plans and prices were available.

Using the Broadband-Plan Query Tool in Virginia offers a useful way of looking at broadband pricing because it offers independent, granular, address-level data that can overcome the concerns about federal datasets, which rely on ISP self-reporting and have been found to be unreliable in some instances, due especially to their tendency to overstate coverage and competition.¹⁰² BQT offers another way of understanding broadband pricing and making comparisons across different localities. Together with qualitative subject matter expert interviews with representatives of ISPs and community anchor

institutions serving people facing barriers to digital inclusion, these insights offer a richer picture of affordability considerations in the Commonwealth.

As noted above, understanding broadband affordability and availability at a fine-grained spatial scale requires a data collection framework that goes beyond self-reported regulatory datasets. The Federal Communications Commission’s (FCC) National Broadband Map and Broadband Data Collection (BDC) filings remain the most comprehensive national datasets on broadband coverage and pricing, yet both rely on ISP self-disclosures that have repeatedly been shown to overstate actual service availability and performance.¹⁰³ Numerous audits and independent studies have revealed systematic overreporting—instances where ISPs claim to serve entire census blocks despite limited physical deployment or where advertised speeds far exceed real-world performance.¹⁰⁴ These discrepancies pose serious challenges for broadband policymaking: when service is overstated or mischaracterized, public investments risk being misdirected, and affordability gaps remain hidden. It is worth noting that none of these existing data sources offer a fine-grained view of broadband pricing, i.e., the amount ISPs charge for different service tiers. BQT offers a unique opportunity to collect this pricing data though critical to help assess the state of broadband affordability in the state—critical for this study.

Against this backdrop, this study adopts an independent, bottom-up approach to measure broadband affordability across ten diverse Virginia localities. The framework integrates automated plan-level data collection using the Broadband-Plan Query Tool (BQT) with demographic and economic data from the U.S. Census Bureau’s American Community Survey (ACS) to evaluate affordability at the census block group (CBG) level. By directly querying ISP websites, BQT provides an independent lens into what consumers actually encounter when shopping for broadband, what plans are available, what speeds are offered, and at what prices. This approach offers a way to overcome many of the shortcomings of existing datasets while producing actionable insights for policy, including for targeting infrastructure subsidies, consumer subscription subsidies, as well as price and service standards for low-income households. The analysis presented here focuses primarily on advertised availability and pricing structures, and so does not measure actual delivered performance (e.g., latency, reliability, or throughput). Instead, it aims to inform policy making on affordability: the relationship between what broadband costs and what households can pay.

Using the Broadband-Plan Query Tool to Study Affordability

As noted above, this study employs the Broadband-Plan Query Tool (BQT) to overcome the inherent limitations of self-reported broadband data. BQT is an automated data-collection framework that emulates a human user’s experience when shopping for broadband service, to independently verify plan

availability, pricing, and advertised speeds at scale. At its core, BQT takes a street address as input and automatically visits the corresponding service-availability page on each ISP's website, recording, as output, data about all available plans, including download and upload speeds, monthly prices (including discounts), and the type of technology used (fiber, cable, DSL, or fixed wireless).

If BQT queries multiple street addresses from a single IP address, ISPs can easily detect the automated activity and block that IP. To avoid such restrictions, BQT uses a proxy network infrastructure that distributes its queries across hundreds of IP addresses, drawn from a mix of residential and data center sources. Importantly, BQT enforces strict rate limits to ensure ethical data collection and prevent any strain on ISPs' infrastructure. Though access to such proxy infrastructure is essential for large-scale querying, collecting data for tens of thousands of street addresses can be costly. This study benefited from generous support from Bright Data's Bright Initiative, which provided free access to their proxy infrastructure for data collection.

The Broadband-Plan Query tool also captures the full FCC Broadband Facts Label for each available plan whenever it is published. These standardized labels, mandated by the FCC since 2024, are designed to provide consumers with clear, consistent disclosures about broadband offerings—similar to nutrition labels for food. Each label lists the base monthly price, typical download and upload speeds, data allowances, and any applicable fees. When available, BQT parses these details automatically. Importantly, it distinguishes between “label prices”—the standard, undiscounted monthly cost of the plan as disclosed on the Broadband Facts Label—and any promotional or discounted prices, which may apply for limited periods or to certain consumer groups. The analysis treats these separately: base label prices represent the structural cost of service, while discounts reflect short-term marketing or eligibility-based adjustments. The analysis also excludes taxes, fees, and equipment rental costs. Unless specified otherwise, the analysis refers to “label prices” whenever reporting prices for low-cost plans in this report.

To ensure data completeness, the Broadband-Plan Query Tool also implements re-querying routines, repeating previous failed queries. BQT also performs automated data validation and cleaning, filtering out malformed results and removing duplicate entries that may appear across multiple address queries. Each verified record is also tagged with geographic metadata. The net result is a structured dataset that reflects, with high fidelity, the plans and prices consumers can actually see when shopping online for broadband service.

Data Sources

The analysis combines the Broadband-Plan Query Tool observations with several complementary datasets to contextualize plan-level broadband offerings within their geographic, socioeconomic, and market environments. Together, these data sources enable a granular evaluation of broadband affordability across Virginia.

Broadband Serviceable Location (BSL) Fabric: The foundation of the sampling framework is the National Broadband Serviceable Location Fabric, maintained by CostQuest for the FCC and the National Telecommunications and Information Administration (NTIA). The Fabric provides precise geographic coordinates and address-level identifiers for all broadband-eligible structures in the United States. These include residential, small business, and mixed-use locations where broadband service could feasibly be installed. The Broadband Serviceable Location dataset ensures that every address queried through the Broadband-Plan Query Tool corresponds to a serviceable structure and supports accurate mapping of ISP offerings to specific census block groups.

FCC National Broadband Map: The National Broadband Map, derived from the FCC’s Broadband Data Collection (BDC) filings, provides information on which Internet Service Providers (ISPs) claim to serve each Broadband Serviceable Location and the technologies they use (fiber, cable, DSL, fixed wireless, or satellite). This dataset enables classification of market structures within each census block group—such as monopoly, duopoly, or triopoly—and identification of the relevant ISPs to be queried using the Broadband-Plan Query Tool. While the National Broadband Map represents the most comprehensive federal record of broadband coverage, it is self-reported by ISPs and therefore subject to inaccuracies, making independent validation through the Broadband-Plan Query Tool both necessary and complementary.

American Community Survey (ACS): Socioeconomic and income data are drawn from the 2019–2023 American Community Survey (ACS) 5-Year Estimates, which provide tract- and block-group-level statistics on household income, population, and demographic composition. These data are used to compute affordability thresholds—specifically, 2 percent of monthly income for households at the 20th income percentile—representing the affordability benchmark recommended by the FCC and adopted in this study. The ACS data provides the income denominator against which the Broadband-Plan Query Tool price observations are evaluated, allowing each census block group to be classified as *affordable* or *unaffordable* based on local economic conditions.

Integration of Data Sources: The integration of these datasets allows for comprehensive cross-validation. The Broadband Serviceable Location and Broadband Map identify which ISPs serve each CBG and supply the universe of addresses for the Broadband-Plan Query Tool queries. BQT then extracts actual plan offerings from ISP websites for a sample of addresses within each serviceable area. Finally, the American Community Survey provides the economic context necessary to evaluate the affordability of these offerings.

Geographic Selection

This study examines broadband availability and affordability across ten localities in Virginia—six counties (Pittsylvania, Halifax, Rockbridge, Loudoun, Fauquier, and Albemarle) and four independent cities (Portsmouth, Martinsville, Harrisonburg, and Richmond). These areas were purposely selected to represent the state’s diverse socioeconomic, geographic, and infrastructural landscape, encompassing a range of suburban markets, urban centers, and rural communities. By combining these varied settings within a single analytical framework, the study provides a balanced and representative view of broadband affordability in Virginia.

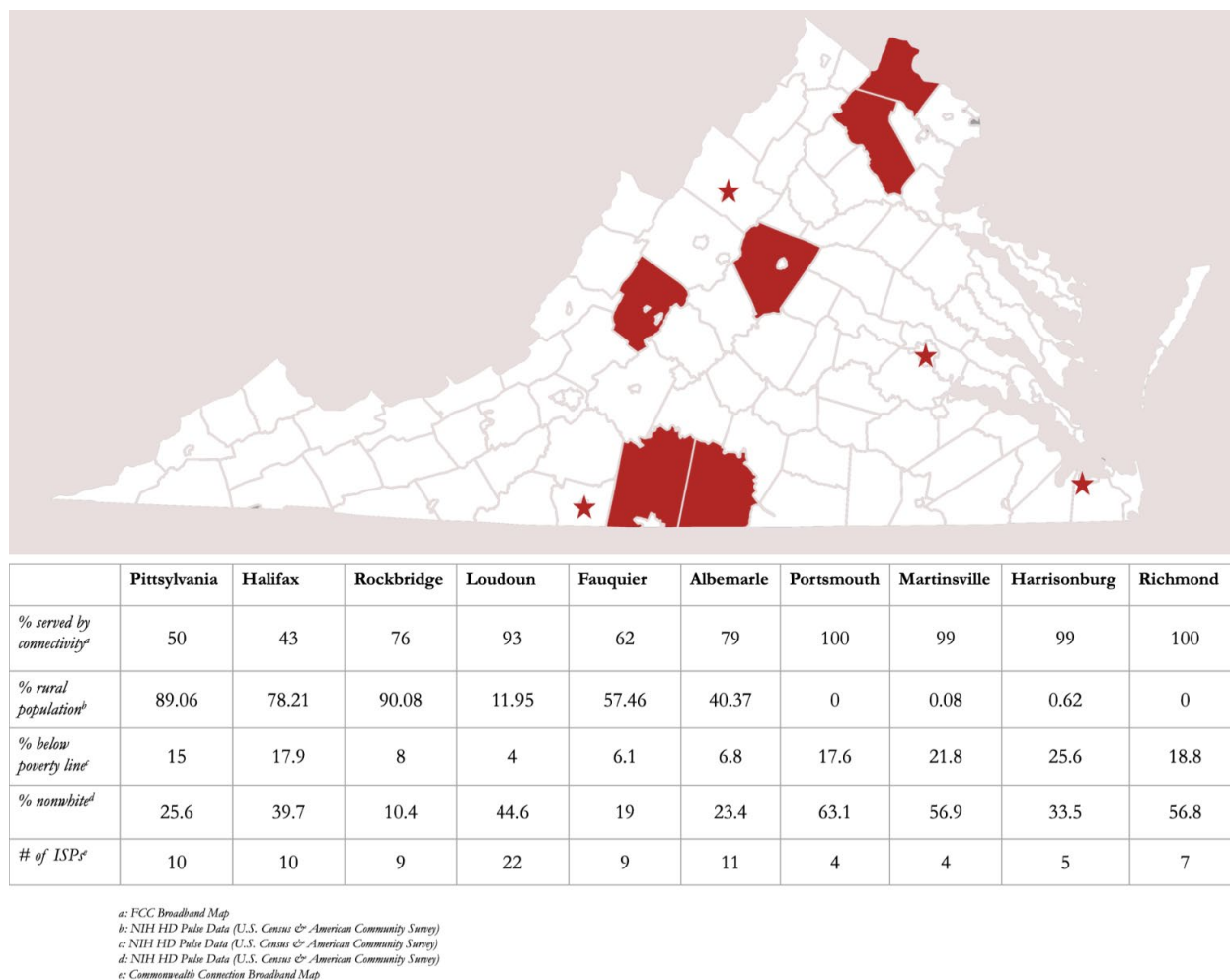


Figure 2: Virginia Localities Sampled for Study

The chosen counties and cities also differ substantially in population density, racial composition, and local market structure. For example, Loudoun County—a high-income, urbanized locality in Northern Virginia—features extensive fiber deployment and a dense competitive market, while Halifax County represents a lower-income, predominantly rural region with limited provider presence and heavier reliance on fixed-wireless access. Portsmouth and Richmond serve as urban examples with complex socioeconomic variation, and Martinsville and Harrisonburg reflect small-city contexts where competition and affordability differ markedly. This diversity allows the analysis to generalize findings about affordability thresholds and rate regulation beyond individual communities, while also highlighting regional disparities that may require targeted policy interventions.

