RURAL IMPERATIVES IN BROADBAND ADOPTION AND DIGITAL INCLUSION

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ABSTRACT

Broadband is increasingly important for participation in a wide range of activities, including commerce, education, and healthcare. Data reveal varied rates of broadband adoption among different demographic groups including those defined by age, educational attainment, household income, and race. Efforts to encourage broadband adoption across demographic groups should facilitate increased participation in beneficial broadband-enabled activities. These efforts are especially important in rural areas where distance from larger metro areas and comparatively small populations can create barriers to access services that are more readily available in urban areas. Where economies of scale in rural places might not support separate, tailored adoption efforts to meet each of multiple demographics, rural providers can combine general adoption efforts with targeted outreach to specific sectors within their communities to distribute and enable more widely the benefits of broadband and digital inclusion.

I. INTRODUCTION AND SUMMARY

Broadband is recognized as a critical tool to enable participation in economic, educational, healthcare, and other opportunities.[1] This facilitation is particularly important in sparsely populated rural areas where internet connections enable users to obtain services that might otherwise be less readily available than in densely populated urban areas. The 2020 coronavirus pandemic underscored this imperative when millions of Americans were compelled suddenly to work, learn, and heal from home. As the crucial value of broadband was highlighted, critical disparities in access and adoption were illuminated. And, while "digital divide" is often defined to describe differences between rural and urban spaces, or the difference between certain rural and other rural spaces, divides exist across other lines, as well. This report will explore broadband adoption rates among various demographics; present benefits of broadband adoption within the context of various use sectors; suggest an analytical construct for promoting greater broadband adoption and digital inclusion in rural spaces. At the outset, the diversity among rural places must be noted: a popular maxim advises, "If you have seen one rural place, you have seen one rural place." Accordingly, strategies to increase rural adoption and improve digital inclusion may be best approached with the understanding that each community reflects the sum of a unique set of conditions and circumstances. These, in turn, can inform tailored strategies that while guided by general principles are adapted specifically for the region or community in which they are to be applied.

II. CURRENT OVERALL AND HOME BROADBAND ADOPTION TRENDS

A. OVERALL BROADBAND ADOPTION

1. Age

The proportion of American adults who use the internet increased from 52% in 2000 to 93% in 2020.[2] The break-out among age groups using the internet reveals that usage across all age groups has increased over the past two decades and appears to plateau at about 98% within various age groups. Adoption trends for users 65 years and older indicate consistent year-on-year growth, leaving open the expectation that adoption rates for that group will also plateau in the high-90% range.

[1] The authors thank Garry Clark, President, National Rural Economic Developers Association; Angie Dickison, Executive Director, Minnesota Office of Broadband Development; Anne Hazlett, Senior Director, Government Relations and Public Affairs, Purdue University; and Jenna Leventoff, Senior Policy Counsel, Public Knowledge, for their gracious and expert review of this paper. The conclusions herein are the authors' own and do not represent the respective opinions of the reviewers or their organizations.

[2] *Internet/Broadband Fact Sheet, Internet & Technology*, Pew Research Center (Apr. 7, 2021) (https://www.pewresearch.org/internet/fact-sheet/internet-broadband/) (visited Apr. 21, 2021) (Pew Research Center).

Table 1: Broadband Adoption by Age

Age	2000	2010	2020
18-29	70%	92%	99%
30-49	61%	85%	98%
50-64	46%	74%	96%
65+	14%	43%	75%

Data Source: Pew Research Center[3]

2. Educational Attainment

Adoption increases in direct correlation to higher levels of educational attainment. Educational attainment is measured across several categories: less than high school graduate; high school graduate; some college; college graduate. Certain of these trends may reflect correlations between education and income, *i.e.,* to the extent higher educational attainment leads to higher levels of income, prospective users with higher levels of education may face lower barriers of affordability. For purposes of the instant discussion, however, the influence of educational attainment on broadband adoption is accepted at face value without an analysis of the specific reasons underlying those impacts.

Table 2: Broadband Adoption by Educational Attainment

Education	2000	2010	2019
Less than high school graduate	19%	41%	71%
High school graduate	40%	68%	84%
Some college	67%	87%	95%
College graduate	78%	93%	98%

Data Source: Pew Research Center

3. Household Income

Whereas "wealth" refers to the cumulative assets of an individual, income refers to money received by a person from private or government sources in the form of wages, salary, or assistance. Income can be expected to correlate to affordability, which remains a barrier to

[3] *Id.,* fn. 2.

adoption for low-income prospective users.[4] Moreover, income correlates to educational attainment, with income generally increasing alongside educational attainment.[5]

Table 3: Broadband Adoption by Household Income

Income	2000	2010	2021
Less than $30,000	34%	61%	86%
$30,000-$49,999	58%	81%	91%
$50,000-$74,999	72%	88%	98%
$75,000+	81%	95%	99%

Data Source: Pew Research Center

4. Race

Identifying broadband adoption rates measured by race are important as efforts to promote digital inclusion endeavor to narrow gaps not only among adopters and non-adopters but also to equalize adoption rates across different communities. Notably, data indicate that disparities among measured groups has narrowed markedly over the past 20 years. Accordingly, whereas (i) the difference in the lowest and highest groups measured by educational attainment is 27 percentage points (see Table 2, above), and (ii) the difference between the highest and lowest points of measured income groups is 13 percentage points (see Table 3, above), (iii) differences between three race-based measures are 2 percentage points per division, for an overall 4

[4] Affordability has been cited as prevailing barrier to broadband adoption. A 2010 FCC report cited 36% of survey respondents identifying monthly cost as the reason for non-adoption. John P. Horrigan, *Broadband Adoption and Use in America: OBI Working Paper Series No. 1*, Federal Communications Commission, at 30 (2010) (https://transition.fcc.gov/national-broadband-plan/broadband-adoption-in-america-paper.pdf) (visited Aug. 5, 2021). A study conducted several years later revealed a corollary conclusion, reporting that approximately two-thirds of non-adopters cited non-price barriers to adoption. *See,* Octavian Carare, Chris McGovern, Raquel Noriega, and Jay Schwarz, *The Willingness to Pay for Broadband of Non-Adopters in the U.S.: Estimates from a Multi-State Survey*, Information Economics and Policy (2015) (https://www.sciencedirect.com/science/article/abs/pii/S0167624514000523) (visited Aug. 5, 2021). *See, also, Emergency Broadband Benefit Program: Report and Order,* Federal Communications Commission, Docket No. 20-445, FCC 21-29, at paras. 1-3 (2021) (citing affordability, generally, as a concern during the COVID-19 pandemic). The perceived impact of income on adoption reflects slightly uneven, yet notable, trends. While the $30,000-$49,999 income bracket shows some signs of tapering, dipping slightly from 93% in 2019 to 91% in 2020, the lowest measured income bracket of less than $30,000 has, with the exception of decline between 2007 and 2008, increased steadily year-over-year. This may reflect impacts of the initial period of the Great Recession (2007-2010), during which job declines affecting lower-wage sectors may have affected broadband affordability. During that period, employment losses were registered in several categories including sales and office occupations (-7.5%); natural resources, construction, and maintenance (-17%); and production, transportation, and material moving (-12%). *See,* "Great Recession, Great Recovery? Trends from the Current Population Survey," Monthly Labor Review, U.S. Bureau of Labor Statistics (Apr. 2018) (https://www.bls.gov/opub/mlr/2018/article/great-recession-great-recovery.htm) (visited Aug. 3, 2021). Usage in the higher income brackets increased an average of 2.66% during these periods.

[5] *See, e.g., Education and Lifetime Earnings,* Research, Statistics & Policy Analysis, Office of Retirement Policy, U.S. Social Security Administration (Nov. 2015) (https://www.ssa.gov/policy/docs/research-summaries/education-earnings.html) (visited Aug. 03, 2021).

percentage point difference between the highest and lowest group (see Table, 4, below). However, and as noted below, these gaps broaden when examining home broadband adoption (please see section II.B.4, below).

Table 4: Broadband Adoption by Race

Race	2000	2010	2021
Black	38%	68%	91%
Hispanic	*Not available*	71%	95%
White	53%	78%	93%

Data Source: Pew Research Center

Overall, adoption rates among surveyed races continues to increase. Adoption rates for Black Americans dipped from 87% to 85% from 2018 to 2019, but then recovered to 91% in 2021; similarly, adoption rates for Hispanic Americans declined from 88% in 2018 to 86% in 2019 but rebounded to 95% in 2021. Adoption rates for White Americans during that period increased at a modest rate, revealing a two-percentage point increase from 2018 to 2019 and a one percentage point increase from 2019 to 2021. Adoption gains for Hispanic Americans were highest over the past decade, increasing 24 percentage points; rates for Black Americans during the past decade effectively mirrored this trend, recording an increase of 23 percentage points.

