

BROADBAND AND BEYOND:

Getting Connected in the Fourth District

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Introduction

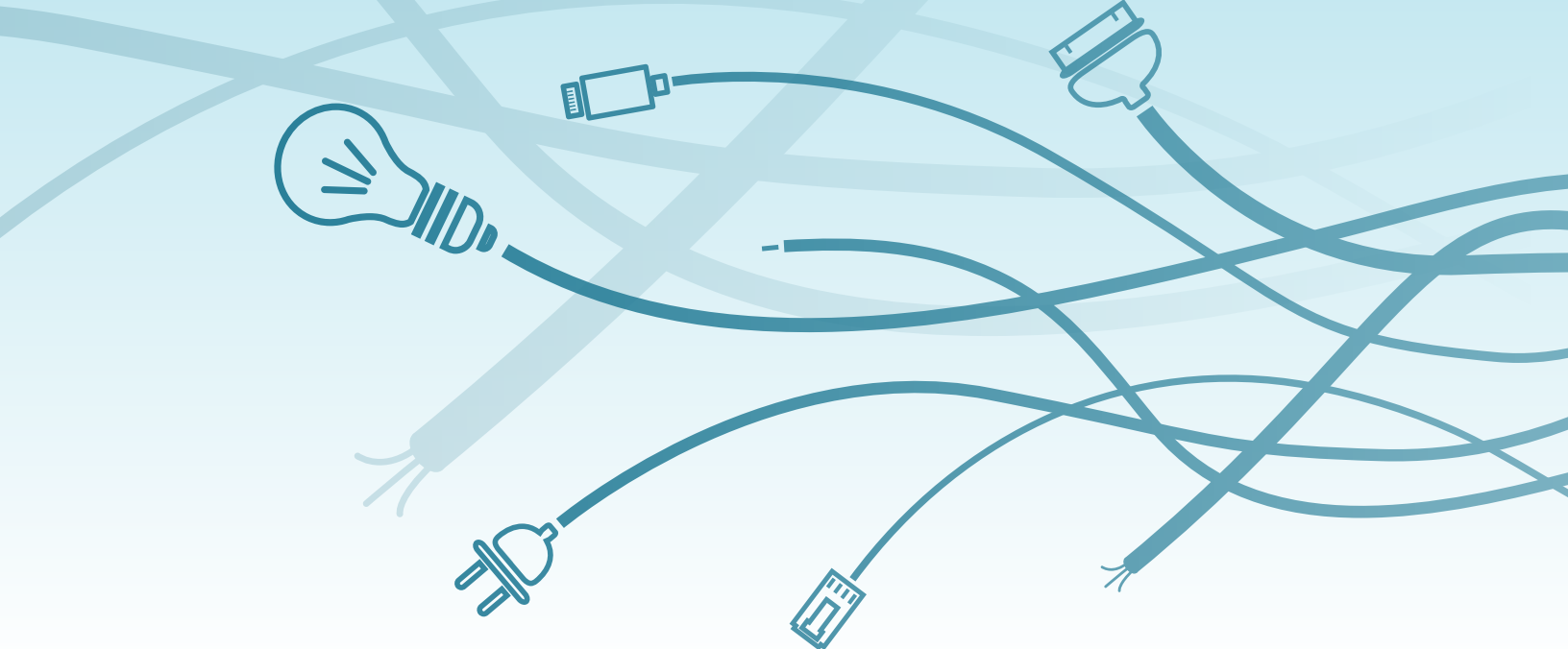
The pandemic brought nationwide attention to digital inequities, often called the digital divide, that exist across geographies and within low-income and minority households. Here we define digital inequity as a condition under which individuals and communities cannot fully participate in society, democracy, and the economy because they do not have the technical capacity. These inequities are not new. For decades, researchers have examined access to broadband (for example) as it relates to a variety of economic and personal outcomes. In 2000, the National Telecommunications and Information Administration (NTIA) and the Economic and Statistics Administration published a report demonstrating substantial differences in internet access by income, race, education level, household type, age, region, and gender. More recent research shows that broadband subscriptions, computer access, and poverty are correlated, and having access to broadband allows people to participate in the labor market at a higher rate (Sanchez, 2023; Sanchez and Scavette, 2021). Studying broadband access is especially important, considering rural areas, people of color, and low-income households are less likely to have access (Atske and Perrin, 2021; Dolcini et al. 2021; US Department of Agriculture, 2023). These newer studies continue to demonstrate what the NTIA pointed out more than two decades ago, and what we know was exacerbated by the pandemic: there remain persistent differences in broadband access and adoption across and within areas of the United States.