The study focuses on two dominant classes of residential broadband technologies: wireline (including fiber, cable, copper, and DSL) and fixed-wireless access (FWA). Wireline networks remain the primary mode of broadband delivery in most of Virginia and account for the majority of household subscriptions. However, FWA is expanding rapidly, especially in rural and exurban markets, making it a critical complement in evaluating both coverage and affordability.

Together, these ten localities encompass a mix of market structures, high- and low-income communities, and urban and rural geographies, with the aim of reflecting the structural diversity of Virginia's broadband ecosystem. They also align with existing state and regional broadband initiatives—such as the Virginia Telecommunications Initiative (VATI) that prioritize equitable access and affordability across varying infrastructure conditions.

Sampling Strategy within Localities

The data collection approach used for this study builds upon the framework established in previous studies using the Broadband-Plan Query Tool, and developed to ensure statistical representativeness, completeness, and reproducibility across different market conditions. Within each locality, we identify all census block groups using the U.S. Census Bureau's geographic boundaries. For every census block group, the FCC's National Broadband Map is used to determine the list of major Internet Service Providers (ISPs)—including both wireline (fiber, copper, cable, DSL) and fixed-wireless (FWA) operators—advertising residential broadband service. The list includes large national providers (e.g., Xfinity, Verizon, Spectrum) and regional ISPs (e.g., Lumos, Ting, RiverStreet Networks, and others).

For each ISP–census block group pair, 30 residential addresses are randomly sampled from the Broadband Serviceable Location (BSL) Fabric. This sampling density balances precision and scalability. Collecting roughly 30 samples per census block group is statistically sufficient to estimate average plan prices and availability with stable confidence intervals—adding substantially more samples would yield diminishing returns in accuracy. At the same time, this number remains computationally efficient, allowing consistent data collection across thousands of census block groups–ISP combinations statewide. The use of multiple addresses per block group also introduces spatial diversity, ensuring that the results capture any localized variation in plan availability within neighborhoods. Together, this approach produces broadband data that are both representative and statistically reliable, while keeping the statewide analysis tractable.

These addresses serve as input queries for the Broadband-Plan Query Tool, which navigates to the ISP's website to retrieve information on available plans, prices, and speeds. As noted above, BQT employs

automated re-querying to ensure that a minimum of 30 samples are successfully collected for each ISP–census block group pair. This ensures that every data point reflects a genuine residential address with verified service availability information.

Overall, this study covered ten localities encompassing 897 census block groups (CBGs), served by approximately ten wired and fixed wireless ISPs. Using the Broadband-Plan Query Tool, we collected around 62,000 data points, ensuring 30 samples for each combination of census block group and wired or fixed wireless ISP serving that block group.

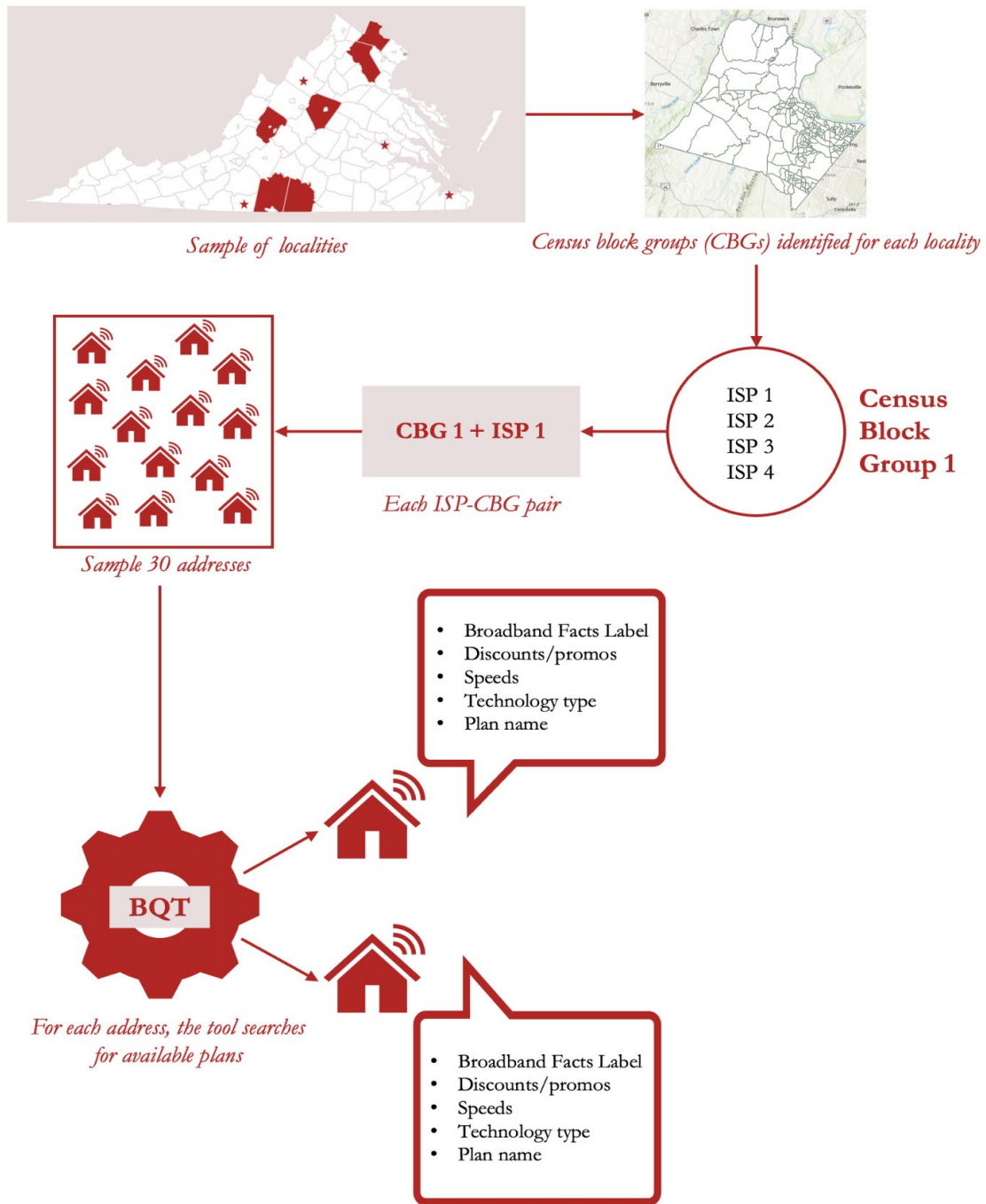


Figure 3: Visualization of the Broadband-Plan Query Tool Process

Captured Data and Price Treatment

For every plan returned by the ISP's website, BQT extracts the following attributes:

- **Broadband Facts Label price:** the base monthly price that ISPs are required to disclose under the FCC's Broadband Facts regulation. This price represents the **standard, undiscounted cost** of the plan that consumers pay after any initial promotions expire.
- **Discounted or promotional price:** if present on the ISP's website, BQT captures the temporary or conditional discounts offered to new customers or specific eligibility groups (e.g., military, low-income, student).
- **Download and upload speeds, technology type, and plan name.**

Each address-level result is tagged with its geographic identifiers (CBG, tract, and city) and the technology category (fiber, cable, DSL, or FWA). The data are then aggregated at the census block group level for analysis. To maintain consistency across providers, discounted prices are analyzed separately from label prices. The label price serves as the benchmark for assessing affordability, since it reflects the sustained cost of service that consumers would bear after any introductory promotions end. Promotional or discounted prices, while useful for understanding short-term market behavior, are treated as complementary statistics.

Defining "Low-Cost" Plans

To evaluate affordability, each census block group's broadband plan prices are compared against an income-based affordability threshold derived from the 2019–2023 American Community Survey (ACS). Following FCC guidance, this study defines the affordability threshold as 2 percent of the disposable income for households at the 20th income percentile within that census block group. Plans with costs below this threshold are deemed *affordable*.

For each ISP–census block group pair, the “low-cost plan” is defined as the cheapest plan whose advertised download speed is more than 100 Mbps—a threshold widely recognized as the minimum adequate capacity for a modern household supporting work, education, and entertainment simultaneously. If no plan satisfies the 100 Mbps threshold, the plan closest to 100 Mbps is treated as that ISP's “low-cost plan” for the census block group. Among all ISPs serving a census block group, the one offering the lowest-priced 100+ Mbps plan (i.e., the cheapest option among all providers meeting the standard) is used as the representative “low-cost” provider for that area.

Interviews

Subject matter expert interviews were conducted between July and October 2025 and included representatives from ISPs and industry professional bodies, staff from community organizations, such as libraries, charities, and community action agencies, serving residents with lived experience of digital exclusion, and independent broadband consultants involved in the digital opportunity planning process (for a list of interview numbers and categories, please see the acknowledgements at the end of the report). Interviews were semi-structured; they followed a general list of topics, but specific questions varied based on the SME's particular area of expertise and/or themes that emerged in the course of the interview itself. Interviews focused primarily on affordability, broadband pricing, device access, and skills or literacy barriers to digital inclusion. They have been used to provide contextual understanding and illustrative examples of affordability and adoption issues and to add descriptive depth to the quantitative findings. Interview data were analyzed by reviewing transcripts to identify salient themes and representative quotes, rather than through systematic coding.

Limitations

Broadband-Plan Query Tool (BQT)

Not all ISPs maintain a queryable web interface, which constrains BQT coverage. For instance, providers such as Brightspeed and certain regional cooperatives require customers to contact sales representatives to verify availability; these ISPs could not be queried automatically and so fall outside the scope of this dataset. Similarly, a small number of rural or cooperative ISPs in Virginia operate on closed or semi-private systems that are not publicly queryable, limiting their representation in the dataset. Moreover, some ISPs do not display special qualifying offers through their primary interface, and so these specific plans fall outside the scope of the BQT's coverage. If, for example, an ISP offers a special low-cost plan to qualifying consumers but requires those consumers to navigate to a special website and verify eligibility before subscribing to a plan, then those plans are beyond BQT's reach. Finally, some ISPs do not display available broadband plans to existing subscribers, limiting BQT's ability to extract representative samples in regions where those ISPs already have high adoption rates.

Satellite broadband providers (e.g., Starlink, HughesNet) were also excluded from the study because their offerings and pricing are not spatially differentiated at the census block group level, and their service characteristics (latency, data caps) make them poor comparators for fixed broadband.