B. HOME BROADBAND ADOPTION

Home broadband adoption rates are different across all categories (age, education, income, and race) than overall broadband adoption rates. These data are important because home broadband connections typically provide more robust and reliable connectivity than mobile wireless connections, thereby supporting more effectively such applications as distance education, telework, and telehealth. However, while the cumulative data of each demographic is different, most of the relative trends within respective demographics follow consistent paths. For example, where the total adoption rate for a particular income level may differ between "home" and "all broadband" adoption, higher income users in both categories will adopt at higher rates than lower income users.

1. Age

Table 5: Home Broadband Adoption by Age

Age	2000	2010	2020
18-29	1%	76%	74%
30-49	1%	71%	82%
50-64	0	59%	79%
65+	*Not available*	21%	62%

Data Source: Pew Research Center

2. Educational Attainment

Table 6: Home Broadband Adoption by Educational Attainment

Education	2000	2010	2019
Less than high school	*Not available*	26%	46%
High school graduate	1%	41%	59%
Some college	0	73%	77%
College graduate	1%	82%	93%

Data Source: Pew Research Center

3. Household Income

Table 7: Home Broadband Adoption by Household Income

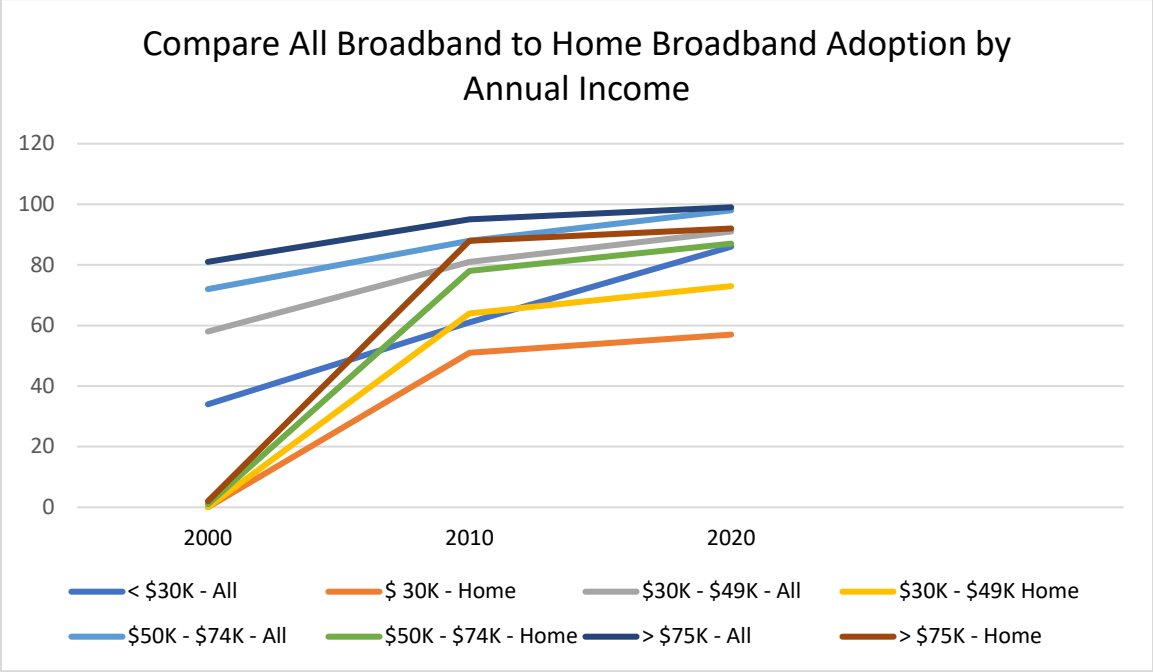
Income	2000	2010	2020
Less than $30,000	0	51%	57%
$30,000-$49,999	0	64%	73%
$50,000-$74,999	1%	78%	87%
$75,000+	2%	88%	92%

Data Source: Pew Research Center

Overall, home broadband adoption rates reveal large rates of growth from 2000 to 2010 but smaller rates of growth from 2010 to 2020. Between 2010-2020, home broadband adoption increased 9% for households earning $30,000-$75,000 annually, while home broadband adoption increased 6% in households earning less than $30,000 per year. During that same period, home broadband adoption increased 4% among households earning $75,000 or more annually. However, while the rate of growth is steeper among lower income groups, total home broadband adoption rates tend to correspond to income, *i.e.,* higher total adoption rates in higher income tiers. Overall, and as illustrated below, home broadband adoption trails all broadband adoption in each income tier. These may reflect several factors, including perceived value (subscribers who perceive that a mobile broadband connection is sufficient may rely solely on mobile subscriptions to the effective exclusion of home subscriptions) and affordability (where mobile wireless connections are less expensive than home broadband connectivity).[6]

[6] As noted above, while survey data over two decades indicate correlations between educational attainment and broadband adoption, the *cause* of those effects is less known. Various reasons have been proposed, including (a) higher income correlating to higher educational attainment or (b) suggestions that technology adoption rates are higher among groups with higher levels of educational attainment irrespective of income. It is notable, however, that the pace of adoption in groups with lower total rates of adoption is outpacing the pace of adoption in categories with higher home broadband adoption. This may reflect the perceived normalization of technology and the integration of broadband enabled applications into more aspects of daily life.

Figure 1: Compare All Broadband to Home Broadband Adoption by Income



Data Source: Pew Research Center

4. Race

Table 8. Home Broadband Adoption by Race

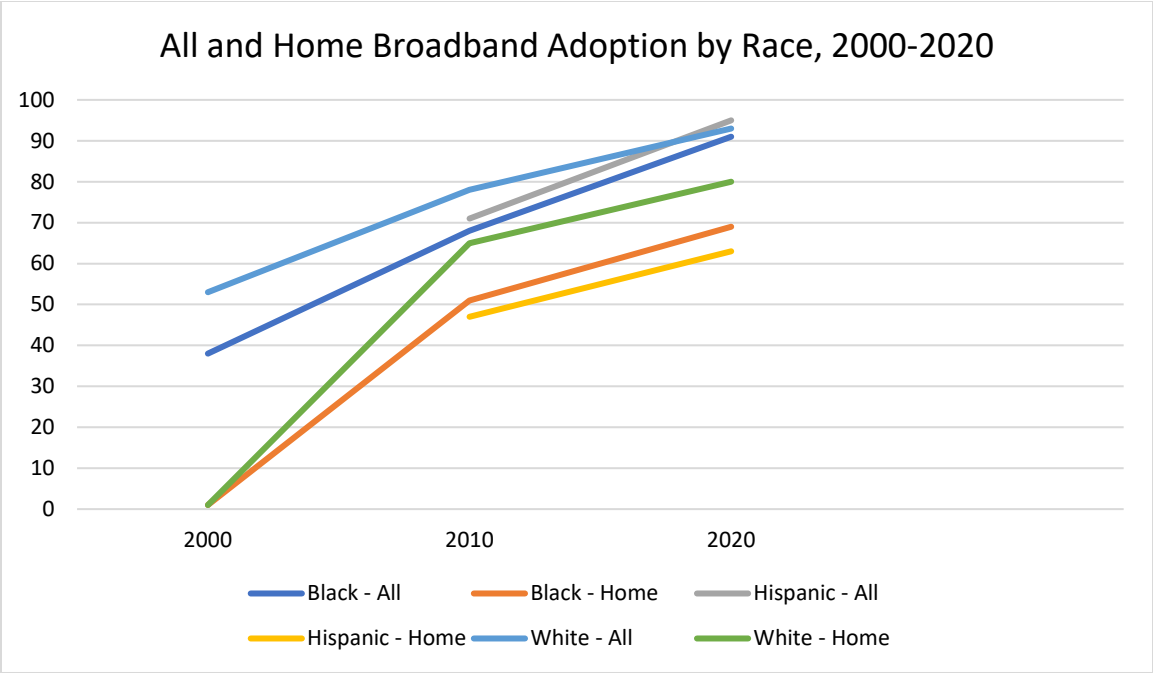
Race	2000	2010	2020
Black	1%	51%	69%
Hispanic	*Not available*	47%	63%
White	1%	65%	80%

Data Source: Pew Research Center

While adoption for the three measured race groups increased at different rates between 2010-2020, the rate of increase within each group was mostly consistent for both "all broadband" and "home broadband" adoption. Specifically, for Black Americans during this period, "all broadband" adoption increased 23% while "home broadband" adoption increased 18%; for Hispanic Americans, "all broadband adoption between 2010-2020 increased 24%, while "home broadband" adoption increased 26%; and, for White Americans, "all broadband" adoption and "home broadband" adoption increased 15% in both categories. Adoption rates measured among racial demographics demonstrate consistent increases across all groups with plateaus for "all" broadband converging at approximately the same point (above 90%). Home broadband adoption rates appear to be increasing at a consistent pace but with significant room for growth.

