



BROADBAND TODAY:
**Rural
America's
Critical
Connection**



*Adapting to a World
Where Connectivity is Key*



FOUNDATION FOR
RURAL SERVICE

BROADBAND TODAY

As a Pandemic Changes Society,
Broadband is Rural America's
Critical Connection

2020: THE START OF A NEW ERA

The pandemic has changed the way we live, work and interact.

Dependence on Broadband



Broadband is now central to working from home, remote learning, telehealth, shopping, accessing government services, social connections and more.

Greater Data Usage



Average broadband network usage soared by **40%** from Q4 2019 to Q4 2020.

Performance



Rural America's broadband networks have performed well, thanks in part to infrastructure investments by rural broadband providers and an increase in fiber-to-the-home penetration.

Full Focus



Stakeholders are focused on all aspects of solving the rural broadband challenge: Access, Affordability and Adoption

The Future of Broadband



Network investment continues from and is supported by:

- » Broadband providers
- » Partnerships
- » States
- » FCC
- » Federal government



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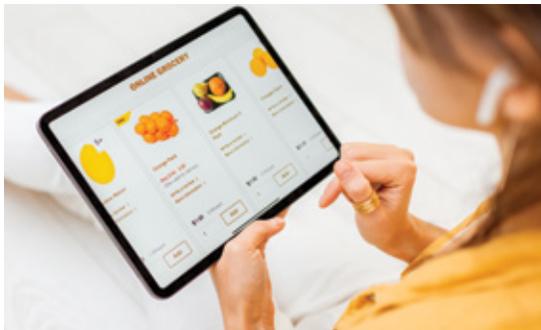
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BROADBAND TODAY: Rural America's Critical Connection

Adapting to a World Where Connectivity is Key

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01 Broadband: **The Common Thread**

This report is being published during a particularly tumultuous time in America's history. The excitement, hope and optimism that naturally accompany the start of a new decade met with a series of challenges as 2020 unfolded: natural disasters, a deadly pandemic, social unrest, economic hardship and political uncertainty. This publication does not seek to address the many implications of these issues. Rather, the intent of this report is to examine the technology that runs like a thread throughout every effort to overcome the challenges the nation has faced in the decade's opening chapter — broadband.

From a technology standpoint, broadband is a means of interconnecting computers and devices across the global network in a fast, reliable manner that is always on, always ready to download and upload content. On the human level, however, broadband is less about how it works and more about what it supports.

Broadband empowers people to share their voice, advocate for change and inspire others.

Broadband equips people to buy and sell, learn new skills, and work their jobs.

Broadband enables people to stay in touch with family, find communities of shared interests and explore their passions.

BROADBAND IS ABOUT:

Connecting families to one another.

Connecting citizens to their governments and communities.

Connecting people to their hobbies and interests.

Connecting employees to their work.

Connecting patients to their health care.

Connecting students to their education.

While these capabilities are certainly important across all sectors, they are especially critical in the broader conversation about quality of life in rural America. Challenges associated with health care, education, poverty, access to services, economic opportunities and more are often exacerbated in rural settings due to factors such as geography (low population density, difficult terrain for building infrastructure, distance from medical facilities and other critical services, etc.) and demographics (technology adoption rates, education levels, general population health, etc.). Broadband can be an equalizing force, helping rural communities and their citizens address, if not overcome, such disparities.

In this report, we provide a basic overview of broadband and then dive into the service as it relates to several important areas. Specifically, we look at: 1) remote learning, 2) working from home, 3) telehealth, 4) business and consumers, and 5) social connections, and explore how the pandemic has impacted each sector. We also look at the impact the pandemic has had on broadband networks and the companies that are building service into rural America. Finally, we look at issues such as the technologies used to provide broadband and policy reforms that could impact the future of broadband deployment.

The Pandemic as a Turning Point

It is important to note that the pandemic has acted less as a change agent and more as an accelerant. In his latest book, "Post Corona: From Crisis to Opportunity," professor and author Scott Galloway writes, "While it will initiate some changes and alter the direction of some trends, the pandemic's primary effect has been to accelerate dynamics already present in society." This is certainly true of broadband's role in the above-mentioned areas, especially as they relate to rural America.

Broadband use has increased in rural areas for a decade, thanks in no small part to the many cooperative and independent providers that connect millions of rural residents and a variety of federal and state programs that have supported such efforts. As outlined in this report, in 2020 the pandemic revealed the critical nature of broadband when response efforts sent millions of students and employees home to continue their education and work. With videoconferences and file sharing multiplying exponentially, demand for bandwidth soared. Broadband became more critical than at any time since its introduction, establishing not only that broadband is an important part of rural living, but also that much work remains to be done to bring broadband access within reach of every rural American.

A Different Kind of Disaster

Among the many events marking 2020 was a particularly active hurricane season. The Gulf states were visited again and again by tropical storms and hurricanes that brought flooding and strong winds — often many miles inland — that claimed lives, destroyed property and damaged critical infrastructure. Each time communications networks and electric distribution systems were laid to the ground, crews from several states drove into the damaged areas to put these systems back together. This is how a community returns to a sense of normalcy; only when basic services are restored can people begin to feel normal again. That is how natural disaster relief works — we respond, we rebuild, and we recover.

The pandemic was a very different kind of disaster. There was no one location or area affected, and there was no putting things back just like they were. Prior disaster mitigation efforts paled in the face of a threat that touched every facet of society. It was not a case of fixing what was broken and going back to normal. The pandemic would change the way we live, work and interact. It would restructure how we function, as families, as institutions, as a society. And broadband is at the core of many of these changes.

FRS: The Mission

The decision to publish this white paper is in keeping with the overall work of the Foundation for Rural Service, the philanthropic arm of NTCA—The Rural Broadband Association. The FRS mission is to sustain and enhance the quality of life in America by advancing an understanding of rural issues. We believe that the future of our rural communities is intrinsically linked to the future of our nation as a whole. FRS invests in rural students through scholarships and youth programs, enhances our communities through grants and advances an understanding of rural issues through educational materials and programming.

By publishing this report, FRS hopes to:

- Provide the public and other interested parties with information to help them better understand the importance of broadband to life in rural America, the pandemic's impact on broadband service and the state of rural broadband in the months and years ahead.
- Equip community leaders with tools to understand broadband's role in improving the quality of life in their cities, towns and counties.
- Document the pandemic's impact on various sectors of society.
- Encourage a broader national conversation on the importance of broadband to rural citizens in light of the COVID-19 pandemic and its fallout.

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02

The Case **For Broadband**

Broadband in Rural America

The United States is a nation of many demographics, ideals and a geography that together weave a rich cultural fabric. As diverse as its inhabitants may be, and as great as our challenges may seem, our shared stories of yesterday and shared dreams of tomorrow unite us in a common identity.

That said, rural America faces unique hurdles and challenges. The geographic realities of living in a less populous region and spread over great distances require of its residents a degree of ingenuity, work ethic, cooperation and innovation that mark every facet of life.

Nowhere is this more evident than in the matter of connectivity. Rural America feeds our nation¹ and many others, yet millions of rural residents remain without access to sufficient broadband. Our military is disproportionately staffed with rural residents², yet one in four rural Americans cannot reliably participate in a videoconference from their home. Rural broadband supports billions of dollars in e-commerce and economic activity³, yet hundreds of square miles across small towns and countrysides have no fiber lines crossing the landscape.

But that story continues to change. Providers of all kinds - mostly based in these same rural areas - are answering the call and doing the job themselves, evolving to deploy fiber and

deliver some of the fastest, most robust internet service in America in the face of vast distances and low densities.^{4, 5, 6, 7}

There are, in fact, two rural Americas⁸, as the COVID-19 pandemic made abundantly clear in 2020. On one hand are those regions with little to no connectivity. On the other are those with fiber networks and gig-speed service available to all homes, schools, businesses and anchor institutions. With increased efforts by locally-based service providers and support from federal^{9, 10} and state¹¹ governments, however, the gap between the two is closing.

By how much? The answer depends on the data you use. Perhaps 18 million¹² Americans remain without broadband. Or maybe that number is 42 million.¹³ Or perhaps 162 million.¹⁴ Regardless, we know there are still millions of citizens who cannot work from home, access remote learning, attend telehealth visits with their doctors or run a small business due to a lack of broadband — and that a significant number of those live in rural America.

Broadband 101

What is “broadband?” The current regulatory definition, according to the Federal Communications Commission, is a connection to the internet at speeds of 25 Mbps download/3 Mbps upload or faster. The term refers to the service connection itself, not equipment such as routers, nor in-home connections such as Wi-Fi, nor network technology such as fiber or fixed wireless. Broadband is how we load websites in browsers, watch YouTube

videos, stream Netflix movies, email photos to family and pay bills online. Increasingly, it's how we connect to our job, how we visit our doctor, how our kids attend school, or complete and submit homework. We've come to view broadband as a basic, critical service much like we do telephone, electricity and public water — it should be available all the time, everywhere, to everyone at a reasonable cost.

Broadband Terms:

Bandwidth — The capacity your internet connection has for uploading or downloading data. You can think of this as a pipe that carries water. A large pipe can move big quantities of water much more quickly than a small straw. Similarly, increasing your internet bandwidth enables you to upload and download data more quickly.