Likewise, it is important to emphasize that BQT measures advertised availability and price, but does not measure actual, delivered performance.

Nonetheless, the tool offers the most transparent, reproducible, and scalable mechanism currently available for assessing broadband affordability from a consumer's perspective. BQT has demonstrated its reliability and policy relevance across several large-scale applications. It has supported the FCC's BEAD challenge process by providing independent verification of service availability claims, contributed to studies on digital discrimination and plan disparities across income levels, and enabled evaluation of the Connect America Fund (CAF) by revealing that a significant fraction of federally subsidized addresses do not receive service at promised speeds. These prior deployments underscore the tool's unique value for both researchers and policymakers: it provides an independent, scalable means of observing the real broadband marketplace without relying on self-reported data.

The analysis is focused on residential broadband offerings; business, enterprise, or institutional connectivity services fall outside the scope of this research. Finally, although the selected localities reflect substantial socioeconomic variation, the study does not aim to analyze broadband adoption or usage behavior, which depend on additional household-level factors (e.g., digital literacy, device ownership) that are beyond the current data's scope.

Data Sources

While the Broadband Serviceable Location Fabric and National Broadband Map offer unprecedented geographic precision, both rely on data supplied by ISPs and are thus susceptible to errors in service reporting or address classification. Some serviceable locations may be misaligned with ISP coverage footprints, leading to occasional missed queries or false negatives in the Broadband-Plan Query Tool results. In addition, ACS income data are aggregated at the block-group level, which may obscure within-group income variation and yield modest uncertainty in affordability thresholds, particularly in highly heterogeneous areas.

Despite these constraints, the combined use of these datasets provides a robust, transparent foundation for analyzing broadband affordability and market structure. Put simply together, these layers, combined, enable a unique bottom-up analysis that links what the broadband plans are advertised in a location to what local households can afford.

Use of AI

Several AI tools were used while conducting research for this study. Interviews were mostly conducted via video call on Google Meet, and transcripts were initially generated by Gemini AI (the built-in AI assistant for Google Meet) and subsequently checked by a human researcher. Claude (Anthropic) and CoPilot (Microsoft) were used to assist in web searching and identifying references for inclusion in the

literature review. NotebookLM (Google) was used to assist in searching within a defined collection of articles, reports, and news stories that had been curated by a human researcher. Perplexity (Perplexity, Inc.), Grammarly (Grammarly, Inc.), and ChatGPT (OpenAI) were used in some sections for editing purposes (e.g. to check grammar). AI tools were not used for report outlining or writing.

Study Advisory Group

JCOTS convened an academic advisory group to support the study by providing additional expert insight and reviewing project objectives and deliverables. The advisory group met online four times over the course of the study and reviewed documents asynchronously. Members of the advisory group are also making presentations to the Commission on various aspects of the study topic between October and December 2025. The Advisory Group members are Dr. Christopher Ali, the Pioneers Chair in Telecommunications and professor of telecommunications at The Pennsylvania State University; Dr. John Horrigan, Senior Fellow at the Benton Institute on Broadband & Society; Dr. David Nemer, Assistant Professor in the Department of Media Studies, and an Affiliate Faculty in Anthropology and the Latin American Studies program at the University of Virginia; and Dr. Bianca Reisdorf, associate professor in the Department of Communication Studies at the University of North Carolina – Charlotte.

Findings and Discussion

The sections that follow present key findings and analysis from the Broadband-Plan Query Tool (BQT) study, which systematically queried broadband plan availability and pricing across ten Virginia localities, representing nearly 900 census block groups and ten ISPs. By emulating consumer searches from diverse geographic areas, BQT generated approximately 62,000 address-level data points to reveal the real-world affordability of low-cost plans offered by both wired and fixed wireless providers.

The key findings from this study are listed below.

- **Affordability Benchmark**
 - Using the 2% income threshold for the 20th percentile of disposable income, broadband priced at \$30/month is affordable for roughly 93% of Virginia’s population—a threshold that aligns with the federal Affordable Connectivity Program (ACP).
 - Raising the cap to \$50/month leaves about half of the population in unaffordable territory, while lower thresholds expand affordability coverage statewide.

- **Rate Regulation and Policy Target**

- Regulating low-cost broadband at \$30/month for a minimum 100 Mbps plan would provide a clear, equitable affordability standard across Virginia.
- This price point ensures affordability for most Virginians without major distortion of provider incentives, while remaining administratively simple for state implementation.
- For a small subset of communities, complementary local subsidies or bridge programs (such as the one in Albemarle) would still be needed to reach full affordability.

- **State of Broadband Offerings**

- Most ISPs offer *low-cost plans* well above the \$30 target.
- Xfinity is the most affordable low-cost service provider in roughly 81% of census block groups, yet its entry-level plan starts at \$50/month.
- AT&T and Verizon Fixed Wireless have extensive coverage but are the cheapest low-cost service provider in only around 7.37% and 0% of census block groups, respectively.
- Verizon (wired) shows the largest variation in low-cost pricing, ranging from \$60–\$85 per month.

- **Accessibility of Low-Cost Plans**

- Even when affordable options exist, they are often hard to find or unavailable on ISP websites.
- Earlier, Comcast's *Internet Essentials* plan was not listed alongside standard options, though this has now been corrected. In contrast, Riverstreet and Verizon require users to call customer service to learn about affordable options, creating friction for low-income and digitally limited households.
- Cox stands out as a positive example, listing affordable offerings prominently and transparently.

- **Market Competition**

- The majority of studied areas are competitive markets (three or more ISPs), but competition has little impact on affordability.
- ISPs rarely adjust *low-cost plan* prices based on competition.

- **Fixed Wireless Access (FWA)**

- FWA services have not improved affordability in most markets. In 90% of census block groups where both wired and FWA providers are present, FWA is \$10–\$60 more expensive with lower average speeds (typically 85–300 Mbps).

Validating the Representativeness of the Study Localities

The selected localities (see Methodology above) were chosen to capture a wide range of demographic, economic, and infrastructure conditions that jointly shape broadband access. They vary along key dimensions such as population density, racial composition, income distribution, and poverty rates, as well as the number and type of Internet service providers (ISPs) operating in each market. For instance, the sample spans affluent and well-served Northern counties like Loudoun (93% served; 44% non-white; 4% below the poverty line; 22 ISPs) and rural Southside counties such as Halifax (43 % served; 40 % non-white; 18 % below the poverty line; 10 ISPs). It also includes mixed-urban localities in the Central and Hampton Roads regions—such as Richmond City (100% served; 57% non-white) and Portsmouth (100% served; 63% non-white)—as well as smaller Valley counties with high rural shares, such as Bath and Rockbridge, where broadband deployment remains uneven despite multiple providers. Collectively, these localities capture Virginia’s regional heterogeneity—from dense metropolitan corridors with competitive fiber and cable markets to sparsely populated rural regions dependent on fewer providers and legacy DSL and fixed-wireless networks.

This selection was validated statistically by comparing the distribution of affordability thresholds—defined as 2% of monthly disposable income for the bottom 20% of households—from the 2019–2023 American Community Survey (ACS) across all Virginia census tracts with the distribution computed for tracts within the ten study areas. The resulting cumulative distribution curves (see Figure 4 below) closely overlap, indicating that the income-based affordability profile of the ten study localities mirrors that of the Commonwealth overall.

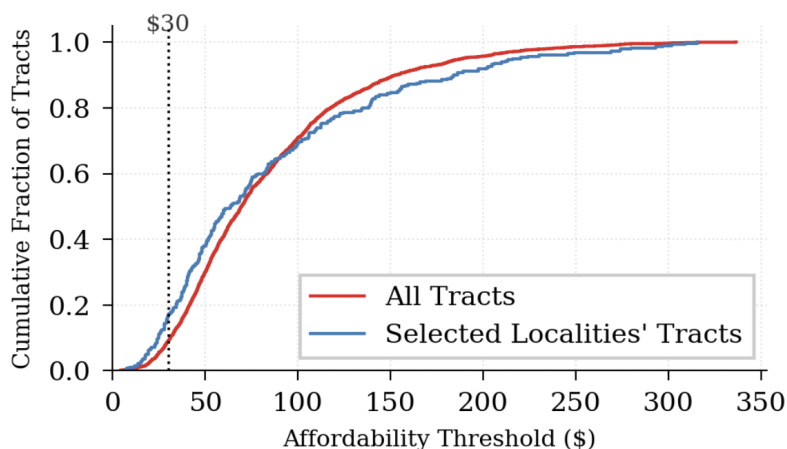


Figure 4: Distribution of Affordability Thresholds: Comparison of Sample Localities and all Virginia Census Tracts

Each line in the figure represents the cumulative share of census tracts in which the affordability threshold (horizontal x-axis) does not exceed a given dollar value. The x-axis shows the affordability threshold for a census tract—defined as 2% of the monthly disposable income of households at the 20th percentile—while the vertical y-axis represents the cumulative fraction of tracts *not* meeting that threshold. We use census tracts as the unit of analysis because they provide the finest geographic granularity for which reliable income distribution data are available in the American Community Survey. The red line corresponds to all census tracts in Virginia, and the blue line reflects tracts within the ten study localities. The close alignment of these two curves suggests that the ten localities collectively capture the statewide distribution of affordability thresholds.

Key finding:

The overlap in income profiles, market structures, and ISP competition patterns suggests that findings on affordability and access in these localities can be generalized to statewide policy discussions. The ten study areas capture Virginia’s demographic, economic, and market diversity, spanning differences in income, race, rurality, and provider competition. This representativeness provides a strong foundation for the analyses that follow and supports using these results to inform statewide affordability benchmarks and policies aimed at closing the Commonwealth’s remaining digital divides.

Determining the Right Rate for Low-Cost Broadband Plans

The central question for addressing broadband affordability is to define what constitutes an affordable, low-cost broadband plan. As noted above (see Introduction), policymakers have widely converged on a standard of 100 Mbps (download) / 20 Mbps (upload) as the minimum bandwidth required for work, education, entertainment, and other connectivity needs. But when is a 100 Mbps plan truly *affordable*? Policymakers and researchers generally use a common benchmark: broadband is considered affordable when its monthly cost does not exceed 2% of a household's disposable income. Using this standard, and household income data from the 2019–2023 American Community Survey (specifically the 20th-percentile income level), we estimate affordability thresholds for every census tract across Virginia.

Figure 4, above, illustrates how many census tracts would fall below or above these thresholds at different price points. However, census tracts vary widely in population—affluent areas tend to be densely populated, while tracts with poor affordability are often sparsely populated. This means that treating every tract equally can exaggerate affordability challenges by giving more weight to places where fewer people live.

To better reflect the lived reality of Virginians, Figure 5 instead weights each tract by its population. In simpler terms, rather than asking “*how many tracts*” can afford broadband at a certain price, it considers “*how many people*” can. The resulting curve shows, from left to right, the share of Virginians who could afford broadband at different price points—\$15, \$30, \$50, and so on. For example, a point on the curve at \$30 shows the percentage of the population for whom broadband would be affordable at that price.