Household income and educational attainment have been found to found to exert positive impacts on broadband adoption rates across all race groups.[7]

Figure 2: Compare All Broadband to Home Broadband Adoption by Race



Data Source: Pew Research Center

C. SECTION CONCLUSIONS AND OBSERVATIONS

Age-related adoption rates appear to be converging as year-over-year data show growth for "all" broadband plateauing in the mid-90% range and above. Age-related adoption rates for home broadband are appearing to converge, as well, as year-over-year data show growth for all groups slowing to plateau at similar points, *i.e.,* mid-90% and above. Moreover, strong adoption rates can be anticipated for the 65+ years old category in future years, as it is not anticipated that current 50-64 years old users, who reflect adoption rates at 96%, will stop using broadband when they reach 65 years of age. In contrast, income and educational attainment continue to present as dominant factors in broadband adoption. It is not clear, however, whether income and educational attainment affect broadband adoption independently or whether, as noted above, ties between those two factors (specifically, higher educational attainment generally leading to higher income) combine to cause similarly occurring increased rates of adoption.[8]

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[7] *See,* Jon P Gant, Nicole E. Turner-Lee, Ying Li, and, Joseph S. Miller, *National Minority Broadband and Adoption: Comparative Trends in Adoption, Acceptance and Use,* Joint Center for Political and Economic Studies, at 42 (Feb. 2010) (http://www.broadbandillinois.org/uploads/cms/documents/mti_broadband_report_web.pdf) (visited Aug. 5, 2021).

[8] As noted above, a higher level of educational attainment generally leads to higher income. *See,* fn. 6, *supra.* Accordingly, the question of *why* educational attainment affects broadband adoption could be posed to ask (a) whether educational attainment affects broadband adoption because educational attainment affects income, or (b)

Overall, income remains an important factor in broadband adoption. Congress recognized this by establishing the Emergency Broadband Benefit program (EBB),[9] which is administered by the Federal Communications Commission (FCC) and directs participating internet service providers (ISPs) to provide a monthly discount of up to $50.00 per month (up to $75.00 on Tribal lands) for an internet service offering and associated equipment. The EBB also enables participating providers to receive a single reimbursement of up to $100.00 for certain eligible end-user equipment, including a laptop, desktop computer, or tablet.[10] Eligible households are permitted to combine EBB benefits with Lifeline Program benefits; the Federal Universal Service Fund (USF) Lifeline program provides discounts of up to $9.25 per month for eligible customers (up to $34.25 on Tribal lands). Although the EBB was promulgated specifically to address affordability shortfalls in the wake of the COVID-19 pandemic, it may indicate a Congressional view that the standard Lifeline discount (which is based upon a long-standing voice subsidy) is insufficient to bridge the affordability gap when it comes to broadband.[11] High enrollment rates for the EBB may be further evidence that affordability remains a formidable barrier to broadband adoption.[12] In August 2021, the U.S. Senate passed a major infrastructure bill that included a modified permanent form of the EBB, specifically, a $30.00 monthly low-income broadband benefit (up to $75.00 for Tribal areas).[13] While the bill also maintains the device subsidy (reflecting concerns that device affordability has been cited as a factor in broadband adoption),

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whether users with higher educational attainment adopt at higher rates for non-income-based reasons. Stated differently, are adoption rates for college graduates earning $50,000-$74,000 annually higher than non-college graduates earning at similar levels, and if so, why? A recent report explains that prior studies incorrectly "conflat[ed] wealth and educational attainment." In contrast, alternative perspectives suggest that educational attainment may correlate to more favorable tendencies to adopt new technology, generally. *See, generally,* Bryan A. Mann, William C. Smith, and David P. Baker, *Schooling Attainment's Influence on Internet Adoption: Education's Role in the Cross-National Development of the Mass Media Knowledge Gap*, FIRE: FORUM FOR INTERNATIONAL RESEARCH IN EDUCATION, Vol. 3, No. 3, at 47 (2016) (Mann, *et al*.). In that view, while higher education attainment can be demonstrated to lead, on average, to higher income, higher broadband adoption rates among more highly educated groups may relate to factors other than higher income. Mann, *et al.* at 51.

[9] Consolidated Appropriations Act, 2021, Pub. L. No. 116-260, 134 Stat. 1182 (2020), *available at* https://www.congress.gov/bill/116th-congress/house-bill/133/text (Consolidated Appropriations Act). The EBB was implemented by the Federal Communications Commission. *Emergency Broadband Benefit Program: Report and Order,* Federal Communications Commission, Docket No. 20-445, FCC 21-29 (2021).

[10] Consolidated Appropriations Act § 904 *et seq.*

[11] Combined with EBB benefits, participants can obtain a nearly $60.00 per month discount off broadband service, with users on Tribal lands eligible to receive nearly $110.00 in monthly discounts.

[12] The FCC announced in late June 2021 that more than 3 million households had been enrolled since mid-May. "FCC Announces Release of Regional Emergency Broadband Benefit Program Data," FCC News (Jun. 29, 2021) (https://docs.fcc.gov/public/attachments/DOC-373674A1.pdf) (visited Aug. 3, 2021). Areas served by small, locally operated ISPs were identified as leaders in enrolling eligible customers. *See,* Issie Lapowsky, *The FCC's Emergency Internet Discounts Are Leaving Millions Behind,* Protocol (Jul. 21, 2021) (https://www.protocol.com/policy/ebb-enrollment) (visited Aug. 3, 2021).

[13] Infrastructure Investment and Jobs Act, Title 5-Broadband Affordability, H.R. 3684, 117th Cong. (2021). As of the publication of this paper, the bill has not been voted by the House of Representatives.

recent surveys indicate that only 6% of non-home broadband adopters cite the cost of a computer as a primary reason for not adopting.[14]

III. EXPLORING THE BENEFITS OF BROADER DIGITAL INCLUSION

A. SOCIAL DETERMINANTS OF HEALTH

Notwithstanding increased broadband adoption in the various demographics presented above, the goal of a sustained digital inclusive community is a continuous pursuit. The imperative to surmount disparities in broadband adoption is underscored by the increasing reliance upon broadband for economic, educational, and health care opportunities. While greater broadband adoption should not be expected to resolve all disparities across those sectors, successful efforts to increase broadband adoption in rural areas and reduce categorical gaps should facilitate gains in economic, educational, healthcare, and other areas. Moreover, while those advantages are increasingly measurable through empirical data, broader analytical constructs offer a useful framework in which to consider the growing need for connectivity. Digital literacies and internet connectivity have been identified within the context of Social Determinants of Health, or SDOH. The U.S. Department of Health and Human Services (HHS) defines SDOH as "conditions in the places where people are born, live, learn, work, play, worship, and age that affect a wide range of health and quality-of life-risks and outcomes."[15] HHS groups SDOH into several broad categories, including Economic Stability; Education Access and Quality; Health Care Access and Quality; Neighborhood and Built Environment; and Social and Community Context.[16] While these categories overlap such sectors as economic activity, education, and healthcare, the novelty of SDOH is that it proposes a direct link between seemingly non-health sectors (*i.e.,* education or economic stability) and physical and mental health.

Overall, the shift to increased use of broadband (in both urban and rural spaces) to support remote interactions for work, school, and medical treatment during the COVID-19 pandemic is expected to result in a "new equilibrium" of higher broadband usage and reliance going forward. The COVID-19 pandemic was a catalyst for broadband engagement and offers instructive examples of how broadband is engaged actively and effectively when it is available. To illustrate the growing demand for broadband, in less than a decade since the FCC first reported these data in 2012, the average broadband speed increased 35% annually. In just the last two years (2017-2019), average broadband speeds increased 54% annually, with an average speed in 2019 of 146.1

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[14] *See,* Monica Anderson, *Mobile Technology and Home Broadband 2019,* Pew Research Center (Jun. 13, 2019) (https://www.pewresearch.org/internet/2019/06/13/mobile-technology-and-home-broadband-2019/) (visited Aug. 24, 2021). In 2015, 43% of non-home broadband adopters cited cost as the primary reason for not subscribing to home broadband service. In 2019, that percentage decreased to 27%, with 21% citing the monthly subscription rates and 6% citing the cost of a computer.

[15] *Healthy People 2030*, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion (https://health.gov/healthypeople/objectives-and-data/social-determinants-health) (visited Jul. 28, 2021).