Bits and Bytes — Units of measurement for data on a computer. Because bits and bytes are so small, you'll usually see data measured in megabits or megabytes, which are 1 million bits or bytes, respectively. Bytes are used to measure file size or capacity — a 10-megabyte file for example — while bits are used to measure the speed of your connection, such as 100 megabits per second, or Mbps.

Fiber — The fastest, most reliable network infrastructure available. Optical fiber is comprised of strands of glass that carry pulses of light. Fiber networks are faster and more reliable than cable or copper and can provide speeds of 1 Gbps and beyond.

FTTH — Fiber To The Home (also known as Fiber To The Premises, or FTTP). This is the connection of fiber optic cable directly to a home or business. This direct connection to a terminal at the premises supports the fastest internet speeds possible.

Gbps — Gigabits per second, a standard of measurement for very fast internet download or upload speeds. A gigabit is equal to 1,000 megabits. Most gigabit-speed internet offerings are delivered over fiber networks.

Gig — A shortened term used to describe an internet connection that can provide at least 1 Gbps of speed. This is an extremely high-speed broadband connection.

Hot Spot — A location where computers and other devices can be connected to the internet, usually over Wi-Fi.

Mbps — Megabits per second, a standard of measurement that describes how many bits of data your internet connection can upload or download per second. The higher the number, the faster you can upload or download content online.

Router — A unit that connects the devices in your home to your internet connection and to one another.

Streaming — Playing files as they download so that you can enjoy a podcast, music or video instantly. This enables you to enjoy live video in real time and to consume media without having to fully download it to your device first.

Upload and Download Speeds — Measured in Mbps or Gbps, this tells you how fast you can upload data (posting a photo or video to social media) or download data (loading a website or streaming video or music). Because most people download more than they upload, some internet packages make the most of limited bandwidth by designating more space for downloading than uploading. For example, 200/10 Mbps speed refers to 200 Mbps for downloading data and 10 Mbps for uploading data. Increases in remote learning, telework, and telehealth during the pandemic have, however, resulted in a greater focus on upload capabilities given the two-way nature of those functions.

Wi-Fi — The technology that makes wireless internet on a local area network possible. Wi-Fi allows you to connect various devices throughout your home or business to the internet without having to plug them directly into a router for access. The router is typically then connected to the broadband network using fiber, coaxial cable, copper, or spectrum-based technologies.

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BROADBAND: Connecting Our Lives



Work From Home

Broadband connects you with servers and applications to work remotely



Telehealth

Broadband connects you with doctors and health care services



Entertainment

Broadband connects you with streaming movies, TV shows, music and games



Shopping

Broadband connects you with grocery stores, restaurants and retailers for pickup and home delivery



Remote Learning

Broadband connects your children with their teachers and study resources



Smart Agriculture

Broadband connects your farm with monitoring, drones, agribots and other production technology



Small Business

Broadband connects your business with customers and suppliers



Family & Community

Broadband connects you with your people over video calls and social media



Government Services

Broadband connects you with online property records, tax payments and license renewals

Broadband ... it touches every facet of our lives.



02 Broadband: In Real Life

Social Connections

Sandy Brown, director of the Alexandria Senior Center in Alexandria, Tennessee, incorporates technology into her group activities. This includes providing beginner technology classes. "This generation gets shut out of so many opportunities because they don't know enough about using the internet," Brown says.

The training focuses on things like attaching a picture to an email, applying for online jobs, getting help from the Department of Veterans Affairs and seeking information about Medicare. Census jobs are one example of opportunities suited for the aging generation, but the application process is only available online, Brown says. "It's important to attract the next generation of seniors coming along to make sure they thrive in a technology-driven world," she adds.

The program relies on broadband access from DTC Communications, who also helped the center secure an FRS grant to purchase much-needed equipment for the center.



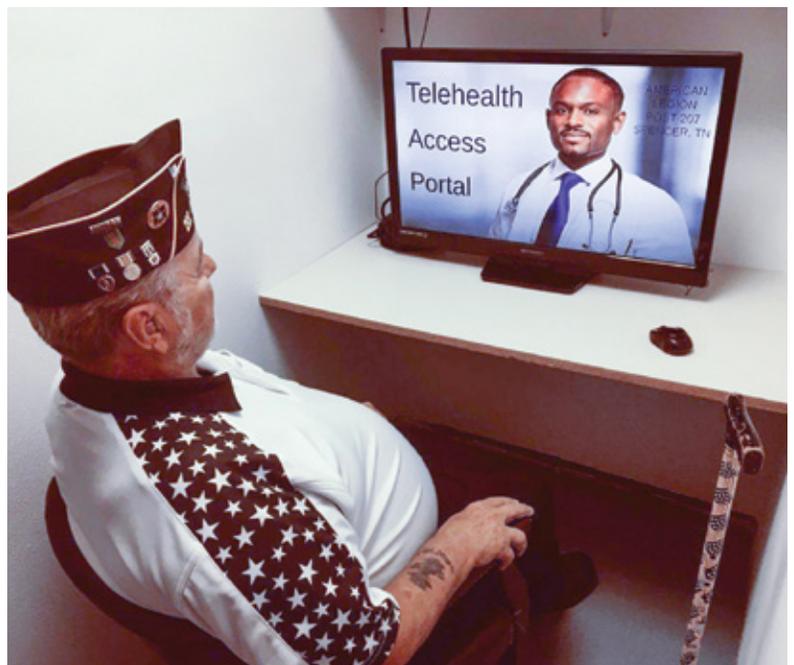
Source: DTC Connection, March/April 2020

Telehealth

For residents of rural Tennessee, an appointment with a medical specialist often requires hours of travel — particularly for veterans visiting a Veterans Administration Medical Center in a metropolitan area.

In Spencer, Tennessee, veterans can go to the Virtual Living Room® program at the local American Legion post, where they find a comfortable, private space and broadband internet access for visits with distant VA health care providers.

"Before the project, it was pretty much an all-day event for a local veteran to get health care, since they live so far away from the hospitals," says Lisa Cope, general manager and CEO at Ben Lomand Connect, the local broadband cooperative that helps support the project. "The Virtual Living Room changed that, and now our veterans are better cared for."



Source: Ben Lomand Connection Sept/Oct 2020

02 Broadband: **In Real Life**

Source: VTX1 Compass, July/August 2020

Agriculture

America's farms must compete in a global market and an often challenging economic environment. It's essential to maximize productivity, and digital tools make that possible.

Spence Pennington and his family grow cotton, grain sorghum, corn, sugarcane and sesame seed. They also raise Brangus cattle in Willacy, Cameron and Hidalgo counties in Texas' Rio Grande Valley.

"I have 10 to 12 systems — my tractors and all my equipment — and I can link them together to make them all sync, thanks to the broadband at my house," he says of the service through the VTX1 Companies. "I can run my agriculture systems, security systems, monitor my equipment. I can literally see the water temp in the radiator of one of my tractors, all from home. When I'm at home, I'm still connected to my farm."

Education

Families & Literacy in Kerrville, Texas, helps adult learners throughout the community and inmates of the Kerr County Jail earn their citizenship or GED, or learn English as a second language.

The in-office broadband connection provided by Hill Country Telephone Cooperative proves vital. Not every student has access to a reliable internet connection at home, so the organization provides Chromebooks on-site so they can take placement tests and register for the appropriate classes.

"It's important that not only can our students speak the language and do the work but they can also efficiently use that technology," says Families & Literacy Executive Director Misty Kothe. "It just makes them more employable in the future."



Source: HCTC Connection, March/April 2020

Work From Home

Aaron and Becca West moved from a Nashville, Tennessee, suburb to a rural area of the state, but that didn't require them to give up their critical internet service. Their new rural communications cooperative, Ben Lomand Connect, provided 1 Gbps internet service across a fiber optic network. This made it possible for Aaron to continue his audio and visual consulting company and Becca to connect with the GoGoKid program through which she used the internet to teach English to Chinese students.

"The fiber was so huge for the contract work," says the Wests. "It was so much easier to communicate. When we were looking for homes here, we immediately ruled them out if they didn't have high-speed internet access."



Source: Ben Lomand Connect Connection, May/June 2020

Business

Ruby, South Carolina, may be off the beaten path, but North Star Leather serves customers across the country from here thanks to its broadband internet connection. The company offers some 150 products, including wallets, money clips and belts, which are created by its 17 local employees. "We're happy to be able to make a living doing something we enjoy while at the same time providing a few jobs here in the USA," says North Star's Michael Batson.

Ninety percent of the company's business is from wholesale and white-label products for other companies who contract with North Star Leather to produce items like wallets and bracelets and stamp their own logo. Often, valued customers or corporate employees receive them as keepsakes. The company also sells retail via its website.

"It's a huge part of our business now," Batson says. "We really wouldn't get anywhere without having the online access we have through Sandhill Telephone. We're constantly interacting with our customers. It's not just the sales we get from the website, but the exposure we get with other people who get private label products. It helps them find us."



Source: Sandhill ConNEXTion, July/Aug 2019



03 The COVID Effect: **Remote Learning**

Overview

By 2019, technology had become a standard tool in childhood education. Teachers were virtually welcoming specialists into their classroom for instruction in advanced courses. Students were receiving homework assignments that required them to access online resources. Increasingly, students were required to submit assignments over school learning management systems such as Blackboard and Schoology.

