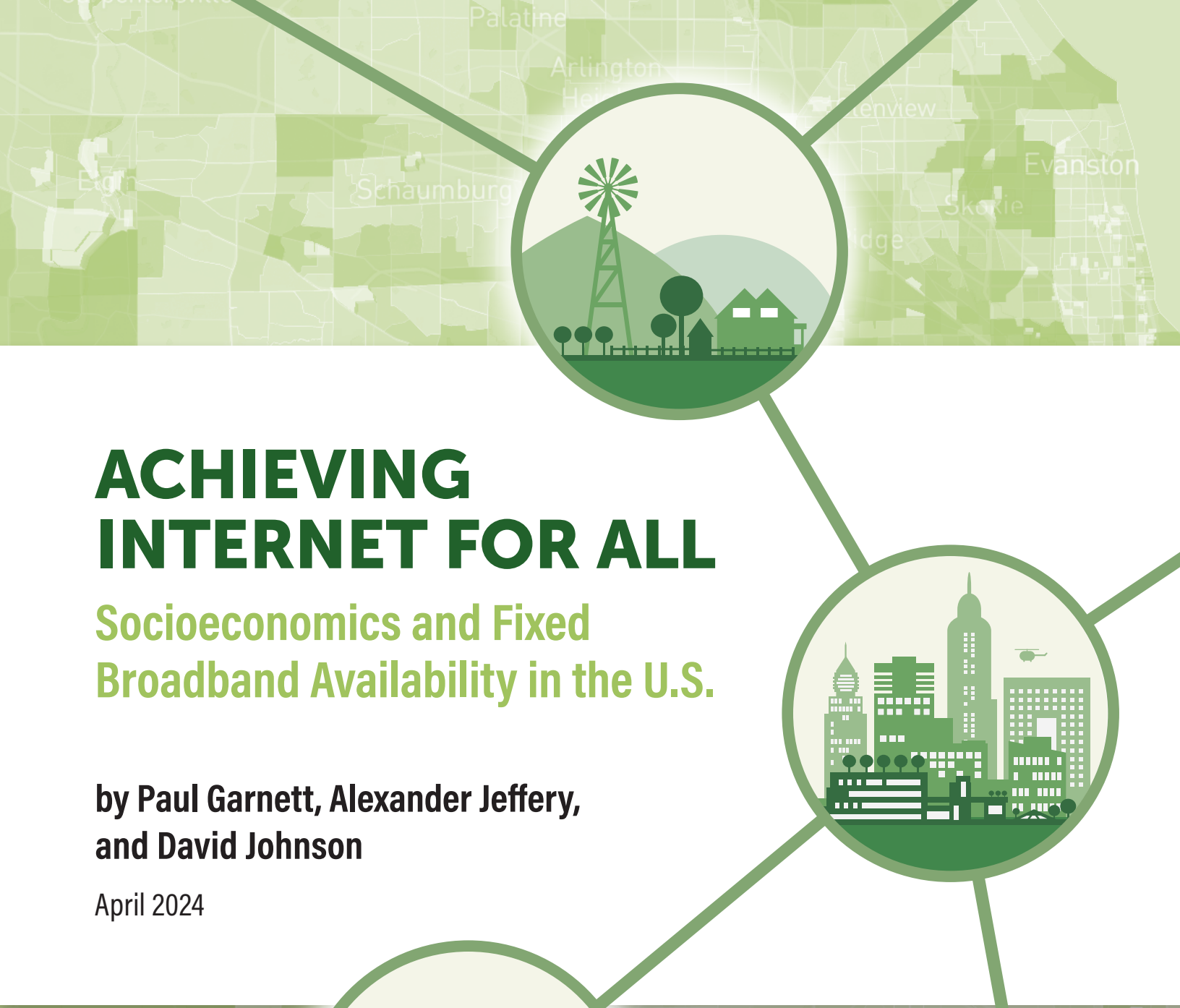
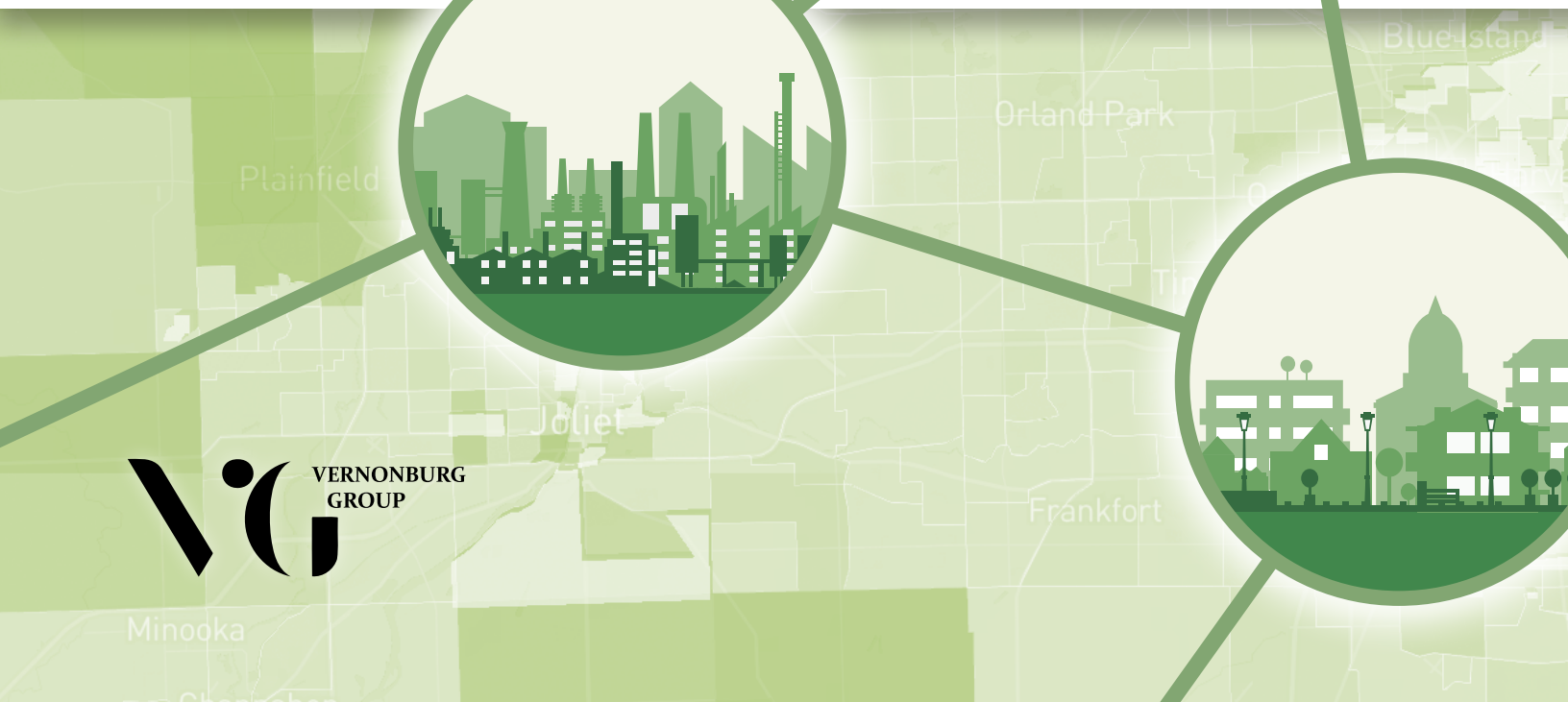



# ACHIEVING INTERNET FOR ALL

## Socioeconomics and Fixed Broadband Availability in the U.S.

**by Paul Garnett, Alexander Jeffery, and David Johnson**

April 2024




VERNONBURG GROUP

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A tireless digital equity advocate, Paul Garnett has over 25 years of experience in the domestic and international telecommunications and technology sectors. Paul is Founder and CEO of Vernonburg Group, a consulting firm based in Savannah, Georgia, USA that works with large and small corporate, international organization, and government clients to close the global broadband gap, with a focus on policy and regulation, market research and risk assessment, access to financing, broadband mapping and economic modeling, digital equity policies and programming, and large-scale broadband project feasibilities.

Prior to starting Vernonburg Group, Paul spent 12 years at Microsoft where he created and led the Airband Initiative, leveraging a partner-driven approach to extend broadband access to unserved communities in the U.S. and in over 20 emerging markets. Prior to Microsoft, Paul worked for CTIA-The Wireless Association, the U.S. Federal Communications Commission, the law firm Swidler Berlin, and the management consulting firm Price Waterhouse. Paul is an attorney and is a member of the District of Columbia and Massachusetts Bars.

Paul Garnett earned his bachelor's degree in political science at Union College and his law degree at the Catholic University of America, Columbus School of Law.


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Alex serves as Senior Public Policy Manager at Vernonburg Group, where he supports business development activities, develops policy and advocacy materials on broadband policy issues, and leads external and stakeholder engagement efforts for clients including governments, non-profits and corporations. Alex has over seven years of professional experience, including five years advocating on technology and telecommunications policy issues and the digital divide. Prior to joining Vernonburg Group, Alex was an Associate at Glen Echo Group, where he developed robust public affairs campaigns, organized successful local and large-scale events, engaged with media, managed coalitions, and developed advocacy campaign strategies.

Alex has also spent time at Comcast NBCUniversal, where he was on the Global Public Policy team, assisting in the development of advocacy materials and fostering mutually beneficial relationships with other key players in the telecommunications policy ecosystem. Alex also spent two years in federal government service, working on emerging technology policy and risk management at the Federal Housing Finance Agency.

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David has 18 years of professional experience carrying out research and deploying technologies with the potential to provide access to poorly connected regions or areas lacking affordable Internet access. David leads Vernonburg Group's work on broadband data analysis and visualization, economic modelling, and market research. He built Vernonburg Group's Digital Equity Map to explore potential linkages between various demographics and lack of broadband access and adoption in the U.S., and led the design of Vernonburg Group's Broadband Funding Optimization Tool to help U.S. state and territorial broadband offices explore the optimal mix of fiber, fixed wireless, and satellite technologies based on local conditions and available funding.

David is an adjunct associate professor in the Computer Science Department at the University of Cape Town, South Africa and a senior research associate at Research ICT Africa. He was previously a principal researcher in the Networks and Media group of the CSIR Meraka Institute in South Africa and an IT Policy fellow at the Center for Information and Technology Policy at Princeton University. He has published 70 articles on wireless connectivity and ICT for development and a book on TV white space technology.

David earned a B.Eng in Electronic Engineering from University of Cape Town. He completed his M.Eng in Computer Engineering at University of Pretoria and an M.Sc and Ph.D in Computer Science from University of California, Santa Barbara.

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**High-speed Internet access is now essential for full participation in modern society.** A reliable home Internet connection can have a transformative impact on a household and can lead to a wealth of previously untapped opportunities in areas like education, healthcare, employment, and civic participation. As Internet service providers (ISPs) and policymakers continue to find ways to expand high-speed broadband connectivity to all United States (U.S.) residents, it is essential no one is left behind.

Adopted in November 2023 pursuant to the bi-partisan Infrastructure Investment and Jobs Act (IIJA) of 2021, the Federal Communications Commission's (FCC's) Digital Discrimination Order attempts to further this goal by taking steps to preclude ISPs from broadband network deployment practices that discriminate on the basis of income level, race, ethnicity, color, religion, and national origin.

**In the wake of the FCC's Order, this paper examines publicly available data on current fixed broadband network deployments in the U.S. and analyzes what correlation, if any, may exist between broadband availability and a subset of those protected characteristics: race/ethnicity and income**. This paper also looks at the impact of rurality on broadband availability, as well as levels of competition in different communities. The authors analyze publicly available national, state, and local demographic data in addition to broadband availability data broken down by speed and technology.

**Apart from a few exceptions, available data do not show a strong correlation between overall broadband availability and income or race/ethnicity.** The data overall show that communities with higher rates of poverty—defined as those with at least 25 percent of households living below the poverty level—have similar access to broadband compared with higher-income U.S. households. These higher poverty communities are only slightly (approximately 1-2 percentage points) less likely to have access to high-speed broadband than higher-income U.S. households.

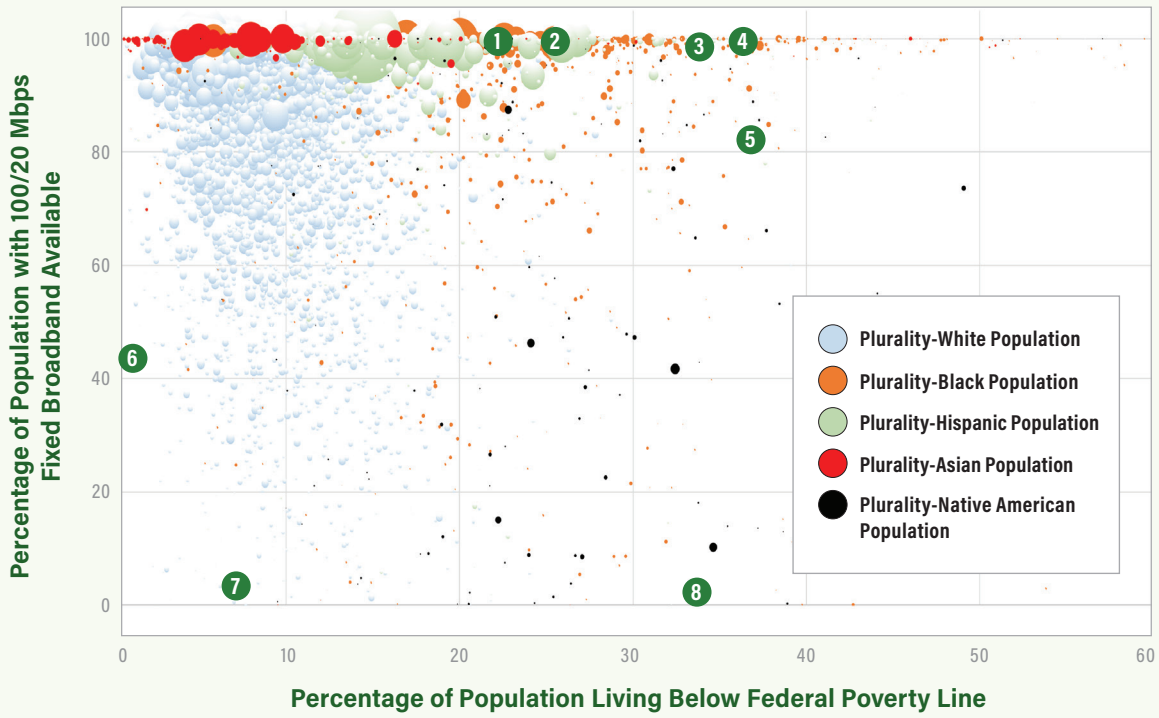
**At a national level, the data do not show significant differences in high-speed broadband availability for any racial or ethnic group, except for Native Americans.** Plurality, majority, and super-majority Asian, Black, and Hispanic communities have slightly better access to broadband than plurality, majority, and super-majority White communities. All ethnic groups, inclusive of Asians, Blacks, Hispanics, and Whites, have markedly better access to broadband than Native Americans. These trends hold true for 100/20 megabits per second (Mbps) broadband connectivity, as well as faster broadband connectivity delivering speeds of more than 1 gigabit per second (Gbps).

**Rurality might help to explain some of the differences** between broadband availability for Asian, Black, Hispanic, and White populations. However, Native Americans in all geographies—including in both urban and rural areas—have worse access to broadband than any other racial or ethnic group.

**Competition follows a similar pattern. U.S. residents living in rural areas and in the highest poverty areas have the least amount of competitive choice.** And regardless of where they are located or their economic situation, Native Americans have markedly less access to competitive choice than Asians, Blacks, Hispanics, and Whites.