Why does the Federal Reserve care about broadband and internet connectivity? Labor force participation is key to the Federal Reserve's achieving its dual mandate of price stability and maximum employment; it is becoming increasingly important for individuals to have access to and to adopt broadband to participate in the economy. Studies show a positive association between workers with a broadband-enabled computer and labor force participation (Sanchez and Scavette, 2021). Broadband use can lead to a 4 percent increase in labor force participation for married women (Dettling, 2017), and subsidizing internet access for low-income families whose children qualify for free and reduced-price lunches can increase participants' employment rates and earnings (Zuo, 2021). Moreover, research has shown that individuals with internet access have a job-finding advantage (Denzer et al., 2021), and unemployment rates are lower in US counties with high-speed access (Lobo et al., 2020).

Three components of digital equity are discussed here:

1. physical access, or a connection to the internet that is fast and reliable,
2. affordability of the service, and
3. adoption related to income and digital-readiness factors.

This report seeks to explore each of these related issues as they play out in the Fourth District,¹ examine the implications of these issues related to a variety of factors, and review current policies and programs, nationally and locally, designed to overcome these challenges.



Terms and Definitions

Broadband: a type of high-speed internet service that provides internet speeds of at least 25 megabits per second (Mbps) download and 3 Mbps upload

Digital equity: a condition under which individuals and communities can fully participate in society, democracy, and the economy because they have the technical capacity

Digital readiness: the skills and trust in technology that lead to using digital tools

Internet: a general term that includes any method of online connection technology, including dial-up, broadband, and satellite

Findings

Overall, access to and adoption of internet and broadband have increased in metro and micro areas across the Fourth District, but digital divides still remain for rural areas, areas with a majority of low- and moderate-income (LMI) households, and communities of color. The digital inequities experienced during the pandemic inspired the creation of policies and funding programs to address broadband access, affordability, and adoption.

- **Access:** For households in rural areas and neighborhoods with a majority of LMI and minority households, large disparities remain.
- **Affordability:** Broadband affordability is an issue for households in urban and rural areas. Broadband pricing is fairly homogeneous across the Fourth District, but some households may not be able to afford this amount based on their income.
- **Adoption:** Broadband adoption lags for households in rural areas, low-income households, and households with members who are not employed or in the labor force. Digital readiness is a component in the lack of adoption in communities, and new programming seeks to help people overcome these challenges.

Digital Access

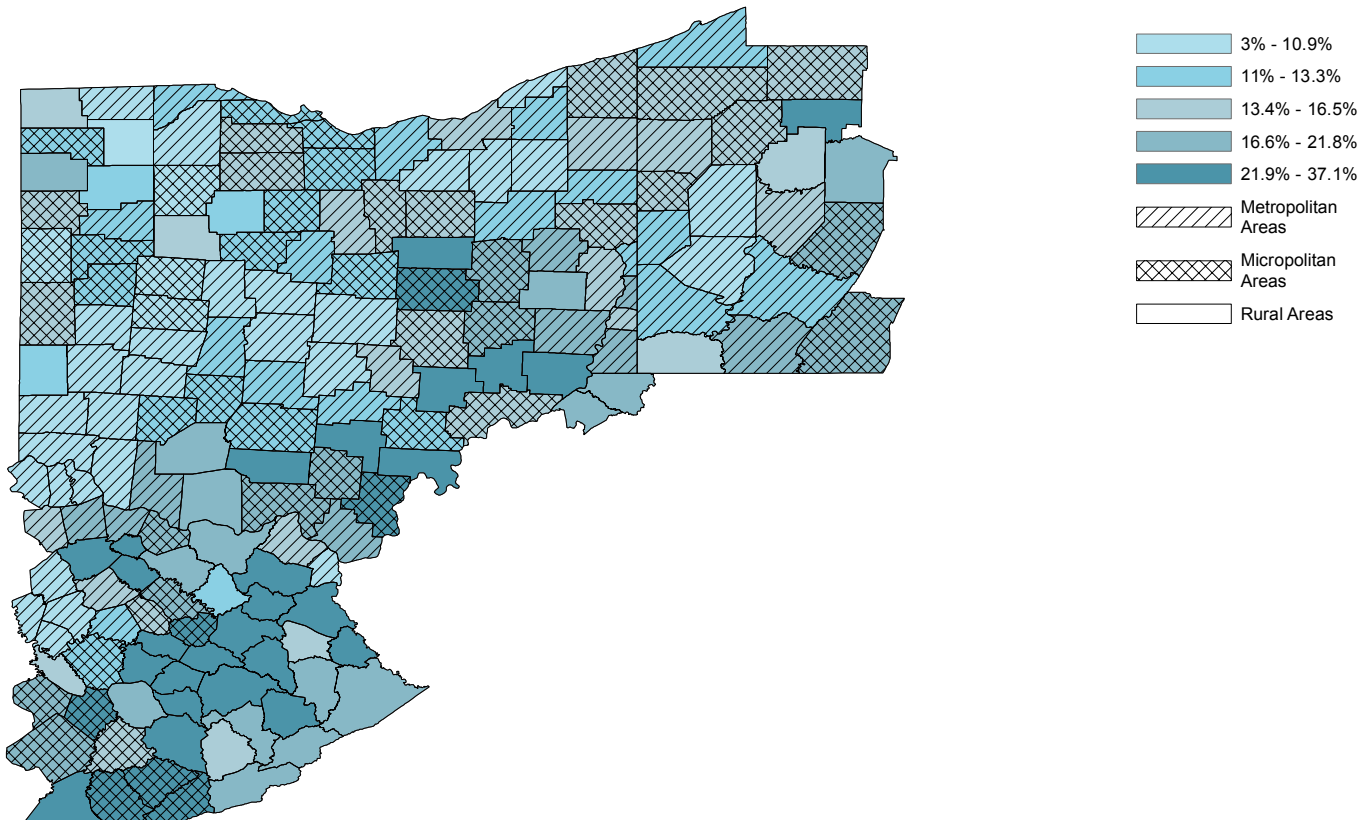
Digital access refers to the ability to participate in the digital society and economy, including having access to broadband and computers. Our emphasis is on households that have access to the internet or broadband of any type. We examine this through two different lenses: geography (defined as metropolitan areas that are mostly urban, micropolitan areas that are semi-urban, and rural areas) and race and income. All factors are important because the Fourth District has a geography that consists of highly stratified urban areas as well as remote rural places; both make broadband access challenging. Of the 169 counties that make up the Fourth District, 53 are rural counties,² many of which are in Appalachia and mountainous, making it challenging to run broadband lines. Additionally, rural areas with low populations equate to low subscriber rates, which disincentivizes internet service providers (ISPs) (Read and Wert, 2022). To put this in context, it could cost \$50,000 to \$300,000 per household to connect remote locations (Tracy, 2023).