The Every Student Succeeds Act of 2015¹ defined such use of technology in education as “digital learning,” which included:

- access to online databases and other primary source documents,
- online and computer-based assessments, and
- access to online course opportunities for students in rural or remote areas.

A lack of broadband access at home created a challenge for millions of students trying to navigate an education that was becoming increasingly reliant on digital learning technology. In fact, research showed² that some 25% of school-aged children in the U.S. — an estimated 13.5 million ages 5 to 17 — were found lacking the broadband access and digital devices needed to participate in remote learning.

Impact of COVID-19

These conditions became the backdrop for the sudden and widespread shift to remote learning in the spring of 2020. In

efforts to curtail the spread of the coronavirus, school officials began shutting down school systems, and “educators only had a few days — or sometimes hours — to move their classes online,” according to a report³ from the National Education Association.

This left millions of Americans at a disadvantage. That same report showed that an estimated 37% of non-metro students lacked “full access” at home (both a broadband connection and a dedicated computer). Further, 16% of teachers lacked full access, creating challenges when attempting to conduct online video instruction.

Despite inadequate access to digital tools, 43% of rural districts indicated⁴ that a primary part of their distance learning strategy for grades K-5 was live virtual classes taught by the student’s teacher.

The potential impact on learning is alarming. A Brookings Institution study summarized⁵ that “students could begin fall 2020 with roughly 70% of the learning gains in reading from the prior year relative to a typical school year.” The numbers were even worse for mathematics, where “students may show even smaller learning gains from the previous year, returning with less than 50% of the gains.” Students in lower grades could be impacted most at “nearly a full year behind in math compared to what we would observe in normal conditions.”

Calculating an anticipated "COVID Slide" based on established "summer slide" metrics, Stanford University estimates⁶ that across 19 states it studied, in 2020 students lost on average between 57 and 183 learning days in reading and between 136 to 232 learning days in math.

"In the absence of any actual assessments, these results serve as scientifically grounded estimates of what happened to students since March," said Dr. Margaret Raymond, director of CREDO at Stanford University. "It will take extended broad-based support from all corners to address the current deficits and the ripples they cause into the future."

These impacts could continue to snowball as students move through grade levels. "When you look at (students) who are moving through that pipeline now, are they going to be prepared to make that jump to the next level?" asks Mike Romano⁷, senior VP of industry affairs and business development for NTCA–The Rural Broadband Association. "And how are those coming out of school going to be looked at by a workforce that's determining whether they've got the skill sets they need based on the educational experience that they had certainly last spring and going through the next year or so?"

While the problems are national in scope, some solutions may arise from local efforts. In a joint letter⁸ to their respective memberships in July 2020, Shirley Bloomfield, CEO of NTCA–The Rural Broadband Association, and Dr. Allen Pratt, executive director of the National Rural Education Association, encouraged local schools and local broadband providers to work together to identify barriers to the connectivity that supports remote learning. The letter pointed out that the issue of access is not a singular problem. In some cases, a fixed broadband connection is not available at the home, while in other cases a connection is available, but the homeowner does not subscribe to service — and that these separate issues require separate approaches toward a solution.

Digital Bridge K-12 is a national initiative that is helping states and schools districts identify students without broadband and purchase service for low-income families.⁹ In September 2020, the program announced a collaboration¹⁰ with NTCA that partners local broadband providers with local school systems, who take on bulk procurement of home internet access for students living in homes that do not already purchase broadband.

In October, a working group reporting¹¹ to the FCC's Broadband Deployment Advisory Committee identified several challenges that will need to be addressed moving forward for the nation to close its digital divide and "increase opportunities for all Americans to benefit from effective distance learning." These included:

- the availability of broadband;
- widespread adoption of broadband technology;
- the need for devices to access broadband;
- affordable broadband service plans; and
- digital literacy training — in native languages — for teachers, students, parents and grandparents.

Further, the National Education Association has called on the federal government¹² to provide the funding necessary to ensure all students have access to broadband, to their own devices that have the software and features to support remote learning, and to digital assistance and technical support after school hours and when school buildings are closed.

The Connected Conundrum Lacks Full Access at Home*

37% of non-metro students **16%** of non-metro teachers

And yet **43%** of rural school districts say live virtual classes will be a primary part of distance learning strategies for K-5

*both a broadband connection and a dedicated computer

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03 The COVID Effect: **Work From Home**

Overview

For decades, the United States has been shifting from an industrial-based economy to a knowledge-based economy. Today, two-thirds of our GDP comes from the service industries, which represents four out of five private-sector jobs.¹

With this trend has come a gradual delinking of job functions from the locations where employees must perform their duties. This has led to the opportunity for several categories of workers to perform their jobs away from their employer's centralized setting. As Citi CEO Michael Corbat summarized², "In an economy where farming and manufacturing as a proportion of total economic activity are in decline, and services are rapidly ascendant, the skills necessary for the workplace are being redefined." The number of those working from home, in whole or in part, prior to the pandemic vary widely depending on survey methodology³:

- American Community Survey reported that in 2018, 5.9% of rural workers "usually worked from home in the last week."
- National Household Travel Survey reported that in 2017, 11.9% of all workers "usually work from home."
- Bureau of Labor Statistics reported that in 2018, 23.7% of all workers "worked some hours at home."

Regardless of how the question is approached, it is clear that the increase of broadband accessibility — over the past decade in particular — has increased opportunities for more Americans to perform their jobs away from traditional office settings.

Impact of COVID-19

This upward trend was accelerated in March 2020 as businesses across the country responded to shutdown orders designed to curb the spread of COVID-19. While this created a hardship for many in the service sector whose work is location-dependent (restaurants, hair salons, fitness centers, entertainment venues, retail), knowledge workers in particular were presented with new work-from-home opportunities (customer service, tech support, legal, human resources, creative).

A study backed and reported on by Harvard Business School⁴ found that the pandemic has had a significant impact on remote work. In one study group, 45% of small-business leaders said that jobs within their companies were being done remotely at least two days per week. A second study group, comprised of business economists who are members of the National Association for Business Economics, found that 80% of their firms had adopted remote work programs.

Earlier this year, the consortium Future Forum announced its Remote Employee Experience Index as a way to better understand the impacts of working from home. The inaugural report⁵ showed that 14% of knowledge workers prefer working from home to working in an office. The top reason, cited by 26% of respondents, was work-life balance. The report also identified five top challenges to working from home:

- Unstable Wi-Fi or internet access
- Maintaining and building working relationships with colleagues

- Staying focused and avoiding distractions
- Feelings of loneliness or isolation
- Keeping up with what others are working on

There are indications that the widespread adoption of work from home policies is not a short-term solution tied to the pandemic. Numerous large businesses have indicated they plan to continue allowing at least a portion of their employees to work from home post-pandemic, including Facebook, Twitter, Square, Shopify and Slack⁶.

This direction appears to be influenced by more than employee preferences. A Gartner survey⁷ indicated that some 75% of finance leaders across a broad range of company sizes plan to move some portion of their workforce to a permanent work-from-home arrangement as a cost-savings measure. While the overall response was that of moving at least 5% to remote status, some respondents indicated much higher rates for a post-pandemic workforce:

4% surveyed said 50% of their workforce would remain remote.

17% surveyed said 20% of their workforce would remain remote.

25% surveyed said 10% of their workforce would remain remote.

The savings could, in fact, be substantial. The firm Global Workplace Analytics estimated⁸ that the typical U.S. company could save \$11,000 per worker each year if they work only half of their schedule remotely. "Our prediction is that the longer people are required to work at home, the greater the adoption we will see when the dust settles," says Kate Lister, president of Global Workplace Analytics. "Our best estimate is that 25-30% of the workforce will be working from home multiple days a week by the end of 2021."

This shift results in much greater demand for residential broadband, not only in service speeds but also in types of service. In the absence of remote work, most homes are adequately served

with asynchronous connections that provide much greater download than upload speeds, since most residential internet activity focuses on consumption of data (streaming movies, browsing the internet, downloading files, etc.). Working from home requires greater upload speeds, often synchronous connections, to accommodate a productivity model wherein users must upload and sync large files with their employer's computer systems.

In its October 2020 report⁹, the FCC's Disaster Response and Recovery Working Group offered the following recommendations and best practices related to implementing a virtual workforce:

- Work with broadband providers to ensure sufficient enterprise bandwidth capabilities and protected VPN server access on the business side to maintain day-to-day operations.
- Consider options to facilitate necessary broadband requirements for work-from-home employees.
- Provide necessary technology to ensure remote use for employees including laptops, monitor screens, tablets, cell-phones and other devices.
- Assign key contact personnel for virtual IT assistance.
- Implement network safeguards to mitigate security threats and allow employees to use encrypted passwords for sharing information electronically.

A Tale of Two Broadband Users

An estimated 25-30% of the workforce could be working from home multiple days a week by the end of 2021. This is creating a potentially permanent broadband user profile:

Traditional	Work From Home
<ul style="list-style-type: none"> • The speed to support typical family use • Asynchronous connection, with higher download than upload speeds • Basic internet browsing, streaming movies and TV shows, listening to music, playing games 	<ul style="list-style-type: none"> • More speed to support work • Synchronous speeds to provide greater upload capacity • Traditional uses, plus videoconferencing, connecting to servers, transferring large files

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[9] Disaster Response and Recovery Working Group, "Report and Recommendations: COVID-19 Response," Presented to the Broadband Deployment Advisory Committee of the Federal Communications Commission, (October 29, 2020), <https://www.fcc.gov/sites/default/files/bdac-disaster-response-recovery-approved-rec-10292020.pdf>



03

The COVID Effect: **Telehealth**

Overview

Of all the applications for broadband connectivity, telehealth has the potential for the greatest personal impact on those residing in rural America. Many of the access challenges facing rural patients and rural health care providers can be addressed by telehealth technologies that are currently available.

