

# Closing the Digital Divide Benefits Everyone, Not Just the Disconnected

An analysis of how universal connectivity benefits education, health care, government services, and employment

This report was developed by Boston Consulting Group (BCG) in partnership with Common Sense.

Common Sense is the nation's leading nonprofit organization dedicated to improving the lives of all kids and families by providing the trustworthy information, education, and independent voice they need to thrive in the 21st century.

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# **Abstract**

Institutions, including schools, hospitals, and governments, have a duty to make their services universally accessible. This duty means that these institutions are unable to fully integrate internet-based technologies into their services because doing so would effectively deny service to people who cannot access the internet.

However, if states can ensure that all people have access to the internet, then institutions will be able to integrate internetbased technologies into their services, improving them for the benefit of all. In this way, closing the digital divide benefits everyone, even households that already have connectivity. Moreover, by shifting the majority of their users online, institutions will be able to specialize their remaining offline services to the unique needs of their most vulnerable and disconnected users.

Closing the digital divide benefits everyone, even households that already have connectivity.

This report explores how this dynamic affects four institutional services: education, health care, government services, and employment. Specifically, the report examines how these services are improved through the integration of internetbased technologies; which types of internet infrastructure result in the greatest improvements to institutional services; and how universal access to high-quality internet—the precondition to allow integration of internet-based technologies—can be achieved using recent federal funding opportunities.

The passage of the American Rescue Plan Act and Infrastructure Investment and Jobs Act has given state governments the opportunity to close their digital divides once and for all. If states are successful, they will not only bring connectivity to the disconnected, they will allow institutions to improve the services that are central to much of our lives. This report is designed to give state governments the information they need to make this a reality.

# Introduction

# The internet is valuable because of what it enables

Imagine you're the administrator of a school district. Your goal is to help students recover from pandemic-era learning loss and prepare them for success in the modern, digital world. You've identified a promising new curriculum that uses online modules to tailor lessons to individual student needs. This curriculum has proven very successful in other districts—students find it engaging and educational, administrators find it easy to use and customize, and teachers find that it lessens their workloads, allowing them to spend more time with students who need individual attention. However, research has shown that at least 16 million students are caught in the persistent digital divide, including nearly a quarter of the students in your district. These students don't have access to home internet service, which is needed to use this curriculum's online assignments, modules, and other internet-based features. What do you do?

If you use the curriculum, the majority of students will benefit. Average scores will improve, family satisfaction will increase, and the need for tutoring and summer programs will decline. However, the benefits will not be equitably distributed, and students without home internet will struggle. These students will have to use their parents' or caregivers' phones as an internet hotspot, which can be prohibitively expensive; find free public Wi-Fi, which can mean hours spent in libraries or parking lots; or simply resign themselves to missing parts of the curriculum. These students will fall behind while their more connected peers make rapid progress.

On the other hand, if you don't use the curriculum, then all students will suffer from the missed opportunity. Your district may fall behind others that adopt the curriculum, your teachers will struggle to meet the disparate impact of learning loss, and your students will spend their time learning to use textbooks rather than computers. In short, all students will be denied the best education available at a time when it is needed most.

Both options have downsides, and yet these are the choices many school administrators face because the best educational tools require the internet.

Luckily, there is now a third option: give every student home internet access. Challenging as it may sound, this option is now possible because of a series of federal laws passed in 2021. These laws have the potential to ensure that every single student has access to high-quality internet at home. If this is achieved, school administrators can implement the best and most cutting-edge curricula available without leaving any students behind.

This report explores how to make this third option a reality. The central point of the report is that, by ensuring every household is connected to high-quality internet, public institutions-like schools, but also health care providers, governments, and employers—can make full use of internetbased technologies, improving both online and offline services for the benefit of everyone.

<sup>1.</sup> Common Sense Media and Boston Consulting Group. (2020). Closing the K-12 digital divide in the age of distance learning. https://www.commonsensemedia.org/sites/default/files/featured-content/files/common\_sense\_media\_report\_final\_7\_1\_3pm\_web.pdf.

The report is separated into three sections:

#### Section 1: How Institutions Use Connectivity

In the first section, we highlight how the digital divide affects four essential services—education, health care, government services, and employment—and the institutions that provide them. We find that, despite the potential for service improvements and cost savings, institutions do not make full use of internet-based technologies because institutions cannot expect the populations they serve to have universal access to high-quality internet. Conversely, when institutions are confident that their populations have internet access, they improve their services using internet-based technologies. In this way, closing the digital divide benefits everyone, not just the disconnected.

Institutions do not make full use of internet-based technologies because institutions cannot expect the populations they serve to have universal access to high-quality internet.

## Section 2: The Infrastructure Required to Innovate Essential Services

In the second section, we analyze how government decisions about the infrastructure of the internet affect the services offered by institutions. When the physical infrastructure of the internet—wires, switches, and towers—are of low quality, then the services carried by this infrastructure suffer. We find that fiber infrastructure delivers the highest-quality services at a level of scale, consistency, and affordability that ensures institutional services remain universally accessible. Fiber should be the first choice for deployment where it is not cost prohibitive. If fiber cannot be deployed, cable should be used. Only when neither is viable should fixed wireless be considered. In general, wired technologies, such as fiber and cable, have better reliability, lower ongoing operating costs, and faster latency than fixed wireless technologies.

Fiber should be the first choice for deployment where it is not cost prohibitive.

# Section 3: How Federal Funds Can Close the Digital Divide and Ensure Equitable Access to **Essential Services**

In the third section, we explain how recent federal laws make it possible for states to give all households access to highquality internet services. We focus on the two most prominent laws: the American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA). We find states can best implement these acts' more than \$80 billion in broadband funding by taking five key actions. States should 1) build state administrative capacity in preparation for the programs; 2) collect data on the size, locations, causes, and consequences of the state's digital divide; 3) incorporate community stakeholders and institutions into the broadband planning process; 4) promote benefit programs that enable lower-income and digitally divided households to get online; and 5) ensure the state's legal and regulatory systems are conducive for sustainable broadband adoption.

Recent federal laws make it possible for states to give all households access to high-quality internet services.

# **Section 1: How Institutions Use Connectivity**

# The internet at its best

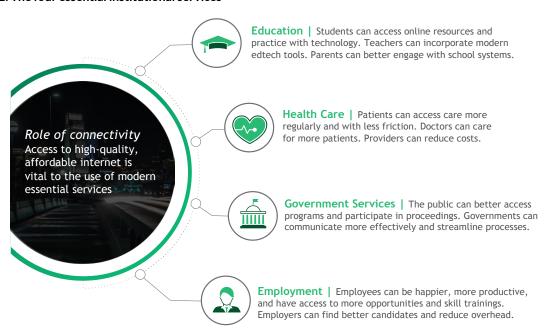
From the perspective of governments, there are strong equity and economic reasons to close the digital divide, and the longterm financial returns of connectivity far exceed the cost to provide it. At the national level, addressing the digital divide would increase labor productivity by 1.1%—a \$160 billion boost to annual GDP.2 Locally, broadband deployment can generate three- to four-fold economic returns over the initial cost of investment.3

At the institutional level, universal access to affordable, highspeed internet can allow governments and institutions to modernize essential public services while also ensuring equitable access throughout a community, city, or state. The

central benefit is that internet-based services facilitate human-to-human interactions. Whether through video calls, collaborative software, VR, or other applications, high-quality internet makes it easier for people to connect with those who can provide essential services. As highlighted in Figure 1, this section explores how connectivity affects four such services:

- 1. Education
- 2. Health Care
- 3. Government Services
- 4. Employment

FIGURE 1. The four essential institutional services



- 2. National Bureau of Economic Research. (2021). Internet access and its implications for productivity, inequality, and resilience. https://www.nber.org/papers/w29102.
- 3. Grant, A., Tyner, W. & DeBoer, L. (2018). Estimation of the net benefits of Indiana statewide adoption of rural broadband. Purdue University and Center for Regional Development. https://pcrd.purdue.edu/wp-content/uploads/2018/12/006-RPINsights-Indiana-Broadband-Study.pdf.

Education. Students have better access to teachers, tutors, information sources, platforms for content creation and sharing, and collaborative workspaces. Teachers can employ edtech tools and advanced technology (AR/VR), individualized curricula, and comprehensive grading and feedback systems, and they can better collaborate with parents and caregivers. Schools can better accommodate computers and modern student data systems, student mobility, disability access, and disruptions during emergencies.

"Achieving universal broadband coverage will make communities more competitive economically, make them healthier, and improve educational access. If we are serious about competing in today's global economy and recruiting the best talent to come to our state and keeping our children where they grew up, then we must do everything in our power to end the digital divide."

- Governor Laura Kelly of Kansas

Health Care. Patients have better access to services, telemedicine, medication maintenance, and appointment scheduling, and these conveniences increase health care usage. Doctors, particularly mental health specialists, are able to see more patients, serve more remote areas, and interact with patients on a more regular basis. Clinics and hospitals can integrate remote health monitoring technologies, reduce costs, increase likelihood of early diagnosis, and decrease wait times.

Government Services. Households can more easily use benefit programs, submit service requests, and participate in government proceedings. Governments can improve the speed and efficiency of their services, improve mass communication and program awareness, and reduce reliance on costly in-person infrastructure. These improvements increase trust in government.

"In today's world, reliable broadband is as essential as water and electricity. This expansion will be transformative for Tennessee families and businesses by removing barriers to commerce, health care, and educational opportunities, as well as other necessities of modern life."

- State Representative Patsy Hazlewood

Employment. Remote workers are more satisfied and productive, and easier to retain. Job seekers have more opportunities, and employers can find better candidates. Connectivity has been shown to increase employment rates, earnings, job skills, and corporate diversity.

"This round of improvements will help people who need high-speed internet to work remotely, allow students to do their homework, give our seniors access to the telehealth options they need, and businesses the ability to compete on the world stage. The possibilities go on and on, and West Virginians everywhere deserve the best access possible."

- Governor Jim Justice of West Virginia

# The Role of Offline Solutions

The transition to universal internet service will take time, and during this period, institutions must continue to offer robust offline services to ensure equitable access. But even if every home eventually gets access to high-quality internet, persistent income inequality and barriers to acquiring digital skills will mean that there will always be some portion of the population that needs offline services (see Figure 2).

However, if institutions can shift the majority of their users to online services, then they can specialize their offline services to the unique needs of this persistently offline population, which often has additional challenges beyond a lack of connectivity. In this way, universal connectivity allows institutions to improve both their online and offline services by more efficiently allocating resources.

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Additionally, institutions may encounter disruptions in internet service that require them to use offline services. For example, internet service may be disrupted due to natural disasters, requiring students to quickly shift to offline learning. In such cases, the offline options should have a similar user experience to the online option to ensure that students can easily continue their studies without requiring training in a new system.