Looking at change in internet access overtime, we find access has increased in metropolitan counties in our

districts, and within selected micropolitan counties;³ data for rural counties are not available for the one-year estimates from the American Community Survey. Available data show that access from 2019 (before the pandemic) to 2021 has gotten better in the Fourth District: from 11.0 percent to 7.8 percent, respectively, in metro area counties, and 11.4 percent to 8.2 percent, respectively, across selected metro and micropolitan counties in the District. These trends mirror national increases in access.

However, there are differences in access among metropolitan, micropolitan, and rural counties. To assess this, we use American Community Survey five-year estimates, since these data are available for all counties in the District to illustrate low access (dark blue) and high access (light blue) (Map 1). For Fourth District households without access, a higher percentage lives in rural counties (19.8 percent) than in micropolitan counties (14.8 percent) and metropolitan counties (10.5 percent). These geographic disparities mirror the nationwide data that show that 9.4 percent of metropolitan, 15.2 percent of micropolitan, and 18.8 percent of rural households do not have access to the internet.

Map 1. Percentage of Fourth District Households That Do Not Have Access to the Internet or Broadband, by County and Area Type, 2017–2021



Sources: American Community Survey 5-Year Annual Estimates, 2017–2021

Just as examining urban–rural geography can reveal challenges that rural communities face, investigating the diversity of households in the Fourth District reveals challenges for areas that have a high proportion of LMI households or people of color. Similar to rural areas, LMI tracts experience less access to both general internet (that is, dial-up) and broadband services than the District’s average. Given that digital access increases social, educational, and vocational opportunities, a systemic lack of access to broadband further perpetuates socioeconomic and racial disparities in society.