**Data also show that fiber-based broadband is less available in lower-income and majority-Black and Hispanic communities in cities across the U.S. Comparatively, cable-based broadband, including 1 Gbps+ speed connectivity, is nearly ubiquitous across the country, including in lower-income communities**

## FIXED BROADBAND AVAILABILITY (100/20 MBPS) VS. POVERTY LEVEL BY RACE/ETHNICITY IN THE U.S. (PLURALITY)




1. **Beltrami County, MN** — Plurality-Native American Census Block Groups (100.0% 100/20 Mbps, 23.0% poverty level)
2. **Magoffin County, KY** — Plurality-White Census Block Groups (100% 100/20 Mbps, 25.6% poverty level)
3. **Bibb County, GA** — Plurality-Black Census Block Groups (98.5% 100/20 Mbps, 34.3% poverty level)
4. **Philadelphia County, PA** — Plurality-Hispanic Census Block Groups (100% 100/20 Mbps, 35.9% poverty level)
5. **Pima County, AZ** — Plurality-Native American Census Block Groups (81.9% 100/20 Mbps, 36.7% poverty level)
6. **Shasta-Trinity National Forest, CA** — Plurality-Asian Census Block Groups (43.1% 100/20 Mbps, 0% poverty level)
7. **Adams County, WA** — Plurality-White Census Block Groups (1.7% 100/20 Mbps, 6.6% poverty level)
8. **Apache County, AZ** — Plurality-Native American Census Block Groups (0.9% 100/20 Mbps, 33.6% poverty level)

Figure 1 — *Broadband Availability vs. Poverty Level by Race/Ethnicity in the United States (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

(see Appendix A). Fiber and fixed wireless broadband networks have less coverage than cable across the board, though both are increasingly building out their networks which has expanded competition and further reduced the digital divide.[1]

As shown in Figure 1, **the data reveal a high degree of variation in broadband availability across communities.** Some communities are broadband availability outliers, with some doing exceptionally well and others doing exceptionally poorly. Even within a given demographic group there can be wide variation in broadband deployment which may not be fully captured by higher-level measures.

# INTRODUCTION

Since 2020, the U.S. government has made an unprecedented investment in fostering digital equity and opportunity, beginning with the Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020 and followed by the Consolidated Appropriations Act (CAA), the America Rescue Plan Act (ARPA), and the Infrastructure Investment and Jobs Act (IIJA) of 2021.[2] These laws make tens of billions of dollars of funding available to federal agencies and state and local governments to solve one of today's most pressing challenges: connecting everyone to high-speed broadband Internet (often called the "digital divide"). These programs have created a huge amount of excitement among communities, government leaders, broadband service providers, and public interest groups as an opportunity to make real strides in ensuring equitable access to broadband.

In order to ensure that these programs fulfill their promise of bringing broadband to all U.S. residents, an intentional focus should be placed on understanding the impact of the digital divide across different types of communities. To better understand and address these inequities, particularly given recent federal efforts to expand broadband deployments, Section 60506 of the IIJA directs the FCC to adopt rules that ensure equal access to broadband service. This requirement aims to prevent so-called "digital discrimination" based on characteristics identified in the IIJA, which are: income level, race, ethnicity, color, religion, and national origin.[3]

The FCC's implementation of Section 60506 of the IIJA culminated in the November 2023 Report and Order on Digital Discrimination of Access. In the Order, the FCC defines "digital discrimination of access" as "policies or practices, not justified by genuine issues of technical or economic feasibility, that (1) differentially impact consumers' access to broadband internet access service based on their income level, race, ethnicity, color, religion, or national origin or (2) are intended to have such differential impact,"[4] and prohibits companies from discriminating based on the characteristics outlined above.[5] This includes programs and policies that are intentionally discriminatory, as well as those that may not have a discriminatory intent but have a disparate impact.[6] Broadband providers are subject to this prohibition, as are any entities that facilitate or otherwise affect consumer access to broadband.[7]

The FCC's order also establishes mechanisms for enforcing these rules, giving itself the ability to conduct investigations and levy fines and forfeiture penalties against violators. The Order establishes that, for a company's activities to warrant FCC action, "robust causality" must exist between the company's activities and the disparate impact in question—the specific policy of this company must be the direct cause of the disparate impact.[8] To initiate investigations, broadband consumers now have access to a dedicated pathway for digital discrimination complaints.[9] Additionally, the FCC's order explicitly allows for states and localities to develop their own digital discrimination rules and provides guidance to those entities in crafting any proposed regulations.

However, there are questions about the extent to which ISP activities are contributing to disparities in broadband availability across different communities. Indeed, the Digital Discrimination Report and Order itself notes that:

> **"Based on the record before us, we do not expect to encounter many instances of intentional discrimination with respect to deployment and network upgrades, as there is little or no evidence in the legislative history of Section 60506 or the record of this proceeding indicating that intentional discrimination by industry participants based on the listed characteristics substantially contributes to disparities in access to broadband internet service across the Nation."**[10]

Consistent with the focus of the FCC's Digital Discrimination proceeding, it is important to note that this paper focuses on broadband access or availability, not broadband adoption or subscription. As has been documented extensively in other papers, due to a variety of factors, lower-income U.S. residents historically have subscribed to fixed broadband at lower rates. One also sees lower broadband and technology adoption rates among specific groups, including residents of rural areas, communities with low rates of literacy and digital skills, aging individuals, persons with disabilities, and certain communities of color (namely Blacks and Hispanics).[11]

## BROADBAND AVAILABILITY IN THE UNITED STATES

As shown in Figure 2, 6.83 percent of the population lacks access to 100/20 Mbps service and would be considered "unserved" based on this threshold.* There is significant variability in the availability of some broadband technologies in comparison to others. As is apparent in Figure 2, 100/20 Mbps cable broadband availability is widespread, with service available to 87 percent of the entire U.S. population. However, fiber broadband service at 100/20 Mbps is available to a much smaller percentage of the population.

In addition to looking at the 100/20 Mbps threshold, this report also shows the availability of gigabit (1 Gbps)-capable broadband service at different income levels and for different racial and ethnic groups. While the focus of recent policymaking efforts has been on access to 100/20 Mbps service, it is also important to understand the extent to which a relationship exists between race, ethnicity, or income and an individual's access to the most advanced broadband technology. Gigabit Internet connections are being made available to an increasing share of the U.S. population, so understanding this relationship is essential for ensuring equity in access to this technology.

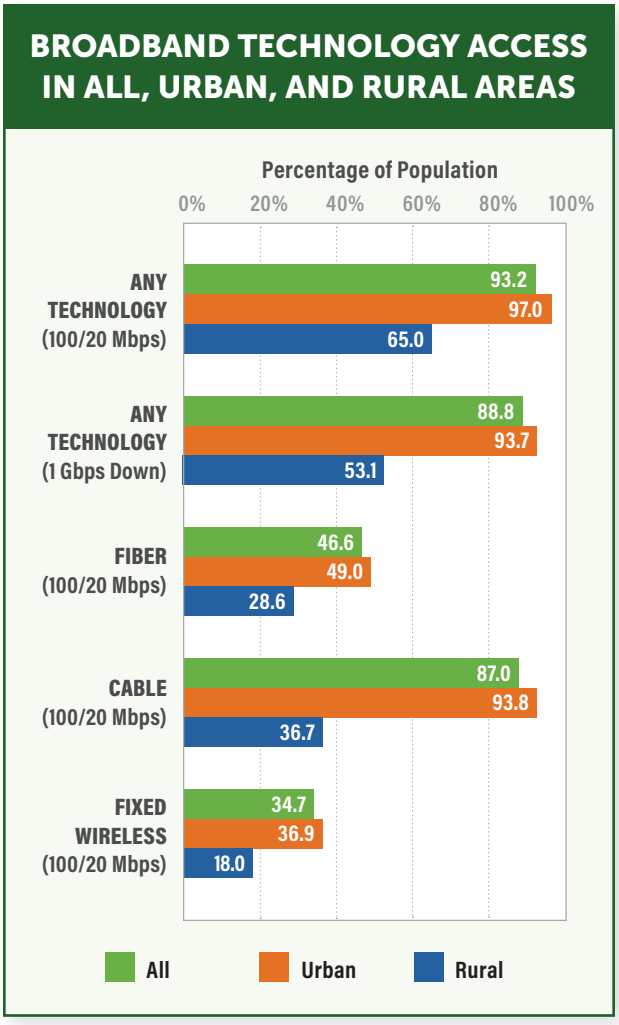



Figure 2 — *Access to Broadband Technologies in the United States (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

* As of January 2024, 5.05 percent of U.S. residents lack access to 25/3 Mbps service. This population currently is considered unserved. See Federal Communications Commission. "National Broadband Map." Updated December 12, 2023. Available at: https://broadbandmap.fcc.gov/area-summary/fixed?version=jun2023&zoom=4&br=r&speed=25_3&tech=1_2_3_7. Accessed January 10, 2024. However, many industry experts and policymakers consider this 25/3 Mbps threshold to be insufficient to meet the needs of broadband users today. In March 2024, the FCC raised the threshold for what is considered "served" with fixed broadband from having 25/3 Mbps service available to having 100/20 Mbps service available. See Federal Communications Commission. "2024 Section 706 Report." March 18, 2024. Available at: https://docs.fcc.gov/public/attachments/FCC-24-27A1.pdf. Accessed March 20, 2024. Moreover, most broadband funding programs already require grantees to deploy networks capable of at least 100/20 Mbps throughputs. For these reasons, 100/20 Mbps is used as the baseline for broadband availability in the rest of this paper.

## BROADBAND AVAILABILITY AND INCOME

This paper next assesses the correlation between broadband availability and income. As the figures in this section and the subsequent section on broadband availability and race/ethnicity will demonstrate, the data show little relationship between income, race, or ethnicity and availability of gigabit-capable broadband service.

In Figure 3, the lighter colored lines show the correlation between broadband availability and poverty as of March 2023. Access is high across all communities in the U.S., regardless of income, and there is almost no difference in overall broadband availability between the lowest- and highest-income communities. The lowest-income communities, where over 60 percent of the population lives below the federal poverty line, are less likely to have access to fiber-based networks (7.1 percentage points less likely). In contrast, data show that cable-based broadband networks are widespread throughout the markets they serve, including in communities with high rates of poverty.

The dashed line shows the portion of the U.S. population that lives in census block groups in areas with increasing rates of poverty. As Figure 3 shows, the number of census block groups meeting the poverty criteria—or where the rate of poverty in the census block is equal to or above the percentage shown on the x-axis—decreases as poverty increases. If one assesses areas of extremely high rates of poverty, where more than 60 percent of residents live at or below the federal poverty line, the population sample size becomes extremely small.

The darker colored lines show the same relationship one year later, with January 2024 data. In this data, overall access to 100/20 Mbps broadband has improved across all income levels. Even in the areas with the lowest incomes, where over 60 percent of people live below the federal poverty line, 92.3 percent of residents have access to 100/20 Mbps broadband. In these areas, residents are only 0.9 percentage points less likely to have access to 100/20 Mbps fixed broadband than in the highest-income communities. In addition, the difference in availability of fiber between the lowest- and highest-income areas has dropped to approximately 4.8 percentage points (from 7.1 percentage points in March 2023). Fixed wireless has improved across all income levels, and residents in the lowest-income areas actually have better access to fixed wireless broadband than in the highest-income communities. Cable-based networks have also continued to grow in availability; interestingly, people in the lowest-income areas are actually 2.7 percentage points more likely to have access to cable-based broadband service than the highest-income areas, where there is little to no poverty. This is likely due to the fact that these lowest-income areas are in a very small number of neighborhoods that are more urbanized.

It is an unquestionably positive development that the data show progress in closing the broadband availability gap. While cable broadband is virtually ubiquitous across all income areas, fiber and fixed wireless providers offer less coverage as incomes decrease (though they are increasingly building out their networks to all areas).

**Available to 87 percent of the U.S. population, cable-based broadband networks are widespread throughout the markets they serve, including in communities with high rates of poverty.**

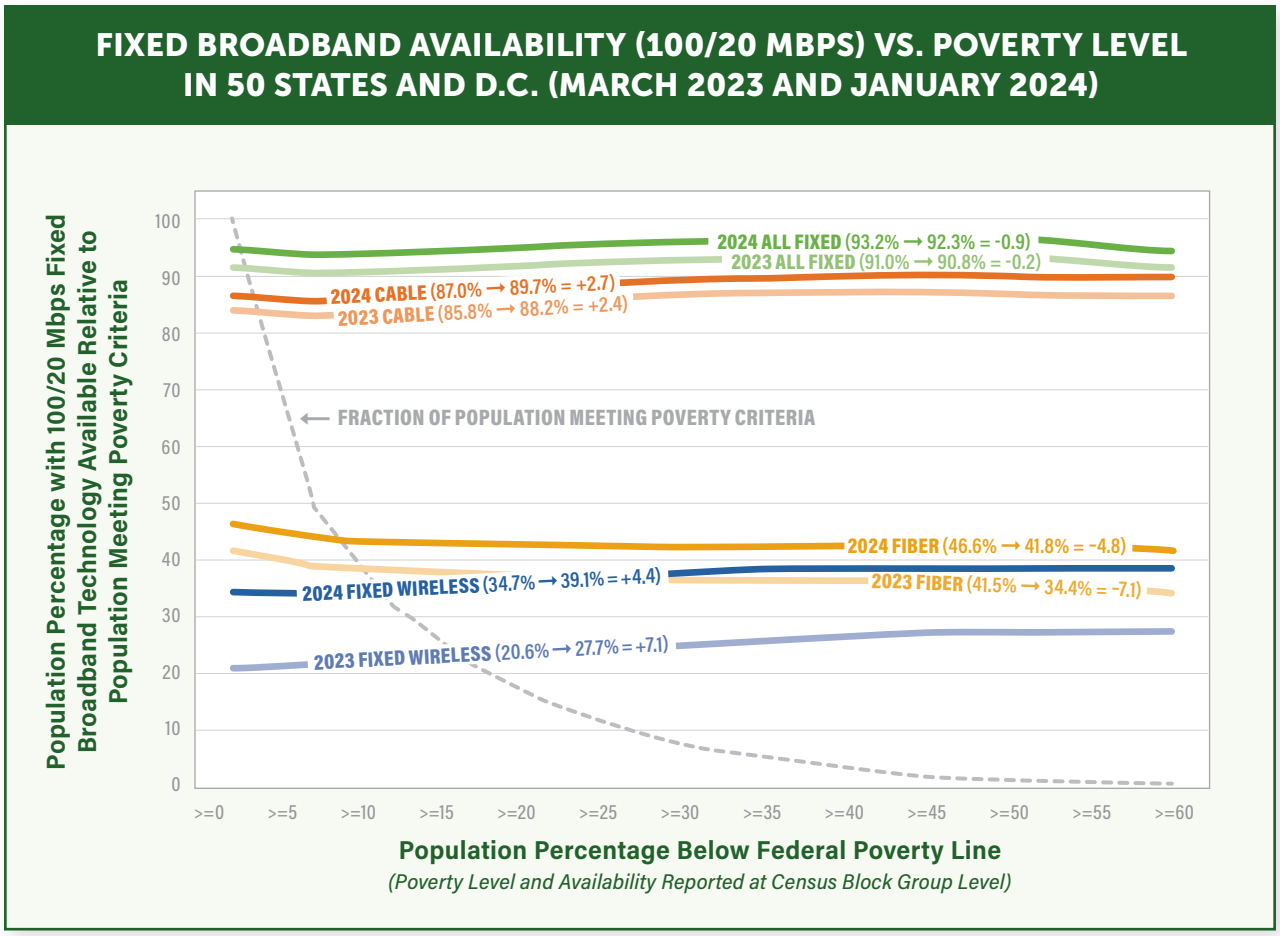



Figure 3 — *Fixed Broadband Availability vs. Poverty Level for March 2023 and January 2024 (Source: FCC BDC, March 2023, FCC BDC, January 2024, and U.S. Census ACS Data from December 2021)*

Increased deployment overall and in communities where the need is greatest can be attributed to a combination of private investment and recent federal government investments in broadband funding programs (e.g., the FCC's Rural Digital Opportunity Fund, U.S. Department of Agriculture's ReConnect program, and other projects funded using CARES Act, CAA, and ARPA funds). Many of these programs include as scoring criteria a prospective grantee's willingness to deploy networks in socially vulnerable communities. ISPs should also be recognized for meeting the moment and developing additional strategies and methods for deploying sustainably in communities of greatest need.