Similarly, an inability to afford service can disrupt a home's connectivity. Educators know that the rising cost of internet service and fluctuations in a home's income can mean that some families will not be able to consistently afford a level of service that supports online education. New federal programs will reduce this possibility, but until these programs are fully implemented, any online curricula should be supplemented with offline or low-bandwidth material. This alternative should be downloadable while on a school or library network or by distributing laptops with preloaded content.

It is important to stress that institutions have a strong preference for online solutions, as they are more flexible, effective, and enable multidirectional communication between the institutions and their audience. However, even in a fully connected world, offline solutions will have a role to play, but they will evolve from their current role as a generalized stopgap for anyone in the digital divide and instead become specialized services for those with low digital literacy and as emergency alternatives when internet disruptions occur.

FIGURE 2. Offline solutions will continue to play a role in ensuring equitable access

	Use case	Examples
	Broadband stopgap	<ul> <li>No broadband infrastructure exists</li> <li>Broadband service is not affordable</li> <li>Lack of affordable or adequate online services (e.g., edtech platforms)</li> </ul>
·:	Complement to online	<ul> <li>Hybrid online platforms and downloadable content (e.g., in education)</li> <li>Integrated UX to allow seamless switching &amp; usage in low bandwidth</li> <li>Expanded range of mechanisms for engagement</li> <li>Pre-downloaded content to shift easily offline (e.g., during travel)</li> <li>Specialized or enhanced services (e.g., health care, education)</li> </ul>
	Emergency situations	<ul><li>Disruptions to internet access</li><li>Natural disasters (e.g., fires, earthquakes)</li><li>Need for immediate assistance</li></ul>

# Education

Long before the pandemic, classrooms had increasingly embraced the role of technology. By 2019, investments in global edtech were nearly \$19 billion, and they are projected to reach \$350 billion by 2025.4 Pre-COVID-19, one-fifth of U.S. public schools already offered courses entirely online.<sup>5</sup>

The growth of online education in K-12 is expected to continue and become a permanent fixture in many schools. Between 20-30% of parents have expressed interest in continuing remote learning for their children post-COVID,6 and 30% of school districts and charter management organizations are considering or in the process of implementing an online or hybrid approach post-pandemic. Even for students who are returning to traditional in-person classrooms, the use of online curricula and edtech tools will necessitate highquality connectivity at home.

This increased interest in online curricula is warranted, given the potential to positively impact student outcomes, particularly in core reading and numeracy skills. Online curricula are effective because they adapt lessons to individual student needs, integrate one-on-one tutoring, and improve student engagement through interactivity and gamification. Moreover, the tools of online curricula are computers and the internet, not paper and textbooks, and so students develop skills with technology and digital citizenship that will benefit them for the rest of their lives. 10 Online curricula also expand access to teachers and can address teacher shortages. For example, Tucson, Arizona, may hire remote math instructors to teach students in online classrooms for part of the day. 11 While not an optimal solution, this would allow the city to continue education until in-person teachers become available.

Online curricula also allow schools to respond to emergencies. This was exemplified prominently during the pandemic, but it can happen for numerous reasons. In New Jersey, schools went online in response to long-term storm damage to the school buildings;<sup>12</sup> in Philadelphia, they went online due to heat; and, in Jackson, Mississippi, they went online during a water crisis. When schools know their students have home internet access, they can be more adaptable.

From an administrative perspective, universal connectivity allows schools to achieve a number of benefits. By purchasing at scale, districts can benefit from the cost efficiencies of bulk procurement and invest in enhanced procurement systems.<sup>13</sup> For example, when the Maine Learning Technology Initiative (MLTI) conducted a procurement to connect all students, they established service-level agreements that included maintenance and repairs, ensuring greater sustainability of results and a provider focus on performance. Connecting all students through the same hardware and software enables better systems integration, better data-tracking of student usage and technology needs, and better student mobility between

- 4. Li, C. & Lalani, F. (2020). The COVID-19 pandemic has changed education forever. This is how. World Economic Forum. https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/.
- 5 National Center for Education Statistics. (n.d.). Fast facts: Distance learning. https://nces.ed.gov/fastfacts/display.asp?id=79.
- 6 Torchia, R. (2021). Is virtual learning here to stay for K-12? EdTech Magazine. https://edtechmagazine.com/k12/article/2021/04/virtual-learning-here-stay-k-12-perfcon.
- 7. Congressional Research Service. (2021). Remote learning for K-12 schools during the COVID-19 pandemic. https://sgp.fas.org/crs/misc/R46883.pdf.
- 8. Ganimian, A., Vegas, E. & Hess, F. (2020). Realizing the promise: How can education technology improve learning for all? Center for Universal Education at Brookings. https://www.brookings.edu/essay/realizing-the-promise-how-can-education-technology-improve-learning-for-all/.
- 9. Vegas, E. (2022). Education technology post-COVID-19: A missed opportunity? Brookings. https://www.brookings.edu/blog/education-plus-development/2022/03/11/education-technology-post-covid-19-a-missed-opportunity/.
- 10. PowerSchool. (2021). The classroom guide to digital literacy in K-12 education. https://www.powerschool.com/blog/the-classroom-guide-to-digital-literacy-in-k-12-education.
- 11. Natanson, H. (2022), 'Never seen it this bad': America faces catastrophic teacher shortage, Washington Post, https://www.washingtonpost.com/education/2022/08/03/school-teacher-shortage/.
- 12. Grom, C. (2021). 1 of N.J.'s largest school districts to delay start after Ida flooding. NJ.com. https://www.nj.com/news/2021/09/1-of-njs-largest-school-districts-to-delay-start-after-ida-flooding.html.
- 13. Bazzaz, D. (2020). Washington is buying \$24M worth of computer technology for students. Seattle Times. https://www.seattletimes.com/seattle-news/education/washington-is-purchasing-24-million-worth-of-computer-technology-for-students/.

schools in the system. Technology integration even extends to student transportation—Wi-Fi-enabled school buses contribute to fewer behavioral incidents, safer bus rides, and lower driver turnover for student transportation.<sup>14</sup> However, without universal connectivity, schools cannot reap these benefits.

This loss is particularly acute in the present climate, where many schools are implementing rigorous programs for learning recovery and remediation. Students in some districts may have lost the equivalent of 22 weeks of instruction, <sup>15</sup> and this is expected to decrease their lifetime earnings by 2.5% per year. Given the number of affected students, this equates to nearly 13% of annual GDP. 16 Therefore, helping students catch up on instruction and critical academic skills is essential, and internet connectivity can help students access online learning and tutoring tools.

Lack of universal connectivity also inhibits schools from exploring cutting-edge educational technologies, such as those that tailor instruction and assessment through AI and use virtual simulations. Schools and universities have used VR in role-playing education exercises involving negotiation, as well as virtual labs to engage students in hands-on learning environments, and virtual campus spaces for students around the world to interact. There are also ways to leverage these technologies to help teach students with functional needs; some districts, for example, are beginning to use VR to help students with functional needs transition to new school environments more easily by allowing them to tour these spaces online ahead of time.<sup>17</sup>

Over 40% of Title I teachers do not assign work that requires internet access because they fear that doing so would exacerbate inequalities.

Far from cutting-edge technologies, schools will struggle even to implement simple online applications when they aren't confident that all of their students have home internet service. Over 40% of Title I teachers do not assign work that requires internet access because they fear that doing so would exacerbate inequalities, and nearly 60% report that a lack of home internet and computers limits student learning. 18 This hesitancy, though necessary to ensure fairness among students, prevents all students from using one of the best educational resources ever created: the internet.

#### Spotlight: Washoe County School District

This Nevada district provides another example of the benefits of widespread connectivity in education settings. The district conducted a technology readiness survey and purchased 17,000 laptops and 6,000 hotspots for the disconnected families the survey identified. This widespread technology distribution unlocked substantial collaboration across the district; as classes shifted back to hybrid and in-person formats in 2021, students and teachers continued using the devices to access communication portals and digital learning materials. In addition, the district implemented a long-term Laptop Refresh Program, which aims to standardize district-wide technology and enable bulk device purchasing, creating pricing efficiencies. For students, standardization also means that families need to be familiarized with fewer devices and applications, which is proving especially helpful in non-Englishspeaking homes.

<sup>14.</sup> School Transportation News. (2022). Recorded webinar: Decrease behavior incidents & improve driver retention with school bus Wi-Fi. https://stnonline.com/multimedia/free-webinar-decrease-behavior-incidents-improve-driver-retention-with-school-bus-wifi/.

<sup>15.</sup> Kane, T. (2022). Kids are far, far behind in school. The Atlantic. https://www.theatlantic.com/ideas/archive/2022/05/schools-learning-loss-remote-covid-education/629938/.

<sup>16.</sup> Psacharopoulos, G., Patrinos, H., Collis, V. & Vegas, E. (2020). The COVID-19 cost of school closures. Brookings. https://www.brookings.edu/blog/education-plus-development/2020/04/29/the-covid-19-cost-of-school-closures/.

<sup>17.</sup> Lynch, M. (2021). Virtual reality matures in the K-12 classroom. The Tech Advocate. https://www.thetechedvocate.org/virtual-reality-matures-in-the-k-12-classroom/.

<sup>18.</sup> Fazlullah, A. & Ong, S. (2019). The homework gap: Teacher perspectives on closing the digital divide. Common Sense Media. https://www.commonsensemedia.org/sites/default/files/featured-content/files/homework-gap-report-2019.pdf.

#### FIGURE 3. Education: Benefits of widespread broadband adoption



Enables digital curriculum



Supports advanced learning methods



Promotes equity in education



Online curriculum in K-12 is expected to become a long-term fixture in many schools to support education and SEL wrap-around services.