The resulting curve provides some critical insights. Perhaps intuitively, Figure 5 demonstrates that a monthly price of \$300 is affordable for practically no one. Likewise, the analysis shows a distinct inflection around \$30 per month, where affordability coverage becomes nearly universal: At \$30 per month, broadband would be affordable for approximately 93 percent of total population. Prices below this point extend affordability only minimally. Yet many families cannot afford prices above this threshold: \$50 per month, for example, exceeds the income-based affordability threshold for over 35% of the Commonwealth's population. Hence, a standard plan that offered households 100 Mbps connectivity at \$30 per month would ensure widespread affordability.

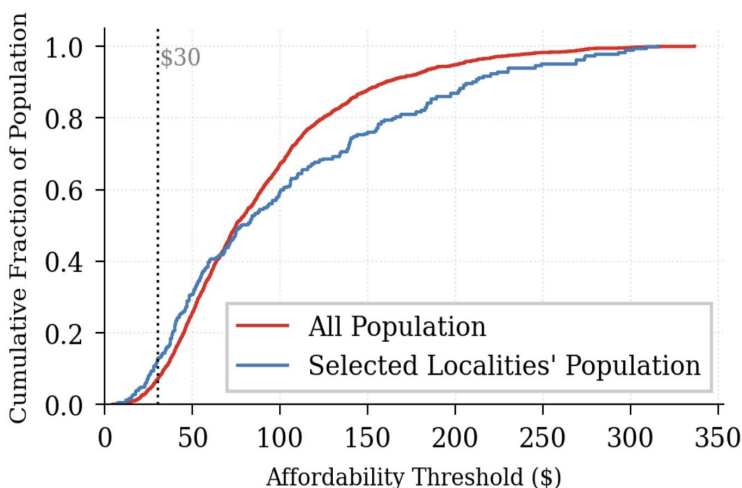


Figure 5: Comparison of Affordability by Population for Virginia and Sampled Localities

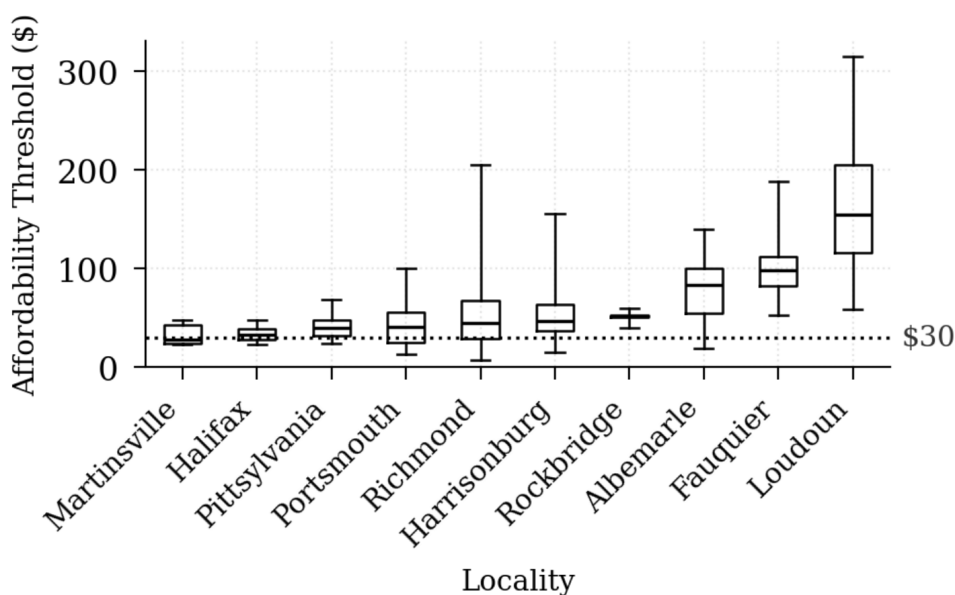


Figure 6: Comparison of Affordability by Population for Virginia and Sampled Localities

Figure 6 illustrates the distribution of the *affordability threshold* across the ten studied localities. The x-axis lists the localities, while the y-axis represents the affordability threshold (in dollars). For each locality, the figure summarizes the variation in affordability thresholds across census tracts using box plots. Each box represents the interquartile range (IQR)—the middle 50 percent of values—with the horizontal line inside denoting the median affordability threshold. The whiskers capture variability outside this range, and points beyond them indicate outliers.

The entire population in certain localities, such as Rockbridge, Fauquier, and Loudoun, lies above the affordability threshold, suggesting that setting a \$30 target price for a low-cost plan could be sufficient to ensure universal broadband affordability in these regions. In contrast, other localities display wider variability, with portions of their population falling below the affordability line. These disparities underscore the need for targeted interventions in areas where affordability gaps persist.

In principle, such findings could motivate regionally tailored affordability programs. For instance, in 2022, Albemarle County’s Broadband Accessibility and Affordability Office launched the “ACP Bridge Program” to assist households most in need. This program supplemented the federal ACP’s \$30 subsidy with an additional \$20 per month for eligible residents, effectively bridging the affordability gap for lower-income households. Extending such locally adaptive programs to a broader set of regions could help ensure affordable broadband access for an even greater share of the population, particularly in communities where affordability thresholds vary significantly across census tracts.

Interviews with ISPs highlighted one of the strengths of the ACP being the federal validation process, which determined and verified eligibility of households for the subsidy. ISPs reported that the clear validation procedure, managed by the federal government, alleviated any burden on providers to qualify customers for the program. In the absence of ACP, several ISPs suggested that states could implement their own subsidy programs, set qualification standards, and—crucially—manage the validation process for customers. As one ISP put it, “If the federal government is validating it, great. They bring their certificate, we’re done. Or if the state of Virginia is validating, great. Bring their certificate and we’re done. If the validation is on the ISP, that’s going to be one of the biggest predictors of ISP participation—like, how broad the criteria are and how hard it is for the ISP to verify that.” Another way of approaching the validation challenge, however, would be to simplify the process of qualifying for a low-cost plan by stipulating a low-cost threshold for which any household is eligible, without needing to prove qualification. This would not only alleviate any burden on providers to qualify low-income households, but it would also avoid shifting the administrative burden of validation onto the state.

Key finding:

Broadband connectivity at \$30 per month would be affordable for approximately 93% of the Commonwealth's population. Many ISPs aligned their low-cost plan offering with the \$30 ACP subsidy when it was available, effectively making their lowest cost plan free for low-income households. In the absence of ACP, states have several options, including implementing a state-level subsidy. However, challenges with ACP, such as lack of awareness among low-income qualifying households, and the need for a robust government-managed validation process, mean that this may not be the most straightforward solution. An alternative approach would be to legislate a low-cost plan threshold in which any customer could enroll.

Affordability of Existing Low-Cost Broadband Plans

Having established the \$30 per month benchmark as an optimal affordability threshold, the next question is whether such low-cost plans are actually available to Virginians today and to what extent existing market offerings align with this benchmark. This analysis provides a bridge between affordability targets and real-world plan availability, offering a view of the gap between current market offerings, as observed using the Broadband-Plan Query Tool, and a desired level of broadband affordability.

Each dot in the statewide frontier plot (Figure 7) represents a single census block group (CBG) within the ten study localities. For every CBG, we identify all Internet Service Providers (ISPs) queryable with BQT that offer residential broadband service and select the plan with a download speed is closest to 100 Mbps (the FCC's current minimum threshold for broadband connectivity), designating it the available "low-cost plan." In some cases, the lowest cost available plan collected by BQT will be at a higher speed threshold, such as 200 or 300 Mbps. If this is the lowest cost plan *and* the closest to 100 Mbps minimum threshold, it is the plan that is sampled and displayed in the figures below.

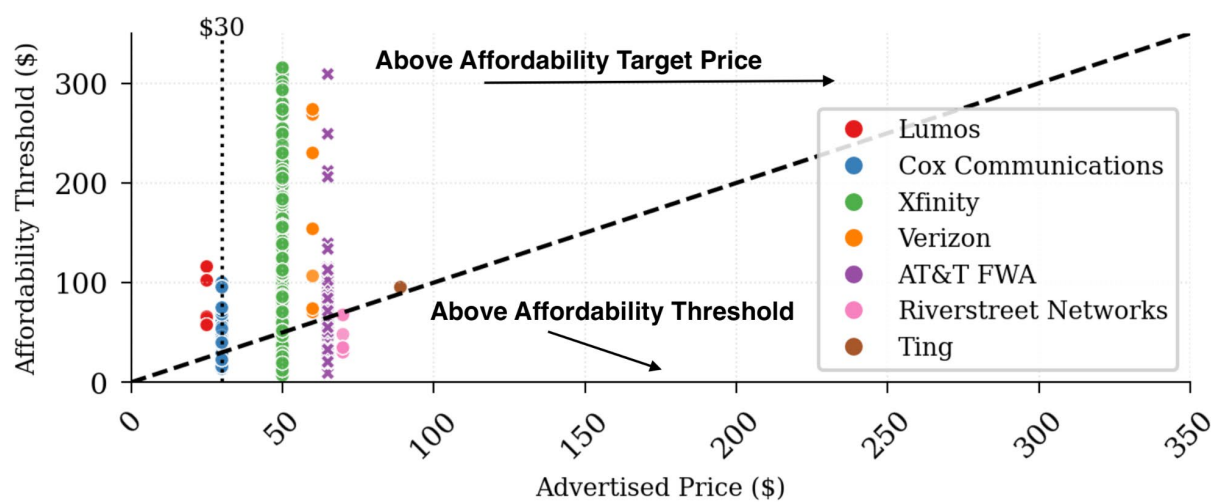


Figure 7: Frontier plots illustrate the current state of broadband affordability in Virginia, with each dot representing a census block group (CBG). The x-axis shows the price of the cheapest low-cost plan, and the y-axis shows its affordability threshold. The vertical line at \$30 marks the target price, while the diagonal line denotes the affordability frontier. Dot colors indicate the provider offering the lowest-cost plan for each CBG. CBGs to the right of the \$30 line would be subject to rate regulation, while those below the diagonal represent areas where low-cost plans are currently unaffordable and would benefit from such regulation. CBGs above the diagonal are already affordable and thus unaffected.

Among all ISPs serving a given CBG, we select the lowest-priced qualifying plan and plot it against that CBG's income-based affordability threshold (derived from the American Community Survey as 2 percent of monthly disposable income for the bottom 20 percent of households). In the plot, the x-axis denotes the mean advertised price of cheapest low-cost plan in a census block group, and the y-axis shows the census block group's affordability threshold. The dotted vertical reference line is set at the \$30 mark, which, as discussed above, represents a price point that would be affordable to 93% of the population. All points to the right of this \$30 line correspond to census block groups where no provider offers a low-cost plan that meets this general affordability target. The dashed diagonal line represents the "affordability frontier": points above this diagonal line indicate census block groups where at least one provider offers a low-cost plan that meets the 2% target for that census block group, while points below indicate census block groups where all available low-cost plans are more expensive than the affordability threshold.

At the statewide level (Figure 7), the pattern is striking: very few census block groups examined using BQT have access to a sub-\$30 broadband plan, and approximately 41.2 percent of Virginia's census block groups lack access to any plan meeting their income-based affordability threshold. This underscores the gap between theoretical affordability (as discussed above) and actual market outcomes.