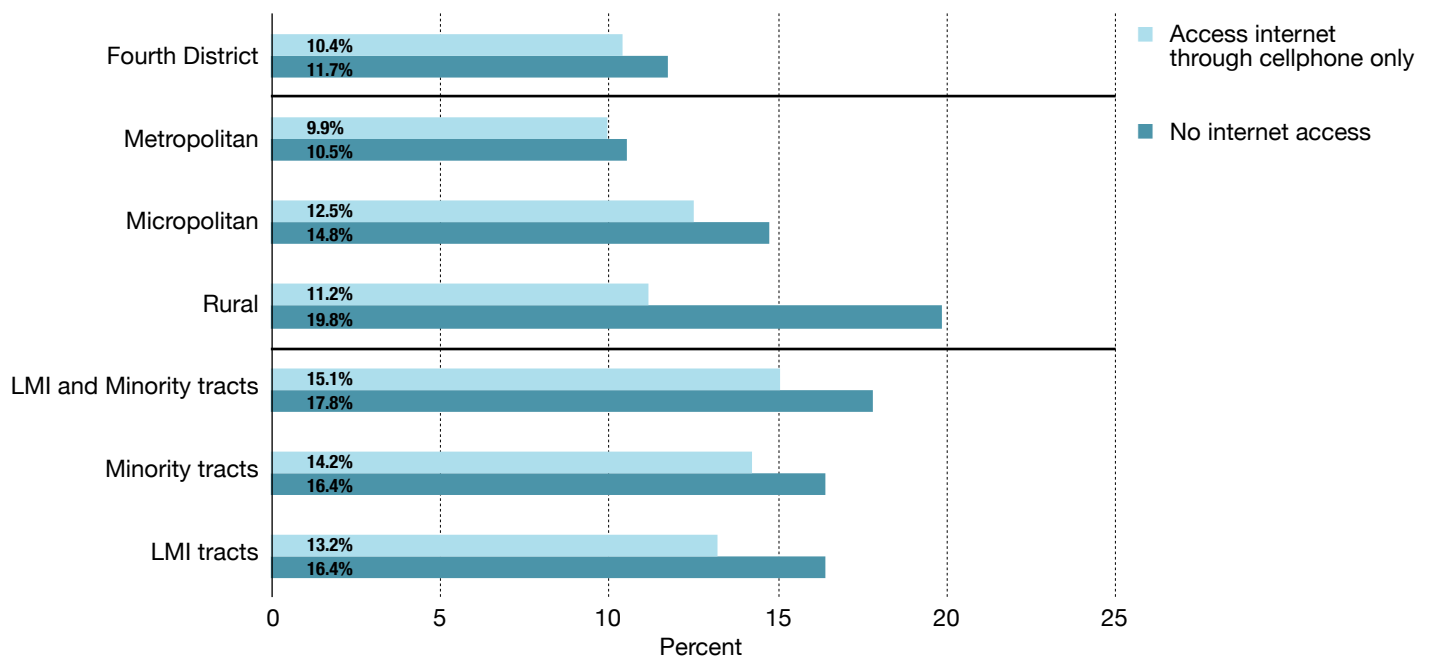
Having access to broadband and the internet in your home is just one way to go online; many households rely on cellphones for internet connectivity. The Pew Research Center estimates that low-income individuals who rely solely on their smartphones for internet use has doubled since 2013 (Vogels, 2021). While smartphones can be useful for activities such as mobile communications and using social media sites, they can make it difficult to participate in activities relating to work or school, putting smartphone-dependent populations at a comparative disadvantage. One study in Michigan showed that students did not have internet or relied solely on a smartphone

had higher odds of technology issues and struggle with completing schoolwork (Hampton et al., 2023).

Our findings show similar disadvantages for those without access. Households in the Fourth District that live in minority- or LMI-categorized census tracts have lower access to broadband.⁴ According to the American Community Survey five-year estimates, 2017–2021, LMI tracts that are categorized as both LMI *and* minority had the highest percentage of households without access to the internet and the highest percentage of households that use only a cellphone data plan to connect to the internet (Figure 1). Notably, households in rural areas have both low adoption rates of cellphone data and low internet access, compounding inaccessibility.

Smartphone-only access can perpetuate a lack of digital skills, and many foundational and industry-specific skills are learned primarily via computer access, not a smartphone. Nationwide, nearly one in three workers lacks the foundational digital skills identified in job ads, including prior computer use, willingness to take a computer-based assessment, or the ability to complete basic computer tasks (Bergson-Shilcock, 2020).

Figure 1. Fourth District Households Using Only a Cellphone Data Plan for Internet Access, by LMI- and Minority-Categorized Census Tracts and County Urban and Rural Designation



Sources: Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 17.0 [dataset]. Minneapolis, MN: IPUMS. 2022. <http://doi.org/10.18128/D050.V17.0>; American Community Survey 5-year annual estimates for 2017–2021.

Policy and Programmatic Solutions to Access

Understanding the problem is only one step to a remedy. In the last few years, despite some pauses and setbacks, billions of dollars in federal funding have been earmarked to solve the complex and multifaceted access issue. The Infrastructure Investment and Jobs Act (IIJA) earmarked \$65 billion for broadband projects focusing on three major programs: Broadband Equity, Access, and Deployment (BEAD), Digital Equity Act (DEA), and the Affordable Connectivity Program (ACP). Nearly \$42.5 billion has been allocated to BEAD funding, which will provide at least \$100 million to each US state and territory for the purpose of increasing broadband infrastructure, with additional allocations for underserved locations. In the fall of 2022, a number of Federal Reserve Banks, including the Federal Reserve Bank of Cleveland, hosted digital equity training programs to assist community leaders in creating statewide broadband deployment plans in partnership with the National Digital Inclusion Alliance (NDIA). In June 2023, the White House announced the BEAD allocations for states, with Fourth District states receiving sizable shares of the overall allocation: \$1.21 billion to West Virginia, \$1.16 billion to Pennsylvania, \$1.09 billion to Kentucky, and \$794 million to Ohio (Internet for All, 2023).