[16] *Id.*

Mbps.[17] CISCO predicts that in less than two years, 92% of the North American population will be online.[18] And, these increases are not limited to downstream usage: OpenVault reports that upstream data usage increased 63% between December 2019 and December 2020.[6] While certain of these gains may reflect increased demand during the COVID-19 pandemic, numerous reports indicate that post-COVID-19 demand for broadband will exceed pre-pandemic levels.

B. SECTOR-SPECIFIC USE CASES OF BROADBAND

1. Education

Several sectors can be explored to demonstrate the value of broadband in rural spaces. It must be noted that the following discussion is not intended to imply that these sectors exclusive to other activities; for example, the increasing incorporation of broadband in agriculture presents unique opportunities.[19] Rather, the following discussion focuses on services that are expected to be of interest to the largest proportion of rural users.

COVID-19-related school closures affected 55 million K-12 students across the United States. While the prevailing expectation and goal is to bring students back to in-person learning, it is anticipated that the COVID-19 experience has enlightened educators, parents, and students to opportunities in distance and remote education. Increased use of broadband capabilities for in-school and outside-school assignments is expected to continue.[20] Moreover, the benefits of broadband are not limited to supporting distance education during disruptive times. Rather, broadband access has been demonstrated as a factor in student success across a variety of settings.

A Michigan State University study explored the relationship between connectivity and middle and high school students' performance on standardized tests and school subject areas. Students with home internet access scored higher on the SAT and PSAT than students with only mobile cell phone access as well as those with no access. [21] Notably, these results controlled for demographic factors. The report explains:

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[17] *Tenth Measuring Broadband America: Fixed Broadband Report,* Office of Engineering and Technology, Federal Communications Commission (Jan. 4, 2021) (https://www.fcc.gov/reports- research/reports/measuring-broadband-america/measuring-fixed-broadband-tenth-report) (visited Jul. 12,2021)

[18] *Cisco Annual Internet Report (2018-2023)*, Cisco, at 8 (updated Mar. 9, 2020) (https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white- paper-c11-741490.pdf) (visited Jul. 12, 2021).

[19] *See,* Joshua Seidemann, *From Fiber to Field: The Role of Rural Broadband in Emerging Agricultural Technology*, Smart Rural Community, NTCA–The Rural Broadband Association (2021) (https://www.ntca.org/sites/default/files/documents/2021-07/06.14.21%20SRC%20Ag%20Tech%20Final.pdf) (visited Aug. 3, 2021).

[20] *The Evolution of Distance Education in 2020*, School of Education and Human Sciences, University of Kansas (Sep. 17, 2020) (https://educationonline.ku.edu/community/distance-education-evolution-in-2020) (visited Jul. 12, 2021).

[21] Keith N. Hampton, Laleah Fernandez, Craig T. Robertson, Johannes M. Bauer, *Broadband and Student Performance Gaps*, Quello Center, Michigan State University, at 35 (2020) (https://quello.msu.edu/wp-content/uploads/2020/03/Broadband_Gap_Quello_Report_MSU.pdf) (visited Jul. 6, 2021) (Quello). On average,

> The negative relationship between having to use a cell phone for home Internet access and SAT/PSAT performance was larger than the deficit in percentile rank experienced by students from low-income families relative to higher-income families or that experienced by racial and ethnic minorities relative to white students, both of which, independently, tend to rank 3-4 percentiles lower than their peers.[22]

Similar data were reported in regarding to grade point averages (GPA) for English, social sciences, mathematics, and science, with average GPA .19 point higher for students with home broadband access than for students with no home access or only mobile wireless access.[23] These data complement findings from prior studies reporting that youth who live in areas with broadband are found to have earned higher scores on college entrance exams such as the SAT or ACT.[24] Moreover, *lack of broadband* has been identified as compounding difficulties for students who have preexisting limited avenues to "elite academic institutions."[25]

Distance education is also engaged at the post-secondary level. U.S. Department of Education data show that in 2018, nearly seven million students were enrolled at degree-granting post-secondary schools in the United States. Of these students, more than one-third (35.3%) engaged distance education; 16.6% were engaged exclusively in distance education. Graduate course work was engaged more than twice as much as undergraduate work (30.7% vs. 14%).[26] These data, as well, demonstrate that where available, significant populations of students take advantage of broadband. The higher rates of distance education engagement for graduate students may reflect opportunities for students to take courses at times that fit personal or work schedules, thereby enabling students to simultaneously work and attend school.

2. Economic Activity and Telework

Broadband remains critical for economic advancement and stability. In the midst of the COVID-19 pandemic (December 2020), it was determined that more than half of middle-income and upper-income workers could work from home. More than 80% of those workers reported using video or online conferencing services to connect to co-workers, with nearly

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students with home internet access placed eight (8) percentile points higher than students with no home broadband or only mobile wireless broadband.

[22] Quello, at 36.

[23] Quello, at 33.

[24] Lisa J. Dettling, Sarena F. Goodman, Jonathan Smith, *Every Little Bit Counts: The Impact of High-Speed Internet on the Transition to College*, Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs, Federal Reserve Board, Washington, DC, at 27 (2015-108).

[25] *Id.*

[26] *Fast Facts: Distance Learning*, National Center for Education Statistics, U.S. Department of Education (2019) (https://nces.ed.gov/fastfacts/display.asp?id=80) (visited Jul. 29, 2021).

two-thirds finding those platforms to be good substitutes for in-person meetings.[27] The range of industries that provide telework opportunities is expansive and is fueling a new-found outlook of "work anywhere, from anywhere," a maxim that bodes well for rural spaces with robust broadband availability as workers consider new residential opportunities.[28] Telework is expected to experience evolutionary increases post-COVID-19 in both government and private sectors.[29] In addition to supporting the ability to work remotely, broadband is also an important component in job searches. Across all income and educational levels, people have utilized online resources when researching new employment opportunities.[30]

Table 9: Demographics of Online Job Seeking within Income and Educational Levels

	Looked online for job information	Applied for a job online
Less than $30,000	50%	43%
$30,000 -$74,000	57%	50%
$75,000 or more	62%	51%
Less than high school	32%	24%
High school grad	44%	38%
Some college	60%	51%
College +	65%	56%

Data source: Pew Research

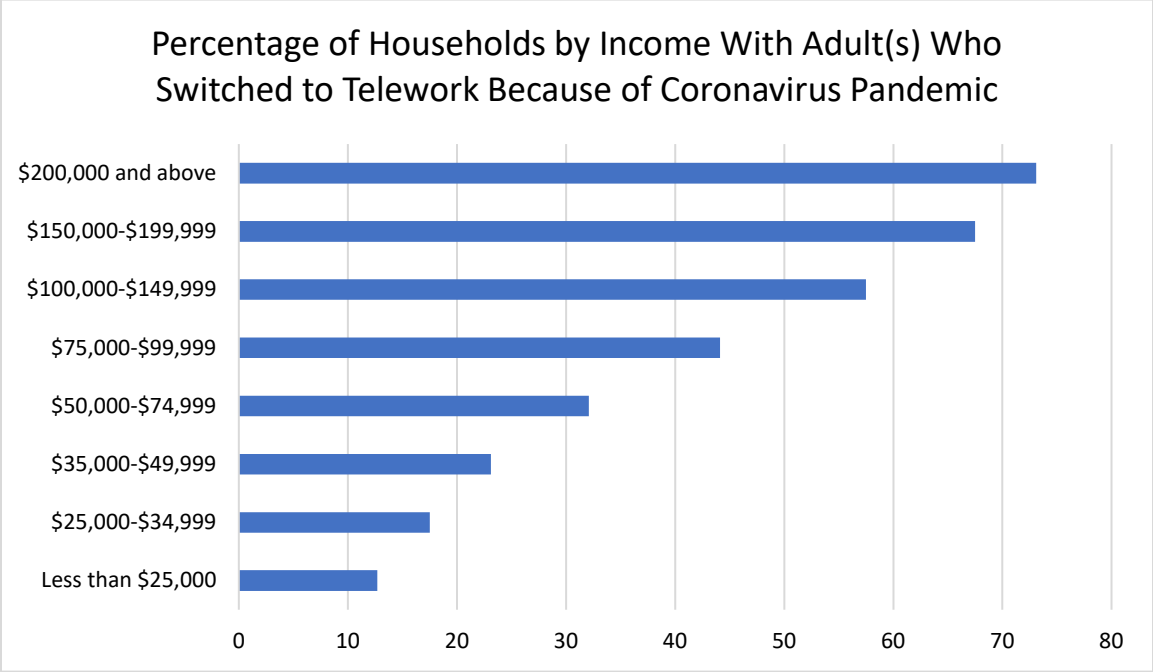
[27] Jim Parker, Julianna Menasce Horowitz, and Rachel Minkn, *How the Coronavirus Outbreak Has – and Hasn't – Changed the Way Americans Work*, Pew Research Center (Dec. 9, 2020) (https://www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt- changed-the-way-americans-work/) (visited Jul. 12, 2021).