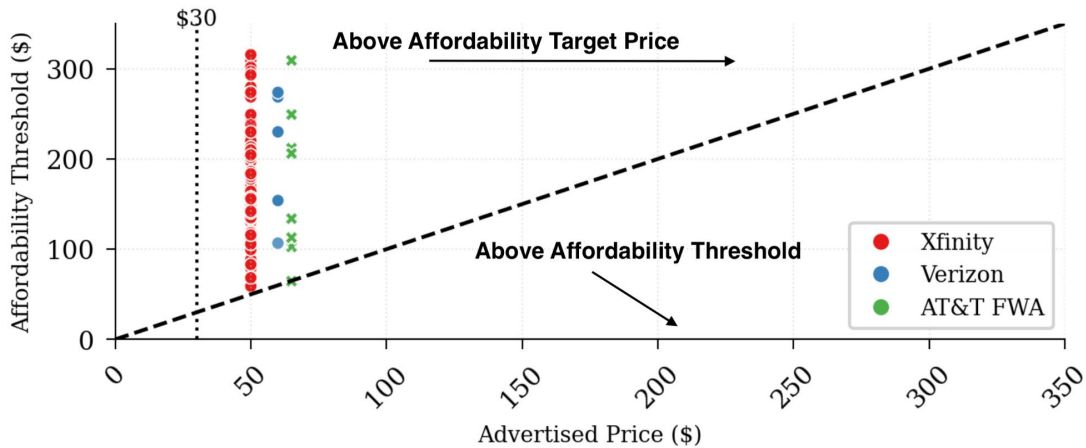


Figure 8: Frontier plots for Loudoun. Though all CBGs are above the \$30 target price, the current low-cost plans, served by Xfinity, Verizon (and Verizon FWA), and AT&T FWA, are below the affordability threshold, i.e., affordable.

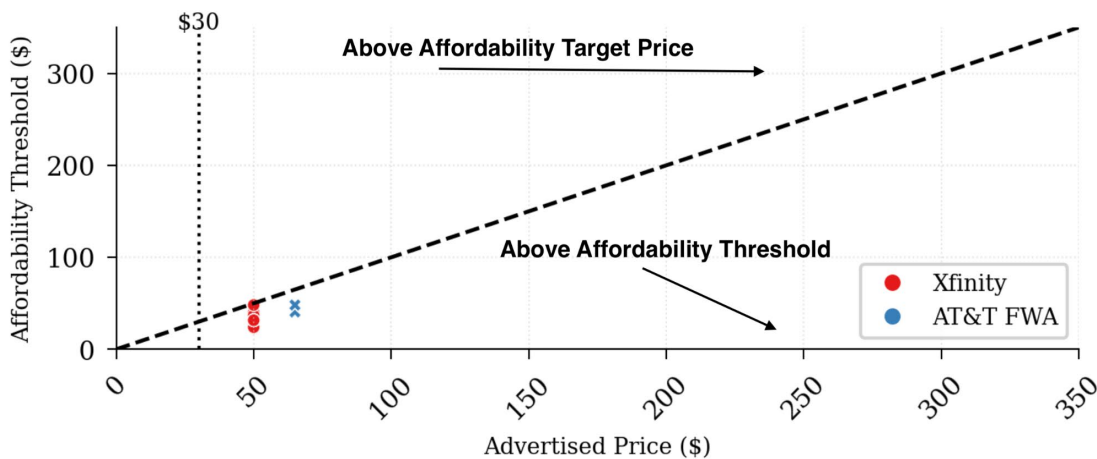


Figure 9: Frontier plots for Halifax. Though all CBGs are above the \$30 target price, the current low-cost plans, served by Xfinity, Verizon FWA, and AT&T FWA, are above the affordability threshold, i.e., unaffordable.

Disaggregating the frontier plots by city (Figures 8 and 9) reveals pronounced heterogeneity across Virginia's broadband landscape. In Loudoun County, one of the more affluent and well-served localities in the study sample, the majority of households already have access to plans that are effectively affordable, given the relatively higher incomes in the county. In sharp contrast, Halifax County shows the opposite extreme: nearly all census block groups fall beyond the frontier, with plan prices exceeding local affordability thresholds. Here, even moderate-income constraints amplify the affordability gap, demonstrating that lower-cost offerings would benefit lower-income and more diverse communities the most.

These findings reinforce the potential value of establishing price and quality standards for low-cost broadband connectivity, ensuring that residents of the Commonwealth can purchase 100 Mbps service at an affordable price, regardless of where they live. Such standards can offer an effective policy lever, ensuring that households in lower-income and/or rural regions will experience substantial the largest relative affordability gains, while having little effect on wealthier regions or localities that are already well-served.

Key finding:

While broadband connectivity at \$30 per month would be affordable for approximately 93% of the Commonwealth's population, very few census block groups have access to a low-cost plan meeting this price point. And findings show that approximately 41.2 percent of Virginia's census block groups lack access to any plan meeting their respective affordability threshold (2% of disposable income). Importantly, what constitutes an "affordable" plan varies by locality because of different demographics. A plan that may be affordable using the 2% income threshold in one locality may not be affordable in another.

Market Structure and Affordability

To better understand the causes of this gap between affordable broadband prices and current market offerings, the analysis turned to an examination of market dynamics, including competitive dynamics as well as technology mix.

1. ISP	2. Coverage (%)	3. Market Structure (%)			4. Cheapest Low- Cost Plan (%)	5. Low-Cost Plan Download Speed (Mbps)	6. Low-Cost Plan Price (\$)
		M	D	T+			
Xfinity	80.5	3.2	8.4	68.8	81.4	300	50
AT&T (FWA)	84.8	0	6.1	78.7	7.37	90-300	65
Verizon (FWA)	65.1	0.2	2.9	61.98	0		
Verizon	44.3	0	0.9	43.4	0.79	300	60-85
Cox	9.0	0	0.7	8.4	9.18	100	30
Riverstreet Networks	4.8	0	0.1	4.7	0.45	100	70
Riverstreet Networks (FWA)	4.8	0	0.1	4.7	0		
Ting	1.8	0	0	1.8	0.11	1000	89
Lumos	1.1	0	0.1	1.0	0.68	300	25
All Points Broadband (FWA)	0.7	0	0	0.7	0		
All ISPs		3.4	27.1	69.5			

Table 1: Summary of coverage, competition, and low-cost plan details.

Specifically, to further examine such questions, Table 1 summarizes the coverage, competitive conditions, and low-cost plan details of all the ISPs across the ten study localities. Here, Column 1 lists all ISPs included in this study, sorted by their coverage across the ten localities analyzed. Column 2 reports each ISP's coverage—that is, the fraction of census block groups, out of the total 897 in the ten localities, that the ISP serves. The three sub-columns of Column 3 describe the market structure for each ISP, showing the fraction of census block groups where it operates as a monopoly (M), duopoly (D), or

in competition with two or more other ISPs (triopoly or more, or T+). The fractions in the sub-columns sum to each ISP's total coverage reported in Column 2. Column 4 indicates the fraction of total 897 census block groups where the ISP offers the most affordable (i.e., lowest-priced) low-cost plan.

Comparing Columns 2 and 4 highlights the imbalance between service coverage and affordability leadership. Some ISPs (e.g., Xfinity) consistently provide the most affordable plans where they operate, while others (e.g., AT&T Fixed Wireless) offer widespread coverage but rarely lead in affordability. In contrast, ISPs such as Cox have relatively limited coverage but tend to offer the most affordable low-cost plans wherever they are available.

The last row of the table summarizes the overall market structure across the studied localities, which is predominantly competitive—with three or more providers serving most census block groups (69.5%). Given this skew, it is difficult to isolate the effects of market structure on broadband affordability. However, two clear patterns emerge. First, Xfinity stands out as most consistently offering the lowest-priced low-cost plans where it operates, and its Broadband Facts Label price for those plans remains consistent across regions. Second, fixed-wireless providers such as AT&T and Verizon are widely present across the study area but generally offer lower-speed options than wireline providers. Specifically, AT&T's fixed-wireless plans range from 90–300 Mbps and cost about \$65 per month, while Verizon's highest fixed-wireless tier (around 1000 Mbps) is priced at \$99.99. Notably, neither provider consistently offers the cheapest low-cost plans (see Column 6).

Key finding:

Xfinity most consistently offers the lowest-priced low-cost plans where it operates, at \$50 per month. Fixed-wireless service from AT&T and Verizon is widely deployed across the study area, but generally offers service that is slower than that offered by wireline providers, and rarely offers the most affordable low-cost plans (see Column 6). Beyond these findings, the sample used in this study makes it difficult to isolate the effects of market structure on broadband affordability.

Accessibility of Low-Cost Broadband Plans

While affordability determines whether broadband service is financially within reach, accessibility determines how easily eligible households can find and enroll in those affordable plans. This review of ISP websites across the ten study localities revealed that low-cost broadband offerings remain inconsistently visible and, in many cases, difficult for consumers to locate or verify online.

For example, earlier versions of Comcast Xfinity’s website prominently displayed a range of standard residential plans but excluded its discounted offering for low-income households—the Internet Essentials plan—from the main comparison page. As demonstrated by the Broadband-Plan Query Tool data (Figure 10), Internet Essentials plans were also not readily surfaced by standard address queries in the ISP’s website interface, suggesting that users would have to search separately or navigate through multiple submenus to discover that such a program existed. Although Xfinity has since updated its website to include Internet Essentials alongside its standard plans (Figure 11), this improvement occurred only recently, underscoring how limited digital visibility can constrain adoption among the very populations these programs aim to serve.

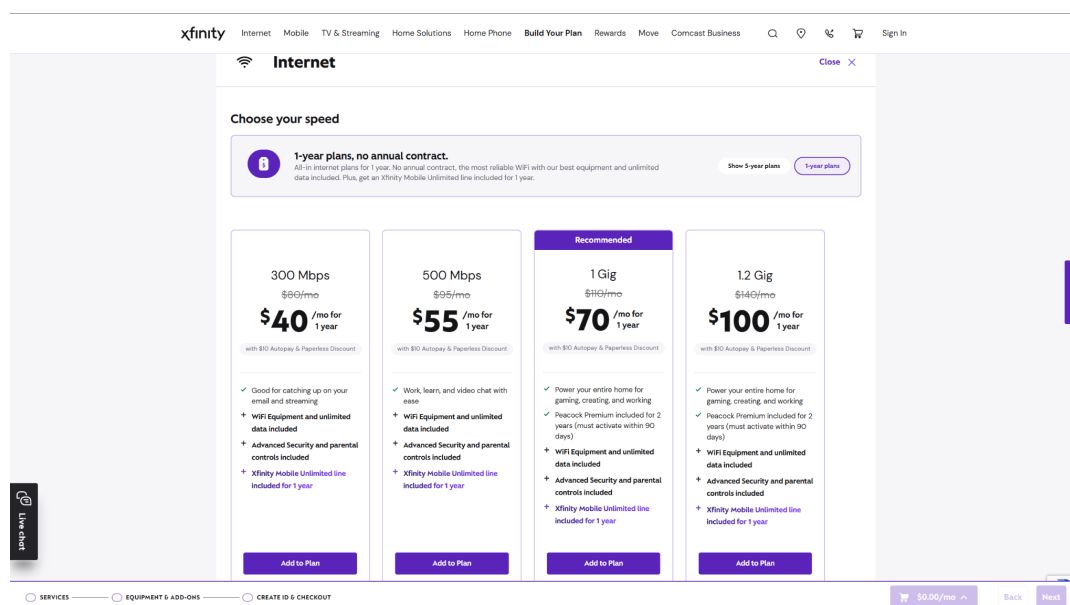


Figure 10: Xfinity website at the time of data collection (prior to report publication)