**Even areas with the lowest incomes, where over 60% of people live below the federal poverty line, are only 0.9 percentage points less likely to have access to 100/20 Mbps fixed broadband than the highest-income areas.**

# BROADBAND AVAILABILITY AND RACE OR ETHNICITY

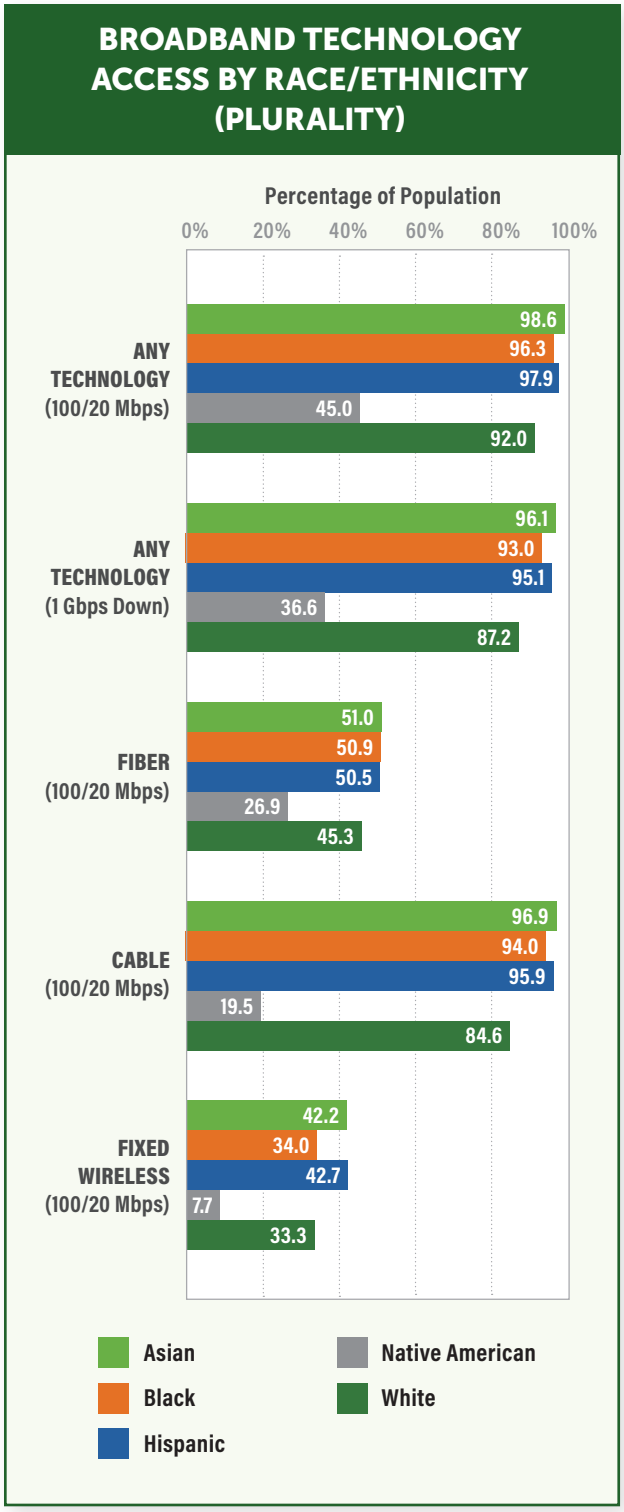



Figure 4 — *Access to Broadband Technologies by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

At a national level, the data do not show a significant difference in high-speed broadband availability for any community of color, except for Native Americans (see Figure 4). Indeed, broadband availability is slightly higher in plurality Black, Hispanic,† and Asian communities than in plurality White communities overall.

**At a national level, the data do not show a significant difference in high-speed broadband availability for any community of color except for Native Americans.**

Below, the discussion isolates the relationship of race and broadband availability by controlling for income and rurality since race, income, and geography are correlated in the U.S. Overall, income and rurality, irrespective of race, correlate to broadband availability. Lower incomes and greater rurality translate to lower broadband availability irrespective of race.

† Census data for Hispanics is collected by asking if an individual identifies as Hispanic or Latino, and then by asking about the race with which they identify. This means that everyone in the Census data who is categorized as Hispanic also falls into one of the other race categories. However, any understanding of broadband availability by race/ethnicity would be incomplete without considering ethnically Hispanic individuals irrespective of racial identity. Therefore, the experience of Hispanics is reflected both in data on "Hispanics" as well as in the experiences of other races.

## Equalizing for Income

Figure 5 shows that when poverty levels are controlled for, plurality Asian areas have the highest rates of broadband availability, followed by plurality Black and Hispanic areas. Lower-income, plurality White areas have a noticeably lower level of overall broadband availability than plurality Asian, Black, and Hispanic areas, but almost 91 percent of lower-income Whites do have high-speed broadband service available to them. Plurality Native American areas, however, have by far the worst access to broadband; less than half of all lower-income, plurality Native American areas have access to any high-speed fixed broadband service. Rurality also likely contributes to Native Americans' lack of access to broadband—many Native American families live in rural areas and Tribal lands. Rurality might also help to explain some of the difference between Asian, Black, Hispanic, and White populations.

**Overall, income and rurality, irrespective of race, correlate to broadband availability. Lower incomes and greater rurality translate to lower broadband availability irrespective of race.**

### BROADBAND TECHNOLOGY ACCESS IN LOWER-INCOME AREAS BY RACE/ETHNICITY (PLURALITY)

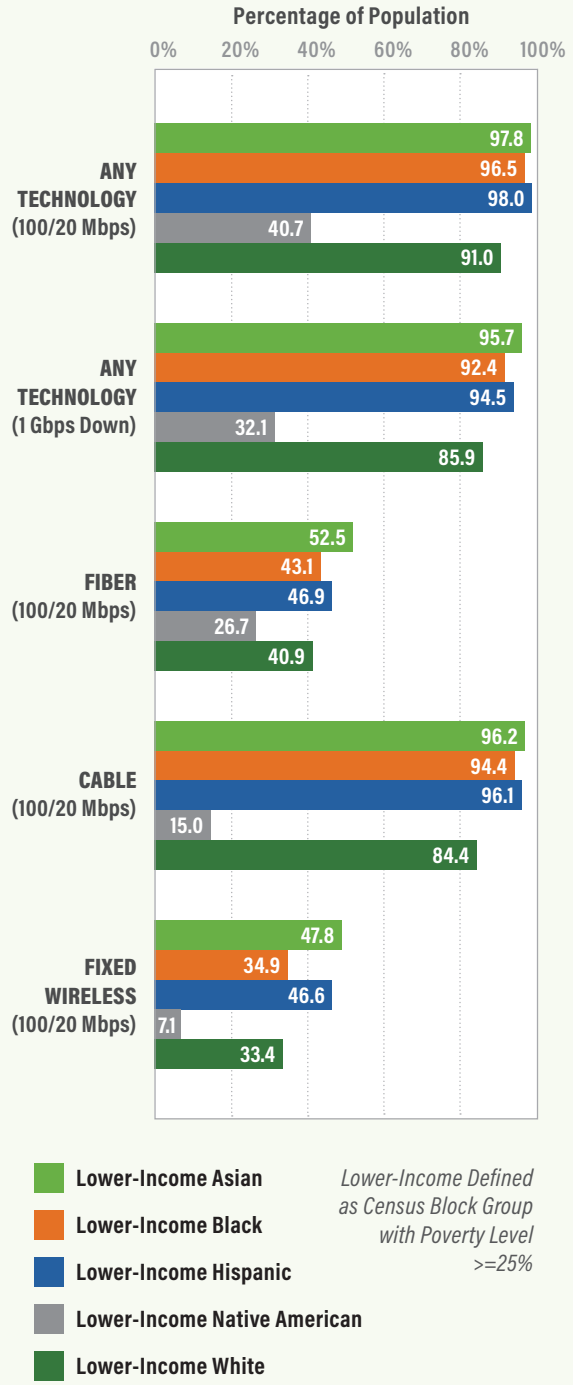



Figure 5 — *Access to Broadband Technologies by Race/Ethnicity in Lower-Income Areas (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

However, Figure 6 shows that in extremely high-poverty areas (where over 60 percent of residents live below the federal poverty line) members of all racial/ethnic groups, apart from Blacks, have comparatively less broadband available to them. Asians in particular experience a significant degradation in availability in the lowest-income areas (12.5 percentage points), registering a drop in availability that is greater than the drop for the White population (which is 7.6 percentage points). Hispanics also have less access to broadband in the lowest-income areas, but the difference is small (less than half of one percentage point) and still leaves Hispanics in the lowest-income areas with better access than Whites living in areas with similar demographics. In fact, Whites have the least access in the lowest income areas of all racial/ethnic groups other than Native Americans.

This demonstrates the importance of digging deeper into data, even when overall trends may not indicate disparities. When

**In the lowest-income areas, all racial/ethnic groups apart from Blacks have less broadband available to them than they would if they lived in higher income communities.**

## FIXED BROADBAND AVAILABILITY (100/20 MBPS) BY RACE/ETHNICITY AND POVERTY LEVEL IN 50 STATES AND D.C.

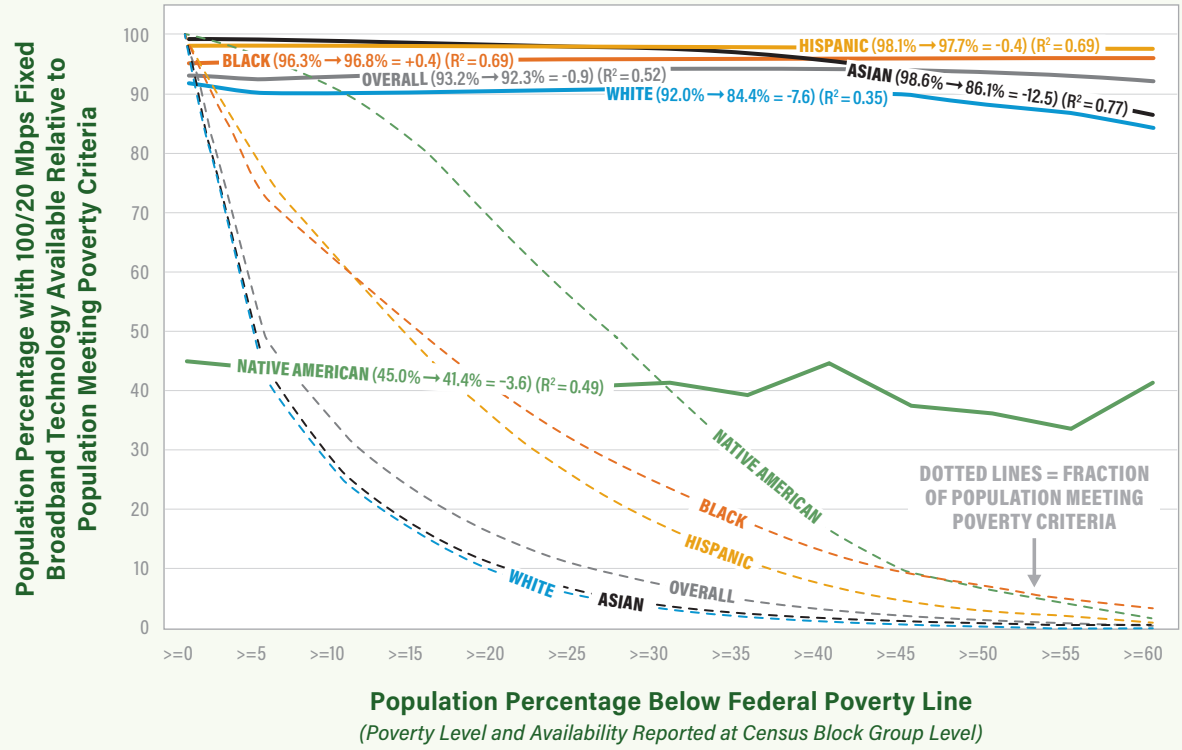



Figure 6 — *Fixed Broadband Availability by Race/Ethnicity and Poverty Level (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

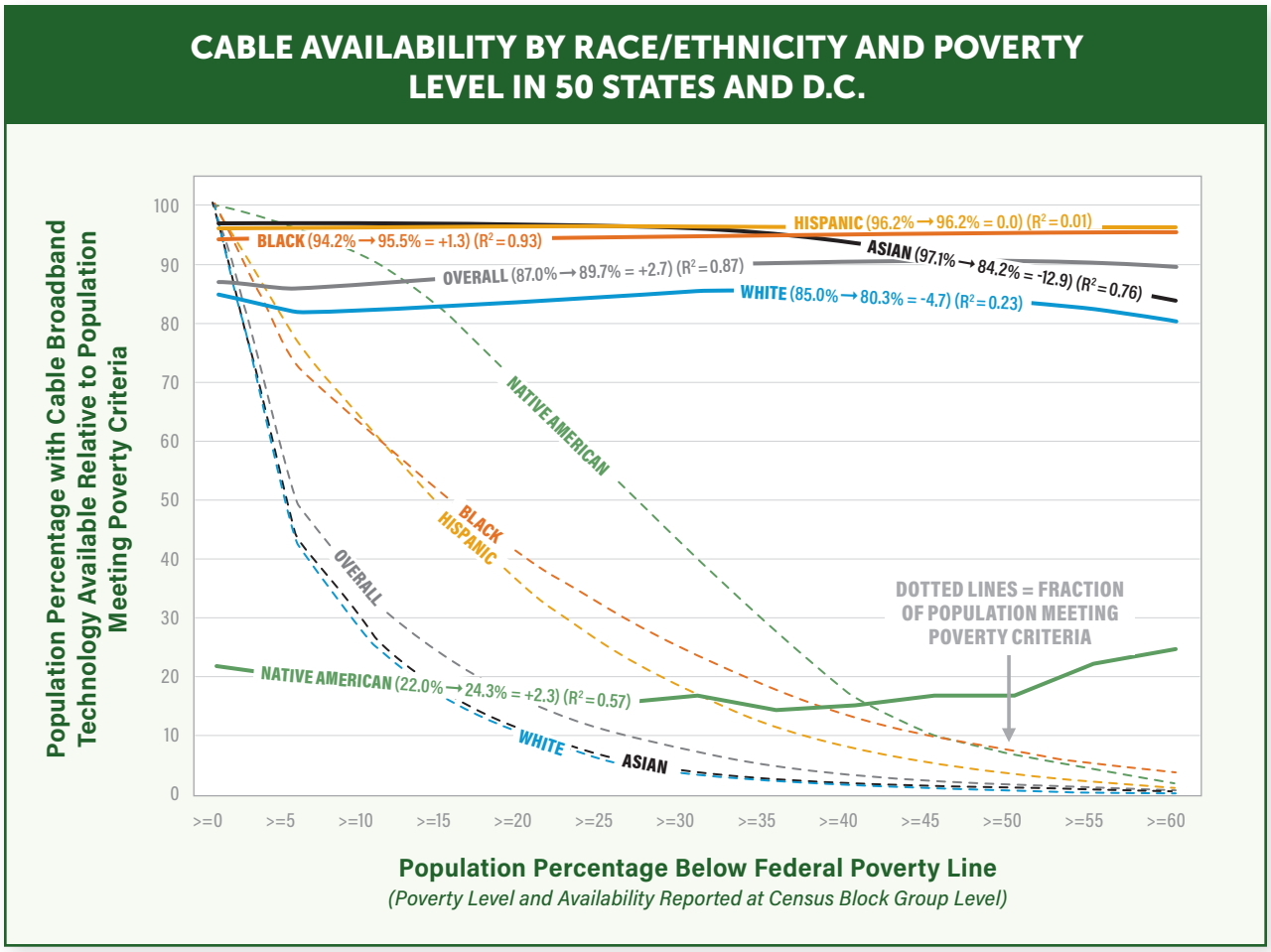



Figure 7 — *Cable Broadband Availability by Race/Ethnicity and Poverty Level (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

looking at Figure 5, it appears that lower-income Hispanics, Asians, and Blacks experience little to no degradation in broadband access compared to their racial/ethnic group overall. Figure 6 shows that this is not the case in very high-poverty areas; in areas where 35 percent or more of the population lives below the poverty line, several racial/ethnic groups begin to experience a reduction in broadband availability. However, the very small percentage of the overall population that lives in these extremely high-poverty areas means that this degradation is not readily apparent in higher-level data. This might warrant further analysis.