[28] *See,* Chip Cutter and Catherine Dill, *Remote Work is the New Signing Bonus,* Wall Street Journal (Jun. 26, 2021) (https://www.wsj.com/articles/remote-work-is-the-new-signing-bonus-11624680029) (visited Jul. 8, 2021); Chip Cutter, *Many Companies Want Remote Workers – Except from Colorado*, Wall Street Journal (Jun. 17, 2021) (https://www.wsj.com/articles/many-companies-want-remote- workersexcept-from-colorado-11623937649) (visited Jul. 8, 2021); *Remote Work Has Two-Thirds of Americans Considering Moving from Cities to the Country*, NextGov.com (Oct. 27,2020) (https://www.nextgov.com/cio-briefing/2020/10/remote-work-has-two-thirds-americans-considering-moving-cities-country/169598/) (visited Jul. 8, 2021).

[29] *See, e.g.,* Natalie Alms, *OPM Official: No Going Back to Pre-COVID Status Quo*, Federal ComputerWeek (Mar. 24, 2021) (https://fcw.com/articles/2021/03/24/opm-post-covid-no-going-back.aspx) (visited Jul. 6, 2021); Susan Lund, Anu Madgavkar, James Manyika, Sven Smit, Kweilin Ellingrud, Mary Meaney, and Olivia Robinson, *The Future of Work After COVID-19*, McKinsey Global Institute (Feb. 18, 2021) (https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19) (visited Jul. 6, 2021).

[30] Aaron Smith, *The Internet and Job Seeking*, Pew Research Center (Nov. 9, 2015) (https://www.pewresearch.org/internet/2015/11/19/1-the-internet-and-job-seeking/) (visited Aug. 6, 2021).

Figure 3: Shift to Telework During Pandemic by Income



Data Source: U.S. Census Bureau[31]

Opportunities afforded by telework in rural spaces is evident in the success of TeleworksUSA, a regional effort across 23 counties in Kentucky that has generated more than $76 million in new wage activity and connected participants to more than 3,400 jobs.[32] Employers include online retail services such as Amazon and Wayfair; hospitality industry positions including Hilton; and CX (consumer experience) specialist Concentrix.[33] More than 50% of teleworkers nationally work in management, business, science, and the arts, revealing an expansive field of telework opportunities in a variety of fields.[34] Overall, telework trends can be expected to increase. The U.S. Bureau of Labor Statistics (BLS) found that telework doubled in 2020.[35] BLS recently amended the Current Population Survey (CPS), which is undertaken jointly by BLS and the

[31] *Household Pulse Survey Data Tables*, U.S. Census Bureau (https://www.census.gov/programs-surveys/household-pulse-survey/data.html) (visited Aug. 6, 2021). Estimates produced using public use microdata files.

[32] *See,* TeleworksUSA website (https://www.teleworksusa.com/work/#employers) (visited Jul. 29, 2021).

[33] *Id.*

[34] Roberto Gallardo, *Who is Remote Working in the U.S.?*, Center for Regional Development, Purdue University (Mar. 16, 2020) (https://pcrd.purdue.edu/who-is-remote-working-in-the-u-s/) (visited Aug. 5, 2021).

[35] *Percent of Employed Persons Working at Home on Days Worked Nearly Doubled in 2020*, U.S. Bureau of Labor Statistics (Jul. 22, 2021) (www.bls.gov) (visited Jul. 27, 2020).

Census Bureau, to address the impact of COVID-19 and telework on the labor market.[36] And, as early as April 2020, the Brookings Institute predicted that telecommuting would increase post-COVID-19.[37] Harvard Business School examined this question several months later and reported, among other findings, that telework will remain more common at many companies after the pandemic ends.[38] And, Government Technology closed out the year advising employer strategies for successful telework solutions.[39] Collectively, these reports support the proposition that broadband availability supports employment opportunities across a range of professions and in a variety of places, and that where available, workers and employers have taken advantage of these capabilities to support employment options in rural areas.

3. Health Care

Health care has been identified as a sector in which positive returns arising out of broadband-enabled engagement can be measured comprehensively and across a wide range of users. The benefits of telehealth, and therefore the benefits of increasing underlying broadband adoption and digital literacy, are particularly promising and important in rural spaces. On average, rural residents are older and face higher rates of chronic and acute conditions than their urban counterparts. According to the Centers for Disease Control and Prevention (CDC), rural Americans are at a greater risk of death from heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke than their urban counterparts.[40] When combined with distance from specialists and other socioeconomic factors, rural residents may be less able or less likely to obtain regular treatment for chronic conditions. By way of example, the CDC reports that COPD (chronic obstructive pulmonary disease) is more common in rural areas than urban areas.[41] Health disparities exist among minority populations, as well. Mortality rates attributable to coronary heart disease (CHD) are higher among black women and men 45-74 years old as compared to women and men in the same age bracket of other races.[42] Significant disparities are

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[36] *Supplemental Data Measuring the Effects of the Coronavirus (COVID-19) Pandemic on the Labor Market*, U.S. Bureau of Labor Statistics (Jul 14, 2021) (https://www.bls.gov/cps/effects-of-the-coronavirus-covid-19-pandemic.htm) (visited Jul. 27, 2021).

[37] Katherine Guyot and Isabel V. Sawhill, *Telecommuting Will Likely Continue Long After the Pandemic,* Brookings (Apr. 6, 2020) (https://www.brookings.edu/blog/up-front/2020/04/06/telecommuting-will-likely-continue-long-after-the-pandemic/) (visited Jul. 27, 2021).

[38] Christopher Stanton, Zoe Cullen, and Michael Luca, *How Much Will Remote Work Continue After the Pandemic?*, Working Knowledge, Harvard Business School (Aug. 24, 2020) (https://hbswk.hbs.edu/item/how-much-will-remote-work-continue-after-the-pandemic) (visited Jul. 27, 2020).

[39] Daniel Castro, *7 Ways to Make Remote Work Successful Beyond COVID-19*, Government Technology (Dec. 2020) (https://www.govtech.com/opinion/7-ways-to-make-remote-work-successful-beyond-covid-19.html) (visited Jul. 27, 2020).

[40] *See, About Rural Health*, Centers for Disease Control and Prevention (Aug. 2, 2017) (https://www.cdc.gov/ruralhealth/about.html) (visited Jul. 27, 2021).

[41] *Rural Health, COPD*, Centers for Disease Control and Prevention (https://www.cdc.gov/ruralhealth/copd/index.html) (visited Aug. 26, 2020).

[42] *Fact Sheet: CDC Health Disparities and Inequalities Report*, Centers for Disease Control, at 3 (2011) (https://www.cdc.gov/minorityhealth/chdir/2011/factsheets/CHDStroke.pdf) (visited Aug. 3, 2021). Among black

also seen among chronic conditions such as diabetes and hypertension/hypertension control.[43] While it is beyond the scope of this paper to investigate the root cause of these disparities, the combined rural and race-based data sets present a positive value proposition for increased health care intervention in rural places across the spectrum of demographic groups. For example, the CDC explains that higher rural COPD rates are due, in part, to "less access to smoking cessation programs" and the fact that "[r]ural residents are also likely to be uninsured and have higher poverty levels, which may lead to less access to early diagnosis and treatment."[44] Increased digital inclusion should enable greater opportunities for more users to engage telehealth for both acute and chronic conditions. Broadband access has also been cited as a tool in combatting substance abuse and the opioid crisis.[45] And the effectiveness of mental health services via telehealth warrants consideration for rural spaces that lack sufficient access to mental health professionals.[46]

The promise of positive returns for telehealth engagement is indicated by trends observed during the COVID-19 pandemic, which revealed that when available, patients and physicians engage telemedicine opportunities. In 1Q20, telehealth encounters increased 50% over the same period in 2019.[47] In addition to physician and patient receptiveness, regulations and health industry policies affect adoption. During the COVID-19 pandemic, several states waived licensure requirements and permitted out-of-state doctors to treat patients across state lines.[48] Federal

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women, the CHD mortality rate before age 75 is 37.9% while the rate for white women is 19.4%; among black men, the CHD mortality rate before age 75 is 61.5% as compared to 41.5% for white men.