Innovative EdTech tools that use AI, virtual simulations, and gamification approaches require connectivity



Research shows that digital learning can positively impact reading and numeracy skills<sup>†</sup>



Online curricula allows schools to nimbly adapt during natural disasters and other disruptions\*



Teachers can only use advanced tech if all students are connected, otherwise this would exacerbate inequities



Districts have reported that Wi-Fi-enabled school buses are contributing to fewer behavioral incidents and safer bus rides<sup>‡</sup>

## Health Care

Like education, health care is similarly undermined by a lack of universal, high-quality connectivity. Before the pandemic, less than 1% of outpatient appointments were held remotely. More recently, that number has climbed to 8%. 19 The share of Medicare visits conducted through telehealth increased from less than one million in 2019 to over 50 million in 2020.<sup>20</sup> This trend continued with patients with disabilities and dually eligible for Medicare and Medicaid as more likely to use telehealth in 2021.21

While this surge is due largely to the pandemic, telehealth participation remains high, in 2021 rates of telehealth utilization remained 40% higher than pre-pandemic levels.<sup>21</sup> In a recent survey, 68% of physicians said they would like to further increase the use of telehealth in their practice.<sup>22</sup> Among patients who recently used telehealth, 73% reported they would continue to use telehealth services in the future, and 41% reported they would have chosen telehealth over an in-person appointment, even if both required a co-pay.<sup>23</sup>

Telehealth is especially prominent for particular disciplines, such as mental health. In 2020, telehealth visits comprised a third of total visits to mental health specialists, compared to 8% of visits to primary care providers and 3% of visits to other

- 19. Rae, M., Amin, K., Cox, C., Panchal, N. & Miller, B. (2022). Telehealth has played an outsized role meeting mental health needs during the COVID-19 pandemic. Kaiser Family Foundation. https://www.kff.org/coronavirus-covid-19/issue-brief/telehealth-has-played-an-outsized-role-meetingmental-health-needs-during-the-covid-19-pandemic/.
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- 25. U.S. Department of Health & Human Services. (2022). Fact sheet: Surgeon general to speak at Youth Mental Wellness Now! Summit and applaud commitments in response to his call to action on youth mental health crisis. https://www.hhs.gov/about/news/2022/06/17/fact-sheet-surgeon-general-to-speak-at-youth-mental-wellness-now.html.

<sup>\*</sup>Congressional Research Service, "Remote Learning for K-12 Schools During the COVID-19 Pandemic"

<sup>†</sup>Brookings

<sup>&</sup>lt;sup>‡</sup>School Transportation News

specialists.<sup>24</sup> In 2021, according to a report from the Bipartisan Policy Center, 44% of all telehealth visits were for behavioral health services.<sup>21</sup> According to the surgeon general, COVID-19 has exposed a youth mental health crisis, 25 and telehealth can help families access providers.

Telehealth also enables remote patient monitoring for patients with chronic health conditions or those using controlled substances, which improves disease management and decreases misuse of medication and unnecessary emergency room visits.<sup>26</sup> Telehealth can also improve ongoing care by reducing the chance of missed visits.<sup>21</sup>

Research also shows that telehealth may expedite speed of care. Telehealth appointments via phone and video have shorter wait times than in-person options (from scheduling to appointment).<sup>27</sup> The reduced wait time not only means that more people are likely to visit physicians, it also allows for earlier diagnoses and treatment, which improves patient outcomes.

Telehealth could impact costs. Cigna data shows that the average cost of a nonurgent virtual care visit is \$93 less than the average cost of an in-person visit (see Figure 4). The cost to see a specialist was \$120 less for a virtual visit than an inperson visit, and a virtual urgent-care visit was \$141 less than an urgent-care clinic.<sup>28</sup>

Telehealth also expands the reach of medical professionals. One-quarter of Americans live in rural areas, but less than 10% of physicians practice in rural communities.<sup>29</sup> Telemedicine offers a way to bridge this distribution. A recent large-scale survey found that 45% of adults believe that inadequate access to technology, including broadband and computers, is a barrier to telehealth, and this was especially prominent among rural residents and adults over the age of 65.30 This underscores the need not only for connectivity and device access, but also for digital literacy programs that can maximize the effectiveness of digital health care for certain populations.

## FIGURE 4. Cost savings from virtual health care visits, by type of visit



Source: Cigna Report. Does virtual care save money?

# **Spotlight: Together Growing Strong**

Due to the enormous benefits for patients and health care providers, some institutions have even begun investing in digital inclusion and digital skills training to help their patients take better advantage of telehealth. Together Growing Strong (TGS), an NYU Langone initiative in Sunset Park, New York, conducted surveys to understand the broadband needs of their community, developed technology literacy workshops, and established a digital equity working group. They also added in-person digital skill training as part of their pilot program for postpartum depression prevention, providing the participating women with the skills needed to access and use platforms for telehealth delivery. Given the maternal health crisis in the U.S., such applications of telehealth to maternal care can have a profound impact on maternal health outcomes.<sup>31</sup> These investments, innovative for a health care institution, are a testament to how essential broad adoption of telehealth is for the future of the health care system.

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## Spotlight: University of North Carolina Chapel Hill School of Medicine

UNC Chapel Hill School of Medicine offers patients comprehensive psychiatric care. In 2021, it completed 120,000 video visits, 30,000 telephone visits, and 8,000 in-person visits. While North Carolina is the ninth most populous state, it ranks 42nd in pediatric behavioral health care access, with clinicians spread across only ~30 of the state's 100 counties. Telehealth can help close that gap. However, there are inequities in telehealth access across patient populations, with psychiatrically vulnerable and Black patients less likely to have the required devices or services to participate.

UNC Chapel Hill School of Medicine partnered with a local managed care organization to deliver ~50-100 smartphones to its most vulnerable patients and offer on-site digital literacy training for device telehealth. They used \$2 million in grant funding to deploy a three-year, school-based psychiatric virtual care program. This program provided appointments to over 10,000 children, including devices and tech support. They also used an additional \$1 million in grant funding to deploy a three-year rural psychiatric virtual care program, which will establish community broadband access points, including devices for ~1,000-5,000 children.

Telehealth offers vulnerable patient populations an option for care when access to in-person visits is limited. However, continued reimbursement to health care providers is the largest barrier to future delivery if grant funding does not fully support long-term project operations. Furthermore, expanded virtual care access will require that state programs address literacy and training in addition to device and service access.

#### FIGURE 5. Health Care: Benefits of widespread broadband adoption



Drives better health outcomes



Unlocks equitable care access



Lowers health care costs



Research shows telehealth may expedite speed of care, with appointments via phone and video having shorter wait times



Connectivity creates broader access for one-quarter of Americans living in rural areas, where less than 10% of physicians practice<sup>†</sup>



Telehealth lowers cost barriers, with average non-urgent virtual visits totaling \$93 less than in-person<sup>‡</sup>



Faster diagnosis and treatment become possible as wait times decrease and patients are seen earlier\*



Telehealth also reduces logistical barriers of receiving care, such as childcare, taking time off work, etc.



Targeted virtual care also costs less; average urgent and specialist visits cost \$141 and \$120 less than in-person, respectively<sup>‡</sup>

<sup>\*</sup>Becker Hospital Review

<sup>†</sup> Fierce Healthcare

<sup>‡</sup>Cigna

# **Government Services**

Online services enable individuals to access the government at all hours of the day and with fewer barriers (e.g., taking time off, finding transportation, obtaining child care). This, in turn, makes government services more useful and accessible to underserved communities. Not only do a majority of Americans expect services to be offered online, nearly nine in ten say that a great online experience can increase their trust in government overall.<sup>32</sup>

Online services are also more cost effective and allow governments to more efficiently allocate existing labor and resources. The U.K. government, for example, estimated that by shifting 80% of public services online, \$2.2 billion per year could be saved, with the cost of digital transactions 20 times lower than by phone and 50 times lower than face to face.<sup>33</sup> Other projects, including an online birth-certificate initiative in Mexico and a public data exchange system in South Korea, have resulted in increased service adoption, higher customer satisfaction, savings in cost and staff time, and economic benefit to industry.34

Online government services can also spur job creation and economic growth. For example, when new businesses have a simple path for filing documents and obtaining licenses, barriers to entry are lowered and growth increases. 35 The same can be true for individuals navigating major life events, such as the birth of a child or retirement, which often require services across multiple agencies in an arduous process that takes up both time and energy.

Oklahoma, for example, has prioritized taking a customercentric approach to government services. During the COVID-19 pandemic, the state revamped its unemployment system and set up a digital portal for residents to apply and track their unemployment benefits. This initiative resulted in the state being able to process 30,000 claims per week and deliver more than \$2 billion in unemployment checks. Individuals were able to receive benefits quicker and the state was able to save money by not needing to hire additional customer service representatives.<sup>36</sup>

Many local government proceedings (e.g., council and neighborhood meetings) have gone online, which has the potential to increase resident participation and engagement. Several states and cities are considering measures to require remote options for government hearings, even after the pandemic, citing the benefits for older Americans, people with disabilities, those who lack transportation, and those with family obligations that prevent them from attending in person.<sup>37</sup> In this way, virtual proceedings have the potential to diversify and democratize local government.<sup>38</sup>

Online solutions have become so ubiquitous that there is significant risk if governments fail to shift services online. When the COVID-19 pandemic began, governments with strong digital infrastructures were able to rapidly adapt. The state government of California, for example, was able to leverage its early efforts to pursue cloud solutions to enable 90% of its state employees to seamlessly switch to telework. 39 Without digitization, governments will struggle to remain effective and flexible when faced with future crises.

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# Spotlight: Oregon Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Program

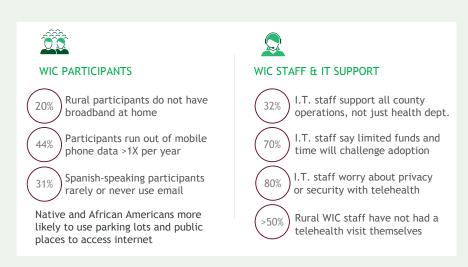
WIC is a prevention-focused public health nutrition program serving lower-income pregnant, postpartum, and breastfeeding individuals, as well as infants and children under the age of 5.

In response to COVID-19, Oregon's WIC program transitioned from in-person appointments to telephone-based appointments for its 80,000 participants. Alongside this transition, Oregon WIC also used surveys to understand readiness for video-based tele-WIC appointments. These surveys, conducted in collaboration with the Language, Literacy, and Technology Research Group at Portland State University, evaluated three populations: WIC participants, WIC staff, and information technology (IT) support staff.

WIC participants were sent a text message inviting them to complete a survey, which was available online and over the phone, and in English, Spanish, and Russian. Respondents were asked about access to broadband internet; device ownership; current interaction with technology for work, family, and personal tasks; experience with and feelings about telehealth; and comfort with video-based WIC appointments. More than 9,500 WIC participants responded, with key results highlighted in the first column of Figure 6. Notably, 300 mostly Spanish speakers completed the survey by phone, with most indicating a lack of internet access or digital skills needed to complete the online survey.

WIC staff were asked about their own telehealth experiences; perceived readiness for adoption of video-based telehealth in their WIC clinic; and advantages and disadvantages for WIC participants. IT support staff were asked about their current scope of responsibility; number of programs and staff supported; and barriers and supports in adopting video-based visits. Findings are featured in the second column of Figure 6.