The American Telehealth Association outlines¹ the most commonly used telehealth approaches as:

- **virtual visits** (traditional phone calls and videoconferencing platform sessions between a doctor and a patient);
- **chat-based interactions** (back-and-forth, non-live communication and sharing of information over email, text messaging or online portals);
- **remote patient monitoring** (the use of wearable sensors and other devices to collect and transmit information regarding the patient's condition back to health care providers); and
- **technology-enabled modalities** (digital diagnostics and therapeutics, consultation between physicians, and general data transmission and interpretation).

Telehealth delivers many benefits² to all parties involved, according to the National Rural Health Association:

- **Rural primary care providers** — Telehealth gives them access to specialists practicing at larger medical facilities.
- **Specialists** — Telehealth opens a wider geographic area for their practice.

- **Patients** — Telehealth supports care in home or closer to home from health care providers.

Overall, a greater level of care is possible through the use of telehealth — and telehealth is supported by robust broadband service. “While not all telehealth use requires broadband capacity,” researchers with the University of Iowa³ reported, “the full potential of telehealth for rural residents and providers will not be realized until broadband is as accessible in rural areas as it is in urban areas.”

Impact of COVID-19

While various options have long existed for using the technology of the day to support health care delivery, the upward trend toward broader adoption of health care delivery across modern telecommunications channels has been steady. The onset of the COVID-19 pandemic dramatically accelerated those trends, resulting in exponential growth in the percentage of visits being conducted via telehealth.

McKinsey & Company reported⁴ that in September 2020, 23% of the population had started or increased use of telehealth for treatment of physical conditions since the pandemic began. This represented a 128% increase since the firm's initial survey in April. A similar trend was noted for the treatment of mental conditions, with 14% indicating they had started or increased telehealth use, representing a 133% increase from April to September.

The recognition of telehealth's importance during the pandemic, and the role it will continue to play in the aftermath, has led to a number of initiatives across the health care industry. In November, the Centers for Medicare & Medicaid Services (CMS) announced expanded flexibility in its regulations through the Acute Hospital Care At Home program.⁵ With the use of telehealth technology, along with in-home visits, CMS (part of the Department of Health and Human Services) expressed a belief that more than 60 acute health conditions could be treated "appropriately and safely" in a home setting. This list of conditions includes asthma, congestive heart failure, pneumonia and chronic obstructive pulmonary disease.

Momentum is building to increase access to telehealth by removing regulatory barriers. The Alliance for Connected Care is seeking support⁶ for its Consensus Principles on Telehealth Across State Lines, calling for providers and patients to be allowed to connect regardless of physical location. Legislation has been proposed⁷ to encourage more states to join the Interstate Medical Licensure Compact, easing restrictions on physicians who wish to treat patients in other states via telehealth. Reporting on Medicaid policy trends, the Center for Connected Health Policy stated⁸ that 27 states plus Washington, D.C. now allow a person's home to be an "eligible originating site" under certain circumstances, while 26 states plus D.C. permit Medicaid reimbursement where a school is the originating site.

As telehealth adoption expands, however, this acceleration is generating concern among health care providers over accessibility of telehealth services — particularly in rural America. In a report by the COVID-19 Healthcare Coalition⁹, rural clinicians identified several barriers to patients accessing telehealth services. These included lack of patient access to technology (77.7%), lack of patient access to broadband/internet (71.6%) and lack of digital literacy in patients (67.6%).

"A successful transition to telemedicine requires the intersection of at least 3 key factors," writes University of Pennsylvania's Dr. Howard M. Julien¹⁰. "Access to broadband internet, an internet-capable device, and sufficient technology literacy to take advantage of the first two factors."

TELEHEALTH: Moving Care Home

Is the health care industry poised for a dramatic, technology-powered disruption? The pandemic highlighted the critical need for broadband to support telehealth services that would enable more people to receive care without visiting physician offices and hospitals. Analysis from McKinsey & Company illustrates the significant shift in services this could mean for the industry:

20% emergency room visits potentially avoided via virtual urgent care offerings

24% health care office visits and outpatient volume delivered virtually

9% health care office visits and outpatient volume delivered virtually "near-virtually." 35% regular home health attendant services virtualized

2% outpatient volume shifted to the home setting (with tech-enabled medication administration)

AND WHAT ABOUT THE DOLLARS?

*"Overall, these changes add up to **\$250 billion** in health care spend in 2020 that could be shifted to virtual or near-virtual care, or 20% of all office, outpatient, and home health spend across Medicare, Medicaid, and commercially insured populations."*

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[2] Windy Alonso, Elizabeth Crouch, and Nicole Thorell, "Telehealth in Rural America," National Rural Health Association, https://www.ruralhealthweb.org/NRHA/media/Emerge_NRHA/Advocacy/Policy%20documents/2019-NRHA-Policy-Paper-Telehealth-in-Rural-America.pdf

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03

The COVID Effect: **Business & Consumers**

Overview

Small businesses are defined as any company with fewer than 500 employees. Almost all U.S. companies — 31.7 million of them — fall within this category. Many are single-person operations, often with no employees. Small businesses include the grocery stores, manufacturing plants, professional services firms, restaurants and retail shops that anchor the local economies of communities across America. Since the turn of the new century, small businesses have created 10.5 million net new jobs — more than 65% of all jobs created during that time. As another indicator of the economic impact of this segment, 40% of private sector payroll is generated by this class of business.¹

As the novel coronavirus began to reach crisis stage in China, these businesses were enjoying a decade of economic growth following the Great Recession. With the stock market on a steady climb and a growth in GDP of almost 48%², business was good.

That was about to change.

Impact of COVID-19

The landscape shifted rapidly for America's businesses in March and April of 2020 as state and local governments took measures to quell the spread of the coronavirus. As the year came to a close, businesses reflected on 2020 when responding to the U.S. Census Bureau's Small Business Pulse Survey³. While 30% overall

said the pandemic had a "large negative effect" on their business, some sectors were hit much more severely. For example, the numbers below reveal a much higher percentage of businesses in these sectors reporting a large negative effect:

Accommodation and Food Services — 65%

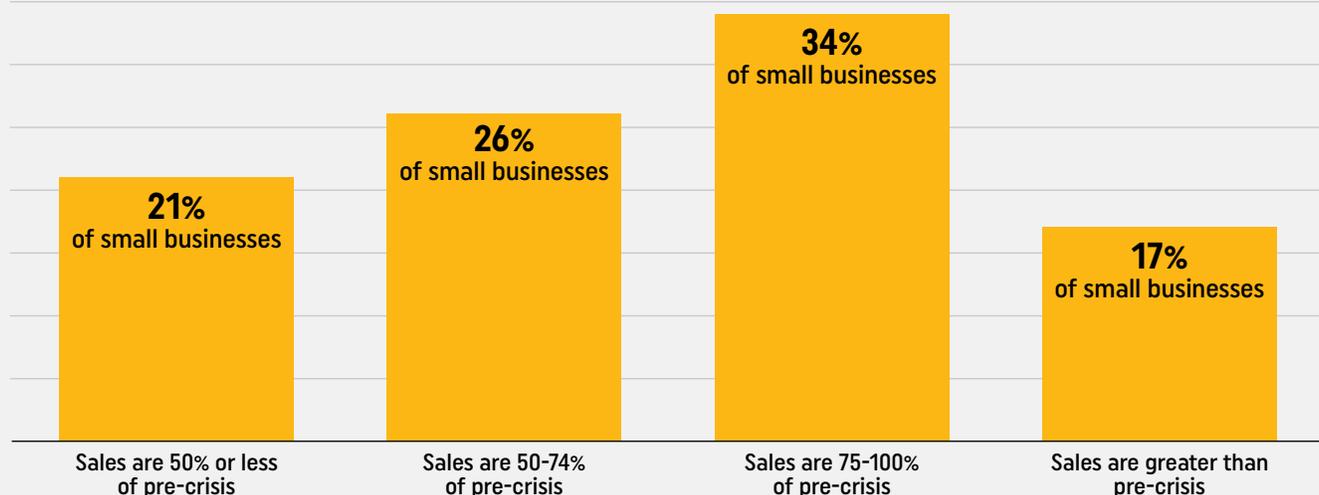
Educational Services — 62%

Arts, Entertainment and Recreation — 60%

Such businesses were forced to explore new ways of delivering products and services to consumers. Restaurants shifted to curbside pickups and delivery, supported through local and national apps such as Uber Eats and DoorDash. Gyms and other on-site fitness operations explored innovative ways to offer virtual content, with a 30% jump in hours U.S. users spent each week on health and fitness apps. As on-site learning was interrupted, online platforms such as Coursera and Udemy saw enormous surges in enrollment of 640% and 425%, respectively.⁴

In October, the NFIB Research Center reported⁵ on the ongoing impact of the pandemic on small businesses. Most small businesses were impacted at some level at the beginning of the crisis, but the research pointed out that economic recovery has been less uniform as the months have unfolded.