[43] *Id.*

[44] *Urban-Rural Differences in COPD Burden*, Chronic Obstructive Pulmonary Disease (COPD), Centers for Disease Control and Prevention (https://www.cdc.gov/copd/features/copd-urban-rural-differences.html#:~:text=Rural%20populations%20may%20have%20more,living%20in%20more%20urban%20areas) (visited Sep. 14, 2020) *citing 2016 County Health Rankings: Key Findings Report*, Population Health Institute, University of Wisconsin (2016) (https://www.countyhealthrankings.org/sites/default/files/media/document/key_measures_report/2016CHR_KeyFindingsReport_0.pdf) (visited Sep. 14, 2020).

[45] *Rural Community Action Guide,* U.S. Office of National Drug Control Policy, U.S. Department of Agriculture at 30-34 (2019) (https://www.usda.gov/sites/default/files/documents/rural-community-action-guide.pdf) (visited Aug. 18, 2021).

[46] Current literature indicates that additional investigations will be necessary before the most effective protocols for mental health via telehealth are evaluated. Moreover, questions regarding appropriate training, licensure, and reimbursement must be addressed. Nevertheless, it is reasonable to anticipate that teletherapy will offer an additional avenue for patient treatment. For an overview of this issue, *see,* Michael L. Barnett, Haiden A. Huskamp, *Telemedicine for Mental Health: Making Progress, Still a Long Way to Go,"* Psychiatry Online (Dec. 18, 2019) (https://ps.psychiatryonline.org/doi/10.1176/appi.ps.201900555) (visited Aug. 24, 2021).

[47] Lisa M. Koonin,, *et al, Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic – United States, January-March 2020,* Morbidity and Mortality Weekly Report, Centers for Disease Control (Oct. 30, 2020) (https://www.cdc.gov/mmwr/volumes/69/wr/mm6943a3.htm) (visited Jul. 13, 2021).

[48] *See, U.S. States and Territories Modifying Requirements for Telehealth in Response to COVID-19*, Federation of State Medical Boards (Jul. 9, 2021) (https://www.fsmb.org/siteassets/advocacy/pdf/states-waiving-licensure-requirements-for-telehealth-in-response-to-covid-19.pdf) (visited Jul. 13, 2021).

regulations also evolved to enable greater telehealth engagement: Medicare implemented changes to permit additional reimbursement opportunities for telehealth, adding 135 services to the eligible services list.[49]

Increased telehealth accessibility led to striking growth in telehealth usage: The Department of Health and Human Services reports that 43.5% of Medicare primary care visits in April 2020 were conducted via telehealth, a remarkable increase from the previous February in which only 0.1% of primary care visits were via telehealth. Of particular interest to the instant discussion, demand in rural areas surged: Increases in telehealth usage were documented in Iowa (33.5%), South Dakota (32.8%), and Oklahoma (34.7%). The most modest increase recorded was a yet stunning 22% (occurring in Nebraska).[50] And, data point not only to acceptance of telemedicine among younger Americans, but in older populations, as well.[22] Even as patients and physicians are returning to office visits, it is expected that demand for telehealth will enjoy higher-than-pre-pandemic rates.[23] Home telehealth can also play an important role in managing chronic disease through patient monitoring, including patient compliance with medication and dietary instructions. Wearable medical devices can track heart rate, glucose levels, and blood pressure. Attentive management of chronic diseases can reduce instances of acute medical episodes that require costly interventions.[51]

In addition to improved healthcare outcomes,[52] economic benefits of rural telehealth have been quantified. Telehealth enables users to avoid lost wages and travel expenses while increasing local medical facility revenues. A 2017 report projected substantial economic benefits from rural telehealth deployment, including, on an annual basis: travel expense savings of $5,718 per medical facility; lost wages savings of $3,431 per medical facility; hospital cost savings of $20,841 per medical facility; increased local revenues for lab work ranging from $9,204 to $39,882 per type of procedure, per medical facility; and increased local pharmacy revenues ranging from $2,319 to $6,239 per medical facility, depending on the specific drug prescribed.[53]

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[49] Seema Verma, *Early Impact of CMS Expansion of Medicare Telehealth During COVID-19*, HealthAffairs, (Jul. 15, 2020) (https://www.healthaffairs.org/do/10.1377/hblog20200715.454789/full/) (visited Jul. 13, 2021).

[50] *Medicare Beneficiary Use of Telehealth Visits: Early Data from the Start of the COVID-19 Pandemic*, Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services, at 22 (Jul. 28, 2020) (https://aspe.hhs.gov/system/files/pdf/263866/hp-issue-brief-medicare-telehealth.pdf) (visited Jul. 16, 2020).

[51] *See,* Julie Wagner, *Chronic Disease Management: Improving Outcomes, Reducing Costs,* ADVOCATES FORUM, School of Social Service and Administration, University of Chicago, at 52-60 (2012); *see, also,* S. Michael Ross, *How Chronic Disease Management Saves Money and Lives,* Cureatr (Jun. 20, 2019) (https://blog.cureatr.com/how-chronic-disease-management-saves-money-and-lives) (visited Aug. 24, 2021).

[52] *See, i.e., Telehealth in Rural Communities*, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (Aug. 18, 2020) (https://www.cdc.gov/chronicdisease/resources/publications/factsheets/telehealth-in-rural-communities.htm) (visited Jul. 27, 2021).

[53] *See,* Rick Schadelbauer, *Anticipating Economic Returns of Rural Telehealth*, Smart Rural Community, NTCA–The Rural Broadband Association (2017) (https://www.ntca.org/sites/default/files/documents/2017-12/SRC_whitepaper_anticipatingeconomicreturns.pdf) visited Aug. 26, 2020).

The combination of patient acceptance, physician engagement, and anticipated economic and medical benefits support goals to increase rural telehealth use. Inasmuch as broadband rests at the foundation of telehealth, it follows that broadband deployment *and adoption* are precursors to realizing these gains in rural areas, and that strategies to increase usage both in the aggregate and among discrete populations are appropriate. Moreover, increased telehealth usage may generate additional benefits when users within high-risk populations or other groups with higher incidences of chronic or acute illnesses access treatment via telehealth that they would not have engaged in a so-called "brick and mortar" setting.[54]

IV. RURAL DEMOGRAPHICS AS FACTORS IN BROADBAND ADOPTION

As the digital revolution continues and intensifies, community partnerships will be critical to bridge gaps in broadband adoption and digital literacy. Additionally, an active broadband champion can be critical to community success. Whereas broadband adoption efforts should strive to close the gap between adopters and non-adopters, digital inclusion may be defined as striving toward equivalent adoption rates across demographic lines. Stated differently, "adoption" may suggest a goal of achieving overall broadband adoption rates of +90%, while

[54] In addition to positive outcomes from telemedicine engagement, broadband connectivity may also exert a positive impact on nutritional wellbeing. However, it is important to note at the outset of this discussion that this issue is a still a topic of investigation and study. Emerging inquires have explored the role of internet connectivity in resolving the adverse impacts of "food deserts," namely, areas in which there is low availability of healthy foods. These investigations explore whether connectivity can facilitate access to healthy food information and services. In these instances, internet connectivity may enable users to identify retail sources of healthful foods more easily, or to even order those foods online. Approximately 2.3 million people live in low-income, rural areas that are more than 10 miles from a supermarket. *Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and Their Consequences*, Economic Research Service, USDA, at 28 (Table 27) (Jun. 2009) (https://www.ers.usda.gov/webdocs/publications/42711/12716_ap036_1_.pdf) (visited Aug. 5, 2021). The potential efficacy of online food purchases for rural areas remains unknown. A study exploring online food purchasing in an urban food desert found the largest proportion of pre-tax online food spending was for meat, fish, poultry, eggs and dairy, whereas dessert, candies and sweets were represented in the smallest proportional category of online food purchases.[54] BM Appelhans, EB Lynch, MA Martin, LM Nackers LM, V Cail, and N Woodrick, *Feasibility and Acceptability of Internet Grocery Service in an Urban Food Desert, Chicago, 2011-2012,* Preventing Chronic Disease, Centers for Disease Control and Prevention (May 2, 2013). A potential challenge for rural areas may be identifying participating retailers who can support online ordering for perishable foods, *e.g.,* those represented in the largest category of purchased products, above (meat, fish, poultry, eggs, and dairy). A 2019 USDA pilot program covering 48 states and the District of Columbia permits online purchases with Supplemental Nutrition Assistance Program (SNAP). (*See, FNS Launches the Online Purchasing Pilot*, Food and Nutrition Service, USDA (May 29, 2021) (https://www.fns.usda.gov/snap/online-purchasing-pilot) (visited Jul. 28, 2021). This initiative was created in response to the 2014 Farm Bill, which required a pilot to "test the feasibility and implications" of allowing online SNAP transactions. (*See,* Agricultural Act of 2014, § 4011(b), 128 Stat. 649, Pub. Law 113-79 (2014)). Implemented in May 2019, conclusive results of the initiative have not been assessed. However, as of February 2021, only 11 of the 46 participating states feature a grocer in addition to Aldi, Amazon, and Walmart; stated differently, there is yet a dearth of participating grocers. Moreover, online purchasing does not necessarily equate to delivery; many users must still travel to the grocer. Finally, both prospective and current participants have identified staffing, payment, and other difficulties in launching and sustaining the pilot programs. Overall, conclusive results to support the proposition that broadband connectivity can alleviate adverse impacts of living in a food desert have not yet been demonstrated. Catherine Douglas Moran, *SNAP Online Availability is About to Explode, But Grocers Say They Still Face Too Many Hurdles*, Grocery Drive (Feb. 16, 2021) (https://www.grocerydive.com/news/snap-online-availability-is-about-to-explode-but-grocers-say-they-still-fa/594664/) (visited Jul. 28, 2021).