In addition, the DEA's \$2.75 billion has been allocated to be disseminated to states that create a five-year digital equity plan that addresses disparities in broadband access and affordability, and the \$14.2 billion in ACP funding seeks to subsidize broadband services and devices for low-income households.⁵ Most of these initiatives are now packaged under the Internet for All funding programs and available through the IIJA, which provides the federal subsidy needed to incentivize ISPs to install affordable infrastructure in areas of historical disinvestment (Read and Wert, 2022), namely, in communities of color, rural geographies, and for people who are currently or at risk of becoming LMI. One example of how federal funding can be used to increase access is the partnership between the Erie County Redevelopment Authority and the state of Pennsylvania, which are working to expand broadband to low-income homes using dollars from the American Rescue Plan Act (ARPA) (Hixenbaugh, 2023).

Broadband Affordability

Broadband must be affordable for households. In a 2021 study, Consumer Reports (2021) found that, in a nationally representative sample, nearly one-third of Americans indicated they do not have broadband because it costs too much. Even though broadband prices have declined as speeds have increased (Shevik, 2023), for many households, especially LMI households, it is still unaffordable. A recent study showed that offering discounted pricing for low-income families can increase employment and the earnings of eligible individuals (Zuo, 2021).

Affordability isn't specifically tied to one geographic area. For many households in urban and suburban areas, adequate infrastructure may exist, but the price of a broadband subscription is not always affordable. And in rural areas, on the other hand, there is often a lack of broadband infrastructure that allows for subscription to an ISP.

Overall, when analyzing broadband pricing data across the Fourth District for 2020 from BroadbandNow, we found that pricing is relatively homogeneous between urban and rural areas across ZIP codes and was roughly \$56 per month. Although the data are not ideal because they do not include what speed is available at the given price, they do shed light on some of the issues around pricing. Budget constraints for LMI households are different from those of higher-income households, and LMI families may not be able to allocate this money to broadband.

To explore what broadband pricing means for different groups, we looked at broadband pricing for different types of communities in the Columbus, Ohio, metropolitan area—one of the most populous metropolitan areas in the Fourth District. Table 1 features urban, rural, and suburban communities with varying income levels in the Central Ohio region.

Table 1. Selected ZIP Codes' Broadband Speeds, Price, and Resident Characteristics

	Geographic Status	Income Classification	Minority Status	Household Median Income	Lowest Advertised Cost for a Broadband Subscription	Annual Broadband Costs as a Percentage of Median Income	Average Broadband Speed (Mbps)
Dublin, Ohio (43017)	Suburban	Upper Income	Non-minority	\$119,868	\$35	0.35%	77.05
Hilliard, Ohio (43228)	Suburban	Moderate Income (LMI)	Non-minority	\$66,840	\$35	0.63%	71.45
Linden, Ohio (43211)	Urban	Low Income (LMI)	Minority	\$30,106	\$35	1.40%	59.51
Mt. Sterling, Ohio (43143)	Outside the Urban Core (rural)	Moderate -Upper Income	Non-minority	\$73,864	\$69.99	1.13%	15.92

Notes: Data on broadband pricing and speeds are from 2020. Data on median household income and income classification are from the 2017–2021 American Community Survey.

Sources: BroadbandNow 2020, American Community Survey 5-year annual estimates for 2017–2021.

Examining annual broadband costs as a percentage of median incomes for these geographies shows that residents in Linden pay a larger share of their income for broadband than residents in other areas, suggesting the need for lower broadband subscription costs due to the additional cost burden. Overall, urban households tend to have access to broadband infrastructure and speed thresholds that rural communities lack. These rural communities may struggle to afford the cost of a monthly broadband subscription or investment in devices (for example, laptops and tablets) that allow for full participation in online activities.

Policy and Programmatic Solutions to Affordability

One component of IIJA funding is the ACP, which is designed specifically to address barriers of affordability by discounting the cost of a monthly internet subscription and connected devices for low-income households. There is evidence that the ACP uptake has not been as great as was hoped (Graber and Piazza, 2022; Scavette, 2022), with some positing that application challenges and a confusing verification process slow adoption (Read and Wert, 2023). Additionally, it is estimated that the ACP will exhaust all IIJA funds by early to mid-2024 (Institute for Local Self-

Reliance, 2023). The decision to renew funding beyond the original \$14.25 billion from the IIJA lies with Congress, and some researchers suggest that without continued funding, broadband access and affordability will continue to be a challenge (Levin, 2023).