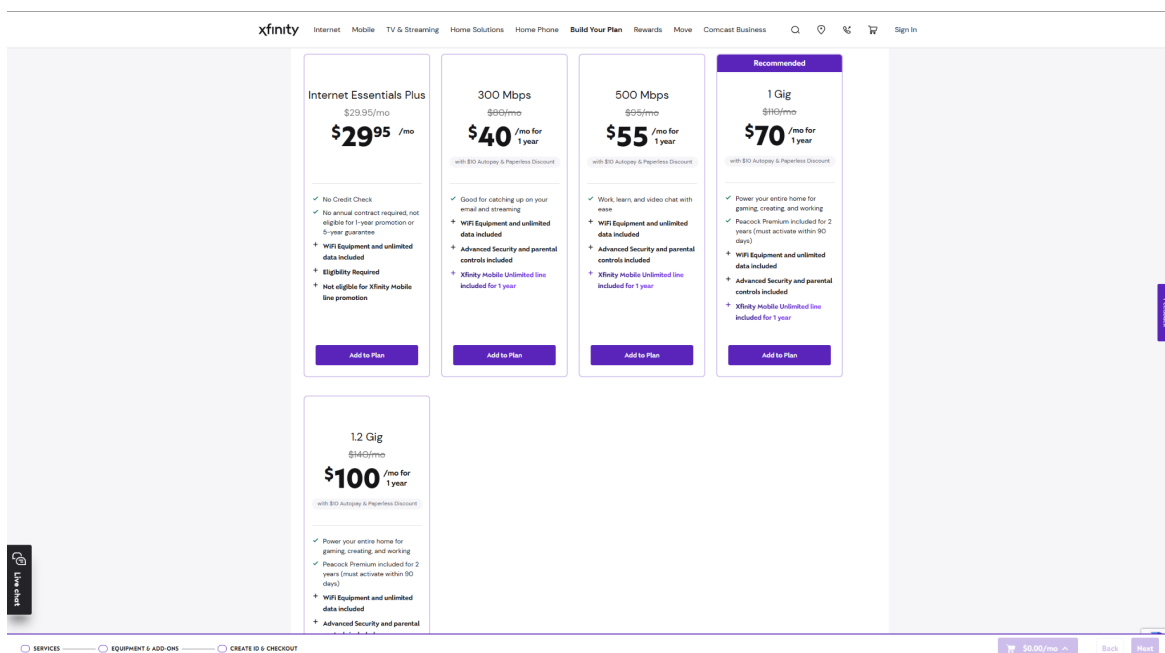


Figure 11: XFINITY website as of report publication

Other providers in our sample still follow less transparent practices. Verizon (Figure 12) and Riverstreet (Figure 13), for instance, provide no clear information about affordable options on their primary residential broadband pages. Instead, these ISPs require potential customers to call customer service or complete eligibility screenings before learning whether discounted plans exist at their address. This additional friction effectively makes affordable plans less accessible, as many consumers—especially those with limited digital literacy—are unlikely to persist through such steps.

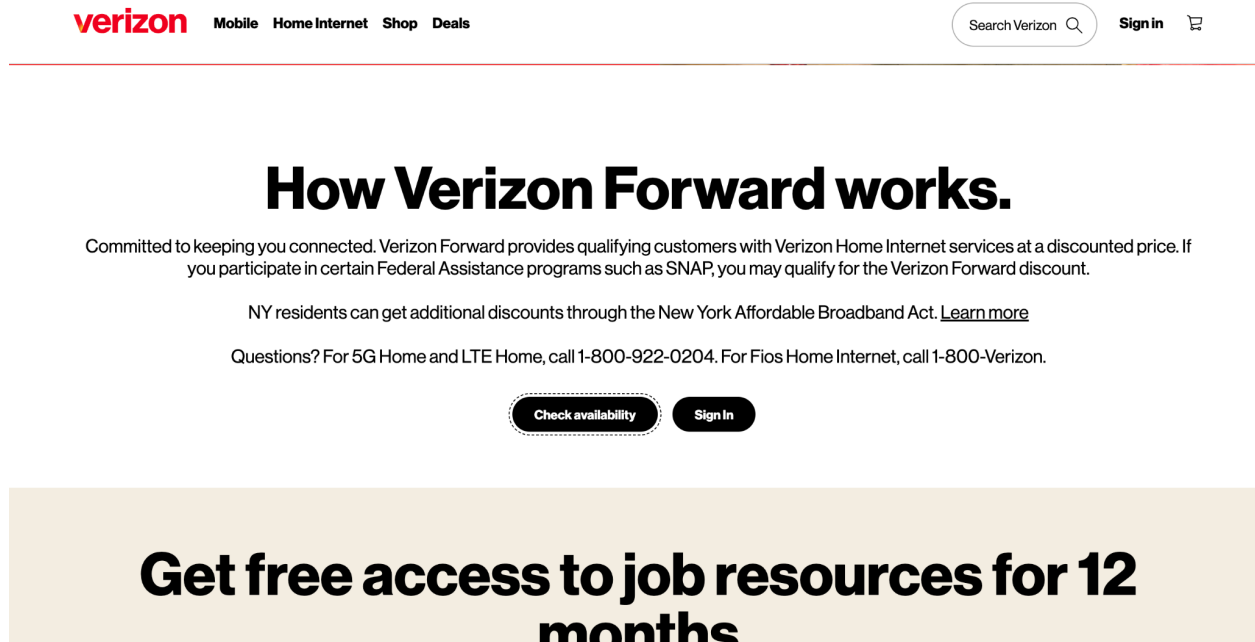


Figure 12: Verizon website

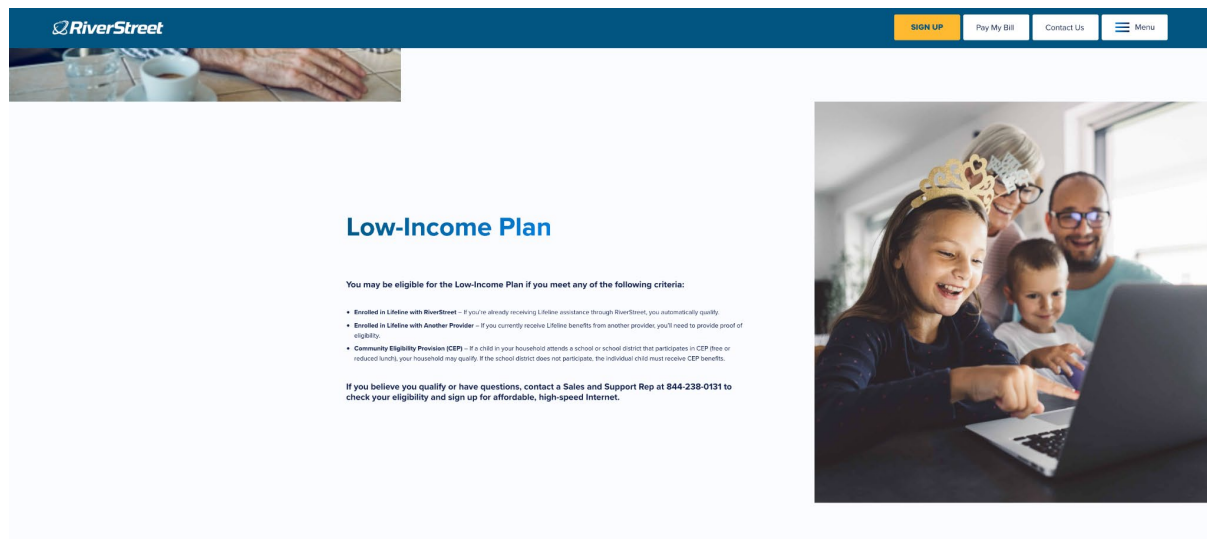


Figure 13: Riverstreet website

By contrast, some ISPs, such as Cox, clearly list their affordable offerings on their main broadband plan pages, with transparent pricing and eligibility information. Brightspeed, which advertises sub-\$30 plans according to interviews, also requires prospective customers to call for pricing options at their address, which adds an additional step and barrier to accessing the low-cost option. These examples demonstrate that accessibility is not purely a technical issue but a matter of policy design and consumer transparency.

Key finding:

Low-cost broadband offerings remain inconsistently visible and, in many cases, difficult for consumers to locate or verify online. This finding suggests that making low-cost broadband plans easily searchable, prominently listed, and equally visible with standard plans can significantly reduce barriers for eligible households and strengthen the effectiveness of affordability programs.

Device-Limited Access

Beyond the Broadband-Plan Query Tool analysis, interviews with community organizations surfaced other important insights about affordability in the Commonwealth. In particular, the limited access to appropriate and reliable devices consistently came up as a major component of the digital divide in Virginia, particularly affecting low-income and underserved populations. For many residents, especially in rural areas, purchasing a new, high-quality device like a laptop can be prohibitively expensive. Consequently, many households rely primarily on smartphones as their sole means of connectivity, often prioritizing the mobile service subscription over acquiring home internet or a secondary device.

One representative of a telecommunications trade association said, “I did hear a lot that people were using [the ACP subsidy] for their cell phone bill rather than bringing broadband into the household. When I heard that, that was really disappointing because in my mind it really wasn’t for cell phone coverage.” This observation suggests that low-income households, who were recipients of ACP, may have been device-limited broadband users, and it is also supported by official data from USAC: 55.9% of ACP subscribers nationwide signed up for mobile broadband (compared to 43.7% for fixed wireline broadband).¹⁰⁵

American Community Survey (ACS) data for Virginia indicates that around 11% of households have a cellular data plan with no other kind of internet plan. In some localities studied for this report, the number are even higher: nearly 26% in Pittsylvania and 21.8% in Halifax. There is also a notable gap between smartphone ownership and desktop or laptop ownership in different localities. For example, 72.4% of households in Rockbridge have a desktop or laptop versus 82.2% with smartphones.