"inclusion" would suggest a goal of achieving broadband adoption rates of +90% within each defined demographic stack.

While there are existing data sets to compare rural to non-rural adoption, it is not clear that surveys comparing rural to non-rural adoption rates among defined categories of age, educational attainment, income, or race have been reported widely.[55] As described in Section II, above, data reveal that in addition to differences in rural/urban adoption, rates also vary among demographic groups including those defined by age, educational attainment, income, and race. Certain of these data may reflect overlapping influences. For example, data indicate lower adoption rates among the elderly and lower income households. To the extent that rural residents are generally older than their urban counterparts and on average have lower household incomes than urban cohorts,[56] one may ask whether lower average adoption rates in rural areas reflect age and income levels of their respective residents, or whether other factors, such as availability, are in play. In similar vein, adoption trends pertaining to educational attainment and income may reflect both intersecting and independent influences, as educational attainment bears upon household income and, by extension, affordability.

In the absence of widely reported data, this report will not endeavor to address differences between, for example, rates of adoption by household income in rural vs. urban places. Instead, this report explores characteristics of rural regions that relate to the categories discussed above, and in turn suggest the usefulness of examining, in each rural locality, the effectiveness of strategies to promote digital inclusion among those various categories. This inquiry (and the ultimate goal of increasing broadband adoption) is necessary in order to more fully realize the benefits of the "digital age" which accrue as more users utilize connectivity. The benefits of broader adoption are best expressed as Metcalfe's Law, which posits what is colloquially referred to as "network effects" – namely, the proposition that the value of a network increases proportionally to the number of users who are connected to that network.

In regard to broadband, a challenging irony emerges: While the internet "provides greater access to knowledge that those who are less educated may need, [] it is the higher educated who are likely to use it first."[57] And alongside the benefits of adoption, the opportunity costs of *non-adoption* must be considered, as well. An evolving view of this problem has been described as an

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[55] *See,* Hee Yun Lee, Eun Young Choi, Kim Youngsun, Jessica Neese, and Yan Luo, *Rural and Non-Rural Digital Divided Persists in Older Adults: Internet Access, Use, and Perception,* Innovation in Aging, Vol. 4, No. S1 (2020) (https://academic.oup.com/innovateage/article/4/Supplement_1/412/6036618) (visited Aug. 5, 2021) ("Compared to older adults living in urban areas, those residing in rural areas had 29% lower odds of internet access.") At the same time, access cannot be predicted to translate to adoption, as many survey respondents cited lack of digital literacy as a barrier to adoption.

[56] Amy Symens Smith and Edward Trevelyan, *In Some States, More Than Half of Older Residents Live in Rural Areas*, Population, U.S. Census Bureau (Sep. 24, 2020) (https://www.census.gov/library/stories/2019/10/older-population-in-rural-america.html) (visited Aug. 3, 2021); Gloria Guzman, Kirby G. Posey, Alemayehu Bishaw, and Craig Benson, *Poverty Rates Higher, Median Income Lower in Rural Counties Than in Urban Areas*, Income and Poverty, U.S. Census Bureau (Dec. 6, 2018) (https://www.census.gov/library/stories/2018/12/differences-in-income-growth-across-united-states-counties.html) (visited Aug. 3, 2021).

[57] Mann, *et al.,* at 48.

> understanding [that] has advanced from a focus on whether or not populations do or do not have access to digital technology (the so-called digital divide) to a more complex understanding of differences in digital skills and Internet use as well as differences in social, political, and economic outcomes deriving from access to, and use of, digital information and communications tools.[58]

Overall, national broadband adoptions rates are 86.6% for some type of broadband, and 76.8% for a home broadband connection.[59] Split into rural and non-rural areas, the U.S. Census Bureau reports adoption rates are 86% for urban households and 81% for rural households;[60] Pew Research reports a 12% gap between rural and urban household connections during the same period (63% rural vs. 75% urban).[61] Without assessing the competing accuracy of either data source, even the more optimistic perspective of the Census Bureau reveals a significant gap between the average rural household adoption rate (81%) and the adoption plateaus of approximately 95% conveyed in Section II, above. Moreover, the data present an overall image of rural spaces, and do not indicate differences between (a) rural areas where robust broadband is available and (b) rural areas where broadband has not been sufficiently deployed. Accordingly, this report approaches the complementary issues of adoption and inclusion from the perspective of areas that have conquered the challenge of broadband deployment.

To illustrate, nearly 70% of locations served by members of NTCA–The Rural Broadband Association[62] (NTCA) are served by fiber to the premise, and nearly 70% of NTCA member locations (residential and business) are capable of securing broadband speeds of 100 Mbps or

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[58] Roberto Gallardo, *Bringing Communities Into the Digital Age*, STATE AND LOCAL GOVERNMENT REVIEW, I-9, at 1 (2020).

[59] *New Census Data Shows Broadband Adoption Rates Up, Mobile Connectivity Growing in Importance*, Connected Nation, *citing* U.S. Census Bureau 2019 American Community Survey (Sep. 24, 2020) (https://connectednation.org/blog/2020/09/24/new-census-data-shows-broadband-adoption-rates-inching-up-mobile-connectivity-growing-in-importance/#:~:text=By%202019%2C%2086.6%20percent%20of,levels%20than%20the%20national%20average.) (visited Jul 26, 2021).

[60] Michael Martin, *Computer and Internet Use in the United States, 2018,* American Community Survey Reports, U.S. Census Bureau (Apr. 2021) (https://www.census.gov/content/dam/Census/library/publications/2021/acs/acs-49.pdf) (visited Aug .17, 2021).

[61] Andrew Perrin, *Digital Gap Between Rural and Non-Rural America Persists*, Pew Research Center (May 31, 2019) (https://www.pewresearch.org/fact-tank/2019/05/31/digital-gap-between-rural-and-nonrural-america-persists/) (visited Jul. 26, 2021).

[62] NTCA–The Rural Broadband Association represents approximately 850 locally-operated, facilities-based broadband service providers throughout rural areas of the United States. All NTCA members are fixed voice and broadband providers; many also provide mobile, video, and other advanced communications services to their customers. NTCA members and small rural providers like them operate in over one-third of the U.S. landmass while serving approximately 5% of the U.S. population; the average population density of an NTCA member service area is seven people per square mile, equal to roughly the density of Montana.

higher.[63] Moreover, as of July 2021, 197 NTCA member companies were certified as "Gig Capable," specifically, of being able to provide gigabit broadband service (1,000 Mbps) to customers without the need to trench or string new aerial fiber. Where broadband is deployed, data reveal year-over-year increases in the proportion of subscribers purchasing higher-speed services: In the nearly 850 rural areas served by members of NTCA, the percentage of customers subscribing to fixed broadband service greater than or equal to 1 Gig more than doubled from 2019 to 2020, and more than 20% of subscribers purchase speeds greater than or equal to 100 Mbps but less than 1 Gig.[64]

Rural areas reflect demographic strata as do urban areas, albeit in different proportions. For example, median household income is generally lower in rural areas than in urban areas by a margin of about 25%.[65] And, in the vein of efforts aimed at narrowing gaps that reflect educational attainment, 34% of young adults in urban areas ages 25-34 held a college degree or higher in 2018, while 20% of similarly aged adults in rural areas held such degrees.[66] Finally, efforts to narrow adoption gaps within discrete race categories may present different considerations in rural areas than in urban area: in metro U.S. areas, racial and ethnic minorities (defined by the USDA as American Indian, Black, Hispanic, or Other) constitute 42% of the population, compared to 22% of the population in non-metro areas.[67] However, while the *proportions* of relevant demographic to the general population may appear to support tailored per-demographic adoption strategies, the smaller real number of prospective subscribers in rural areas likely implicates considerations as to whether a *general* effort to increase adoption, rather than a *suite* of adoption efforts on a per demographic basis, is more feasible. By way of explanation, NTCA reported broadband "take rates" of 72% in member service areas in 2016.[68] With an average of approximately 4,500 fixed broadband connections,[69] those figures suggest a reasonable estimate of about 1,750 total prospective non-adopters per community. Already

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[63] *NTCA 2020 Broadband Survey Report* at 2, 6 (2020) (https://www.ntca.org/sites/default/files/documents/2020-12/2020%20Broadband%20Survey%20Report.pdf) (visited Jul. 29, 2021).