The regression values ($R^2$) show how well correlated the decrease in availability of 100/20 Mbps fixed broadband is to increasing poverty levels for different racial and ethnic groups. A value of one indicates a perfect correlation and a value of zero shows that there is no correlation. The Asian, Hispanic, and Black populations have higher regression values, which show that for these groups, lower access to 100/20 Mbps is primarily driven by extreme poverty, whereas other groups like Whites and Native Americans have lower regression values, indicating that other factors such as rurality are also driving lack of broadband availability.

Figure 7 shows a similar trend around cable broadband availability. While overall cable-based broadband availability is strong among lower-income members of each racial/ethnic group, Figure 8 shows that this does

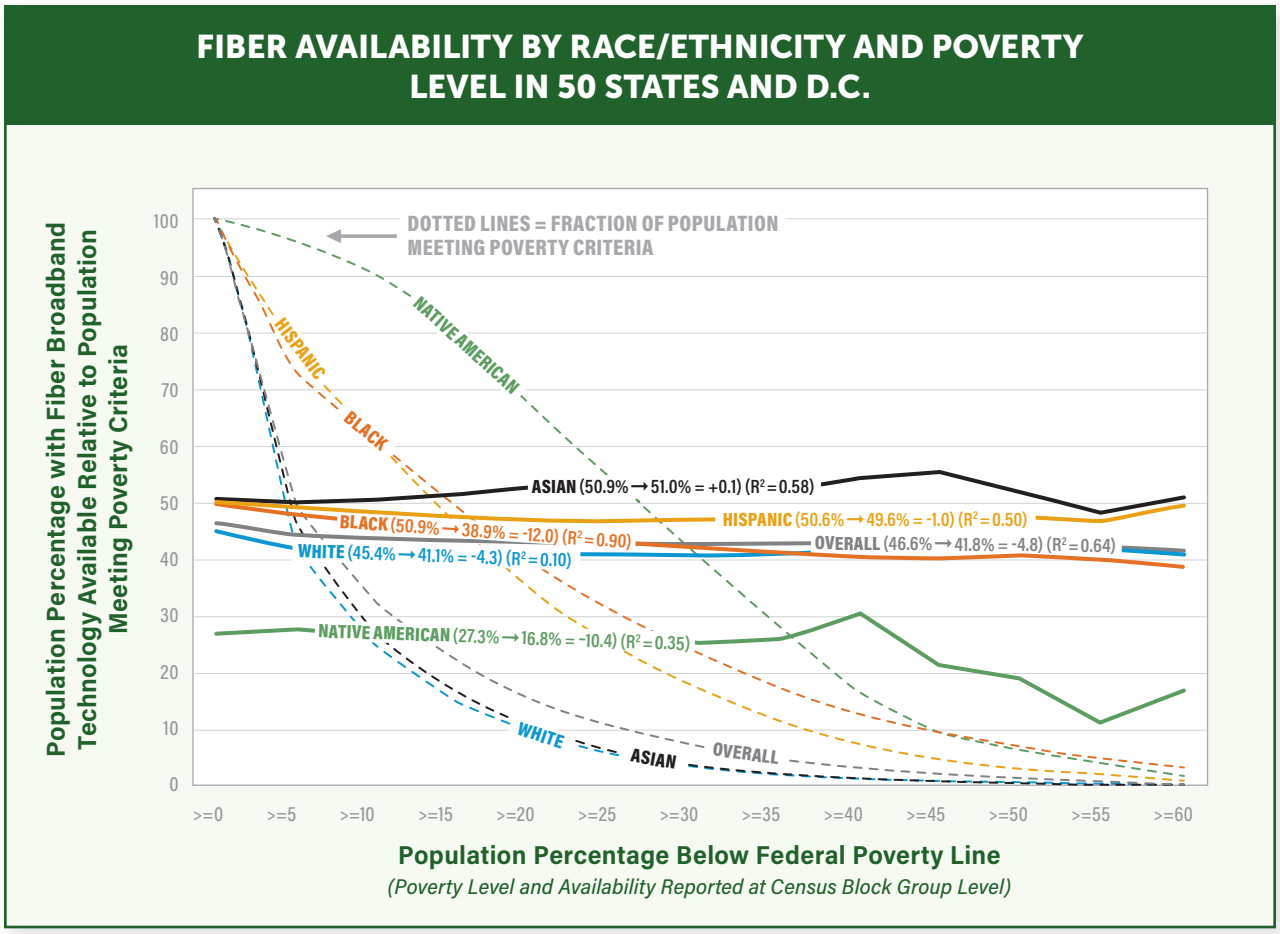



Figure 8 — *Fiber Broadband Availability by Race/Ethnicity and Poverty Level (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

not tell the whole story. For Blacks and Native Americans living in the highest-poverty areas, access to cable-based broadband is slightly better than for Blacks and Native Americans overall, but there is less cable-based broadband available to Asians and Whites in areas with the highest rates of poverty. This might be partly due to cable's historic urban-based deployments.

Figure 8 shows fiber broadband availability by race as poverty increases. Even in the highest-income areas, less than half of all members of each racial/ethnic group apart from Asians have fiber broadband service available to them. And as the poverty of an area increases, every racial/ethnic group experiences a decrease in fiber availability, with the exception of Asians. Blacks and Native Americans experience the most significant drops, while Hispanics are the least affected by poverty in terms of fiber availability.

## Comparing Broadband Availability in Rural and Urban Areas

Rurality is one of the most important factors to control for when assessing the impact of race, ethnicity, and income on broadband availability. Rurality is perhaps the most important factor in determining whether a population, regardless of their racial or ethnic makeup or income profile, has access to broadband. Broadband infrastructure deployments in rural areas have lagged those in more densely populated geographies due to the high average costs of deploying and operating a network in more sparsely populated areas, with less potential return on the investment (because there are fewer potential customers to average costs across). Among urban households, 97.0 percent have access to broadband that meets the 100/20 Mbps threshold, compared to just 64.9 percent of rural households.[12] Given that residents of rural areas have such a different experience accessing broadband compared to non-rural residents, this paper examines data from these geographies independently. Figure 9 shows the percentage of the overall population of each race/ethnic group that lives in rural areas, as well as the percentage of each race's lower-income population that lives in rural areas. The data show that as a percent of the population, Native Americans and Whites are the most rural, but that Whites and Hispanics make up the largest segments of the rural population in real terms.

**Rurality is perhaps the most important factor in determining whether a population, regardless of its racial or ethnic makeup or income profile, has access to broadband.**

| | Percent of Population Living in Rural Areas | Population Living in Rural Areas | Percent of Lower-Income Population Living in Rural Areas | Lower-Income Population Living in Rural Areas |
|---|---|---|---|---|
| **ASIAN** | 2.82% | 630,516 | 1.87% | 28,428 |
| **BLACK** | 8.28% | 3,743,865 | 6.34% | 643,200 |
| **HISPANIC** | 7.51% | 4,661,481 | 4.93% | 514,150 |
| **NATIVE AMERICAN** | 28.75% | 1,222,427 | 40.74% | 364,935 |
| **WHITE** | 23.06% | 51,936,447 | 16.90% | 2,677,154 |
| **OVERALL** | 18.04% | 59,798,793 | 11.46% | 3,987,046 |

Figure 9 — *Rural Population by Race/Ethnicity (Source: U.S. Census ACS Data from December 2021)*

## BROADBAND TECHNOLOGY ACCESS IN RURAL AREAS BY RACE/ETHNICITY (PLURALITY)

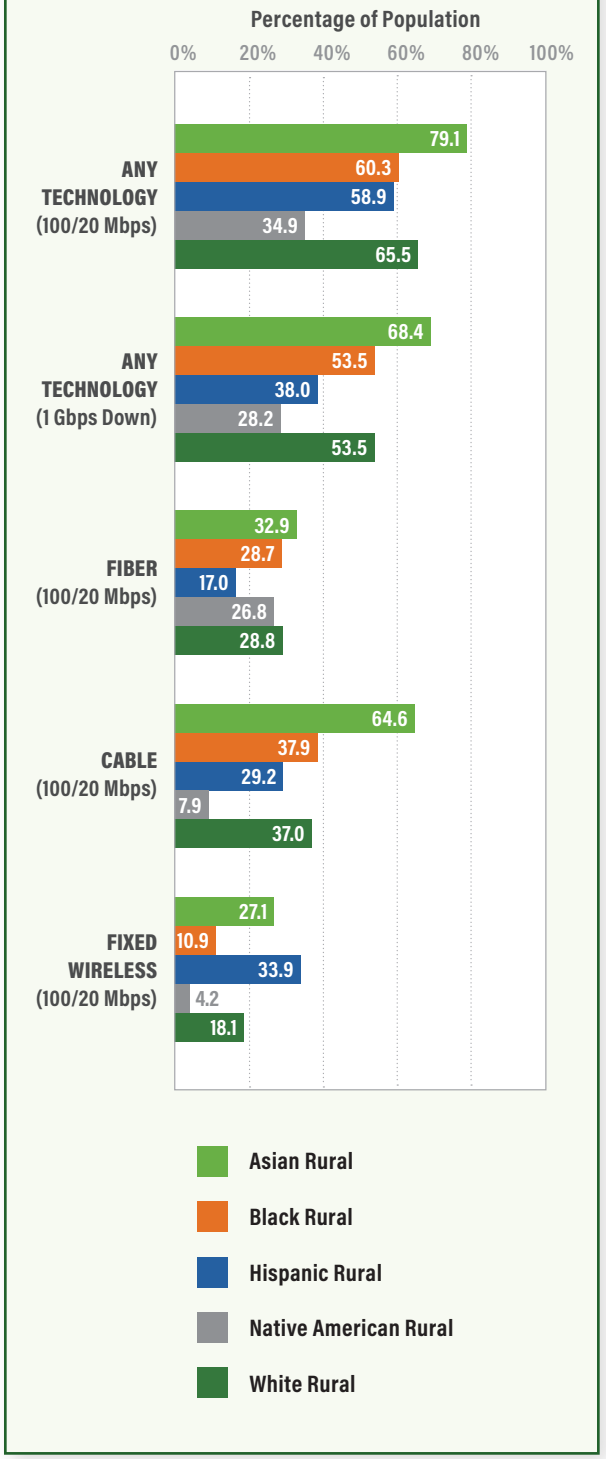



Figure 10 — *Access to Broadband Technologies in Rural Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

## BROADBAND TECHNOLOGY ACCESS IN LOWER-INCOME RURAL AREAS BY RACE/ETHNICITY (PLURALITY)

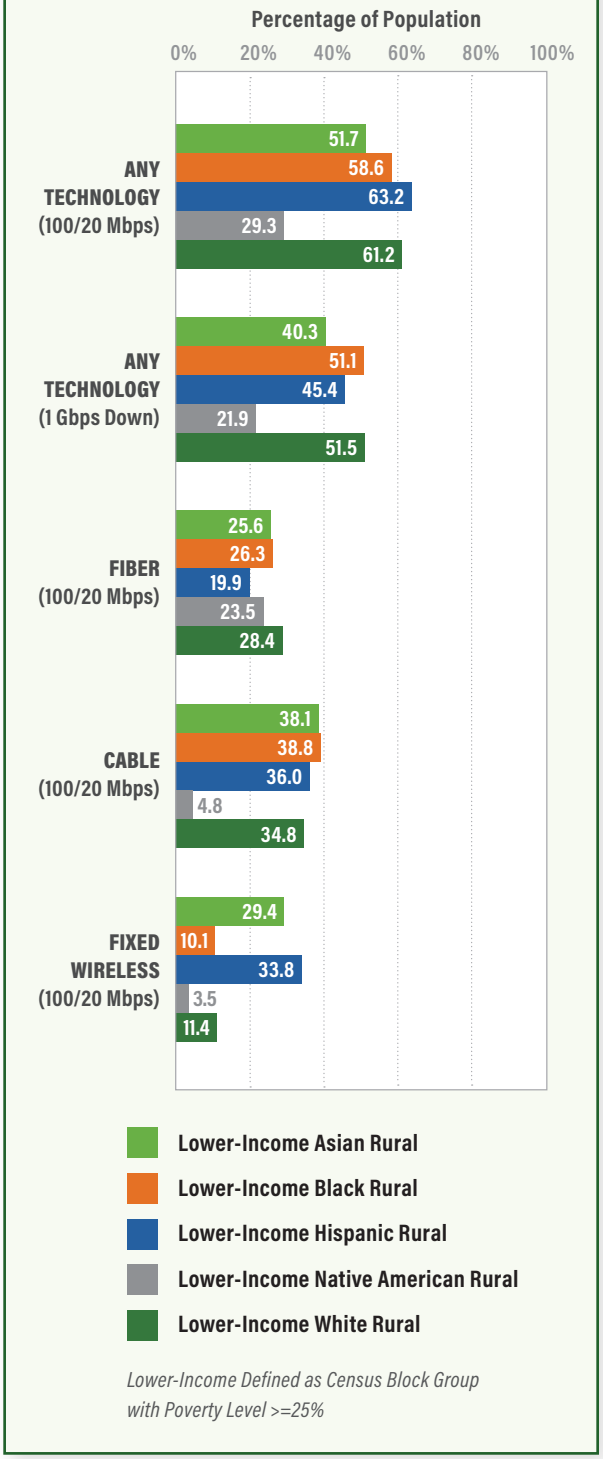



Figure 11 — *Access to Broadband Technologies in Lower-Income Rural Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

Figure 10 shows broadband availability in rural areas across different ethnic groups. Overall, this shows that trends in rural areas slightly differ from trends that exist on a national level: Asians again have the best access to broadband, but Whites have slightly better access to broadband than Hispanics and Blacks. Native Americans continue to fare significantly worse than other ethnic groups in terms of access to broadband.

Figure 11 demonstrates that the same gaps exist even after equalizing for income, further illustrating the impact of income on broadband availability. Approximately 37.2 percent of rural lower-income individuals lack access to 100/20 Mbps broadband.[13] The impact of poverty on broadband availability in rural areas appears mixed when one looks at the different racial and ethnic groups. Lower-income Native Americans in rural areas continue to have lower rates of broadband availability than other races or ethnicities.

This stands in stark contrast to broadband availability in urban areas. Figure 12 shows that in urban areas, all ethnic groups, with the exception of Native Americans, experience similarly high levels of broadband availability (between 96.6 percent and 98.7 percent of the relevant population with access to 100/20 Mbps); all levels of broadband availability are much higher than in rural areas. Native Americans have by far the worst access to fixed broadband service (approximately 54% of the population with access to 100/20 Mbps). While additional research should be conducted to determine what is causing these differences, policymakers should consider further efforts to increase broadband availability for Native Americans.