Sales Levels for Small Businesses in October 2020 Compared to Pre-Crisis

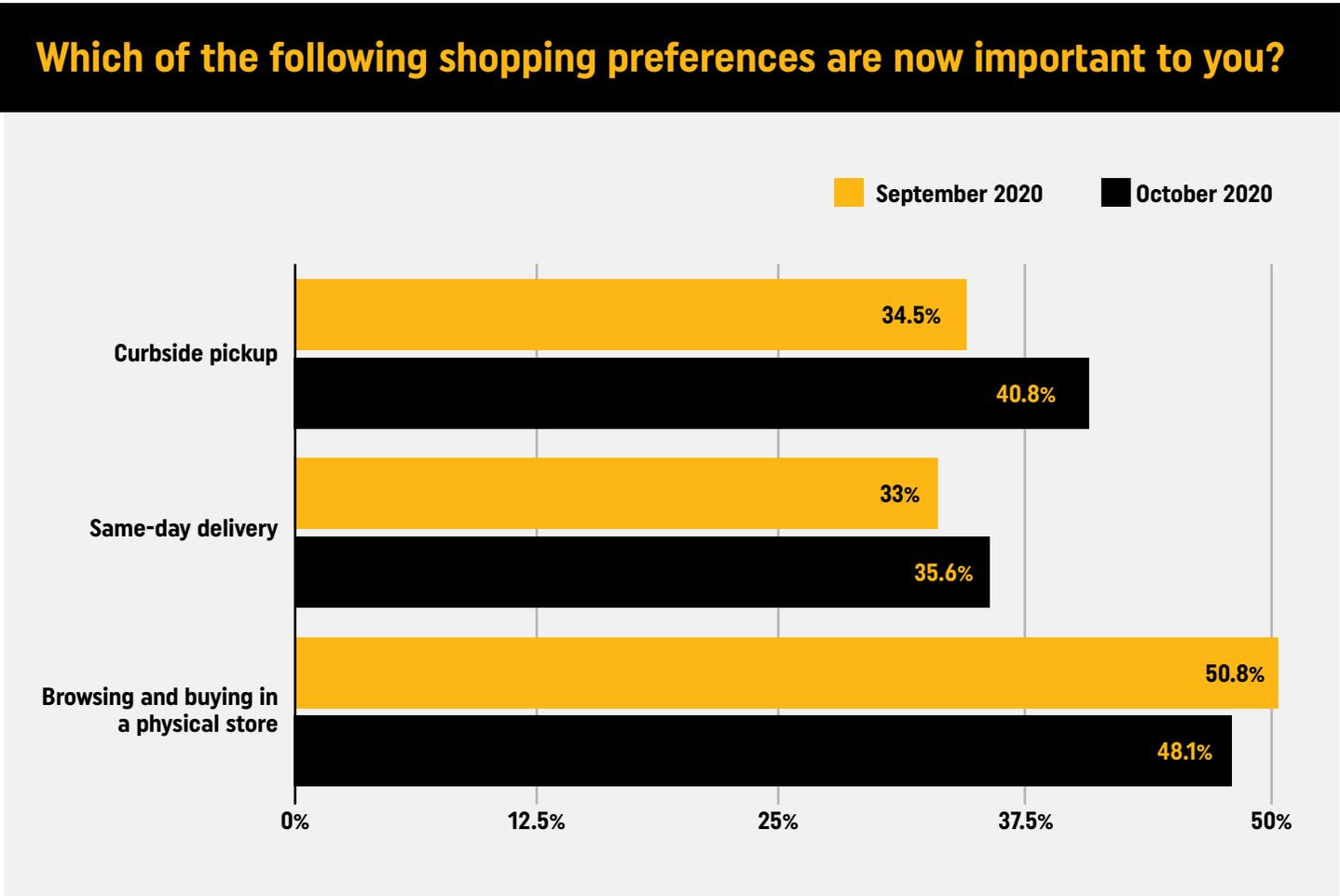


That same report shows that many of those businesses that borrowed funds through the federal government's Paycheck Protection Program (PPP) see continued difficult times in the coming months. Almost one in five said they anticipate laying off employees in the next six months, while more than half said they would need more financial help in 2021.

In terms of consumer behavior, online shopping was already trending upwards in the months before the pandemic. The third and fourth quarters of 2019 saw increases in e-commerce of 17.3% and 16.6%, respectively, compared to the same periods a year prior. The first quarter of 2020 followed that trend, with a 14.8% year-over-year increase⁶. However, as consumers found themselves at home more, and with brick-and-mortar stores closed for several weeks, e-commerce skyrocketed:



Convenience and safety continue to play an important role in how consumers make purchasing decisions. Those trends are evident in the two most recent months of reporting in Win BIG Media's consumer sentiment research⁷, where consumers were asked, "Which of the following shopping preferences are now important to you?"



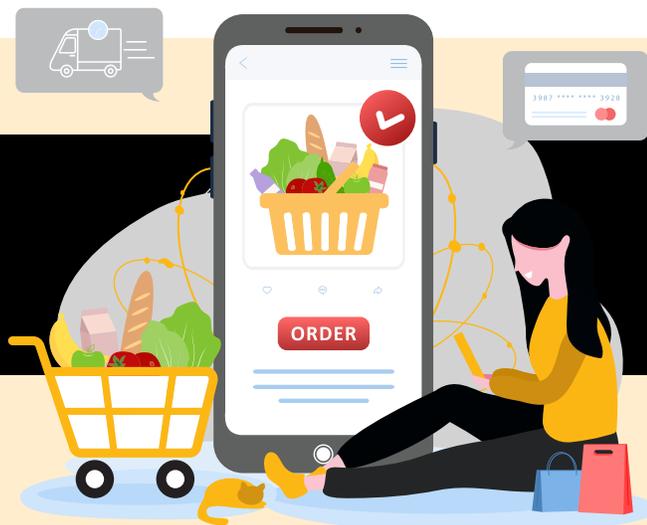
Beyond the fallout surrounding the coronavirus outbreak, consumer behavior in 2020 was also influenced by how companies responded to racial injustice. A special report from the Edelman Trust Barometer⁸ showed that 60% of the general population would be influenced by how a brand responded to racial injustice

protests when deciding whether to buy from or boycott them in the future. This sentiment was particularly strong among the 18-34 age bracket at 70%. Sixty-one percent of those age 35-54 agreed, along with 52% of those ages 55 and over.

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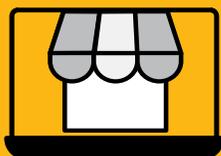
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Online may really be the new normal



Shopify, the e-commerce platform that helps businesses sell online, released a study in September 2020 that showed "53% of North American buyers said that the pandemic has changed the way they will shop going forward."

How will those changes play out? According to the report:



ONLINE SHOPPING:

52% of consumers say they have shifted more of their shopping online.



SUPPORT FOR LOCAL BUSINESSES:

61% of consumers plan to continue shopping with local businesses as 2020 draws to a close.



CURBSIDE PICKUP:

40% of consumers made purchases online and picked them up curbside in the first three months of the pandemic — and **38%** say they plan to continue doing so.



LOCAL DELIVERY:

31% of consumers bought something online and had it delivered locally in the first three months of the pandemic — and **33%** say they will use local delivery as 2020 draws to a close.



VIRTUAL EXPERIENCES:

Many service businesses created online events as a way to maintain contact with and serve their customers. Some **14%** of consumers reported buying a virtual version of a service, with **63%** of those saying they did so more during the pandemic than before.

Dayna Winter, "5 Pandemic Buying Habits That Are Here to Stay—According to Shopify Research," Shopify, (September 10, 2020), <https://www.shopify.com/blog/consumer-trends>



03

The COVID Effect: **Social Connections**

Overview

We are social animals. Since ancient times, mankind has developed ways to stay connected. Before the invention of the printing press, we were sending handwritten stories and letters across land and sea. While connection with our local family, tribe and community are at the core of our social well-being, we have continually devised new ways of reaching beyond those physical limits to broader circles: telegraph, the U.S. Postal Service, public switched telephone networks, fax machines, the internet, social media. We are a species in continual pursuit of connectivity. Facebook serves as a good barometer of this concept. In the fall of 2016, the social media platform had more than 1.8 billion monthly active users across the globe. That number has surged to 2.7 billion.¹ Through this and similar platforms such as Twitter, Instagram, WhatsApp and TikTok, the foundation was laid for a world in which human connection was about to be significantly disrupted.