#### FIGURE 6. Oregon WIC survey takeaways



Source: Oregon Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Program

The results indicate that there is a significant variability in the readiness and capacity among WIC participants, WIC staff, and IT support to implement tele-WIC visits. To ensure equitable implementation of tele-WIC, investments must be made to expand reliable, affordable broadband access; connect people to devices that match their technology needs; and provide education to improve digital literacy, privacy, and security. In addition, dedicated funding is needed to increase staffing, capacity, and acquisition of technology at the local health departments and community nonprofits that deliver the WIC program.

#### FIGURE 7. Government services: Benefits of widespread broadband adoption



Opens access to elections and events



Democratizes receipt of services



Improves government performance



Virtual components to in-person meetings can diversify and democratize civic discourse, while raising awareness of public issues\*



Digital government enables service access at all hours, and with fewer barriers (i.e., time, transportation) than in-person experiences



Digital access can help government be more efficient in responding to feedback and reaching underserved communities



Access gaps can exclude population segments from participating in remote, local government decision-making



Insufficient access risks fewer people receiving essential services, like COVID vaccines, drivers' license renewals, voter registration, etc.



Projects moved to digital formats have improved service adoption, customer satisfaction, cost savings, and profitability†

# **Employment**

COVID-19 sparked a fundamental change in the nature of work. Before the pandemic, fewer than 5% of workers worked remotely. During the pandemic, that number grew to over 60%. Now, it is stabilizing around 30%. 40 That is a sixfold increase from pre-pandemic levels.

From an employee's perspective, remote workers are happier and have a better work-life balance despite working more hours. 41 Forty-one percent feel more productive when working from home, compared to 14% who feel less productive. 42 In fact, four in ten remote workers would look for another job if their employer required a full return to the office.<sup>43</sup>

From an employer perspective, remote work gives access to a broader talent pool, which can result in more qualified hires and support a company's diversity and inclusion goals. Job listings that allow remote work draw seven times more applicants, 44 and remote work flexibility reduced employee attrition by more than one-third.45 In one study, 78% of respondents said that a remote work option was the most effective nonmonetary way to retain employees. 46 These advantages, coupled with lower real estate and operating costs, suggest that the shift to remote work may improve company profits.

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<sup>\*</sup>Inter-American Development Bank

<sup>†</sup>Grancius

Beyond remote work, connectivity also improves an individual's ability to find a job. For lower-income individuals, the introduction of home internet service increases their likelihood of employment by 14%. Among these newly connected households, 62% cited the internet as having helped them or a family member successfully find employment.<sup>47</sup> Similarly, a research synthesis by the World Bank finds that the relationship between internet and employment is positive—for every 1% increase in internet penetration, employment increases between 0.2% and 5.3%, with variation by study and by industry.4

"It's nearly impossible to both recruit new businesses and in many cases keep existing businesses in areas that do not have stable high-speed internet."

- Governor Laura Kelly of Kansas

#### FIGURE 8. Employment: Benefits of widespread broadband adoption



unemployment rates



Allows for application access and job research



Improves skill building and job performance



Lower-income people with access to Internet Essentials are over 8 p.p. more likely to be employed than those without access\*



Internet access provides people with the tools to apply for jobs and network



Remote work increases access to flexible job training and enables skill building through modern technologies (AR/VR)



For every 1% increase in internet penetration, employment can increase between 0.2% and 5.3%, varying by industry<sup>†</sup>



Access also helps people research potential employers and seek career guidance, driving better employment opportunities



Research suggests remote options can drive higher employee productivity, and improved retention

<sup>\*</sup>American Economic Journal

<sup>†</sup>World Bank Group

<sup>47.</sup> Zuo, G. (2021). Wired and hired: Employment effects of subsidized broadband internet for low-income Americans. American Economic Journal: Economic Policy. https://www.aeaweb.org/articles?id=10.1257/pol.20190648

<sup>48.</sup> World Bank Group, (2012), Broadband strategies toolkit. https://ddtoolkits.worldbankgroup.org/broadband-strategies/driving-demand/broadband-firms-and-employment#:~:text=According%20 to%20this%20research%2C%20the,increase%20in%201%25%20of%20penetration.

# Section 2: The Infrastructure Required to **Innovate Essential Services**

# Decisions made today will affect the internet for generations

There are many different types of infrastructure that can be used to build internet networks, and the type of infrastructure used will affect the type of online services that institutions can offer. For institutions to offer the best online services, internet infrastructure must support internet service that is fast, stable, scalable, affordable, and universally available. When this is achieved, institutions can confidently invest in their online services, knowing they will be of high quality and available to all.

As states receive unprecedented broadband funding, understanding the advantages and use cases for each type of infrastructure is imperative. In this section, we provide an overview and analysis of three types of broadband infrastructure, summarized in Figure 9. First, we discuss two wireline solutions, fiber-optic infrastructure and hybrid fiber-coaxial (HFC) infrastructure (commonly called "cable internet"), both of which use physical wires to connect premises to the internet. Second, we discuss fixed wireless access (FWA) infrastructure, which is a wireless, cellular-based technology that transmits internet through radio waves from an off-site access tower to individual receivers installed on-premises.

FIGURE 9. Assessment of broadband infrastructure deployment paths

	Fiber-Optic	Cable/HFC —	FWA
Typical download / upload speed	250-2000/250-2000 Mbps	10-1500/5-100 Mbps	30-300/5-20 Mbps <sup>†</sup>
Typical one-time costs (per home)*	• Cost to pass \$600-4,000 • Cost to connect \$300-400	• Cost to pass \$500-3,000 • Cost to connect \$200-300	• Base station: ~\$125‡ • Cust. premises equip.: ~\$400-1,000§
Ongoing annual operating costs	\$55	\$105	\$95-450#
Scalability	High cost of material/mile with low to moderate existing infrastructure, well suited for dense urban & suburban areas, tech supports long-term viability	Moderate to high existing infrastructure is available across urban, suburban & some rural areas, upload speed ceiling requires upgrades over time	Easily deployable base station infrastructure, economical & scalable in rural and suburban areas
Benefits & limitations	Highest speed/capacity Highest reliability, less susceptible to signal interference  Lowest latency (10-15 ms) Lowest ongoing operating expense Longest useful life (-40yr.) Highest up-front capital expense Most complex to deploy	Less up-front capital investment High speed/capacity Total capacity shared with other homes (can impact speed) Continued investment required to scale capacity	Fastest time to deploy, does not require last-mile infrastructure Lowest up-front CapEx requirements Less reliable signal, dependent on distance, spectrum, foliage, etc. Highest OPEX, given electrical, network & maintenance costs Highest latency (30-40 ms)

<sup>\*</sup> Cost to past variable based on household density, with lower cost figures associated with urban areas; estimates based on MoffettNathanson, Fiber Broadband Association &

<sup>†</sup> Download speeds based on current T-Mobile and Verizon offerings; upload speeds provided by 10,000-participant survey conducted by Evercore Research and reflect 5G service; Evercore survey results also show download speeds of on average >100 Mbps.

<sup>&</sup>lt;sup>‡</sup> Electronic Frontier Foundation.

<sup>§</sup> Based on T-Mobile & Verizon FWA offerings.

 $<sup>^{\#}</sup>$ Based on Macrocell CAPEX of \$250,000, serving ~2,000 homes; homes reached varies by spectrum, base tower infrastructure, population density, etc.

# The Pros and Cons of Broadband Infrastructure Technologies

## Wired Technologies

Generally, infrastructure built with wired technology is faster and more reliable, has lower latency and operating costs, and can accommodate more users. However, wired infrastructure can also cost more to build per mile.

## Wired Technologies: Fiber-Optic Infrastructure

Fiber-optic technology uses physical cables that contain up to a few hundred bundled strands of glass to carry data to a premises in the form of light pulses. Fiber is recognized as a future-proof, technologically superior infrastructure compared to alternatives, driven by its fast speed, low latency, unconstrained capacity, and limited susceptibility to signal noise. Fiber is the fastest broadband infrastructure available, with typical symmetrical speeds of approximately 250-2,000 Mbps. While this represents an average speed, world-record fiber transmissions have reached 319 Tbps. 49

The Electronic Frontier Foundation estimates that typical fiber-optic cable has approximately 10,000 times more usable bandwidth than a standard coaxial cable. 50 While cable captures the majority market share, fiber (20% market share) continues to eat into this figure. 51 As advanced technologies are developed and internet usage grows, fiber will be positioned to support vastly higher speeds per premise with upgrades to existing infrastructure. Fiber also has the lowest latency (10-15 ms compared to alternative types of infrastructure), making it best positioned to support technologies like AR/VR.<sup>52</sup> Unlike HFC networks, where speeds are determined by local network congestion, fiber networks are scalable and have nearly unconstrained capacity, with speeds independent of consumption across other premises. Fiber has the strongest technological capability relative to all other broadband technologies.

Fiber's structural advantage has spurred an explosion of infrastructure deployment across the U.S. over the past few years. Despite accelerated adoption, cable captures the lion's share of existing infrastructure in the U.S., making fiber most economically suitable for greenfield network build-outs. Fiber networks also have the longest time to market and highest up-front capital costs per mile, though elevated up-front costs are offset by fiber's scalability and lower ongoing operating costs compared to alternative types of infrastructure. These cost reductions are driven largely by fiber's superior performance compared to other networks, as this yields higher customer satisfaction and lower ongoing maintenance expense relative to other technologies. Given this, fiber is best suited for denser urban and suburban environments, where up-front capital costs are mitigated by higher population density.

It is important to note that fiber's main downside—its high up-front cost-can be offset or even eliminated entirely by recent federal funding programs. This is discussed further in Section 3.

"Fiber is what you want, no matter what. If we have that, we have unlimited capacity to increase speeds. If we are building something over wireless, or copper or even cable, none of those can be future-proofed the way fiber can."

- Deb Socia, President and CEO, The Enterprise Center

<sup>49.</sup> Sakharkar, A. (2021). World record: Internet speed of 319 Tb/s over 3,001 km. Tech Explorist. https://www.techexplorist.com/world-record-internet-speed-319-tb-s-over-3001-km/40257/.

<sup>50.</sup> Cyphers, B. (2019). The case for fiber to the home, today; Why fiber is a superior medium for 21st century broadband. Electronic Frontier Foundation. https://www.eff.org/wp/case-fiber-home-today-why-fiber-superior-medium-21st-century-broadband.

<sup>51.</sup> Goovaerts, D. (2022). FBA report: 43% of U.S. households now have access to fiber. Fierce Telecom. https://www.fiercetelecom.com/broadband/fba-report-43-us-households-now-have-access-fiber.

<sup>52.</sup> Federal Communications Commissions. (2020). A report on consumer fixed broadband performance in the United States. https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-ninth-report.