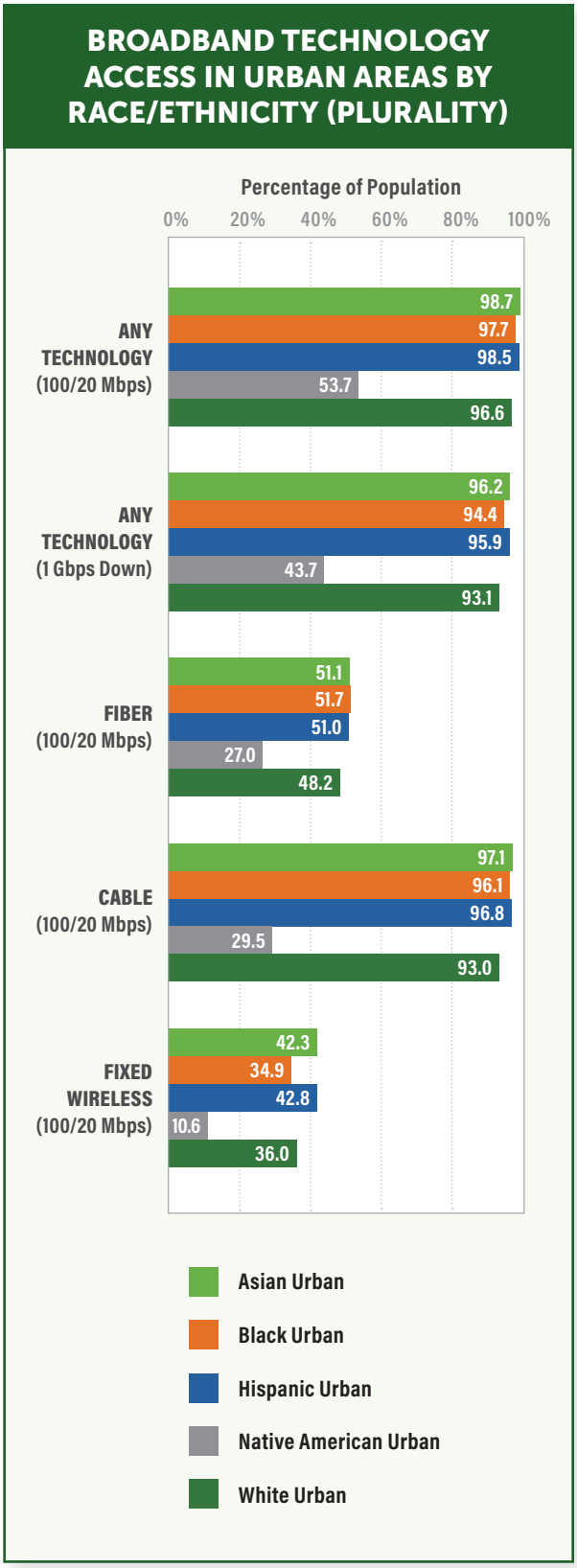



Figure 12 — *Broadband Availability in Urban Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

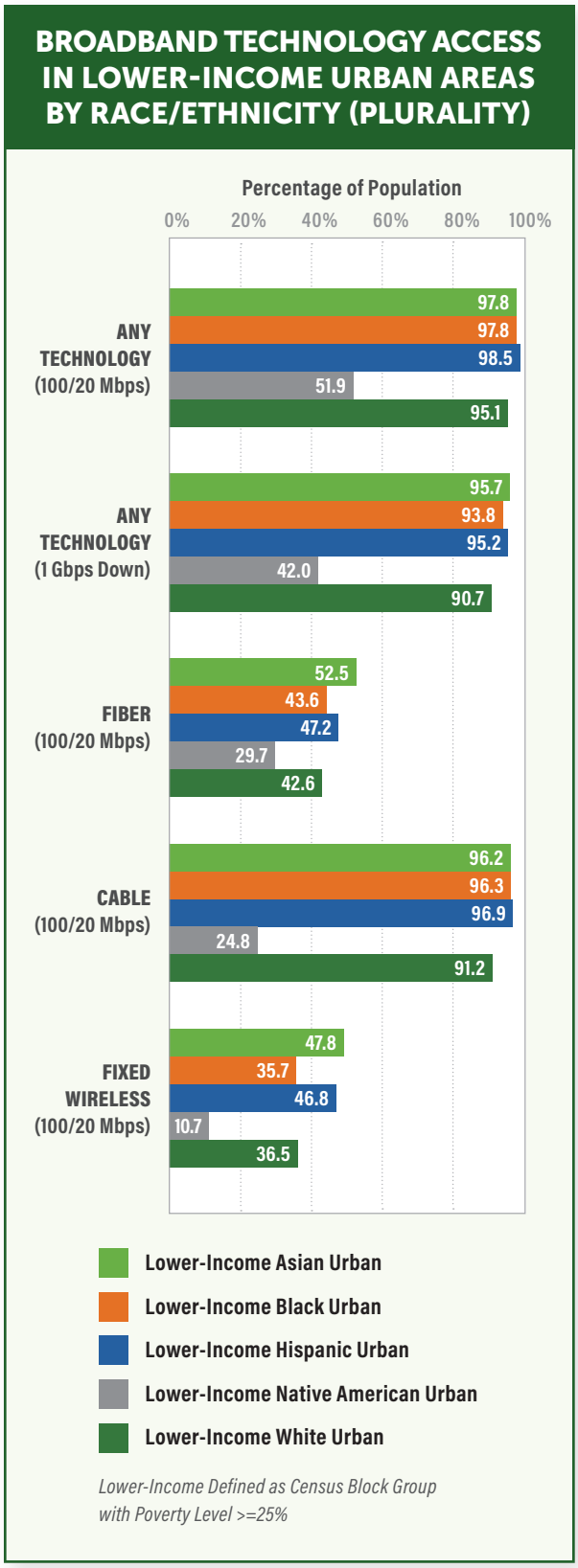



Figure 13 — *Broadband Availability in Lower-Income Urban Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

Figure 13 then shows the same to be true in lower-income urban areas, and that lower-income, plurality Native American areas have worse broadband access than all other communities, which have similar levels of overall broadband availability. Interestingly, in urban areas with higher rates of poverty, Hispanics, Blacks, and Asians each have slightly better access to 100/20 Mbps and gigabit-capable broadband than Whites.

High-level analysis of national trends can be a powerful tool in helping policymakers identify which populations are most in need by understanding the extent to which different levels of broadband availability exist among different communities. And, with the noted exception of Native Americans, this paper demonstrates that access to broadband for communities of color of any income is on par with, and frequently surpasses, access to broadband for Whites in the same income group.

## Sensitivity of Broadband Availability to Racial Concentration

The primary focus of this paper has been to determine the availability of 100/20 Mbps broadband to lower-income U.S. residents, as well as different racial/ethnic groups. In order to do this, the authors have analyzed the availability of broadband service in plurality-population communities (i.e., identifying the largest ethnic group in a community even if they are not the majority). This is due to where U.S. residents live; the majority of U.S. residents of all races live in mixed-race neighborhoods, and racial diversity in communities across the country continues to increase.[14] However, it also is important to understand the impact of increasing the concentration of residents of color on the availability of broadband in a community. Figure 14 demonstrates that the trends described above hold

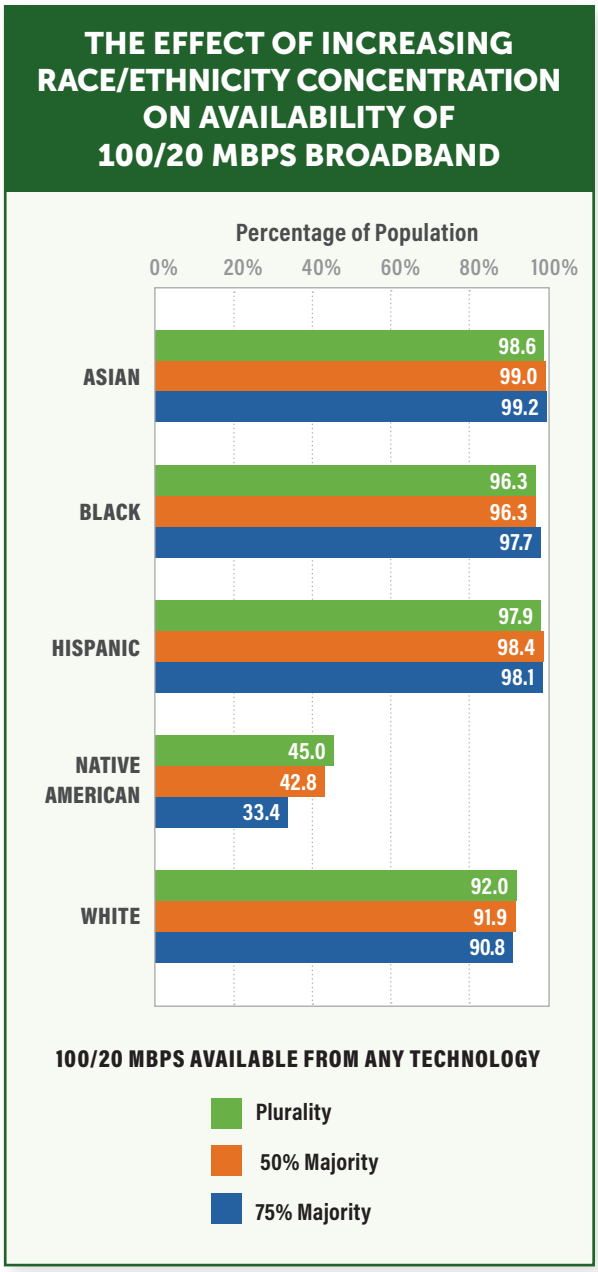



Figure 14 — *The Effect of Increasing Race/Ethnicity Concentration on Availability of 100/20 Mbps Broadband (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

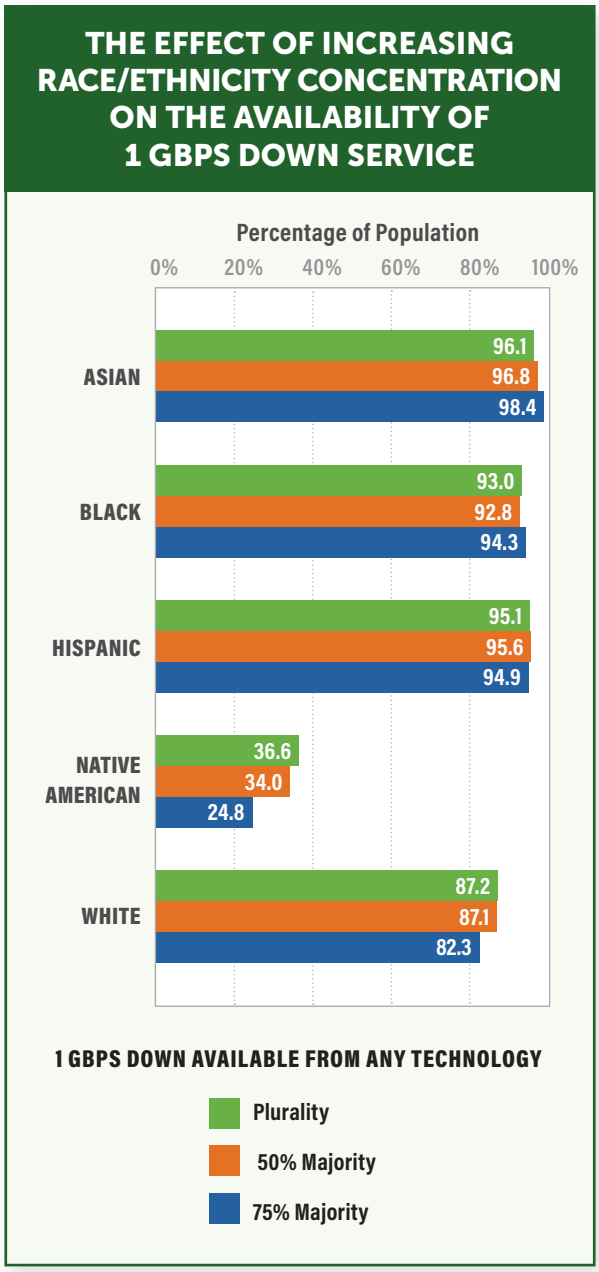



Figure 15 — *The Effect of Increasing Race/Ethnicity Concentration on the Availability of 1 Gbps Down Service (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

even after increasing racial concentration thresholds. The only two groups that experience a drop in 100/20 Mbps availability as racial diversity decreases are Whites and Native Americans, with Native Americans experiencing a much greater drop in availability than Whites. For Blacks and Asians, availability of broadband actually slightly improves as the concentration of members of these groups increases within a community.

The same holds true for the most advanced broadband technologies. As shown in Figure 15, availability of gigabit speed service again slightly improves for both Blacks and Asians as concentration of these populations increases.

Availability for Hispanics is generally consistent and holds at around 95 percent even as concentration increases. Once more, Whites and Native Americans are the two groups who are worse off overall, and who experience the largest drops in availability. In both cases, this might be attributable to rurality. There is a noticeable drop in availability of gigabit service in the highest concentration White communities, where over 75 percent of residents are White. However, the biggest drop is again experienced by Native Americans; in areas where more than 75 percent of residents are Native American, residents are 12 percentage points less likely to have gigabit service available than if they are in plurality-Native American areas. As has been the case in all analyses, Native Americans are significantly worse off in their overall access to gigabit service as compared to all other races.

## COMPETITION

The focus of the FCC's Digital Discrimination Order, and the focus of this paper's discussion up to this point, has been on the correlation between race/ethnicity, income, or rurality and any broadband availability.

However, competition levels may also be of interest as the benefits of competition to consumers are widely understood and accepted. Competition helps keep prices low and incentivizes companies to maintain and improve the quality of their goods and services.[15] Overall, there have been many positive developments in the state of broadband competition in the United States as both fiber and fixed wireless providers serve customers. Analysis of the FCC's broadband data, for instance, has shown a large and ongoing expansion in consumer choice.[16] And in just a matter of years, 5G fixed wireless went from non-existent to aggressively competing with cable and telcos to the point that now over five percent of U.S. broadband subscribers have fixed wireless.[17]

Figure 16 shows that, on a national level, similar trends exist around competition as were previously discussed around general availability: Black and Asian communities are well-served by competition, while White plurality areas have less competitive choice, and Native American plurality areas remain the worst off in terms of competitive choice. As discussed previously, the rurality of an ethnic or racial group's population might help explain many of these differences.

Figure 17 shows that, even after equalizing for income, the same trends continue to persist. Interestingly, lower-income White, Hispanic, and Asian plurality areas actually have better access to competition than the same populations do overall. Lower-income Black plurality areas do experience a slight reduction in competitive choice compared to Black plurality areas overall, however the difference is small, and lower-income Black plurality areas continue to have superior access to competitive choice compared to lower-income White plurality areas.

While there does not appear to be a link between racial/ethnic status or income and access to competition, one factor that does affect access to competition and cuts across all races and economic strata is rurality.

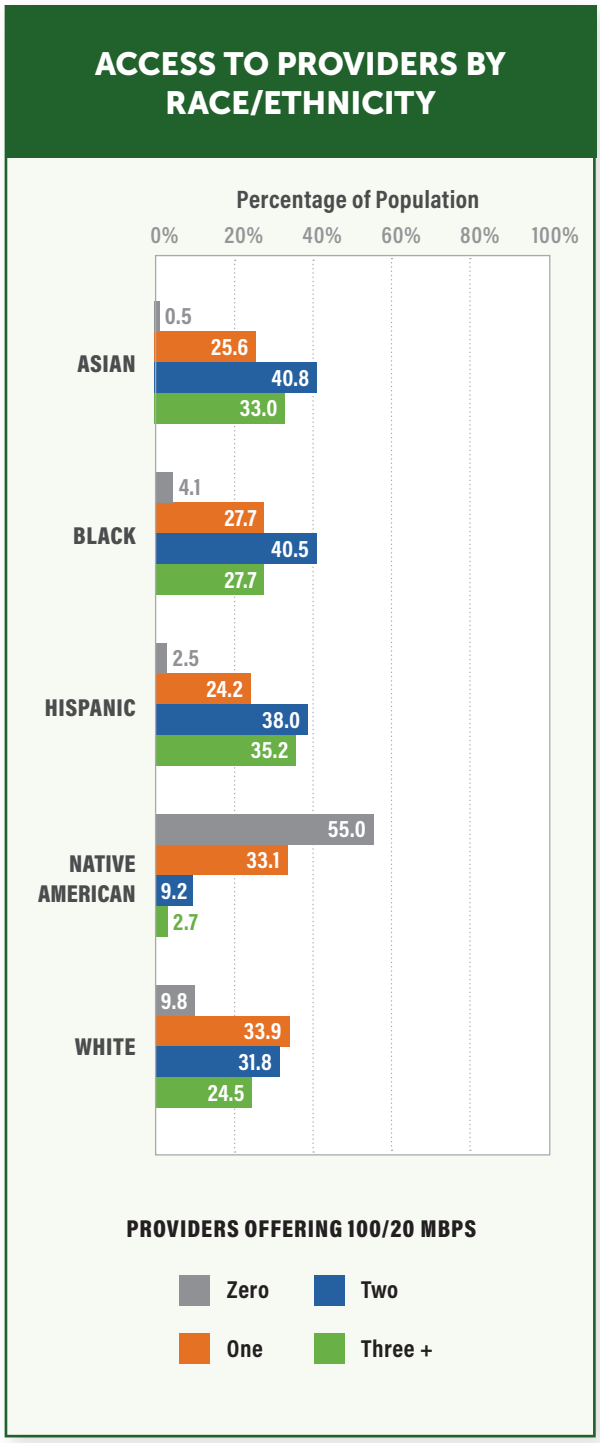



Figure 16 — *Access to Providers by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