Broadband Adoption

Broadband adoption describes a household's successful residential subscription to broadband services (as opposed to access). Adoption by geography follows the same patterns as access by geography; overall, micropolitan and rural counties have less adoption of broadband services than metropolitan counties and the average Fourth District county. In the Fourth District, rural and micropolitan counties see the lowest proportion of households with a broadband subscription, at 77.1 percent and 82.1 percent, respectively, using the county-level American Community Survey five-year estimates. Metropolitan counties have a higher adoption at 87.0 percent. When looking at adoption over time using available data from the American Community Survey one-year estimates, overall, adoption has increased in urban and semi-urban areas in the Fourth District, mirroring national trends.⁶

Barrier to Adoption: Income and Race

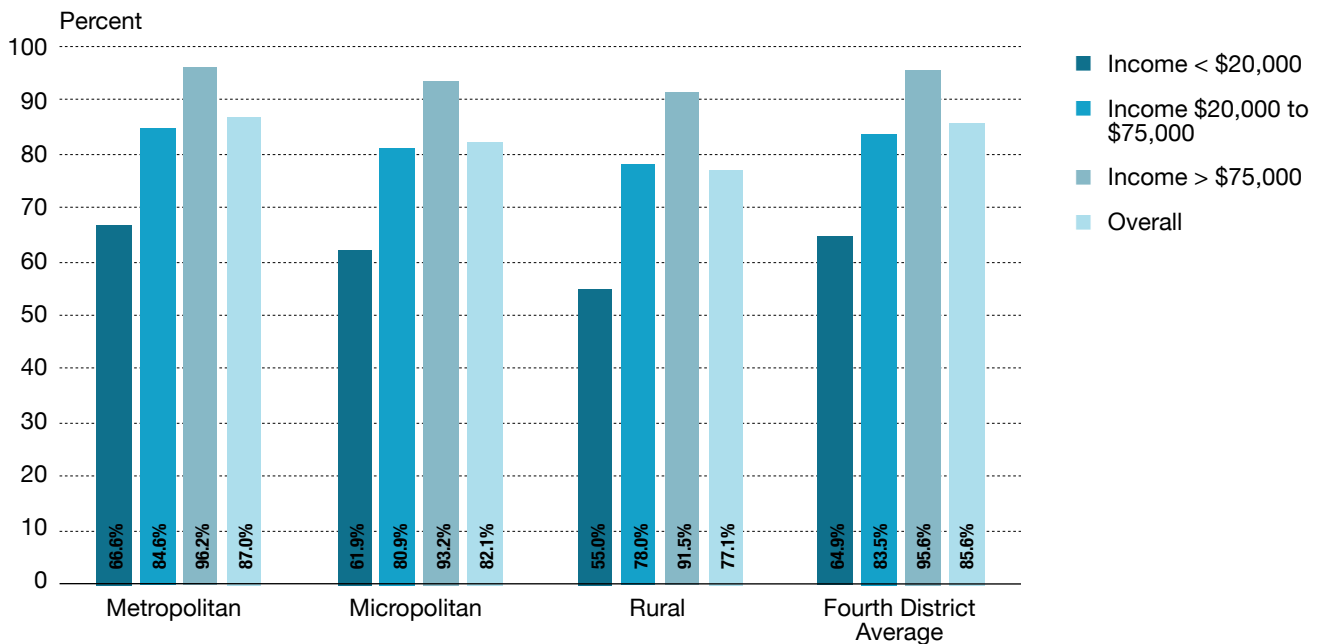
Adding variables such as income to the adoption analysis can provide context to adoption in the Fourth District. Across all geographic areas in the Fourth District, broadband subscription rates are particularly low among households whose annual income is less than \$20,000, especially those in rural areas (Figure 2).⁷ Additionally, households with lower incomes show a lower level of broadband adoption, indicating that adoption is a function of not only availability but also income constraints and affordability. It is the hope that subsidized broadband through the ACP can increase broadband adoption for LMI households. From the same data, we can see that a lack of adoption also holds for census tracts designated as LMI or minority areas. Roughly 80.5 percent of minority tracts have a broadband subscription, a percentage that is similar to that of LMI tracts (80.3 percent) but higher than that of tracts that are categorized as LMI *and* minority (78.9 percent). These percentages are significantly lower than the overall Fourth District adoption of 85.6 percent. For many places across the country, broadband adoption is an issue not just for lower-income rural areas but also for urban areas, inhibiting attachment to the labor market for residents in both areas (Sanchez and Scavette, 2020).

Barrier to Adoption: Digital Readiness

Even if households have access to broadband, a computer, and affordable subscription rates, having the knowledge and skills to navigate online spaces is vital to reducing digital inequities. A lack of digital readiness hinders one's ability to fully participate in many aspects of life, especially as it relates to finding good jobs, networking, advancing one's career, and generally participating in the labor force (Hecker and Loprest, 2019; Irving, 2022). The National Skills Coalition indicated that 92 percent of job ads definitely or likely require digital skills (Bergson-Shilcock et al., 2023), while nearly one-third of Americans lack digital skills (Bergson-Shilcock, 2020).

Further, not all individuals have the same opportunity to achieve digital readiness; research shows that white individuals over 50 are more likely to be digitally literate and possess higher levels of digital skills than older women and older people of color (Hecker, et al., 2021). To prioritize strategic broadband workforce development, skills and training programs could be incorporated into a broader professional pipeline—rather than individual projects—that encourages sustainable employment (Varn, 2022).