# Wired Technologies: Cable Hybrid (Fiber-Coaxial) Infrastructure

Cable uses a hybrid of fiber-optic and coaxial cables (HFC) to connect premises to broadband. This technology gained rapid adoption in the early 1990s and has since become the most extensively deployed broadband infrastructure. Cable accounted for ~50% of broadband market share in 2021. Given the high volume of legacy HFC infrastructure, cable is best suited for brownfield edge-outs, where upgrading existing cable avoids the high up-front capital costs associated with new network builds.

From a technological perspective, HFC first delivers signals through fiber cables, which are connected to a node. Traditional coaxial cables then connect to the node and provide the final transmission to about 50 to 200 homes on average. Today, HFC offers typical speeds of 10-1,500/10-100 Mbps. While this speed is generally sufficient to meet typical household usage today, it is dependent on local network specific congestion, and lacks the symmetry of fiber. Symmetry becomes increasingly important as interactive services become more prevalent. Such services, which include health care, education, and work, rely on video streaming and data uploads, which require fast, symmetrical download and upload speeds. To illustrate the importance of symmetry, consider how during a telehealth appointment it is just as important for the doctor to have a clear view of the patient as it is for the patient to have a clear view of the doctor.

To illustrate the importance of symmetry, consider how during a telehealth appointment it is just as important for the doctor to have a clear view of the patient as it is for the patient to have a clear view of the doctor.

Cable is also more susceptible to signal noise than fiber, meaning it is more likely to experience unintended signal modifications. Overall, fiber's technological superiority makes it a more future-proof option compared to HFC as internet usage continues to accelerate. However, HFC is anticipated to migrate to an upgraded operating standard beginning in 2022. This specification is expected to have measurably faster latency and speeds, but will likely take a few years to be fully tested and scaled.

While cable also has generally lower average annual operating costs per home than FWA, these average costs of \$105 are approximately double that of fiber. 53 Operating costs are higher for two primary reasons. First, cable networks have a larger volume of network-issue calls to operators than fiberoptic networks, which adds incremental expense per user. Secondly, cable users have historically been less satisfied with the technology's performance compared to fiber, which drives a higher churn rate for cable.

Ultimately, cable could be well suited for brownfield edgeouts of existing network infrastructure in denser urban and suburban environments, where up-front capital costs are mitigated by higher population density.

## Wireless Technologies: Fixed Wireless Access Infrastructure

Fixed wireless access (FWA) is a cellular-based connection that transmits internet to premises through radio waves, making the technology independent of cable. A lack of cable means that FWA can be deployed across rougher terrain and at vastly accelerated speeds relative to fixed wired technologies, particularly in suburban and rural areas where existing fixed wired infrastructure is either limited or nonexistent. Rather than digging into the ground and laying cable, FWA relies on the implementation of a base tower to transmit radio signals. This drives lower up-front capital costs of approximately \$525-1,125 per household compared to competing technologies.<sup>54</sup> This cost accounts for an average macro cell deployment and includes base tower infrastructure and

<sup>53.</sup> Fiber Broadband Association. (2020). Access Network OpEx Analysis white paper. https://www.fiberbroadband.org/page/fiber-research.

<sup>54.</sup> Analysis assumes deployment of a \$250,000 macrocell, serving on average 2,000 households. This is subject to change based on base tower technology, household density, etc.

customer premises equipment (CPE) expenses. Today, the majority of up-front capital is typically composed of CPE costs, which are anticipated to decline in the coming years as FWA undergoes further technological innovation. Costs per household also vary based on a range of factors, such as the size of the base tower, spectrum availability and interference, average usage per household, and population density within the coverage area.

While FWA has notable advantages in time to market and cost of initial deployment compared to fixed wired technologies, the infrastructure has higher ongoing operating costs and is typically relatively limited in terms of network capacity, signal reliability, speed, and latency. Higher costs for network upgrades, maintenance, and electrical usage yield increased ongoing operating costs for FWA compared to competing technologies. These ongoing costs can range from ~\$95-450 per household. 55 Meanwhile, signal reliability and consistency continue to be a hurdle for FWA technology compared to fixed wired solutions. Line-of-sight connection between the base tower and an on-premises antenna is necessary to ensure a strong signal. Foliage, inclement weather, and less porous building materials at the end premise can all interfere with signal transmission. Signal quality is a function of a premise's distance to the base tower, and weaker signals can be expected at more distant premises or those lacking line of sight to the base tower. Capacity is also dependent on available spectrum, network density, and others' consumption within the network area. If household density within the coverage area is high and a large volume of consumers use the network at the same time, network capacity may be impeded.

In terms of typical speed, FWA is the lowest at 30–300/5–20 Mbps, making it a less suitable option for high-usage households and more poorly positioned to accommodate increased usage per household over time, barring further innovation. Latency is also the longest for this technology, at 30-40 ms. This makes FWA the least suitable option for applications like VR/AR and gaming that rely on low latency for operation. When service is unstable and prone to disruption, education lessons can be derailed and learning is lost; health care delivery can be interrupted; or government services may not be

used. A stable, uninterrupted online experience is critical to incentivizing investment in and adoption of essential services.

Ultimately, FWA is best positioned for use cases in rural and suburban geographies where low infrastructure requirements position the technology as an economical and quickly scalable solution, or in urban areas where it can be used for supplementary coverage in addition to existing fixed wired infrastructure. Additionally, it should be noted that the Broadband Equity, Access, and Deployment program (BEAD), which is the largest of the upcoming federal funding opportunities, considers most forms of FWA technologies to be unreliable and therefore ineligible for BEAD outside of extreme circumstances. 56

# Summary

Fiber's superior capacity, speed, scalability, and reliability relative to alternative types of infrastructure position it as the most future-proof technology. For this reason, fiber should be the first choice for deployment where it is not cost prohibitive. It should also be noted that the BEAD Notice of Funding Opportunity is written such that states must consider fiber projects as "priority projects."

As a category, fixed wired broadband is recognized for increased signal reliability, lower ongoing operating costs, and faster latency than FWA. If fiber cannot be deployed because the economic or logistical case is restrictive, cable could be used. Where these options are not viable, FWA can then be considered. FWA's lower up-front capital requirements and faster time to market have driven increasing adoption in rural and suburban areas where wired infrastructure either does not exist or cannot sufficiently support local communities. While FWA's less capital intensive and easily deployable base station infrastructure makes it well suited for these use cases, lack of signal reliability, reduced speed, and slower latency compared to fixed wired options make it a technologically inferior option, particularly for higher-density use cases.

<sup>55.</sup> Estimate from current industry experts.

<sup>56.</sup> Broadband Equity, Access, and Deployment Program. (2022). Notice of funding opportunity. https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

# Section 3: How Federal Funds Can Close the Digital Divide and Ensure Equitable Access to Essential Services

# The once-in-a-generation opportunity

In 2021, Congress committed more than \$80 billion for broadband through two major federal laws: the American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA). The programs these laws created are unique for five main reasons:

- Large size—they are the largest single investment in broadband in America's history;
- Strong infrastructure requirements—recipients must prioritize high-quality, fiber networks;

- Focus on affordability—subsidizes internet service for low-income households and requires networks to offer affordable internet service;
- Support for inclusion—the funds prioritize digital equity initiatives and stakeholder engagement;
- Administrative processes—individual states, rather than federal agencies, are in charge of implementation.

See Figure 10 for a comprehensive look at funding amounts, uses, and timelines.

					Primary imp	act	✓ Sec	condary i	mpact
	Program name	Agency	Туре	Amount	Timing	Access	Afford- ability	Adoption/ Awareness	Planning
IIJA	Broadband Equity, Access, and Deployment Program (BEAD)	<b>-</b>	Formula allocation	\$42.5B	Letter of intent due 7/18/22	<b>⊘</b>	<b>⊘</b>	<b>⊘</b>	<b>⊘</b>
	State Digital Equity and Capacity Grant Program		Formula allocation	\$1.5B	Planning application due 7/12/22				
	Digital Equity Competitive Grant Program		Competitive grant	\$1.3B	Estimated mid 2024				
	Middle Mile Broadband Infrastructure Grant Program (MMBI)	<b>9</b>	Competitive grant	\$1B	Application due 9/30/22	$\bigcirc$			
	Affordable Connectivity Program (ACP)	Æ	Consumer subsidy	\$14.2B	Transition from EBB 12/21; lasts until funds exhausted			$\bigcirc$	
	Affordable Connectivity Program Outreach Grants (ACP)	Æ	Competitive grant	\$100M*	Undefined; proposed multi-year program with annual grant cycles				
	Private Activity Bonds (PAB)	₩IRS	Tax-exempt bond	\$335M <sup>†</sup>	Vary by state and locality				
ARPA	Coronavirus Capital Projects Fund	8	Formula allocation	\$10B	Funding request due 12/27/21	<b>Ø</b>	<b>⊘</b>	<b>⊘</b>	<b>⊘</b>
	Coronavirus State and Local Fiscal Recovery Fund (SLFRF)	8	Formula allocation	\$350B	Treasury accepting requests			$\bigcirc$	
	Emergency Connectivity Fund (ECF)	Æ	Competitive grant	\$7.2B	Application window closed 5/13/22				

 $<sup>^{\</sup>ast}$  IIJA allows the FCC to spend up to \$100M on this program, but the amount has not been finalized.

<sup>†</sup> The limit for each state is the greater of either (i) \$110 multiplied by the state's population or (ii) \$335,000,000. Publicly owned projects do not count against the limit; privately owned projects do (but only 25% of their amount).

# The Infrastructure Investment and Jobs Act

# The Broadband Equity, Access, and **Deployment Program**

The bulk of the IIJA's broadband funding comes through the Broadband Equity, Access, and Deployment program (BEAD), which is designed to deploy (i.e., build) broadband infrastructure in areas that lack it. Critically, networks built with BEAD money must prioritize fiber infrastructure, offer speeds of at least 100/20 Mbps, meet affordability standards, and provide service to all households in a funded area. If BEAD's requirements are met, the resulting networks will likely be sufficient for institutions to confidently invest in internet-based technologies.

BEAD funds will be allocated to each state based on the size of their digital divide, as measured according to the Federal Communications Commission (FCC)'s broadband availability map. BEAD requires states to sequence projects in a series of tiers, and a state must complete (or have a plan to complete) each tier before progressing to the next. Tier 1 consists of deployment in "unserved" areas where residents lack service of at least 25/3 Mbps. Tier 2 consists of deployment in "underserved" areas where residents lack service of at least 100/20 Mbps. And Tier 3 includes both deployment to community anchor institutions with service below 1/1 Gbps and/or other connectivity projects, like device programs. For most states, the majority of BEAD funds are expected to be absorbed by Tiers 1 and 2.