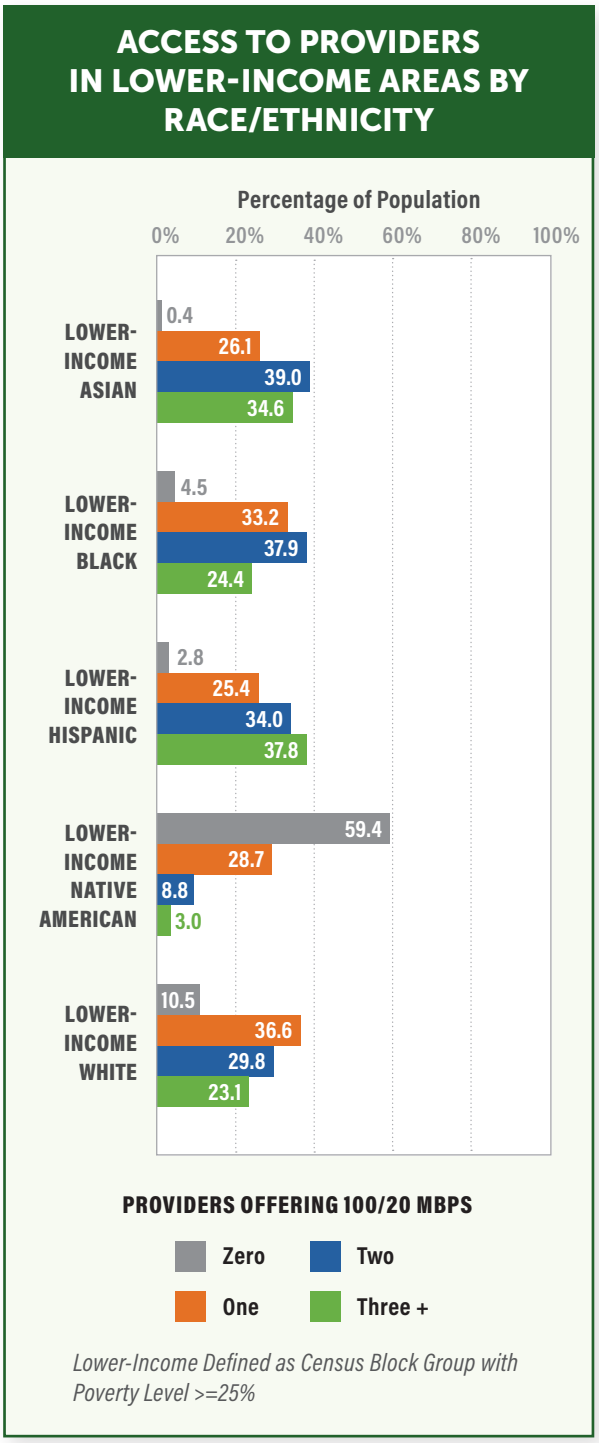
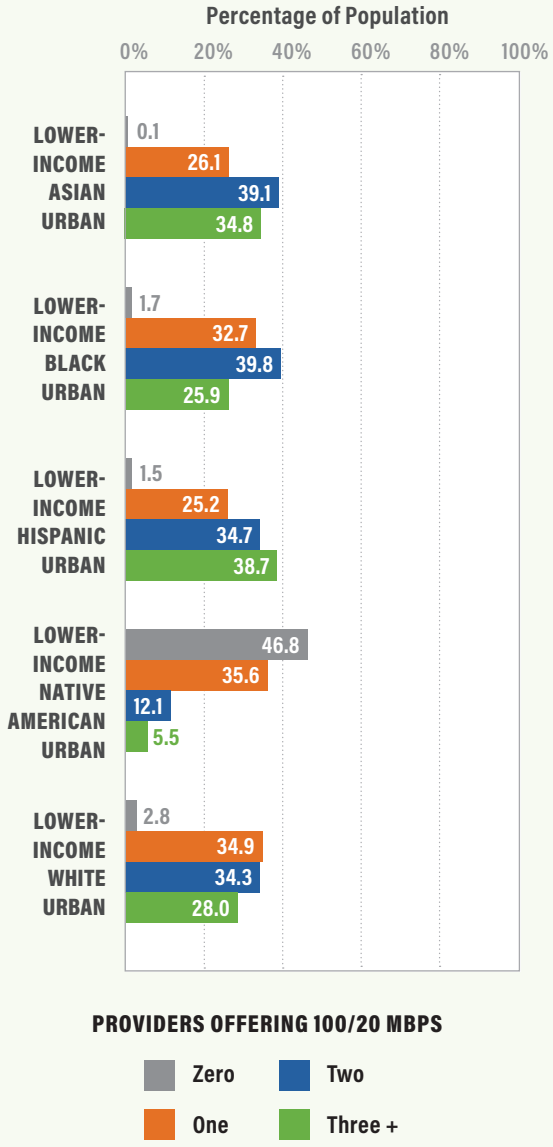



Figure 17 — *Access to Providers in Lower-Income Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

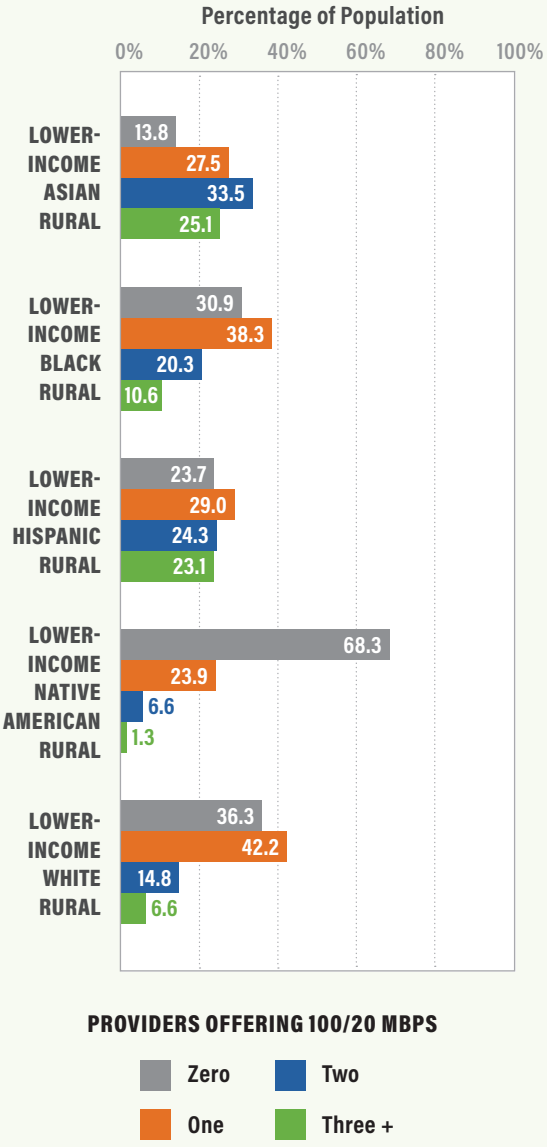
## ACCESS TO PROVIDERS IN LOWER-INCOME URBAN AREAS BY RACE/ETHNICITY




*Lower-Income Defined as Census Block Group with Poverty Level >=25%*

Figure 18 — *Access to Providers in Lower-Income Urban Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

## ACCESS TO PROVIDERS IN LOWER-INCOME RURAL AREAS BY RACE/ETHNICITY




*Lower-Income Defined as Census Block Group with Poverty Level >=25%*

Figure 19 — *Access to Providers in Lower-Income Rural Areas by Race/Ethnicity (Source: FCC BDC Data from January 2024 and U.S. Census ACS Data from December 2021)*

Figure 18 shows that in urban areas access to competition in lower-income areas is equal or better to overall access to competition for all racial and ethnic groups (as evidenced in Figure 17). This makes sense; urban areas are the most densely populated, and that population density allows for multiple networks to be built in the same areas while maintaining profitability.

However, overall competition levels look very different when focusing on rural areas. Figure 19 shows that, after equalizing for income, competition falls precipitously for every racial/ethnic group. In lower-income urban areas, the majority of Blacks, Whites, Hispanics, and Asians have access to at least two broadband providers. In lower-income rural areas, the majority of only one racial/ethnic group, Asians, has access to at least two broadband providers. And in rural areas, lower-income Native Americans have almost no access to competition at all: less than four percent of Native American households in lower-income areas have access to more than one broadband provider, and almost 70 percent lack access to any.

Current federal efforts, including the FCC's Digital Discrimination Order and various federal funding programs, are focused on ensuring that all U.S. residents have access to at least one provider of high-speed home broadband. Given that over six percent of the U.S. currently does not, this is an understandably important priority for policymakers. Fortunately, innovative technology deployments are bringing increased competitive options to consumers in rural areas. For example, low earth orbit (LEO) satellite broadband service, offering higher throughputs and lower latencies than traditional satellite-based connectivity services, has begun widespread deployment, which creates competitive choice everywhere, including in the most remote rural areas. In addition, providers are launching terrestrial fixed wireless services with increasing speed capabilities, including in rural areas.

## CONCLUSION

As policymakers continue their work to achieve universal broadband access for all U.S. residents, it is critical to ensure that, rather than deepening existing digital divides, access to broadband continues to expand to all communities. This paper, which focuses on access to broadband for lower-income communities and communities of color, demonstrates that availability among lower-income communities and plurality and majority communities of color is on par with, and frequently surpasses, the level of broadband available in plurality and majority-White communities with similar incomes and geographies. However, there are also caveats to this conclusion. Notably, Native Americans are the worst-served racial/ethnic group in all geographies and contexts, and additional emphasis should be placed on increasing access to broadband among Native American populations. Similarly, broadband availability trends down in the highest-poverty areas (where more than 35 percent of the population lives below the poverty line), and policymakers should pay particular attention to whether access in those high-poverty areas reaches parity with lower-poverty areas as federal funding programs continue to support expanded deployments.

That being said, the data around the correlation between broadband access, poverty, and/or race/ethnicity shows progress and success, both on the part of policymakers who have been working to expand access and of ISPs which have found new ways to sustainably connect additional customers. As long as policymakers and ISPs in the U.S. continue on this path, and work to make improvements in access for Native Americans and those living in the lowest-income areas, the U.S. will be able to realize its vision of Internet for all.

# APPENDIX A: FOCUSING ON FIBER BROADBAND AVAILABILITY

Over the last decade, platform-based competition driven in part by fiber-based providers has increased substantially. A decade ago, less than a quarter of U.S. households had access to fiber broadband;[18] today the share of U.S. households with such access is approaching 50 percent (see Figure 2). From March 31, 2023 through January 31, 2024 alone, fiber networks were extended to 6.7 million more U.S. households (derived from data underlying Figures 3 and 4).

Current broadband availability data do not indicate that income has a strong impact on overall access to 100/20 Mbps broadband; however, current fiber broadband availability correlates with higher incomes.

For example, Figure 20 shows that in Chicago cable-based Internet service is widely available to the entire population regardless of income level. As previously described, it is common for cable-based ISPs to serve all the addresses within a city or county irrespective of poverty levels, which is easily visible.

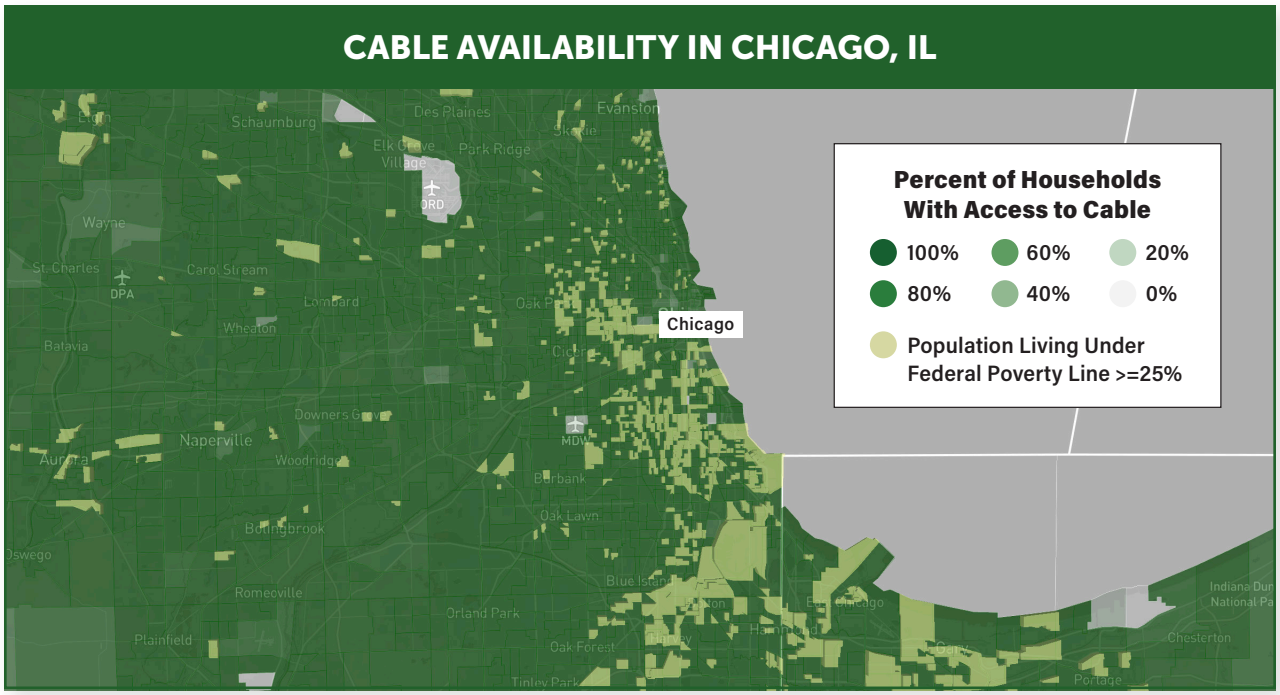



Figure 20 — *Cable-Based Broadband Service Availability and Income in Chicago, Illinois (Source: Vernonburg Group Digital Equity Map)*

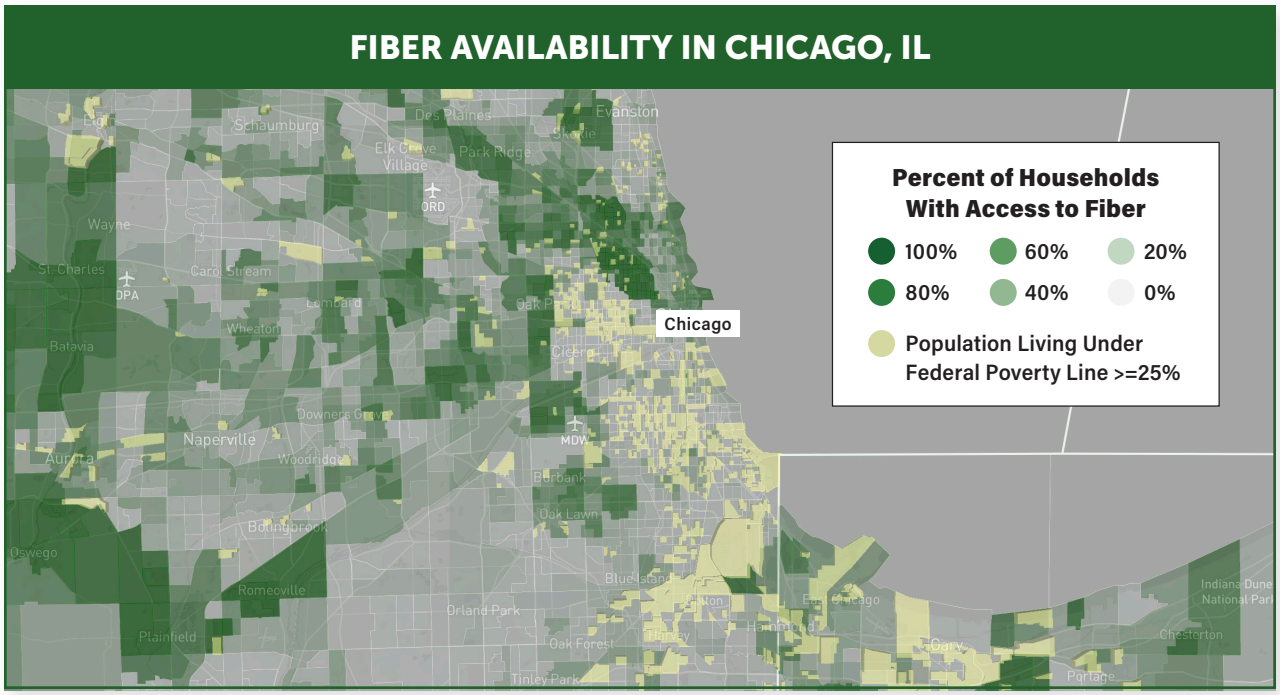



Figure 21 — *Fiber-Based Broadband Service Availability and Income in Chicago, Illinois (Source: Vernonburg Group Digital Equity Map)*

In contrast, Figure 21 shows that fiber in Chicago has been much more selectively deployed. The higher income areas on the North Shore have the densest fiber networks, with almost 100 percent of households having fiber available. Lower-income areas, on the other hand, have very little fiber availability. There are some exceptions to this, including a large area on the South Side near Lake Michigan; however, this area is also the location of the University of Chicago, a leading research university, which is a possible explanation for the relative availability of fiber in comparison to other socio-economically diverse areas. Overall, it appears that fiber providers in Chicago are much more selective about deployments to lower-income areas, and that the income of an area is a factor for these companies in choosing where to deploy.