Figure 2. Fourth District Broadband Adoption by Income, 2017–2021



Sources: Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 17.0 [dataset]. Minneapolis, MN: IPUMS. 2022. <http://doi.org/10.18128/D050.V17.0>; American Community Survey 5-Year Annual Estimates, 2017–2021.



Policy and Programmatic Solutions to Adoption

The policy solutions to increase the adoption of broadband are intertwined with the solutions to issues of access and affordability. Many of the recent federal and state funding opportunities have earmarked money for digital readiness as a way to increase adoption. Libraries and nonprofits have become pillars in the digital readiness area by providing trusted digital navigators who help others get online and use computers, computer hardware, and the internet, and who offer one-on-one help to those who may have digital-readiness challenges (Federal Communications Commission, 2021). A variety of promising cross-sector practices are underway to increase digital readiness and skills in the Fourth District:

- The Pittsburgh-based nonprofit Neighborhood Allies, in partnership with the Verizon Community Forward Initiative, opened two community learning centers in the Homewood–Brushton neighborhood: one in the local YMCA to enhance youth learning and bridge the digital equity gap and one in the local community college branch to enhance adult digital skills and training (CCAC, 2023; Neighborhood Allies, 2023).
- The National Digital Inclusion Alliance provided funding to Shaping Our Appalachian Region (SOAR) to form an Eastern Kentucky Office of Digital Equity & Literacy, providing a digital navigator to help people find training and educational resources (Morrill, 2022).
- The Greater Cleveland Digital Equity Coalition includes more than 70 entities from public, private, and nonprofit sectors to elevate and fund programs in the digital equity arena. The coalition champions a variety of organizations that provide high-speed internet access, digital skills trainers, low-cost technology, and support (Cleveland Foundation, 2021).
- Hospitals in the Fourth District are working with local nonprofits to enhance digital access and readiness so that they can help close the digital divide and improve health outcomes.

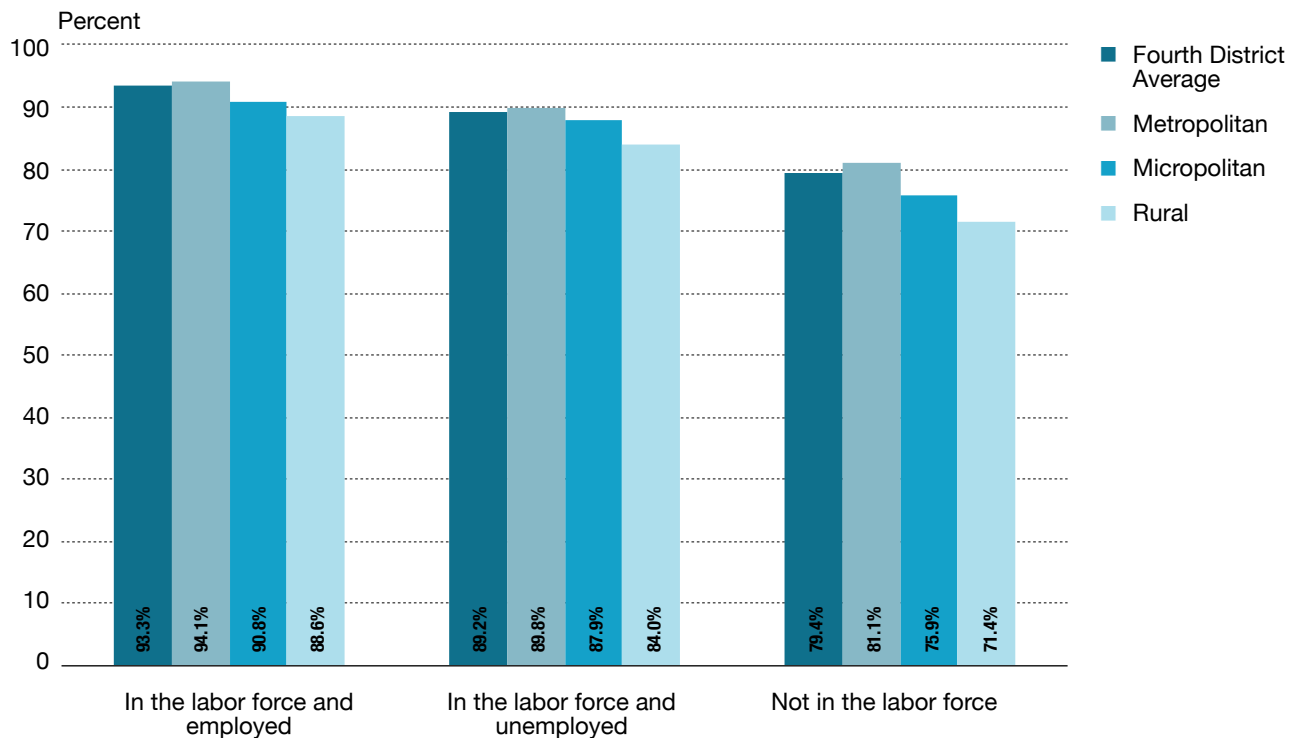
Why Digital Equity Matters: Policy, Funding, and a Path Forward