#### The Digital Equity Act Programs

The IIJA created a suite of first-of-their-kind programs to fund digital literacy and inclusion initiatives. These programs—the State Digital Equity Planning and Capacity Grant Program and the Digital Equity Competitive Grant Program-fund noninfrastructure initiatives like digital navigators and digital skill training. The State Digital Equity Planning and Capacity Grant Program, like BEAD, allocates money to states based on the size of their digital divide, and states then use this money to create and implement Digital Equity Plans. Conversely, the Competitive Grant Program awards funds directly to nonstate

entities, like nonprofits and local institutions, through a competitive grant process.

From an institutional perspective, these programs are important because many disconnected individuals are unfamiliar with technology, and this can prevent them from using an institution's online services. Access to the internet and devices, by itself, is not sufficient; people must also be trained in the use of these technologies. Helping vulnerable populations develop these skills is the purpose of Digital Equity Act programs.

#### The Affordable Connectivity Program

The Affordable Connectivity Program (ACP) is a consumer subsidy to help individual households afford internet service and devices. It is a continuation and modification of the Emergency Broadband Benefit, which was created during the pandemic. The ACP gives eligible households \$30 per month for internet service (\$75 for households on tribal lands) and a one-time \$100 discount for a device. Critically, the monthly discount can result in free internet service when combined with ISPs' low-cost (i.e., \$30 or less) plans. Approximately 48 million households (40% of U.S. households) qualify. Qualification requires a household income below 200% of the federal poverty line and/or participation in certain government assistance programs, such as SNAP, Medicaid, and Free and Reduced-Price School Lunch.

Research has shown that, among un- and under-connected households, cost is cited as one of, if not the main barriers to internet adoption. 57, 58 The ACP can help these households overcome this barrier. Institutions can leverage the ACP by raising awareness and helping households enroll. Notably, the ACP does not currently have a permanent source of funding, and, unless additional funding is secured, the ACP will exist only until its original appropriation is depleted, which may be as early as 2024 or 2025. 59 Given the importance of affordable connectivity, institutions should consider advocating for additional ACP funding or an equivalent state program.

<sup>57.</sup> California Emerging Technology Fund and University of Southern California. (2021). Statewide Survey on Broadband Adoption 2021. https://www.cetfund.org/wp-content/uploads/2021/03/Annual\_Survey\_2021\_CETF\_USC\_Final\_Summary\_Report\_CETF\_A.pdf#page=20.

<sup>58.</sup> Pew Research Center. (2021). \_Mobile Technology and Home Broadband 2021. \_https://www.pewresearch.org/internet/wp-content/uploads/ sites/9/2021/06/PI\_2021.06.03\_Mobile-Broadband\_FINAL.pdf.

<sup>59.</sup> Institute for Local Self-Reliance. (2022). Affordable connectivity program dashboard. https://apps.communitynets.org/acpdashboard/.

## The American Rescue Plan Act

#### The Capital Projects Fund

The Capital Projects Fund (CPF) is the most flexible of all the available broadband programs. Like BEAD, it is allocated to states according to a formula, 60 and states are in charge of implementation. Unlike BEAD, it does not prioritize deployment in unserved areas. Rather, it can be used in a wider range of locations and on a variety of initiatives, such as devices programs, affordability programs, and community centers. Moreover, where it is used for deployment, the resulting networks should offer 100/100 Mbps where feasible, which is a higher standard than BEAD. As of early September 2022, the U.S. Department of Treasury had announced approval of grants for 13 states and over 50 tribal plans.<sup>61</sup>

States should consider how they coordinate CPF with BEAD and other funds. Due to its flexibility, CPF is a good program for connecting areas that do not meet the technical definition of "unserved" (which is BEAD's focus). Similarly, CPF is a solution for non-deployment issues, such as a lack of devices. Certainly, access to internet infrastructure is critical, but individuals must also be able to afford internet service, have a device capable of running key applications, and have the skills to use these technologies. CPF is capable of addressing all of these needs.

Finally, as the deadline for CPF grant plans was September 24, 2022, state policymakers should consider replicating the structure and the rules of the CPF at the state level. Once funding through BEAD is allocated to projects, states will have a clearer picture of which communities require additional support. The CPF program, with its strong requirements and flexibility, offers a good template for how to design a post-BEAD state grant program because it can address the majority of expected broadband costs, like expanding or upgrading infrastructure networks, making home connectivity and devices more affordable, and sustaining digital inclusion programming.

#### The Emergency Connectivity Fund

The Emergency Connectivity Fund (ECF) was created to ensure continuing access to education despite pandemic induced disruptions to learning. It did this by giving schools and libraries funds to purchase internet service and devices for students and teachers to use at home—a use not covered by existing federal programs.

The ECF has proven incredibly effective. As of September 2022, it has enabled schools and libraries in every U.S. state and territory to purchase a combined 11.5 million devices and 7.5 million internet service connections. Moreover, it has done this in a way that ensures quality and cost efficiency. It allows institutions to:

- Engage in bulk purchasing, lowering the average price per
- Choose which technologies are procured (for both devices and internet service), ensuring the technologies can support the curriculum, are suitable for student connectivity needs, and integrate with existing technology and tech support;
- Ensure that all students and teachers have connectivity and devices, enabling institutions to incorporate internetbased technologies into their standard educational services without leaving anyone behind.

However, the ECF's funding will soon be depleted, and when it is, the 13 million students it is connecting will be at risk of falling back into the digital divide. States and their institutional partners can prevent this by using state resources, such as the CPF or other funding sources, to implement state versions of the ECF. This would allow the state to maintain connectivity afforded by ECF and potentially improve the program to incorporate teacher training, IT resources, and digital inclusion programming.

<sup>60.</sup> U.S. Department of the Treasury. (2021). Coronavirus capital projects fund allocations for states, District of Columbia, and Puerto Rico. https://home.treasury.gov/system/files/136/Allocations-States.pdf.

<sup>61.</sup> U.S. Department of the Treasury. (2022). Capital projects fund. https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/capital-projects-fund.

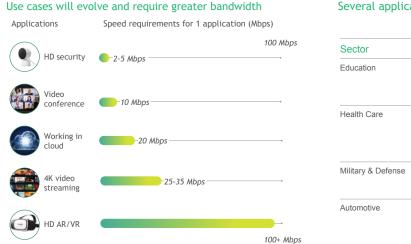
# What families can accomplish with 100/20 Mbps broadband speeds

As detailed above, federal programs are designed to deploy broadband infrastructure that meets or exceeds speeds of 100/20 Mbps. 100/20 Mbps is sufficient for many current uses, but it may struggle to support future applications and/or multiple simultaneous users. States should therefore build infrastructure with the understanding that 100/20 Mbps is the minimum speed that households need for current uses, but future uses may require higher speeds. As explained in Section 2, fiber infrastructure has the advantage of being able to easily meet higher speed requirements.

States should therefore build infrastructure with the understanding that 100/20 Mbps is the minimum speed that households need for current uses, but future uses may require higher speeds.

In 2015, the FCC set 25/3 Mbps as the minimum speed required to be considered "served" by broadband. 62 However, usage has since increased, especially as a result of the pandemic. And this usage is not expected to wane; online activities have become a routine part of everyday life, and adoption of AR/VR and data streaming technologies will demand increased speeds. See Figure 11 for examples of the bandwidth requirements and applications.

FIGURE 11. Examples of speed requirements by application



#### Several applications for HD AR/VR across sectors

	Non-exhaustive					
Sector	Examples					
Education	Workforce training     Role-playing education exercises, labs     Virtual campus spaces for students around the world to interact					
Health Care	<ul> <li>Visualization aids to explain medical ailments to patients</li> <li>Treatment of certain conditions (e.g., phantom limb pain)</li> <li>Training and simulation</li> </ul>					
Military & Defense	Control and navigation for pilots     Understanding of war field     Virtual training and complex simulations					
Automotive	Preview product at all stages of manufacturing and design     Incorporated in testing products (e.g., crash simulation, immersive vehicle environment)					

Sources: Cisco Annual Internet Report, 2018-2023; company websites; BCG Megatrends Overview of Augmented Reality, Virtual Reality, and Mixed Reality; BCG analysis

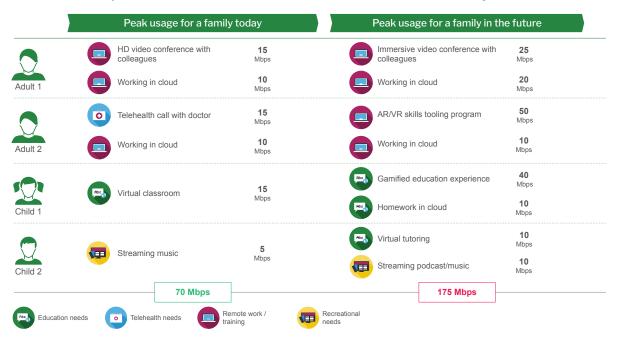
<sup>62.</sup> Fung, B. (2015). The FCC has set a new, faster definition for broadband. Washington Post. https://www.washingtonpost.com/news/the-switch/wp/2015/01/29/the-fcc-has-set-a-new-faster-definition-for-broadband/.

Figure 12 shows typical broadband usage of a four-person family both now and in the future. Households require access to at least 100/20 Mbps to seamlessly complete everyday tasks. While this is the minimum speed required today, the use of AR/VR and similar applications will quickly push speed demands beyond a 100/20 Mbps standard. As public entities

think about future broadband infrastructure, this growth needs to be considered. This finding underscores the conclusion of Section 2: Fiber's superior capacity, speed, and reliability position it as the most future-proof technology. Fiber should thus be the first choice for deployment where it is not cost prohibitive.

FIGURE 12. A day in the life of a family (2 adults, 2 kids)

# Innovation required to meet increased bandwidth needs for a family in the future



Source: Bandwidth requirements based on industry averages

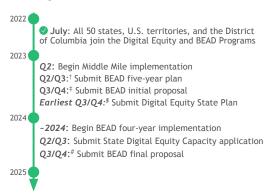
# How States Should Use Federal Funds

To reach universal connectivity and ensure that all households have access to the internet with speeds of at least 100/20 Mbps, states should take action to effectively deploy the funds. Doing so ensures the highest return on investment and sets states up for continued investment and adoption of essential services. Prior Common Sense reports have discussed high-level policy actions that states can take to invest in closing the digital divide. 63 As summarized in Figure 13, this section builds on that work with more in-depth steps and recommendations for states in light of the recent legislation and influx of funding.