[64] *Id.* at 8.

[65] *Rural America at a Glance, 2017 Edition*, Economic Research Service, USDA (2017) (https://www.ers.usda.gov/webdocs/publications/85740/eib182_brochure%20format.pdf?v=217) (visited Jul. 29, 2021).

[66] *Rural Education*, Economic Research Service, USDA (https://www.ers.usda.gov/topics/rural-economy-population/employment-education/rural-education/#:~:text=Between%202000%20and%202018%2C%20the,15%20percent%20to%2020%20percent.) (visited Apr. 22, 2021).

[67] *Rural America at a Glance: 2018 Edition*, Economic Research Service, USDA at 3 (2018) (https://www.ers.usda.gov/webdocs/publications/90556/eib-200.pdf) (visited Apr. 22, 2021).

[68] *NTCA Broadband/Internet Availability Survey Report*, NTCA–The Rural Broadband Association, at 8 (Jul. 2017) (https://www.ntca.org/sites/default/files/documents/2018-01/2016ntcabroadbandsurveyreport.pdf) (visited Aug. 17, 2021).

[69] *NTCA 2020 Broadband Survey Report*, at 8. The average across respondents was 4,434 fixed broadband connections.

slender rural economies of scale, generally, as well as limited staff in a small company could be further diffused by the relatively small size of each demographic group. This does not mean, however, that efforts that would have the potential, if not ultimate, effect of reaching discrete demographics should not be pursued.

As noted above, strategies to increase rural broadband adoption and digital inclusion benefit from recognizing the diversity of rural spaces, often expressed in the colloquialism, "If you have seen one rural place, you have seen one rural place." As an overarching consideration, overlaps among demographic categories can support a general adoption strategy. For example, inasmuch as income correlates positively to educational attainment,[70] efforts targeted to increase adoption among low-income users could capture subscribers among categories of corresponding educational attainment. Likewise, age, household income, and educational attainment influence broadband adoption rates within minority communities much the way they influence adoption rates, generally.[71] Accordingly, targeted efforts to reach elderly or low-income users could simultaneously attract prospective subscribers regardless of racial affiliation. And even as affordability barriers are addressed, it is also important to address perceived relevance and to consider the value of promoting the benefits digital literacy; as noted above, two-thirds of non-adopters cited reasons unrelated to price as reasons for not taking internet service.[72] Accordingly, as small rural providers may consider broad, general adoption campaigns, those efforts may be deployed more effectively through focused outreach efforts with community organizations to reach specific demographic communities. These may include, but are not limited to, coordinated work with social service organizations to reach low-income populations; digital literacy efforts with senior citizen and other organizations; outreach to fraternal, faith-based, or other cultural associations to promote digital inclusion; and materials for non-English speakers. Above all, strategies to increase rural adoption and improve digital inclusion should reflect the sum of each community's unique conditions and circumstances. These can inform strategies that while guided by general principles are adapted specifically for the region or community in which they are to be applied.

A variety of tailored inclusion efforts is evidenced by efforts of small, locally operated communications companies. In Shallotte, North Carolina, Atlantic Telephone Membership Corporation (ATMC) partnered with local county public libraries to create a digital inclusion

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[70] *See,* Elka Torpey, *Measuring the Value of Education*, Career Outlook, Bureau of Labor Statistics (Apr. 2018) (https://www.bls.gov/careeroutlook/2018/data-on-display/education-pays.htm#:~:text=Median%20weekly%20earnings%20in%202017,weekly%20earnings%20for%20all%20workers) (visited Apr. 22, 2021). Notably, average weekly earnings for workers with a professional degree are slightly higher than earnings for workers with a doctoral degree. With that exception, median weekly earnings increase as higher levels of education are attained.

[71] Jon P. Gant, Nicole E. Turner-Lee, Yung Li, and, Joseph S. Miller, *National Minority Broadband and Adoption: Comparative Trends in Adoption, Acceptance and Use,* Joint Center for Political and Economic Studies, at 3 (Feb. 2010) (http://www.broadbandillinois.org/uploads/cms/documents/mti_broadband_report_web.pdf) (visited Aug. 5, 2021) (Gant, *et al.*)

[72] *See,* fn. 4, *supra, citing* Octavian Carare, Chris McGovern, Raquel Noriega, and Jay Schwarz, *The Willingness to Pay for Broadband of Non-Adopters in the U.S.: Estimates from a Multi-State Survey*, Information Economics and Policy (2015) (https://www.sciencedirect.com/science/article/abs/pii/S0167624514000523) (visited Aug. 5, 2021).

plan. Measures include surveying residents about their internet usage, service tiers used, and provider information. ATMC also supported virtual fitness classes for seniors in the county during the COVID-19 pandemic. In Moncks Corner, South Carolina, Home Telephone Co., Inc. partnered with the public school district to provide free internet to households with school-age children in lower-performing schools. Home Telecom has invested in infrastructure updates to support this initiative. Sacred Wind Communications, which serves Navajo Nation lands in Yatahey, New Mexico, partnered with a career academy to provide internet access for students during the coronavirus emergency. These efforts illustrate the unique role of locally operated broadband providers, specifically, their presence in and knowledge of each community's needs and their ability to work effectively with local partners.

A studied examination of a community's characteristics can also lead to tailored outreach success. Horry Telephone Cooperative, Inc. (HTC) (Conway, South Carolina) worked extensively to determine the scope of various demographic communities within its service areas. HTC staff, assisted by a college intern who served as a project lead, conducted targeted outreach within specific demographic segments, including the elderly and families with children. Working with community organizations, HTC identified respective issues of predominant interest within the various communities and, alongside local leaders, selected venues and approaches that would be attractive for outreach efforts. These efforts culminated in a tailored educational curriculum that addressed different use scenarios for broadband, including telehealth, financial management, and education. HTC personnel partnered with community leaders to design outreach sessions focused on "introductions to broadband" and digital literacy programs. By working hand-in-hand and appearing with community leadership, HTC conveyed the hallmark of locally operated communications providers, namely, their commitment to serving their community. These grassroots outreach efforts reflected simultaneously the general strategy of promoting broadband adoption alongside targeted efforts to increase digital inclusion within specific demographic segments.

V. CONCLUSION

Data indicate that gaps in broadband adoption are closing at various rates among different demographic groups. Gaps between different tiers of household income and educational attainment present the widest discrepancies in broadband adoption rates. Age-related gaps are narrowing and can be expected to effectively close over time. Varying adoption rates among different racial demographics are narrowing, as well; while home broadband adoption rates reveal room for growth, all groups are exhibiting upward-trending rates of adoption. In rural areas, efforts to narrow adoption gaps are important because broadband-enabled applications can mitigate particularly rural conditions surrounding economic development, education, healthcare, and other services. Taking into account the limited economies of scale in rural spaces and the small size of discrete demographic groups, small rural broadband providers may consider combining all-encompassing broadband adoption campaigns with targeted outreach efforts to a range of community organizations and associations. These strategies can build upon locally operated providers' connections to their communities to promote increased adoption and digital literacy within different demographic groups.

About NTCA–The Rural Broadband Association:
NTCA–The Rural Broadband Association represents approximately 850 independent, community-based telecommunications companies that lead innovation in rural America. NTCA advocates on behalf of its members; provides training and development; produces publications and industry events; and offers an array of employee benefit programs. In an era of exploding technology, deregulation, and marketplace competition, NTCA's members are leading the IP evolution for rural consumers, delivering technologies that make rural communities vibrant places in which to live and do business. Because of their efforts, rural America is fertile ground for innovation in agriculture, economic development, education, health care, public safety, and other services. Visit us at www.ntca.org.

About Smart Rural Community:
Smart Rural Community℠ is an initiative of NTCA–The Rural Broadband Association, promoting rural broadband networks and applications to foster innovative agricultural, economic development, education, health care, other vital services. Smart Rural Community administers award, best practices, and educational programming. For more information, please visit www.smartruralcommunity.org.

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Additional Smart Rural Community White Papers:
"Beyond Rural Walls: A Scholars' Conversation About Rural and Urban Spaces," Joshua Seidemann, Editor, NTCA–The Rural Broadband Association (2016).

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