**Overall, it appears that fiber providers in Chicago are much more selective about deployments to lower-income, majority-Black, and majority-Hispanic areas, and that the income of an area is a factor for these companies in choosing where to deploy.**

These same lower-income communities also happen to be communities with large Hispanic and Black populations. In Figure 22 and 23, the yellow highlighted areas indicate majority-Hispanic or majority-Black areas, and the dark green areas are those where fiber is available.

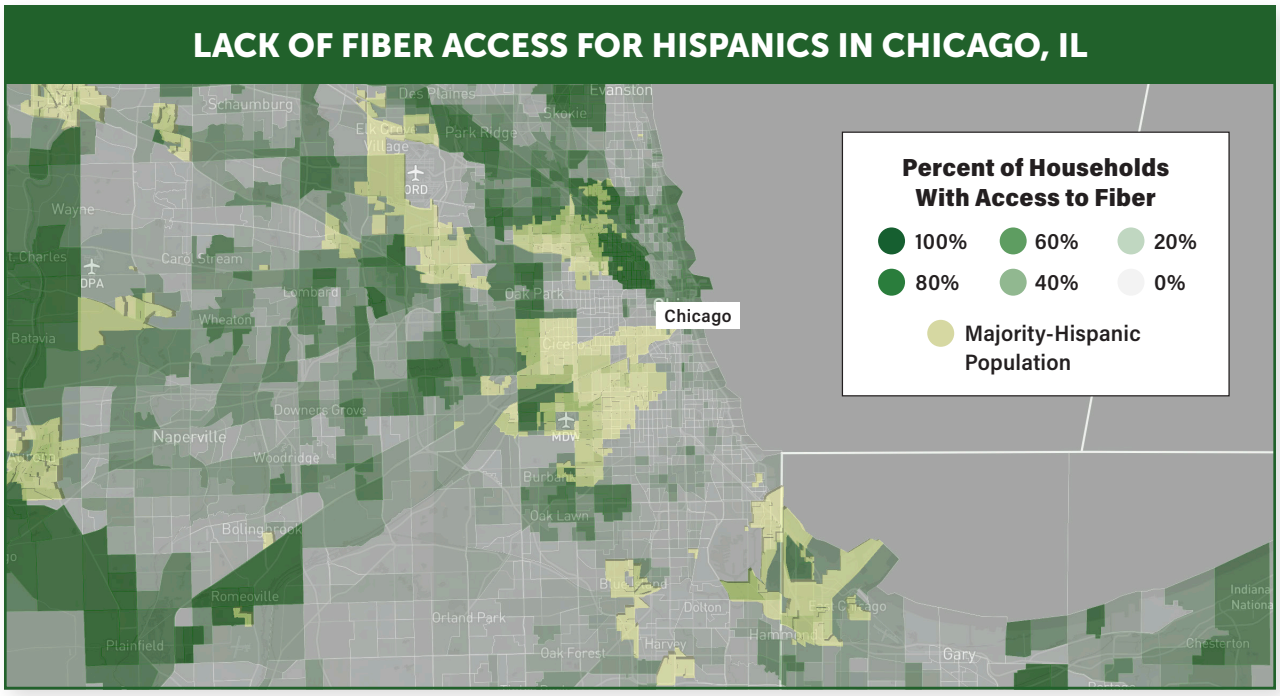



Figure 22 — *Majority-Hispanic Locations in Chicago, Illinois Lacking Access to Fiber Connectivity (Source: Vernonburg Group Digital Equity Map)*

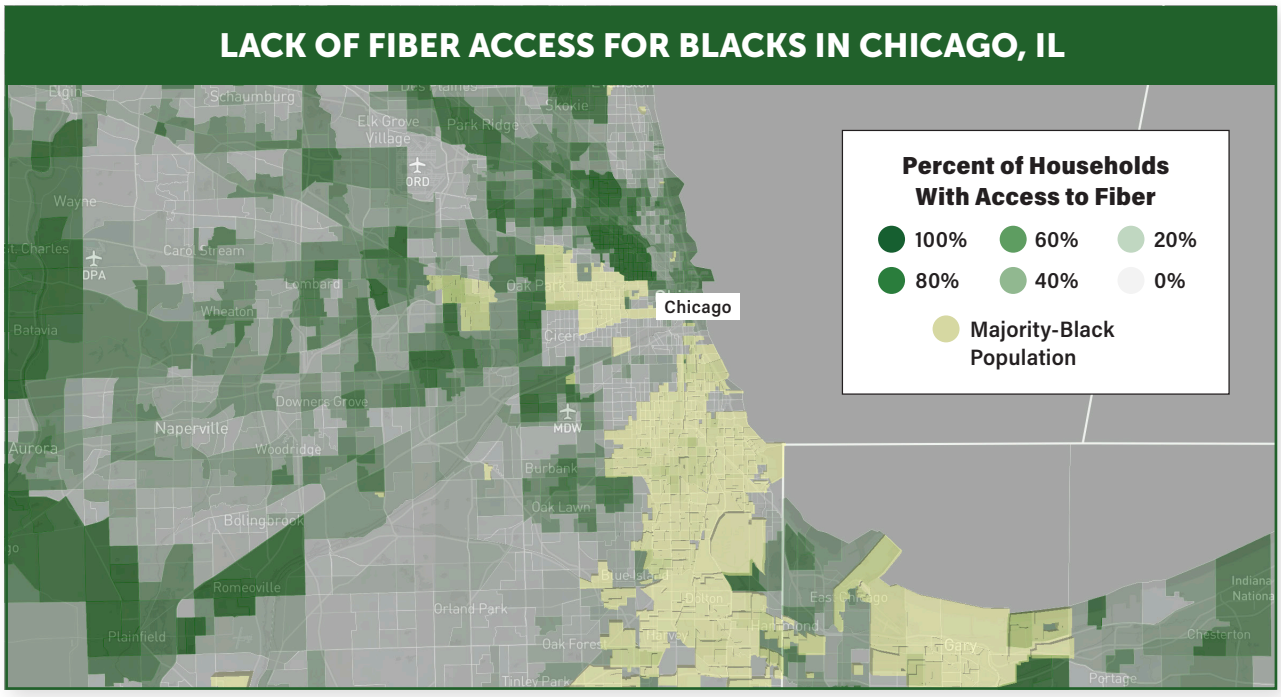



Figure 23 — *Majority-Black Locations in Chicago, Illinois Lacking Access to Fiber Connectivity (Source: Vernonburg Group Digital Equity Map)*

We see this same pattern in many markets across the U.S. Figure 24 shows that in Jackson, Mississippi, cable broadband service is similarly widely available, including to the lower-income communities in the city.

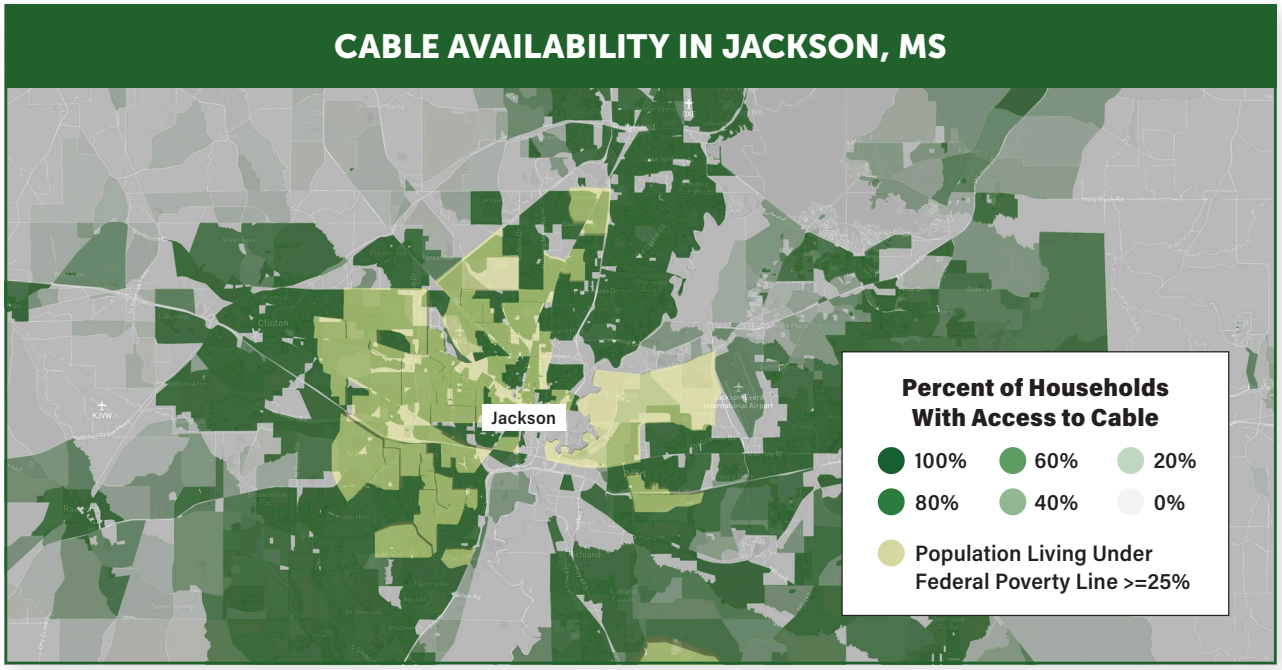



Figure 24 — *Cable-Based Broadband Service Availability and Income in Jackson, Mississippi (Source: Vernonburg Group Digital Equity Map)*

By contrast, Figure 25 shows fiber availability in Jackson. Fiber is available in almost no lower-income communities anywhere in the city. Where there is some fiber availability in lower-income communities, these deployments appear to be to communities that are small "pockets" of poverty in largely higher-income areas. Fiber broadband service is widely available in outer areas of the city and the suburbs, which are also higher-income communities.

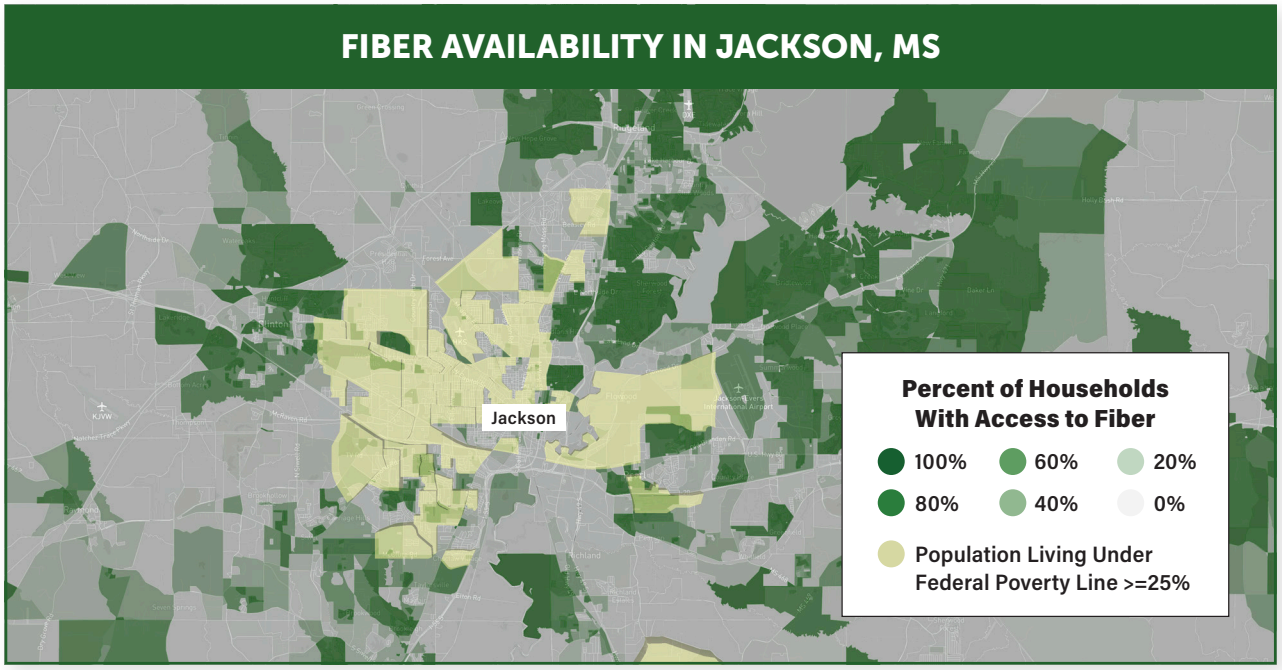



Figure 25 — *Fiber-Based Broadband Service Availability and Income in Jackson, Mississippi (Source: Vernonburg Group Digital Equity Map)*

Figure 26 shows where fiber is deployed relative to majority-Black areas in Jackson. Concerningly, fiber providers in Jackson appear not only to be avoiding deployments in lower-income communities (which are often majority-Black), but also in higher-income Black communities. There are large swaths of the South and West sides of the city that do not appear to be lower-income based on Figure 25 above, but are also almost completely lacking in fiber availability. Additional analysis should be conducted specifically in Jackson to better understand what factors are motivating fiber deployments.

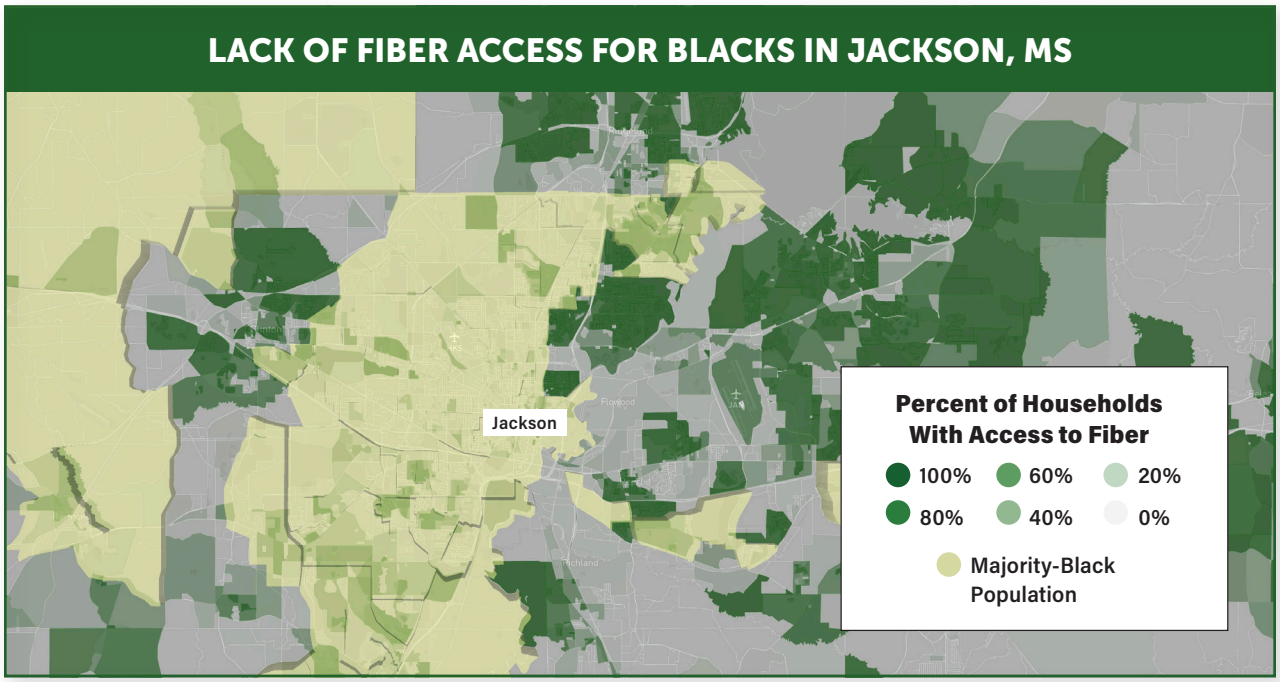



Figure 26 — *Majority-Black Locations in Jackson, Mississippi Lacking Access to Fiber Connectivity (Source: Vernonburg Group Digital Equity Map)*

Another similar example is Buffalo, New York. Figure 27 shows that in Buffalo cable-based broadband is ubiquitous across the city and surrounding areas, with the exception of a small number of census tracts.