Digital equity matters because it is important for all people to be connected to the same economic opportunities. Examining data on labor force participation and digital participation reveals differences in the percentage of connectivity by labor force status and geography (Figure 3). But regardless of labor force status, a smaller share of those in rural areas have computers and broadband subscriptions when compared to other geographies. Almost 30 percent of those not in the labor force in rural areas do not have a computer with broadband subscription, and this has implications for this population’s ability to engage in the online economy and find sustainable employment. Similar trends can be seen when examining LMI- and minority-categorized census tracts. Those census tracts categorized as LMI have a lower percentage of households that are connected, and those that are designated as LMI and minority have the least connectivity.

The pandemic brought to light these labor market and other long-existing digital equity disparities discussed in this report. Subsequently, the policy landscape and funding in the broadband and digital skills arena have measurably increased and grown in complexity over the last few years. With all of this funding, there is a dizzying array of programs—the US Government Accountability Office (2022) recently identified at least 133 different federal programs, many of which are not coordinated across agencies—that look to support or increase broadband access, affordability, and skills. Innovative funding and programming can help close the divide; many communities are looking to use ARPA and IIJA funding to overcome gaps, while some unobligated balances for funds were returned under the recent Fiscal Responsibility Act (debt ceiling bill) (Taglang, 2023).

Beyond this, definitions and coordination matter. The American Community Survey data in this report hold to the current FCC broadband definition of 25 Mbps (download)/3 Mbps (upload), but with the current demands

Figure 3. Civilian Household Population Aged 16 Years and Older with a Computer and Broadband Subscription within the Fourth District, 2017–2021



Source: Steven Manson, Jonathan Schroeder, David Van Riper, Tracy Kugler, and Steven Ruggles. IPUMS National Historical Geographic Information System: Version 17.0 [dataset]. Minneapolis, MN: IPUMS. 2022. <http://doi.org/10.18128/D050.V17.0>; American Community Survey 5-Year Annual Estimates, 2017–2021.

of technology, such speeds may not be enough to meet these bandwidths. The IIJA makes the distinction between unserved (25/3 Mbps) and underserved (100/20 Mbps) communities, and, beyond this, many states have their own guidelines for unserved and underserved (Varn, 2023). The FCC is looking to expand its broadband definition to 100/20 Mbps to meet current standards of speed demands; this is an ongoing discussion (Conroy, et al., 2021; Federal Communications Commission, 2022). How broadband and speeds are defined can make a difference in providing service to underserved areas, especially if multiple federal and state agencies are involved.

Digital equity is a multidimensional problem that incorporates issues of infrastructure (access), skills and readiness, and affordability. All elements of digital equity are related: without adequate broadband access and affordability, broadband adoption cannot be fully achieved, and without digital readiness and adoption of computers and digital technologies, prosperity is not achievable for all. New resources such as the [Broadband Map](#), the [ACP Program Enrollment Performance Tool](#), and the NTIA/Census Bureau's [Access Broadband data dashboard](#) will help provide a data-driven approach to research, funding, and policymaking. From doctors and hospitals to philanthropy, the involvement of all sectors of the economy is critical to overcoming digital inequities. As digital equity funding rolls out and conversations continue, it is important to learn about and highlight best practices and innovations in this area to increase access, affordability, and adoption. Funding, combined with the government, education, healthcare, and private-sector supporters who understand the importance of broadband in having access to constituents and consumers, can make broadband something that every household has.

Endnotes

1. The Federal Reserve's Fourth District includes Ohio, eastern Kentucky, western Pennsylvania, and the northern panhandle of West Virginia.
2. Rural counties are defined as those counties without a metropolitan or micropolitan designation.
3. Data from the American Community Survey one-year estimates for 2019 and 2021; not all counties are included because some counties in the Fourth District do not meet the minimum population threshold (65,000 residents) to be included.
4. Census tracts were categorized accordingly if they had a minority population greater than 50 percent and an LMI ratio of less than 80 percent. An LMI tract is one in which the median family income is less than 80 percent of the area median income. For more information on LMI designations, see Board of Governors of the Federal Reserve System (2023).
5. Some allocations through IIJA and ARPA were halted and unallocated money was called back under the Fiscal Responsibility Act (debt ceiling bill of 2023) (Taglang, 2023).
6. Data are not available for many semi-urban and rural counties that do not meet the 65,000 population threshold to be included.
7. The \$20,000 cutoff was used to approximate the poverty threshold of \$21,960 for a single head of household with two dependent children.

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