Region	Estimated Total Households	Percentage of Computing Devices across Households				
		Desktop or laptop	Smartphone	Tablet or other portable wireless computer	Other computer	No computer
State						
Virginia	3,326,260	82	89.9	65.8	2.5	5.2
Counties						
Albemarle	45,064	86.8	90.1	68.9	7.6	4.4
Fauquier	26,266	84.5	91.1	72.2	2.3	4.8
Halifax	13,673	56.2	69.6	42.1	1.2	22.6
Loudon	140,823	94.1	96.0	81.5	3.0	1.1
Pittsylvania	24,633	64.4	79.4	44.2	2.1	13.9
Rockbridge	9,552	72.4	82.2	53.7	2.9	9.4
Cities						
Harrisonburg	17,331	76.6	91.2	57.8	1.4	5.2
Martinsville	5,619	63.2	83.9	44.5	5.1	11.1
Portsmouth	39,678	72.9	88.0	56.8	2.6	6.0
Richmond	102,145	79.0	89.5	58.7	1.8	6.6

Figure 14: ACS Data on Computing Devices Across Households in Virginia (5-year estimates, 2023)

Region	Estimated Number of Households with Internet	Percentage of Different Internet Subscriptions across Households					Cellular data plan with no other type of Internet subscription
		Dial-up with no other type of Internet subscription	Broadband of any type	Cellular data plan	Broadband such as cable, fiber optic or DSL	Satellite Internet service	
State							
Virginia	2,996,730	0.1	89.9	84	74.9	6.2	11.2
Counties							
Albemarle	41,188	0.1	91.3	84.4	73.9	6.2	13.6
Fauquier	23,982	0.2	91.1	85.9	61	15.2	16.3
Halifax	9,065	0.1	66.2	59.3	36	10.6	21.8
Loudon	136,185	0.1	96.7	89.7	87.9	5	6.5
Pittsylvania	18,725	0.2	75.8	68.5	39.8	10.2	25.9
Rockbridge	8,036	0.7	83.4	75.7	61	10.8	15.4
Cities							
Harrisonburg	14,479	0.1	83.5	78.8	71.5	4.2	10.0
Martinsville	4,633	0.0	82.5	64.5	64	5.2	14.4
Portsmouth	34,754	0.1	87.5	82.2	64.9	4.8	19.9
Richmond	86,808	0.1	84.9	80.3	72.3	4.5	10.5

Figure 15: ACS Data on Household Internet Subscriptions in Virginia (5-year estimates, 2023)

“I think the biggest trade-off we’ve seen is the subscription cost between mobile service and home internet. Because it’s almost like mobile service is internet I can take with me wherever I go. So why would I also pay to have, you know, a wire run to my house? It’s just the subscription costs. And I think there’s also the trade-off, too, of like, ISPs have an affordable plan, but it’s also not great, right? So why would I pay anything for something that’s not very good? So I think the main trade-off is really that mobile service versus home internet.”

- Subject matter expert from a community action agency serving covered populations

This reliance on mobile-only access creates immediate functional issues, as complex essential tasks—such as filling out multi-part government forms for social services (like housing vouchers or Social Security assistance), creating and submitting job applications, compiling resumes, or utilizing telehealth services—are either challenging or virtually impossible to complete effectively on a mobile device. One telehealth provider at a free clinic in northern Virginia noted that probably 95 to 97 percent of patients

have only a phone to access health services. Another non-profit provider of education support for school children observed that just doing basic tasks like uploading a PDF resume can be insurmountable on a mobile device for job-seekers.

“Have you ever tried to apply for a job on your phone? I haven’t, but it seems ridiculous. [...] I think sometimes we have this view that like, oh, if we just fix housing, we will solve this issue. If we just fix food, we’ll solve this issue. We interpret it a little more as a thousand tiny hurdles. [...] If you’re a single mom of three kids and, you know, you have to file some paperwork for housing, it’s really hard to do on your phone, and it’s really hard to do on your phone from a cafe or from a parking lot when you have to be so right.”

- *Subject matter expert from a non-profit serving covered populations*

Local organizations and public libraries function as crucial intervention points attempting to bridge this device gap. Libraries provide public computer workstations for residents who lack personal devices, often seeing usage concentrated in low-income areas or by patrons needing to print documents or apply for jobs. One library director in a central Virginia city observed, “I’m finding that everybody has one of these [holding up a mobile phone]. Even if you are a person in poverty, you can get one of these. And you may not have a data plan, but you can use it to get on the WiFi.” In addition to public computers, many libraries circulate mobile hotspots to provide connectivity that patrons can take home, especially in more rural areas where affordable and reliable access remains a barrier. For instance, a library director in southwest Virginia recounted in an interview how people often choose to use library hotspots rather than pay for internet service that is available at home because it is too expensive. However, sustaining these lending programs is difficult due to the expense of replacing devices that do not return or are damaged, making them a costly proposition for libraries. Non-profit organizations often distribute devices and sometimes couple device provision with digital skills training. Despite these efforts, programs to address device-limited access are largely reactive—responsive to observed local need—and sometimes suffer from inconsistent funding availability.

Key finding:

Many low-income residents reportedly rely on mobile plans and smartphones alone for internet access. While having access to one device and a mobile subscription can help bridge the absolute digital divide, it presents additional challenges and puts phone-only users at a frequent disadvantage.

Moreover, most contemporary broadband deployment and adoption initiatives do not focus on mobile coverage, cost, and adoption.

Policy Recommendations

Recommendation 1: Require mobile-responsive websites for essential services, starting with public sector and publicly funded services.

Study findings highlighted device access as a key affordability barrier for low-income households. Low-income households disproportionately rely on smartphones alone to get online and often opt to pay for mobile subscriptions over home broadband connections. Although these devices provide access to the internet, it is device-limited access, which also can result in device-limited digital literacy. Many everyday tasks that people need to complete online today are difficult to accomplish on a mobile phone, such as applying for jobs, filing taxes or housing paperwork, and accessing health data or telehealth services. While Virginia has strong accessibility requirements and Information Technology modernization initiatives, it lacks explicit statutory requirements for mobile-responsive design specifically tailored to mobile-only users.

- Consider requiring essential public services to ensure their public-facing websites and forms are fully functional on common mobile devices, with priority for critical transactions related to tax filing and payment systems, benefits applications, housing applications, healthcare appointment scheduling and patient portals, permit applications, and public records requests, for example.
- Consider including stipulations for mobile-responsive sites to function under variable network conditions.
- Consider applying these requirements to all state/local government agencies and departments, educational institutions receiving public funding, healthcare providers and facilities receiving public funding or reimbursement, and any entity delivering services on behalf of the state government through contractual arrangements.
- Consider a tiered compliance requirement, where new websites and digital services must be immediately compliant, redesigned sites or platforms must be compliant upon completion of the redesign, and legacy systems are allowed 2 years to comply.

- Policymakers may consider referencing the Connected Government Act (2018)¹⁰⁶ and the 21st Century Integrated Digital Experience Act (2018)¹⁰⁷ and associated guidance¹⁰⁸ on mobile-responsive or mobile-first service design.

Recommendation 2: Require accessibility for low-cost internet plans.

The findings from this study indicate that it may be difficult for consumers to find low-cost plans or plans targeted at low-income customers when they are shopping for broadband. These plans may not be readily advertised, they may be hosted on separate sub-pages of an ISP's website, or they may not be suggested to consumers when they enter their address into ISPs' broadband address tool to find availability and cost information. In some cases, consumers need to take extra steps, such as calling the ISP customer service number to find out about plan pricing. Making this information more readily available would help consumers make informed choices about available plans.

- Consider ensuring equitable access to affordable internet service by requiring Internet Service Providers (ISPs) to prominently display and actively promote low-cost broadband options that meet the FCC minimum broadband standard of 100 Mbps/20 Mbps.
- Consider requirements that ensure searchability by: Optimizing all low-income plan pages for search engine discovery; Including clear internal site search functionality that returns low-income plan information when users enter common search terms like “affordable,” “low-cost,” “discount,” or “assistance.”
- Consider requiring low-cost plans to be displayed to consumers who enter their address into ISP websites' broadband address tools to identify broadband availability at their address.
- Consider ensuring that it is not required for customers to enter their service address before viewing low-cost plan options.
- Consider implementing point-of-sale requirements that would require low-cost plan options to be displayed at all physical retail locations with signage of equal size and prominence to advertisements for standard plans and disclosed during all sales interactions such as phone conversations, online chats, in-store consultations, and door-to-door sales.

Recommendation 3: Require ISPs to offer a basic 100 Mbps plan for \$30 per month.

Policymakers and scholars have widely converged on a standard for broadband, and a standard for affordability. Broadband connectivity is most commonly defined—by the FCC, in the BEAD program, and in other literature—as a service that offers consumers download speeds of 100 Mbps and upload speeds

of 20 Mbps. Broadband access is generally considered affordable when it is priced at less than 2% of a household's income. The study's findings indicate that 93% of households in the Commonwealth would be able to afford broadband internet access offered at \$30 per month. Moreover, the study finds a significant gap between this threshold of affordability and the current offerings in the market. Other states facing analogous gaps have enacted legislation requiring that ISPs offer low-cost broadband plans that meet prescribed price and service standards. See, e.g., 2021 N.Y. Sess. Laws 202–04 (McKinney) (codified at N.Y. Gen. Bus. Law § 399-zzzzz); N.Y. State Telecomm. Ass'n v. James, 101 F.4th 135 (2d Cir. 2024).

- Consider requiring ISPs to offer a low-cost broadband plan, offering download speeds of 100 Mbps and upload speeds of 20 Mbps, at no more than \$30 per month.
- Consider mandating periodic review, overseen by the DHCD, of the price and service standards set out in this low-cost broadband plan requirement.

Recommendation 4: Offer targeted tax credits to help ensure near-universal affordability.

If the previous recommendations were to be implemented, such price and service standards for basic broadband connectivity, alongside easier consumer access to such low-cost plans, would ensure affordable broadband internet access for 93% of the Commonwealth's population. Nevertheless, such standards would still leave 7% behind—and that 7% may be geographically clustered, leading to exaggerated economic effects on particular communities and locales. Some regions, such as Albemarle County, implemented supplemental programs to address gaps between existing affordability policies and local affordability needs. Such programs offer a model for ensuring near-universal affordability. A tax credit of \$360 for broadband-subscribing households whose disposable income falls below \$18,000 can ensure affordability for practically 100% of the Commonwealth's residents.

- Consider legislating a \$360 tax credit for broadband-subscribing households with a disposable income under \$18,000 to bring the net cost of broadband connectivity within the affordability threshold for all Virginians.
- Policymakers may consider a different price standard for basic connectivity (see Recommendation 3), in which case the specifics of the tax credit (i.e., credit amount, qualifying income threshold) may be adjusted to maintain near-universal affordability.

Recommendation 5: Establish a grant funding program to replace lost BEAD non-deployment and Digital Equity Act funding.

Most federal funding for non-deployment initiatives that would tackle other dimensions of the digital divide has been suspended or canceled within the last year. The Virginia Digital Opportunity plan sets out an intention for the state to invest in tackling affordability and adoption issues alongside access. Ten Regional Digital Opportunity Plans also lay out locality-specific plans for addressing affordability and adoption, and DHCD received over 40 applications for Digital Equity Capacity grants that have not been awarded. Many community organizations have contributed significant staff time and resources to developing comprehensive digital opportunity plans and pilots, working closely with DHCD, and they would benefit from the funding support.

- Consider establishing a state-funded and -administered Digital Opportunity grant program to disburse funds to some of the projects submitted as part of the Digital Equity Capacity Grant program, which have already been reviewed by DHCD.
- Consider adding a non-deployment initiative to VATI, designating some funds in each budget for adoption and affordability initiatives, with the proportion of funds going toward these non-deployment aspects of the digital divide increasing year-on-year as the gap in access closes.

Recommendation 6: Require independent longitudinal data collection on broadband quality (speeds) and pricing.

This study has surfaced a need for comprehensive, longitudinal data collection on dimensions of the digital divide beyond access, and it has arguably only scratched the surface by collecting data using the BQT method across just ten localities in the Commonwealth. Every data collection method has distinct limitations, pointing to a need to triangulate findings across both quantitative (e.g. surveys, BQT, speed tests, etc.) and qualitative (e.g. interviews, document analysis, etc.) data. Most data collection efforts to date at the state and federal level have focused on tracking broadband infrastructure deployment and collecting data reported by ISPs. These data sources can be bolstered by additional, independently collected and analyzed data on issues related to quality, affordability and adoption of broadband to provide a more comprehensive picture of progress on closing the digital divide.