Impact of COVID-19

Our need to engage was met with the stark realities of a pandemic in 2020. Severe limitations were placed on in-person gatherings, particularly public assemblies such as shopping and dining, sporting events, conferences, and live entertainment. Moreover, a shared experience as far-reaching as a pandemic heightened our need to converse and connect over a global event that was impacting everyone. As author and ethnographer Simon Sinek says, "We form tribes and connections around a common vision or shared values."²

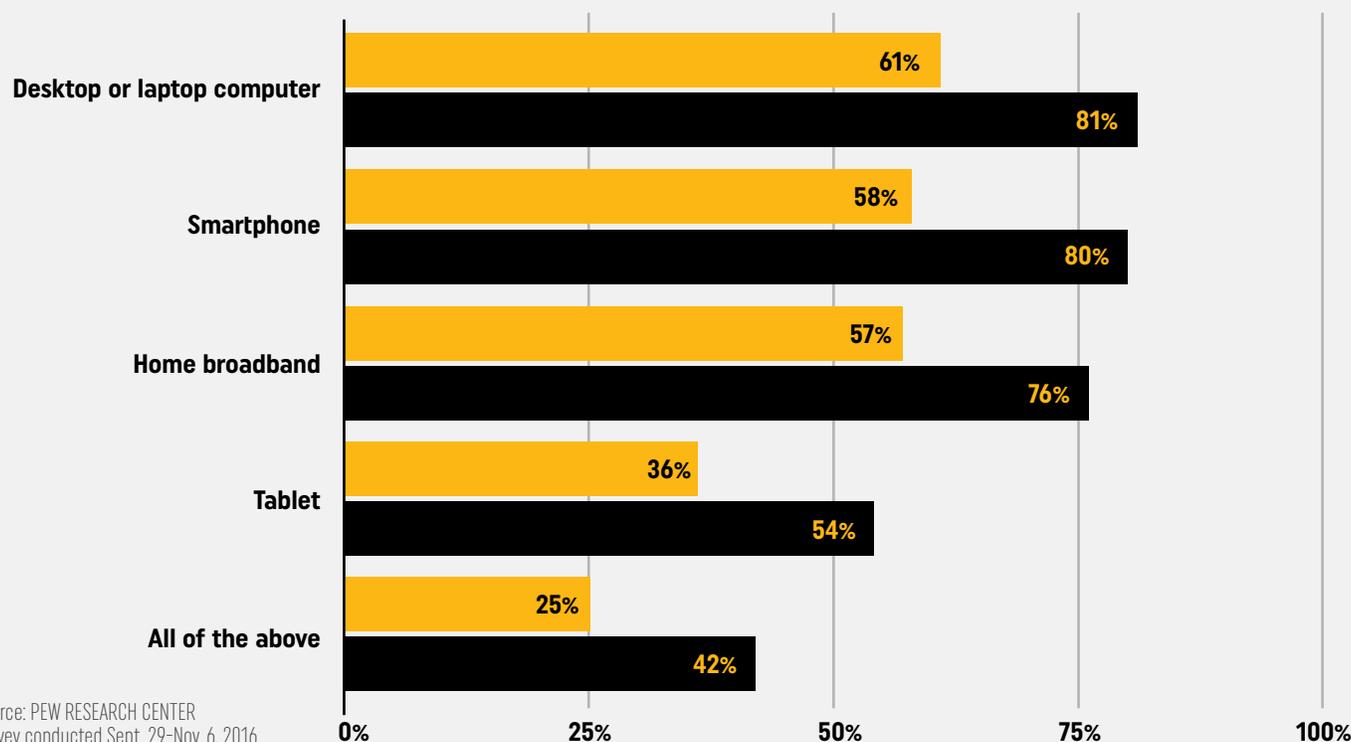
In its October 2020 report³ to the FCC's Broadband Deployment Advisory Committee, the Disaster Response and Recovery Working Group pointed out that "during COVID-19, broadband connectivity was not just critical for learning, working, and getting health care; broadband provided a critical mechanism for people to stay connected." From graduation ceremonies and church services to weddings and funerals, social media and video platforms have played an important role in helping people share important moments and maintain a sense of community. Alternate means of connectivity have become especially critical for vulnerable populations. With COVID-19 hitting the elderly population hard, particularly those in group settings such as nursing homes and assisted living facilities, communicating over broadband-enabled technology can reduce the sense of isolation. Heading into the pandemic, only 8% of older adults used video chat every day, according to an AARP study⁴. Social media was popular with 42%, with 43% using email and 56% using text messaging.

Adoption of communications technology is unfortunately not as high among disabled Americans, who comprise some 26% of the U.S. population, or 61 million people.⁵ In a Pew Research study⁶, only 57% of disabled Americans reported having home broadband service, compared to 76% of those with no disability. In fact, the research showed that disabled Americans were three times as likely to say they never go online at all.

Disabled Americans are less likely to have home broadband, tech devices

% of U.S. adults who say they have ...

Any disability No disability



Source: PEW RESEARCH CENTER
Survey conducted Sept. 29–Nov. 6, 2016

Overall, more than half of Americans consider digital connectivity — particularly the internet — as being essential during the pandemic⁷. Another 34% say that while not essential, the service is important.

Beyond connecting with family and friends for routine socialization and for special occasions, shutdown measures to control the coronavirus also interfered with group activities. A third of U.S. adults turned to the internet in 2020 to have a virtual party or social gathering⁸. It's worth noting that a considerable gap

separated urban and suburban adults (35% each) from rural adults (only 23%). Urban and suburban adults were also more likely to watch a concert or play through a streaming service (22% and 21%, respectively) than their rural counterparts (16%). In the closing weeks of the year — with months of quarantines, stay-at-home orders, shutdowns and overall significant disruptions in social connectivity — Americans reported⁹ that they were most eager to return to getting together with family (42%), getting together with friends (39%) and dining indoors at a restaurant or bar (36%).

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[7] Emily A. Vogels, Andrew Perrin, Lee Rainie and Monica Anderson, "53% of Americans say the internet has been essential during the COVID-19 outbreak," PEW Research Center, (April 30, 2020), <https://www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak>

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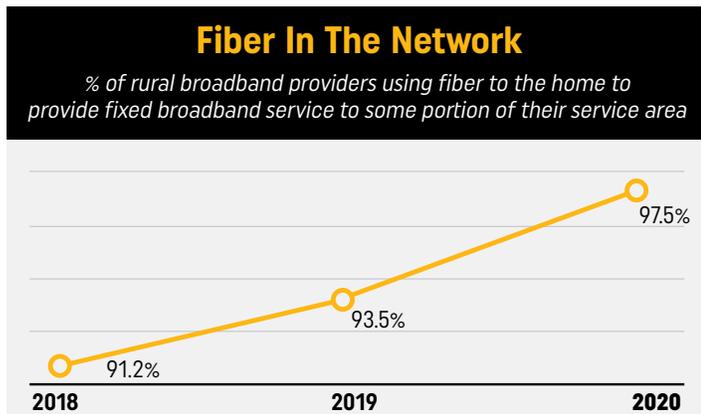
03

The COVID Effect: **Networks**

Overview

As 2020 got underway, rural broadband providers were continuing the trend of building out their networks with fiber. This growth gained momentum as the nation dealt with the fallout of the pandemic. The chart below shows the growth in fiber across the past three years, as reported by members of NTCA–The Rural Broadband Association¹.

The presence of robust broadband networks proved advantageous for providers, who found themselves dealing with a significant shift in network traffic and usage patterns. In fact, NTCA members serving more than 650,000 broadband connections across 38 states reported² that their networks continued to perform as designed and without disruption despite changes and increases in demand.



Impact of COVID-19

A report from the FCC's Disaster Response and Recovery Working Group³ identified the following key conclusions in regard to the overall performance of America's broadband networks during the pandemic:

- (a) networks performed well overall during the pandemic;
- (b) availability and adoption challenges were intensified as critical societal functions transitioned online, almost overnight;
- (c) municipalities were able to ensure that permitting generally was not an obstacle to maintaining and, as needed, expanding broadband networks during the pandemic; and
- (d) the rapid and significant social changes brought on by the pandemic, such as increased teleworking, remote learning, and use of telemedicine, are becoming ingrained and will likely lead to long-term changes in broadband usage and adoption.

Supply Chain Issues

A perfect storm occurred in 2020 when three realities converged: 1) the need for broadband connectivity increased as the pandemic forced workers and students home for several weeks; 2) state and federal funds flowed to broadband providers to connect consumers and build new networks; and 3) the pandemic caused disruptions in operations for manufacturers across the globe who are part of the complex supply chain.

Quarterly Data Usage *median monthly weighted average*



As reported by Openvault in its OVBI Broadband Insight Reports for 2Q20, 3Q20 and 4Q20, U.S. broadband usage rose sharply as pandemic-related shifts in work and school patterns unfolded. The numbers have not returned to pre-pandemic levels, signaling a new normal for broadband usage.

Average Broadband Household Index *Snapshot of the average U.S. broadband household - Q4 2020*

-  **483 GB** Average Bandwidth Usage
-  **452 GB** Average Downstream Usage
-  **31 GB** Average Upstream Usage
-  **4** Average Number of Streaming Services*
-  **10.37** Average # of Connected Devices**

Source: OVBI Broadband Insight Report 4Q20 – www.openvault.com
 *Deloitte Insights- Digital media trends survey, 14th edition
 **Statista

The result was that lead times for critical supplies to build broadband networks (including fiber, routers and other equipment) began to stretch well beyond normal delays. Anecdotally, some broadband providers were being told that delivery of fiber orders would take from eight months to a year. The NTCA survey of broadband providers revealed concerning trends:

- Almost 90% of respondents had experienced delays in procuring equipment.
- 32% reported delays of five to eight weeks from prior windows on fiber fulfillment.
- 32% reported delays of more than 12 weeks on fiber fulfillment.
- 48% reported delays for network equipment of nine to 12 weeks.
- 58% reported delays of nine to 12 weeks beyond prior estimates for customer premise equipment such as routers.