Figure 28 shows that, once again, fiber providers in Buffalo have been much more selective in deploying to lower-income areas. While there has been some fiber deployment in lower-income areas, the vast majority of lower-income areas lack access to fiber-based broadband. Again, the lower-income areas that have been served with fiber are those that abut or are surrounded by higher-income areas.

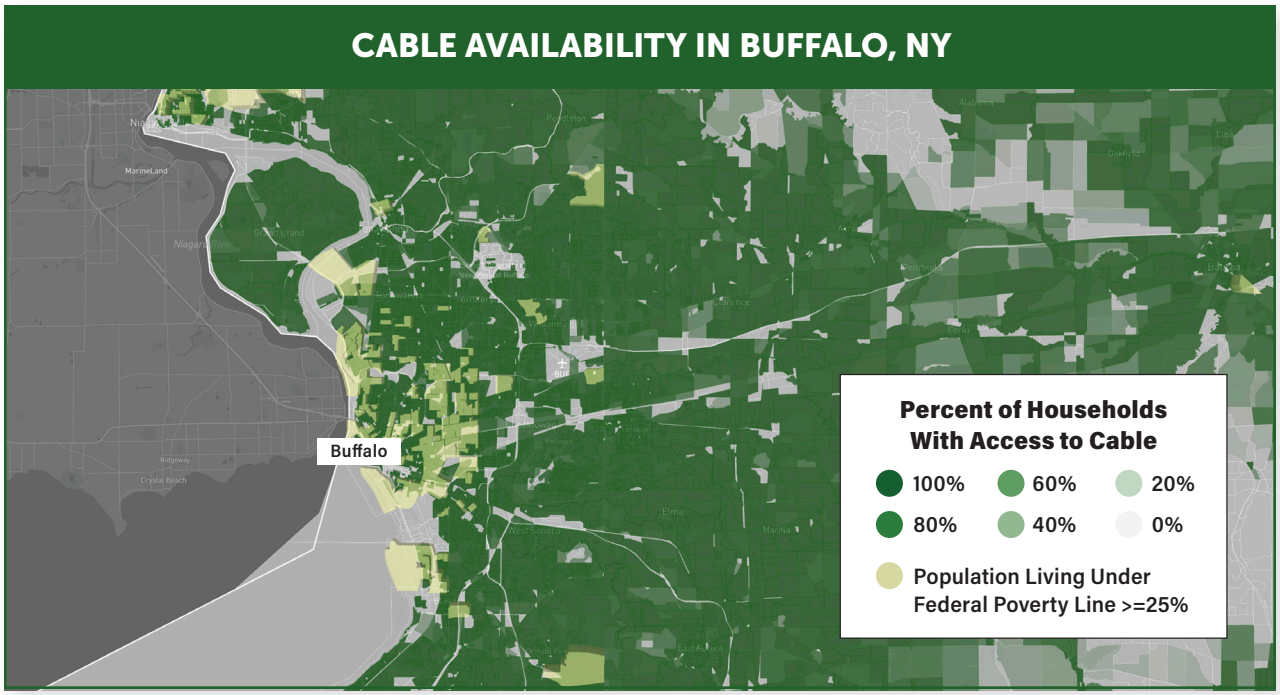



Figure 27 — *Cable-Based Broadband Service Availability and Income in Buffalo, New York (Source: Vernonburg Group Digital Equity Map)*

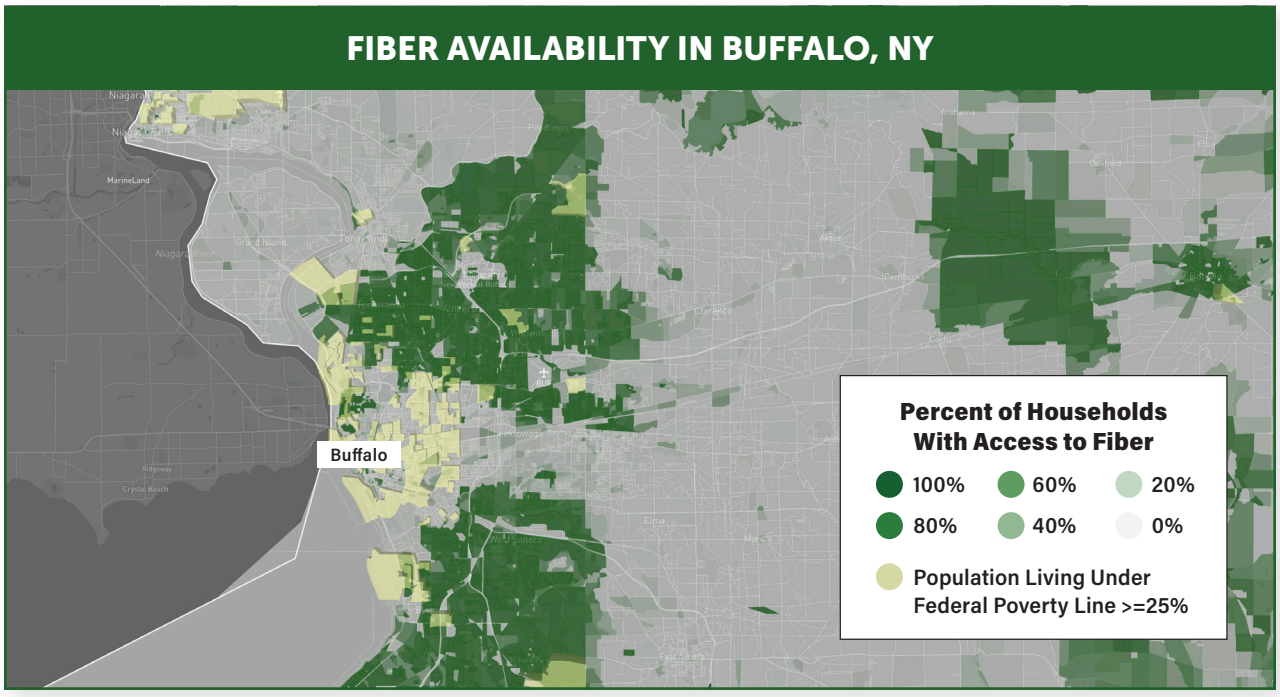



Figure 28 — *Fiber-Based Broadband Service Availability and Income in Buffalo, New York (Source: Vernonburg Group Digital Equity Map)*

In Buffalo, majority-Black areas, some of which also overlap with lower-income areas (identified in Figure 29), are regularly passed over by fiber-based broadband providers, which appear to be focusing their deployments in the highest-income areas and avoiding communities where the majority of residents are people of color.

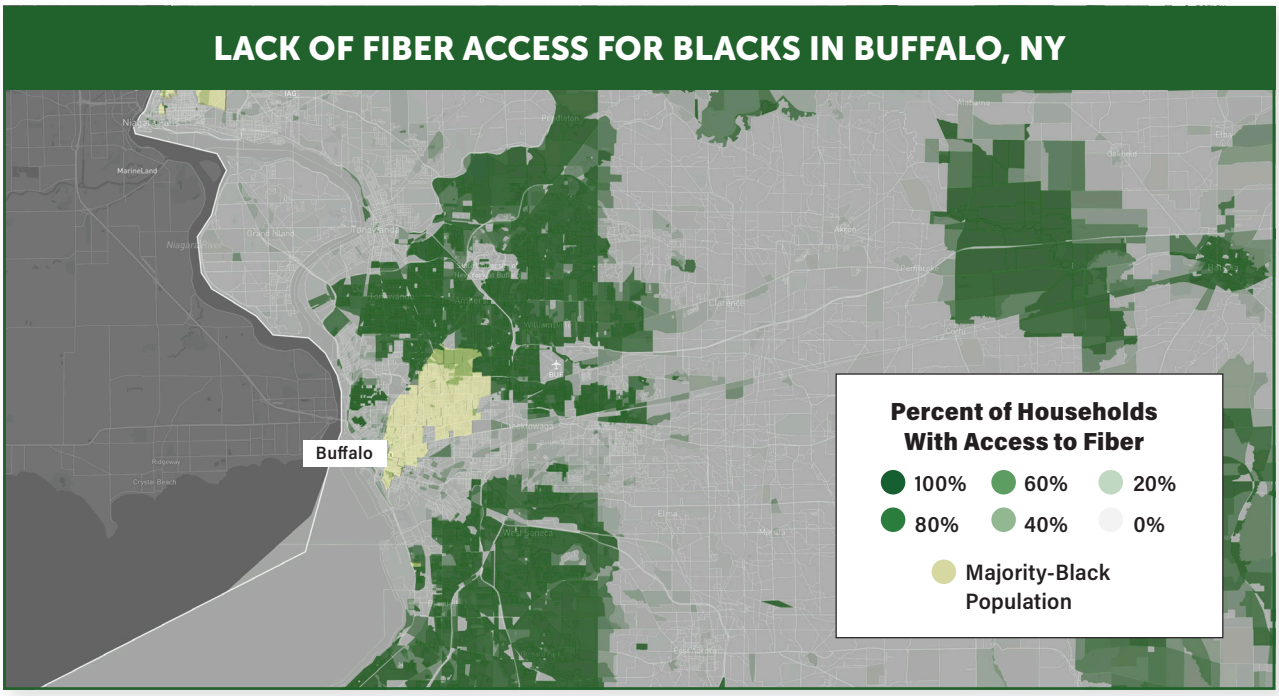



Figure 29 — *Majority-Black Locations in Buffalo, New York Lacking Access to Fiber Connectivity (Source: Vernonburg Group Digital Equity Map)*

The data visualizations provided in this Appendix are a snapshot of fiber broadband availability to date. The broadband market is dynamic and fiber providers are likely to continue to expand their networks to even more U.S. households as they have for many years.

As the country continues to work to achieve universal access to fixed broadband, policymakers should continue to monitor fiber-based network deployments in communities with large concentrations of lower-income households and people of color to ensure that the digital divide is closing for the most historically disadvantaged communities at the same time it is closing for other communities.

# APPENDIX B: METHODOLOGY AND KEY ASSUMPTIONS

Digital discrimination is a multifaceted topic, and it is important to be clear about the approach that this paper takes and what conclusions can be drawn from it. Below are some key considerations when reading this paper.

- This paper analyzes current and publicly available data. The FCC's Digital Discrimination Order is not retroactive and applies only to future broadband deployments.[19] Nothing in this paper should be taken to indicate non-compliance with the FCC's Digital Discrimination Order on the part of any broadband service providers. The FCC's Digital Discrimination Order specifically notes that disparate impacts in certain situations may be a result of "genuine technical and economic feasibility"—which can only be determined on a case-by-case basis.

- Vernonburg Group's Digital Equity Map relies on various sources of FCC data (particularly the Broadband Data Collection (BDC) data for the purposes of this paper) and combines that with data from the U.S. Census Bureau's American Community Survey (ACS) to develop a comprehensive view of broadband availability by a variety of demographics.[20] The FCC BDC data is from January 2024, and the most recent Census ACS data is from December 2021. This is the basis for the Vernonburg Group's Digital Equity Map and all Figures in this paper.

- Demographic data is only available by race/ethnicity and income. It is not available for analysis of broadband availability trends relative to the other characteristics included in the FCC's Digital Discrimination Order: color, religion, and national origin. Additional data will need to be collected and made publicly available for an understanding of the correlation, if any, between those factors and broadband availability.

- To examine the experience of various racial/ethnic groups, Vernonburg Group looked at plurality and majority census blocks for each race/ethnic group and analyzed available broadband availability data. These trends and analysis are based only on situations where each race is the plurality or majority group, and do not capture the experience of individuals of a particular race/ethnic group who live in areas where they are not the plurality or majority.

- For the purposes of this paper, the poverty level is defined as the 2021 federal poverty level. The poverty level varies by household size, but, for a four-person household in the 48 contiguous United States, it corresponds to an income of $26,500 or less per year. Alaska ($33,130) and Hawaii ($30,480) each have different income thresholds for meeting the federal poverty thresholds in those states.

- This paper uses "percentage of population" with access to specific speeds or technologies. Due to the Census data being population-based and the FCC data being location and unit-based,[21] an estimate for the fraction of the population with available access is required. This estimate is calculated by multiplying the fraction of units per census block with access to a specific speed or technology by the population per census block.

- For the purposes of this paper, Vernonburg Group uses a definition of rural that is based on population density: an area with less than 250 inhabitants per square mile is considered rural.[22] To avoid data gaps, urban (over 750 inhabitants per square mile) and suburban areas (between 250 and 750 inhabitants per square mile) are grouped together under the heading of urban. This definition translates to approximately 60 million rural inhabitants and exposes connectivity in lower-population density rural areas where connectivity is more costly on average to deploy. In comparison, the U.S. Census definition of rural inhabitants includes those located in the center of higher-population density small towns as rural, resulting in approximately 66 million rural inhabitants.[23] Given that this paper examines the impact of rurality, Vernonburg Group has chosen a definition that focuses on the most rural areas, where the economic and technical challenges are the most similar, as opposed to including areas which, despite being distant from large cities, have a higher-population density.

# ENDNOTES


1 Diana Goovaerts. Fierce Telecom. "Buckle up, cable — AT&T just gave FWA fresh legs". February 26, 2024. (quoting Jonathan Chaplin at New Street Research). Available at https://www.fiercetelecom.com/broadband/buckle-cable-fwa-growth-shows-no-signs-slowing. Accessed February 29, 2024. Diana Goovaerts. Fierce Telecom. "Here's how much fiber US operators are planning to build in 2023." February 24, 2023. Available at https://www.fiercetelecom.com/broadband/heres-how-much-fiber-us-operators-are-planning-build-2023. Accessed February 29, 2024.

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3 Federal Communications Commission. "Report and Order and Further Notice of Proposed Rulemaking." Pg. 16-17. November 20, 2023. Available at: https://docs.fcc.gov/public/attachments/FCC-23-100A1.pdf. Accessed December 12, 2023.

4 Federal Communications Commission. "Report and Order and Further Notice of Proposed Rulemaking." Pg. 16-17. November 20, 2023. Available at: https://docs.fcc.gov/public/attachments/FCC-23-100A1.pdf. Accessed December 12, 2023.

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6 Ibid.

7 Federal Communications Commission. "Report and Order and Further Notice of Proposed Rulemaking." Pg. 4. November 20, 2023. Available at: https://docs.fcc.gov/public/attachments/FCC-23-100A1.pdf. Accessed December 12, 2023.

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21 The FCC Broadband Serviceable Location Fabric (Fabric) provides a unit count value for each record. This field represents the sum of residential and non-residential broadband demand on that location record. Multi-dwelling buildings such as apartment blocks have multiple units per Broadband Serviceable Location and single-dwelling buildings such as houses have a single unit per Broadband Serviceable Location. Fabric residential unit counts are established to be consistent with Census 2022 Housing Unit (HU) estimates.

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