- Consider funding an expansion of the Commonwealth Connection mapping project to include data on pricing and adoption, with some funding allocated to independent research conducted with research partners (such as universities) to collect data on consumer experiences, which could include: crowd-sourced data collected from members of the public, bottom-up data

collected using tools like the Broadband-Plan Query Tool, surveys, and additional data reported by ISPs, such as plan pricing.

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Appendix

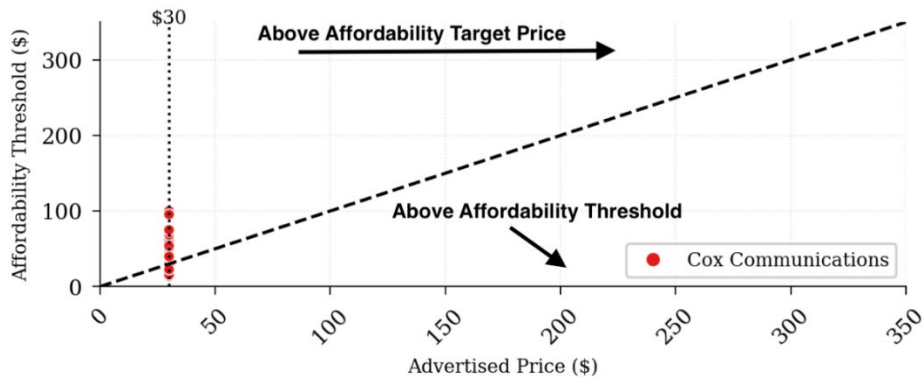


Figure A1: Frontier plots for Portsmouth. The low-cost plan is served by Cox Communications.

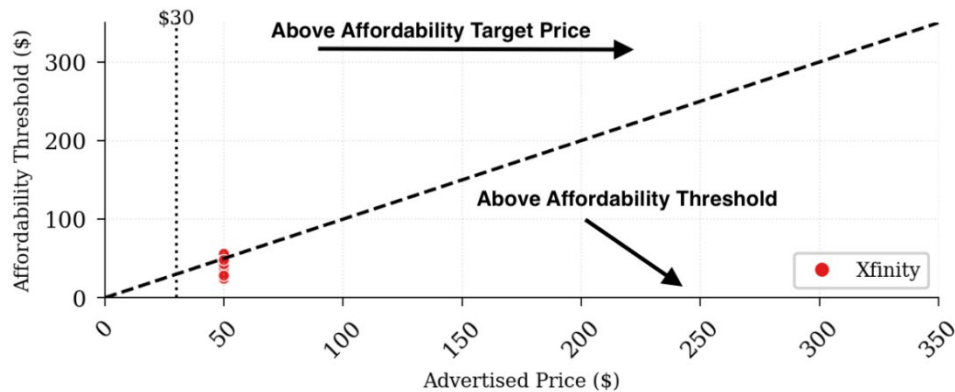


Figure A2: Frontier plots for Martinsville. The low-cost plan is served by Xfinity, and the majority of these low-cost plans are above the affordability threshold, i.e., unaffordable.

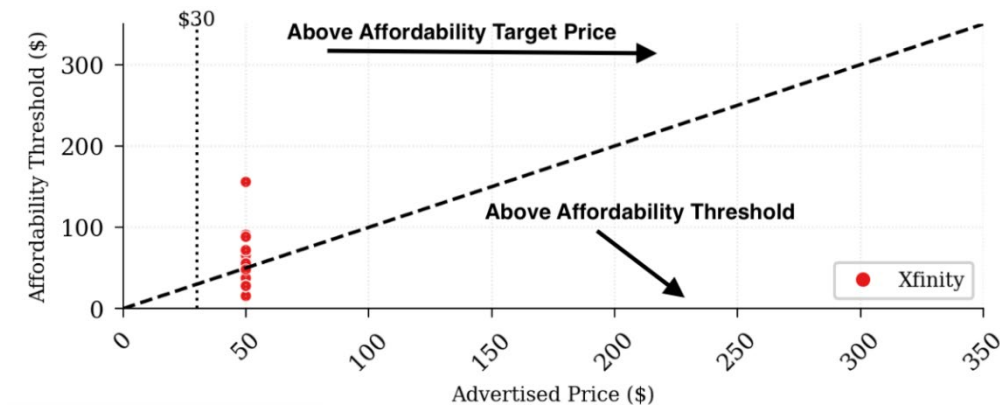


Figure A3: Frontier plots for Harrisonburg. The low-cost plan is served by Xfinity.

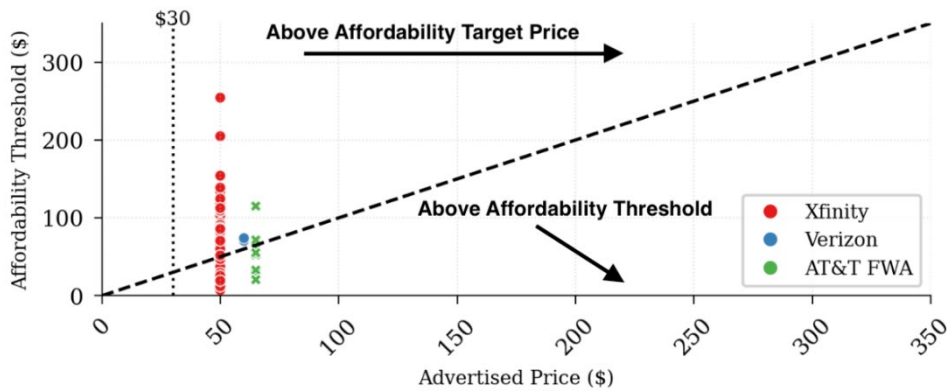


Figure A4: Frontier plots for Richmond. Though all CBGs are above the \$30 target price, some low-cost plans (served by Xfinity and AT&T FWA) are above the affordability threshold.

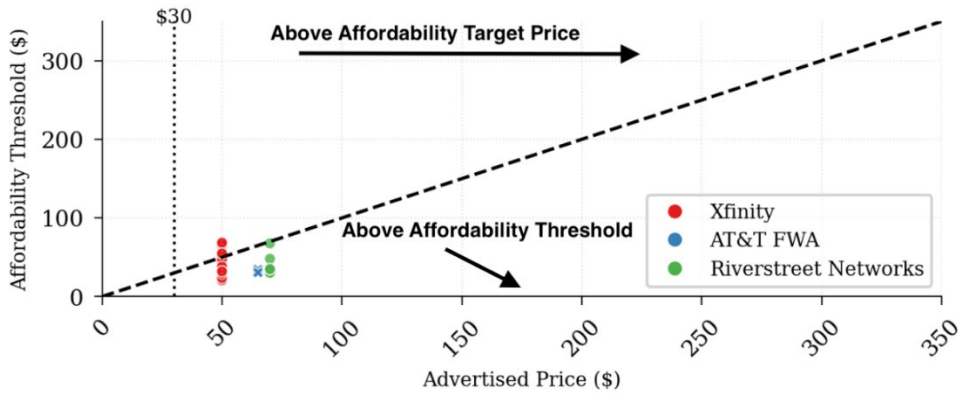


Figure A5: Frontier plots for Pittsylvania. The majority of low-cost plans (served by Xfinity, AT&T FWA, and Riverstreet Networks) are above the affordability threshold.

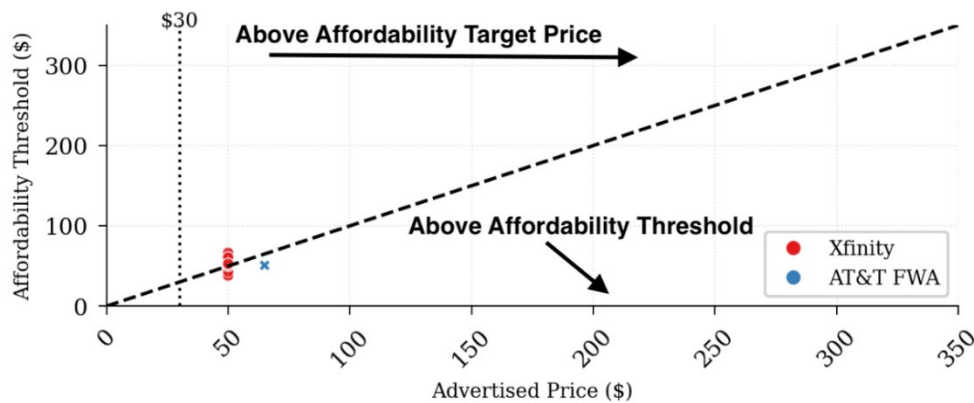


Figure A6: Frontier plots for Rockbridge.

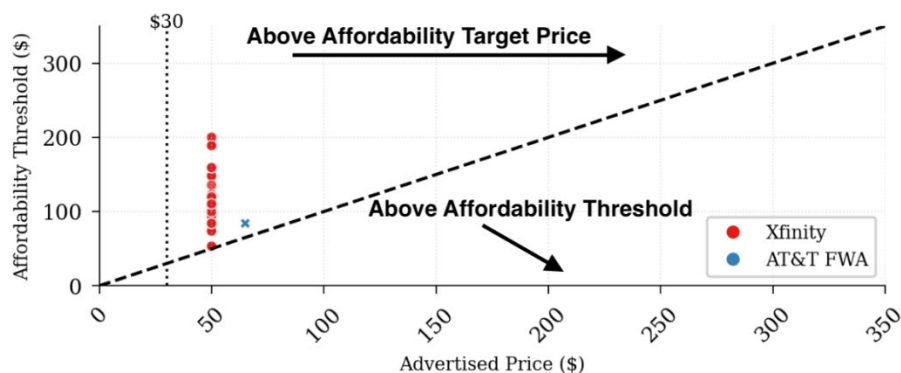


Figure A7: Frontier plots for Fauquier. Although all CBGs are above \$30, all low-cost plans, served by Xfinity and AT&T FWA, are below the affordability threshold.

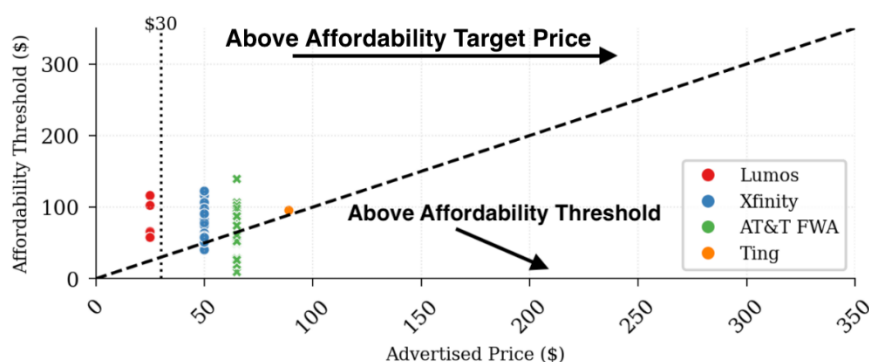


Figure A8: Frontier plots for Albemarle. The low-cost plans in some CBGs (served by Lumos) are less than \$30, and the majority of low-cost plans are below the affordability threshold.

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