### 1. Build State Capacity

First, states should work to understand the funding and technical requirements of the IIJA. The IIJA's programs are complicated and require states to comply with rules that cover a range of subjects, from labor laws to climate impact and cybersecurity. An approximate time line of next steps follows in Figure 14. For up-to-date guidance on submission requirements, see the NTIA's Internet for All website.64

#### FIGURE 14. Funding timelines



- \* EEs that receive Initial Planning Funds must submit Five-Year Action Plans.
- † Due 270 days after planning funds received.
- <sup>‡</sup> Due 180 days after new DATA maps and notice of funding amounts issued.
- § Due within one year of the date on which a state is awarded DE Planning Grant Program funds
- # Due 365 days after initial proposal approval.

Note: Estimated timelines based on information provided in NTIA overviews.

FIGURE 13. Actions states should take to maximize impact



64. National Telecommunications and Information Administration (NTIA) Internet for All website. https://www.internetforall.gov/programs.

<sup>63.</sup> Ali, T., Chandra, S., Cherukumilli, S., Fazlullah, A., Galicia, E., Hill, H., McAlpine, N., McBride, L., Vaduganathan, N., Weiss, D. & Wu, M. (2021). Looking back, looking forward: What it will take to permanently close the K-12 digital divide. Common Sense Media. https://www.commonsensemedia.org/sites/default/files/featured-content/files/final\_- what\_it\_will\_take\_to\_permanently\_close\_the\_ k-12\_digital\_divide\_vfeb3.pdf.

Successful implementation of these programs will require a dedicated and fully staffed broadband office. In addition to program implementation, offices will serve as central hubs to share best practices and technical assistance, convene stakeholders, and hold forums for sharing ideas with other regions. An ideal broadband office requires expertise that spans a range of roles, as demonstrated in Figure 15. These roles are illustrative of the practices and responsibilities of an ideal broadband office, but they should be adapted to the unique needs of each state.

The roles and responsibilities within an ideal broadband office include:

- Broadband Office Director. Acts as a central resource hub and strategy coordinator, overseeing all director and manager roles within the broadband office. Institutes working groups across stakeholders to facilitate discussions that can inform policy, strategy, and planning. Builds the office's capabilities and capacity, and supervises the launch, pilot, and expansion of major broadband programs.
- **Broadband Infrastructure and Grants Manager.** Identifies geographies for broadband infrastructure projects. Oversees the design of a subgrantee and grants management process, understanding that grants evaluation will require technical, financial, and legal expertise to expertly vet grantees for award. Leads the grants evaluation team and administers funding according to the

- principles established by the office's broadband strategy. Establishes internal reporting requirements against which grant performance will need to be tracked, and leads federal funding reporting to ensure successful program delivery and compliance.
- Community Engagement Manager. Designs a strategy to engage with stakeholders across the full digital equity ecosystem, including public entities, ISPs, anchor institutions, and CBOs. Understands the needs and local expertise of these stakeholders, which will be critical in ensuring successful broadband program delivery. Prepares proposals for the use of BEAD funds in collaboration with these stakeholders, as collaboration is a requirement of the BEAD application process. Leads technical assistance with the implementation of community-level digital equity plans, and acts as a point of state support for local leaders. Participates in stakeholder program planning; helps stakeholders understand how they are impacted by the digital divide, where they have programmatic or funding needs, and what goals need to be established to ensure shortfalls are addressed. Helps build capacity to ensure broadband projects are successfully delivered at the local level.
- Strategic Planning Director. Spearheads the development of statewide broadband plans, which should incorporate clear metrics, KPIs, and time lines to ensure successful delivery. Serves as an expert on federal developments in broadband policy, while also analyzing

FIGURE 15. Six key role archetypes of the ideal broadband office

**Broadband Office** Mapping, Policy Research Digital Equity Planning Planning and Evaluation and Strategic and Grants Planning • Develop stakeholder • Draft BEAD 5-yr, Draft Digital Equity Design subgrantee Develop coverage Define program process (specs. maps, ensure maps engagement strategy initial, and final Plan and be the timelines. Engage with state digital equity lead financials, etc.) milestones, and can be used to proposals. agencies, ISPs. Evaluate grant define projects and incorporating info for BEAD resourcing needs applications and check ISP data anchor institutions, from others Assess barriers to Ensure effective administer funds Conduct fieldwork CBOs, etc., to meet • Document existing and develop linkages across efforts and funding Define deployment to ensure programs BEAD regs. and mechanisms for workstreams regions and resolve meet grant specs understand needs Develop broadband digital equity Evaluate • Evaluate FCC maps performance and conflicts Inform ISPs of goals, plans, metrics Serve as digital Track progress and engage in broadband funds Serve as expert on identify areas for equity expert in against reporting challenge process Detail engagement federal and state stakeholder improvement requirements · Lead broader data to meet IIJA reas. broadband policy conversations Develop publicfacing reports to Lead IIJA collection efforts on Define digital equity and guide compliance digital skills, etc. implementation best practices (e.g., inform stakeholders reporting on existing and equity in mapping, future programs deployment)

developments in the programs and policies of peer states to ensure continued implementation of best practices. (This will be critical in ensuring that best practices are incorporated in the planning process.) Uses expertise to inform and write BEAD and other funding proposals, while documenting existing funding and program efforts across the state.

- Digital Equity Planning Director. Spearheads and builds long-term digital equity plans, programming, and capacity. Establishes clear goals and KPIs for programs to ensure continued year-over-year measurement. Serves as a strategy and policy expert for ongoing digital equity projects and engages stakeholders across the full ecosystem to ensure expertise represents various perspectives. Works closely with the Strategic Planning Director to build programming, and sets best practices related to digital equity across the broadband office. NDIA provides a list of suggested activities for digital equity offices, 65 including coordinating digital inclusion activities; developing digital equity policy; coordinating funding; strengthening digital equity ecosystems; educating policymakers, local governments, and stakeholders on digital equity and inclusion; guiding digital equity research and data use; and piloting scalable digital inclusion models.
- **Program Planning and Evaluation Director.** Serves as a leader in ensuring that the state's broadband plan is adopted and implemented. Evaluates the performance of the program against predetermined goals and identifies areas to refine and build out future programs. Collaborates with other directors and managers within the office based on findings to ensure that their respective initiatives are lean and on track for success. Prepares public-facing reports in concert with this evaluation to inform stakeholders of existing program progress and include plans for future program development.

North Carolina offers an example of a broadband office that is investing in helping counties with their own digital equity efforts. The state established the nation's first state Office of Digital Equity and Literacy, which is housed within the Department of Information Technology, Division of Broadband and Digital Equity (DBDE). In addition to investing substantially in digital infrastructure, the state allocated \$50 million in a digital literacy awareness campaign. It is also providing an important technical assistance role, helping 18 counties in the state to develop their own digital equity plans and providing a digital inclusion plan template to guide county-level digital inclusion planning.66

Governor Kelly of Kansas also created an Office of Broadband Development housed in the Kansas Department of Commerce to deliver a coordinated statewide approach to broadband strategy. In the creation of this office, the governor emphasized the importance of connectivity for economic development, education, and healthcare. The governor also noted that the promise of telemedicine to transform health care would be undermined without sufficient internet.<sup>67</sup>

#### 2. Map the Divide

In late 2022, the FCC is expected to release new broadband maps that will show, down to the address level, where broadband is available and where it is not. The NTIA will then use these FCC maps to do two things: allocate BEAD funding to each state based on the relative size of their digital divide, and determine where a state should prioritize BEAD deployment. However, the existence of these FCC maps does not negate the need for states to create their own state maps. In fact, the need for state maps is perhaps greater than ever.

State maps have several uses that will be vital to the success of federal programs. First, state maps can help verify the accuracy of the FCC's maps. The FCC maps, like all new maps, will have flaws, and so the FCC will open a challenge process by which states and the general public can suggest corrections. If a state has its own maps and data, it will be more effective in the challenge process and thereby ensure a better implementation of BEAD. Second, state maps can capture details which will not be included in the FCC maps, such as broadband access within multi-dwelling units (e.g. apartment buildings), the cost of

<sup>65.</sup> Huffman, A. (2021). Defining a state digital equity office. National Digital Inclusion Alliance. https://www.digitalinclusion.org/defining-a-state-digital-equity-office/

<sup>66.</sup> Bergson-Shilcock, A. (2022). States are leading the way on digital equity. National Skills Coalition. https://nationalskillscoalition.org/blog/digital-equity/states-are-leading-the-way-on-digital-equity/.

<sup>67.</sup> Carpenter, T. (2020). Gov. Laura Kelly signals new wave of broadband development in Kansas. Kansas Reflector. https://kansasreflector.com/2020/10/08/gov-laura-kelly-signals-new-wave-of-broadband-development-in-kansas/.

available internet services, the prevalence of digital skills and devices, and other such barriers to adoption. These additional metrics will be useful to understand all aspects of the digital divide and inform Digital Equity Act goals. Third, the state mapping process can provide a venue for states, ISPs, and community organizations to build a shared vision of the digital divide and align on priority projects. Finally, state maps will help states to independently anticipate project costs, evaluate the progress, and hold grantees accountable.

We recognize that obtaining household-level connectivity data can be difficult. To collect community-level data, states should enable and partner with community institutions that have a close relationship with households (e.g. schools, public housing, and public health). One of the simplest ways to do this is by incorporating questions about connectivity into existing surveys. Such questions, also known as digital needs assessments (DNAs), can provide a snapshot of a community's connectivity. DNAs should measure a variety of metrics, including the availability, quality, and price of devices and internet service; an individual's comfort and skills with technology; and an individual's reliance on public Wi-Fi.68 DNAs should also be conducted on a recurring basis and, where possible, tied to location and demographic information.

As an example, in 2022 Virginia passed S.B. 724,69 which requires schools to add questions about home connectivity to their existing student surveys. Schools already routinely survey their students, and so, by adding questions about household connectivity, Virginia has found a simple way to collect broadband data. This will be useful for communities looking to unlock federal funds. Similarly, the Colorado Office of the Future of Work collaborated with the Department of Public Health & Environment to include questions on digital skills in a health survey.<sup>70</sup>

Beyond DNAs, states can collect data using more specialized institutional tools.<sup>71</sup> In California, the nonprofit California Emerging Technology Fund (CETF) administers a "Statewide Survey on Broadband Adoption." This helps California understand statewide trends in adoption among vulnerable communities. 72 Similarly, North Carolina has a set of visual dashboards that track a range of connectivity indicators, including fixed and cellular coverage, service cost, and upload and download speeds. The dashboards are updated daily and can be disaggregated by county to show areas of specific need.<sup>73</sup>

#### 3. Plan with Institutions

To unlock their full funding, the BEAD program and the State Digital Equity and Capacity Grant program both require states to develop detailed plans and submit them for federal approval. Each of these plans will require states to describe planned uses of the funds and establish measurable goals.