A December 2020 report⁴ found that concerns over supply chain issues have risen dramatically among broadband providers; 27.7% of survey respondents said they were concerned about delays in fiber order fulfillment, up from 9.3% for the same period in 2019.

In November 2020, a cybersecurity study group issued a report⁵ on the impact of COVID-19 on the information technology and communications sector. Citing “profound disruptions to the globalized model of supply chains,” the report identified three key issues:

1. The pandemic has underscored the need for an approach that was already underway over the last six years: diversifying supply chains to a broader array of locations and away from single source/single region suppliers.
2. The pandemic exposed how some manufacturing companies were unprepared because of their reliance on lean inventory models, which provide great efficiency and cost effectiveness in normal environments.
3. COVID-19 also underscored the difficulties that companies face in understanding their junior tier suppliers and where they are located.

The report went on to present a number of recommendations, from developing standard methods of mapping sub-tier suppliers to exploring ways for manufacturers to keep more inventory in reserve.

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Overview of Broadband Technologies

Beyond what rural America needs — and why — it's appropriate to ask, "How do we get there?" Many broadband technologies are currently operational, and others are being developed and deployed; but not all may be equal in being ready to address tomorrow's needs or the unique dynamics of rural environments.

Broadband services can be delivered to the customer using either wireless or wireline technologies. Wireless technologies, which include satellite, use the air as a transmission medium and can be fixed or mobile. Wireline broadband is — with rare exception — delivered using copper cable (either twisted-pair or coax) or fiber optic cable. Each technology choice has its own benefits and drawbacks regarding speed, capacity, latency, reliability, mobility and other factors. As with any infrastructure — such as roads, bridges, or electric or water systems — the question often turns upon whether it is deemed more efficient and effective to build something more quickly at a lower upfront cost that will not satisfy demand for capacity over the long run or to plan ahead for the capacity that will be needed over the life of the asset and build for that capacity from the start (rather than needing to rebuild the network repeatedly). Those building networks, and policymakers as well, must make such choices in determining what kinds of broadband networks to build and support.

	Benefits	Drawbacks
Wireless		
mmW 5G	Tremendous speed and capacity over very short distances.	Very limited wireless reach makes it not suitable for sparsely populated rural areas.
Midband 4G/5G	Lower upfront costs; speeds comparable to good copper networks.	Slower speeds due to limited spectrum; frequent upgrades are costly; requires deep fiber.
Wireline		
DSL (twisted-pair copper)	Can leverage existing outside plant.	Limited speeds; not suitable for long distances; requires deep fiber; expensive upgrades.
Coax	Can leverage existing outside plant.	Not suitable for long distances; requires deep fiber; expensive upgrades.
Fiber	Future-proof; easier upgrades; lowest total cost over the life of the network; suitable for distances up to 20 miles between electronics.	Higher upfront costs; may be slower to deploy.

The Physics of Rural — The distance dilemma plagues nearly all rural broadband customers. Increasing the distance between a customer and his or her serving electronics or wireless tower has a significant deleterious impact on the broadband speed that customer can receive. Because of this, technologies that may provide adequate broadband to customers in densely populated areas face greater challenges in rural applications where large distances exist between customers. Fiber, however, has been shown to be a great distance neutralizer: The customer can be across the street from the electronics or 20+ miles away and still receive the same speeds.

Fixed Wireless (4G/5G) — "5G" is often touted as a salvation for connectivity. Certainly, evolutions in wireless technologies in recent years have increased fixed wireless broadband capability and they can offer helpful platforms for reaching customers not yet connected via other means — but they face real challenges in meeting rapidly increasing broadband demands for many rural customers. One reason for this is the vast amount of spectrum recently made available by the FCC for broadband is in the millimeter wave (mmW) band, which is in very high frequency. Unfortunately for rural customers, as wireless frequency increases, the

distance the wireless signal can travel decreases — for mmW, this often means only a few hundred feet.

A fixed wireless network that would be practical for rural deployments would need to serve many customers from each tower, which due to low customer densities would need to reach several miles from the tower. This would eliminate mmW frequencies, which as discussed above have limited propagation. Under the right conditions, systems in the 2.5 GHz (BRS) or 3.5 GHz (CBRS or C-Band) "mid band" frequencies could be capable of delivering as much as 100 Mbps at a distance of 5 to 8 miles from the tower (depending on many factors, such as line-of-sight, terrain, antennas, number of customers per sector, etc.).

When compared to a fiber network, a rural fixed broadband wireless system may benefit from faster deployment and lower initial capital expenses, but the broadband speeds they can deliver are relatively modest by today's standards — and these speeds may not keep pace with ever-increasing user demand. It is also important to remember that most wireless towers need to be served by a fiber optic network to achieve these speeds, to aggregate all of the demand from the spectrum in the local area.

The only practical way therefore to improve speeds in the future to the wireless customer is to move the tower — and the fiber serving the tower — closer to the customer.

Copper & Coax Wireline Technologies — Most locations in rural America still have their fixed broadband services delivered using a wireline copper network — either using twisted-pair copper cable or occasionally coaxial cable. Twisted-pair cable technologies can provide speeds of 100 Mbps over short distances — around 1,500 feet depending upon the gauge and quality of the cable. For rural applications, it is rarely practical to place electronics within 1,500 feet of each customer, especially when there may only be two or fewer customers per mile. Similar to wireless, delivery of these speeds would also require that the field electronics be fed by a fiber network.

CATV operators have historically deployed coaxial networks to serve their customers, where broadband is delivered using Data Over Cable Service Interface Specification (DOCSIS). The most widely deployed DOCSIS is version 3.1, which allows delivery of downstream speeds that exceed 1 Gbps. However, these networks are more suited for densely populated areas and are uncommon in rural areas. As with DSL, many fiber-fed field electronics close to the customer are required to achieve these speeds. These technologies also have more limited upload capability, which has become increasingly important as users engage in more two-way online activities like remote learning, telework, and telehealth.

Fiber Optics — Nearly all broadband networks rely on fiber optic technologies at some point where the traffic of many users is aggregated and high speed and large capacities are needed. We see this not only in landline networks, where fiber connects both DSL field units and DOCSIS fiber nodes, but also in wireless networks where fiber is used to backhaul traffic from towers. For both wireline and wireless networks, the “broadband bottleneck” is the last portion of the network which is often copper, coax, or wireless.

Because of this, many operators have now extended the fiber network all the way to the customer premises and eliminated the use of copper or wireless in their networks. This is referred to as Fiber-to-the-Premises (FTTP).

There are two general types of FTTP network architectures in use today, which are Passive Optical Network (PON) and Point-to-Point (P2P). All common FTTP networks deployed in the U.S. can offer gigabit broadband services. FTTP networks are also well suited to rural areas due to the large distances possible between the provider electronics and the customer location — often 12 to 20 miles.

Additionally, fiber does not face the speed constraints of other technologies. The most widely deployed FTTP network architecture in the U.S. is Gigabit-capable Passive Optical Network (GPON), in which it is not uncommon for providers to offer customers broadband services of several hundred Mbps and even 1 Gbps. While the number of 1 Gbps services is limited in GPON due to the capacity limitations, next-generation networks such as NG-PON2 and XGS-PON are being deployed today that increase the downstream aggregate bandwidth to 10 to 40 Gbps, enabling broadband services of 1 Gbps to many more customers.

FTTP networks are also more easily upgraded to offer faster speeds as user demands increase. While other technologies may require locating more towers or field electronics closer to the customer, most FTTP upgrades can be accomplished simply by sending a command to provision a faster speed. Upgrades in FTTP central electronics and electronics on the customer home are only necessary when requirements exceed the speed of the equipment.

Satellites — Some ask if satellites might someday be the answer to rural broadband challenges. Geostationary orbit satellites (GEO) have been used to deliver broadband to some parts of the U.S. for years. These satellites are more than 22,000 miles above the equator and often offer 25 Mbps broadband service but recently have begun offering 100 Mbps service in some limited areas. However, these services have strict data caps, and because of their distance above the earth, they also suffer from high latency — often 10 or 20 times greater than a landline network. This makes them unsuitable for many modern applications.

Recently, companies have been launching a new generation of broadband satellites — Low Earth Orbiting Satellites (LEOs). These satellites are only a few hundred miles above the earth, so they do not suffer from the latency issues of GEO satellites. Because of their low altitude, they also have much smaller spotbeams on the earth and many more satellites, which should allow them to serve more customers at higher speeds. (Early beta tester speed results are between 50 to 100 Mbps downstream and 10 to 20 Mbps upstream.) These benefits come at the cost of increased complexity, which may make it difficult to provide broadband at reasonable prices. LEO satellites will still only be able to provide broadband to a very small fraction of the unserved and under-served broadband customers in the United States.

Information provided by:





04 Rural Broadband: **Moving Forward**

Overview

In many ways, the United States is entering a new broadband era. The technologies and practices for deploying broadband are being refined. New funding mechanisms are becoming available. A new presidential administration has listed universal broadband¹ among its top priorities. Meanwhile, the fallout from the COVID-19 pandemic has increased the sense of urgency to bring connectivity within reach of all Americans. As we move forward into this new era, several factors will impact how the broadband story unfolds.

State-Level Activity

Millions of federal dollars have been allocated in recent years, through a number of programs, toward funding broadband deployment. State governments, however, have increasingly recognized the need to become involved. Their focus has been in three key areas: 1) continuing to establish governance and funding structures, 2) clarifying who can provide broadband, and 3) addressing emerging digital issues and opportunities.²

In a study³ released in October 2020, researchers with Oklahoma State University and Purdue University looked at the impact of state policies on the availability of broadband, specifically: 1) the availability of state-level funding programs, 2) the existence of a state-level broadband office or task force with full-time employees, and 3) restrictions on competitive entry into the broadband business. The study found a measurable positive impact in rural areas associated with state involvement on the availability of

broadband, the presence of fiber networks and the incidence of competitive broadband offerings.⁴

More activity can be expected from states as the focus on broadband increases. Attention at the state level on broadband accessibility and affordability has been heightened by the pandemic, which has impacted public health efforts, businesses and education. Governors across the nation have jointly identified⁵ strategies and best practices to guide states in expanding broadband to their citizens. These include:

- Establish robust, cross-cutting governance structures.
- Initiate partnerships with other state agencies, local and county governments, and other entities to kickstart broadband investments.
- Leverage anchor institutions to provide rapid community internet service.
- Leverage existing infrastructure projects with dig-once coordination.
- Leverage electric utilities' infrastructure and services to facilitate deployments of broadband networks.
- Coordinate and expand broadband affordability programs.
- Deploy innovative procurement strategies.
- Improve broadband coverage maps.
- Identify funding and financing sources for broadband deployment.

Broadband Funding

A major development in broadband funding for 2020 was the FCC's announcement in December of the winning bidders in phase one of its Rural Digital Opportunity Fund⁶. Preliminarily, 180 winners were approved to receive a portion of the \$9.23 billion across a 10-year funding window. These winners represented projects in 49 states and one territory. FCC review of the winners to confirm they will perform as promised is currently underway in the face of questions regarding the vetting of such bidders prior to the auction being conducted.

In 2019, the USDA awarded grants, loans and grant/loan combos totaling \$663,198,738 through its ReConnect program⁷. The purpose of this program was to support broadband development across rural America. The program's second round awarded \$655,179,473, for a total investment of \$1.3 billion. Construction for many of these projects is ongoing.

Beyond the major federal programs, there are some 50 sources of federal support for broadband projects⁸. These span dozens of agencies, including the Appalachian Regional Commission, the Department of Interior and the Institute of Museum and Library Services. Combined, this represents billions of dollars in available funding.

It is reasonable to suspect that additional broadband funding opportunities will come from the new presidential administration. Infrastructure development, including universal broadband, is listed under two of the four major priority areas for President Joe Biden: economic recovery⁹ and climate change¹⁰. There is precedent for Biden's interest in broadband; when he served as vice president, part of the administration's response to the Great Recession was an investment of \$7.5 billion in broadband projects¹¹ as part of the American Recovery and Reinvestment Act.

Policy Reform

The FCC in the next quadrennial will most certainly face important policy decisions that could have a major impact on broadband deployment.

What Is Broadband?

One of these is the definition of "broadband" itself. Under current FCC guidelines, broadband is defined as 25 Mbps download and 3 Mbps upload. Aside from the speeds themselves, the definition is important because it forms the basis for funding decisions — only those areas lacking 25/3 Mbps are eligible for federal "broadband" funding.

The need for more robust connectivity climbs as more services move online, education and work shift to the home, telehealth

grows in importance, and streaming of movies, television, games and music increases. Many have therefore called for the current definition of broadband — which they already consider inadequate for the bandwidth requirements of many homes — to increase in order to ensure that networks funded in whole or in part by federal dollars will meet consumer demands for the foreseeable future.

This creates a difficult conflict for the FCC. If the definition of broadband shifts, millions of locations now considered served by broadband would revert back to an unserved status, wiping out years of reported progress. As the regulatory body's 2020 Broadband Deployment Report¹¹ states: "The number of Americans lacking access to fixed terrestrial broadband service at 25/3 Mbps continues to decline, going down by more than 14% in 2018 and more than 30% between 2016 and 2018."

Consultant and telecom industry veteran Doug Dawson frames this quandary¹² thusly: "I think that a new FCC will certainly be under pressure to relook at the definition, but they're going to have the same old dilemma of, do they have the courage to reclassify millions of homes as not having broadband anymore?."

Better Mapping

Mapping of where broadband is and is not available has long been an area of concern that the FCC is in the process of trying to fix. In 2019, the FCC took initial steps to address¹³ the often-highlighted problems with its former practice of building its broadband coverage maps based on census block coverage as reported by internet service providers themselves. Providers will soon start to report their coverage areas based on geospatial maps, a move intended to provide much greater accuracy in determining what residences are truly underserved by broadband, and Congress has provided funds for the FCC to develop a "fabric" of serviceable locations against which providers can report the availability of broadband. It will still be important, however, for providers to report based upon a common set of standards, as more granular maps do not necessarily translate to more accurate maps unless all providers are reporting based upon the same sets of assumptions and assessments of network capabilities.

Net Neutrality

Finally, the FCC may well return its attention to the issue of net neutrality and the agency's authority to regulate broadband. In 2015, under the leadership of Chairman Tom Wheeler, the FCC used Title II regulations "to implement and enforce open internet protections, banning paid prioritization, and the blocking and throttling of lawful content and services."¹⁴ Chairman Ajit Pai's FCC reversed course in its Restoring Internet Freedom¹⁵ in

2018, returning to a deregulatory regime that focused primarily on transparency overseen by the Federal Trade Commission. It appears likely that a new FCC with a Democratic majority will choose to reexamine the policy yet again.

Adoption

As leaders at the federal, state and local levels work together to solve the challenge of broadband availability, another less obvious challenge is at work in the background: broadband adoption. Sometimes a resident is not connected to broadband because there is not a service provider in the area to connect them to broadband and sell them service. However, in many situations broadband service is indeed available and the resident has made the decision not to connect.

There may be a number of reasons behind the resident's decision. The FCC's Disaster Response and Recovery Working Group report identifies several potential barriers to adoption, including:

1. the monthly cost of the service;
2. the cost of an internet-capable device;
3. knowledge of how to use increasingly complex devices and services; and/or
4. lack of relevance from the user's perspective.

While the latter may come as a surprise, that and a lack of interest is the reason 34% of non-internet users give for why they are not online. Difficulty with using the technology keeps 32% of non-users offline, while 19% cite the expense of internet service and computers or other connected devices as a deterrent.¹⁶

If 15% of U.S. adults in rural America are not connected to the internet, this likely has a measurable impact on their quality of life. As the pandemic has highlighted, a lack of internet access puts citizens at a disadvantage for work, education, health care and social connections. The impact may be even more far-reaching, however, as a team of researchers reported in mid-2020.¹⁷ A lack of broadband adoption may in fact impact job productivity in a community.

The study's authors wrote that "policies targeting adoption in rural areas may result in productivity increases" and conclude that "as more industries and business digitize and as more communities engage digitally with their citizens, ensuring that residents and businesses have the necessary resources to productively use broadband technology is essential."

The FCC Working Group recommended in its report a number of program ideas to promote broadband adoption. These include education, outreach, awareness, training and equipment, with a focus on partnerships with broadband providers and key community anchor institutions such as schools, libraries and agencies serving vulnerable populations.

As part of the Consolidated Appropriations Act of 2021, passed in December 2020, Congress set aside \$3.2 billion to establish the Emergency Broadband Benefit Program.¹⁸ The FCC is charged with implementing the program, which will provide eligible households a monthly discount of up to \$50 off broadband service (up to \$75 for Tribal lands), along with a reimbursement of up to \$100 to broadband providers who provide a connected device to eligible households.

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ABOUT THE FOUNDATION FOR RURAL SERVICE

The Foundation for Rural Service (FRS) was established in 1994 as a non-profit 501(c)(3) by NTCA–The Rural Broadband Association. The organization plays a unique role within the telecommunications industry by supporting rural telecom companies, consumers and policymakers with educational information, products and programming. The FRS mission is to sustain and enhance the quality of life in America by advancing an understanding of rural issues. The vision of FRS is to harness the power of the rural communications industry to enrich lives in America.

With every program, FRS calls attention to rural challenges, goals and achievements, and educates the public and lawmakers on exactly why rural America is so unique and worth fighting for. Similarly, FRS is committed to educational achievement in rural communities, recognizing that tomorrow's economic and civic development depends on the involvement and success of today's students.



**Rural Telephone
Finance Cooperative**

ABOUT RTFC

This project was generously supported by RTFC. RTFC is a privately funded, member-owned cooperative finance organization that provides financing exclusively to America's rural telecommunications industry. RTFC offers loans and financial services to creditworthy telecommunications systems eligible to borrow from RUS, as well as affiliates of these systems. For more information, visit www.rtfc.coop.



ABOUT WORDSOUTH

WordSouth — A Content Marketing Company was founded in 1996 to support the communications efforts of rural telecommunications and electric cooperatives. WordSouth partners with community-based service providers to help them tell their stories, market their services and train their people. In 2020, WordSouth was named to the Inc. 5000 list of America's fastest-growing privately held companies. Later that year it was acquired by Oregon-based Pioneer Utility Resources, a communications cooperative; the combined companies provide an array of services to broadband providers and electric distributors across the U.S.



ABOUT VANTAGE POINT

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