One of the major requirements of these plans is that states collaborate with community stakeholders. Specifically, BEAD's Five-Year Action Plan and State Digital Equity Plans must describe a comprehensive community engagement process, showing collaboration with local, regional, and tribal entities. NTIA has released guidance on Setting Up Initial Stakeholder Engagement<sup>74</sup> and Planning a Stakeholder Engagement Strategy.<sup>75</sup>

These plans should also incorporate a vision for how broadband infrastructure and digital equity initiatives will enhance institutional services. To ensure plans meet institutional needs, states should include institutional stakeholders in the planning process as early as possible. For example, a state broadband office might collaborate with the state's Department of Education to understand connectivity

- 68. Council of Chief State School Officers. (2020). Home digital access data collection: Blueprint for state education leaders. https://ccsso.org/sites/default/files/2020-07/7.22.20\_CCSSO%20Home%20Digital%20Access%20Data%20Collection%20Blueprint%20 for%20State%20Leaders.pdf.
- 69. Text of Virginia State Bill 724. https://lis.virginia.gov/cgi-bin/legp604.exe?221+ful+SB724.
- 70. Bergson-Shilcock, A. (2022). States are leading the way on digital equity. National Skills Coalition. https://nationalskillscoalition.org/blog/digital-equity/states-are-leading-the-way-on-digital-equity/.
- 71. Ritzo, C., Rhinesmith, C., & Jiang, J. (2022). Measuring library broadband networks to address knowledge gaps and data caps. Information Technology and Libraries, 41(3). https://doi.org/10.6017/ital.v41i3.13775.
- 72. California Emerging Technology Fund. (n.d.) Statewide surveys: California broadband adoption by the numbers. https://www.cetfund.org/action-and $results/statewide-surveys/\#: \sim: text = CETF\%20 developed\%20 and \%20 sponsors\%20 the, from \%2055\%25\%20 to \%2090\%25.$
- 73. North Carolina Department of Information Technology. (n.d.) Broadband survey dashboards. https://www.ncbroadband.gov/broadband-survey/broadband-survey-dashboards.
- 74. National Telecommunications and Information Administration (NTIA). (2022). Setting up initial stakeholder engagement. https://broadbandusa.ntia.doc.gov/sites/default/files/2022-04/Initiating%20Stakeholder%20Engagement.pdf.
- 75. NTIA. (2022). Planning a stakeholder engagement strategy. https://broadbandusa.ntia.doc.gov/sites/default/files/2022-04/Planning%20a%20 Stakeholder%20Engagement%20Strategy.pdf.

requirements for online learning in the state. 76 Similarly, the state could work with the Department of Health to understand the connectivity requirements for innovations in public health. States can also connect with nonprofit organizations, like the School, Health, and Libraries Broadband Coalition (SHLB)<sup>77</sup> and the National League of Cities (NLC),<sup>78</sup> to understand the unique needs of their institutional members and the communities they serve.

Institutions can help build state broadband plans in a variety of ways, including but not limited to:

- Defining technical requirements (e.g. broadband speeds, latency, jitter, and device capabilities) needed for current and future internet-based services;
- Articulating the digital skills needed to use internetbased institutional services. Clearly defined skills will help states create comprehensive digital equity plans;
- Including local communities in digital divide efforts. For example, by distributing resources and surveys (as detailed above), promoting ACP adoption (as detailed below), or encouraging public participation in the planning process;
- Conducting research on the impact of broadband connectivity on education, healthcare, and other essential services.

Once stakeholders align on strategy, states should develop public-facing documentation of the goals and road map. This will increase transparency, allow for more informed public feedback, and promote accountability. New York, 79 North Carolina, 80 Texas, 81 and other states 82 offer good examples of a comprehensive, transparent planning process.

#### 4. Promote the ACP

Historically, ISPs have prioritized investments in areas with a high concentration of potential customers. These areas, typically populous and/or affluent, are more likely to generate return on investment (ROI), an important consideration when building something with high up-front cost like a broadband network. However, this pursuit of reliable ROI has meant that ISPs neglect lower-income and rural areas, which have unreliable ROI.

The ACP can change this calculation. With widespread enrollment, the ACP could turn lower-income communities into a reliable source of ROI. This would make them attractive to existing ISPs and could even support the development of new ISPs. By doing so, the ACP could bring connectivity to digitally redlined communities and potentially foster competition in the broadband market (see Figure 16, page 31).

However, research shows that there is a general lack of awareness of the ACP, and the application processes can discourage enrollment, especially among individuals with low digital literacy.83 Therefore, states should support institutions and other community-based organizations to promote enrollment in the ACP as a means of incentivizing infrastructure investment in digitally redlined communities. This will be especially important in the coming years as ISPs decide where to apply for BEAD grants.

Figure 17 (see page 31) shows how the ACP improves ROI calculations for ISPs. Our analysis finds that the ACP reduces the per-household subsidy required to incentivize ISP investment by \$500.

<sup>76.</sup> Common Sense Media's prior report, Closing the K-12 digital divide in the age of distance learning, provides a guide on technical requirements for various elements of digital learning. https://www.commonsensemedia.org/sites/default/files/featured-content/files/common\_sense\_media\_ report\_final\_7\_1\_3pm\_web.pdf

<sup>77.</sup> School, Health, and Libraries Broadband Coalition (SHLB) website. https://www.shlb.org/.

<sup>78.</sup> National League of Cities website. https://www.nlc.org/topic/technology/.

<sup>79.</sup> New York State ConnectALL Initiative website. https://broadband.ny.gov/.

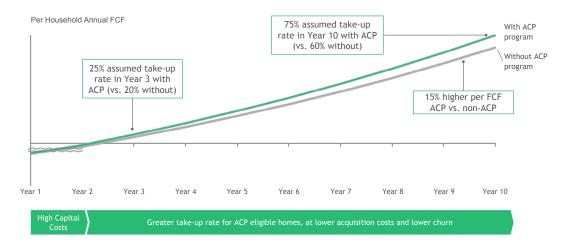
<sup>80.</sup> North Carolina Department of Information Technology. (n.d.) North Carolina's digital divide. https://www.ncbroadband.gov/digital-divide.

<sup>81.</sup> Texas Broadband Development Office. (2022). Texas broadband plan. https://comptroller.texas.gov/programs/broadband/plan.php.

<sup>82.</sup> A full list of state broadband plans is available on the NTIA website: https://broadbandusa.ntia.doc.gov/resources/states.

<sup>83.</sup> Goodchild, C., Hill, H., Kalmus, M., Lee, J. & Webb, D. (2022). Boosting broadband adoption and remote K-12 education in low-income households. Boston Consulting Group. https://mkt-bcg-com-public-pdfs.s3.amazonaws.com/prod/accelerating-broadband-adoption-for-remote-educationlow-income-households.pdf.

FIGURE 16. Network deployments in regions with ACP-eligible homes realize higher cash flows, faster



Note: See economic case for full details on model structure and assumptions.

Sources: Expert and ISP interviews, Benton Institute; BCG analysis

FIGURE 17. Existence of ACP reduces by 25% the per-household subsidy needed to incentivize providers to build in rural areas

	Greenfield rural opportunity economics, in a world					
	Without ACP	With ACP		Rationale (for figures in a world with ACP)		
	Total	Total <sup>1</sup>	ACP Segment*			
% take-up <sup>†</sup>	+5% (Y1) +20% (Y3)	+7% (Y1) +25% (Y3)	+2% (Y1) +5% (Y3)	Higher due to lower cost to consumer and additional adoption support		
Monthly churn	2%	1.5%	1%	Lower given lower involuntary churn and less price-driven churn at lower cost to consumers, coupled with additional barriers to switching (e.g., new forms)		
ARPU	\$70	\$60	\$35	Lower given limited spend above subsidy (e.g., those w/large adoption barriers on <\$30 plan; others w/greater digital literacy pick a higher plan w/\$30 subsidy)		
Ancillary margin	\$10	\$10	\$10	Equivalent ancillary margin given equivalent likelihood to need hardware, etc.		
Operating costs‡	\$140	\$130	\$100	Lower operating costs as some costs are borne by community organizations (e.g., marketing and promo) and somewhat lower cost to serve (e.g., help desk)		
Cost to pass§	\$5,500	\$5,500	\$5,500	Equivalent in line with cost to pass fiber in a rural area		
Cost to connect#	\$800	\$800	\$800	Equivalent in line with customer installation costs in a rural area		
Per-household FCF in year 10	\$435	\$495		Higher given larger subscriber base, lower acquisition and lower churn; somewhat offset by lower ARPU		
Per-household passed break-even subsidy®	\$2,200	\$1,700	The existence of ACP, which subsidizes subscriber service fees up to \$360 per year, reduces the per-household subsidy required to incentivize ISP investment by \$500, generating benefit for the government and increasing the market attractiveness for new entrants and incumbent providers.			

<sup>\*</sup> Estimates 30% of subs are ACP enrollees.

Sources: Expert and ISP interviews, Benton Institute; BCG analysis

<sup>†</sup> Percent of households that subscribe to broadband (net of churn); estimates 60% take-up in year 10 in the world without ACP, 75% in the world with ACP.

 $<sup>^{\</sup>ddagger}$  Includes one-time acquisition costs and ongoing cost to serve equivalent to 35% of ARPU.

<sup>§</sup> Cost of construction, design, and electronics; "low" rural costs, per Benton.

<sup>#</sup> Cost of customer installation; "low" rural costs, per Benton.

FCF in year 10 represents perpetuity CF; estimates 4% inflation YoY.

<sup>&</sup>lt;sup>®</sup> NPV based on 20% WACC and 4% perpetuity growth. Note: Some numbers rounded for ease of reading.

The ACP improves the economic case for deployment for several reasons:

- 1. It effectively lowers the cost of service and thereby increases the take-up rate (i.e., the percentage of households that subscribe to internet service).
- 2. ACP subscribers have lower churn (i.e., fewer cancellations per month). Because their bill is subsidized by the government, an ACP household's ability to subscribe is less contingent on income and employment. For similar reasons, ACP households are also less likely to voluntarily churn because some price sensitivity is removed. Moreover, ACP customers are less likely to switch service providers because the burden of signing up with a government benefit is higher.
- 3. ACP subscribers are easier for ISPs to acquire. Governments and philanthropies are funding awareness campaigns, and community organizations are assisting with enrollment. These activities reduce the marketing costs needed to acquire ACP subscribers.84



States should work with institutions to promote enrollment in the ACP. Common Sense, in partnership with the Digital Equity Institute and Arizona State University (ASU), demonstrates one way this can be done. Together, these partners are running an ACP marketing campaign in Phoenix, Arizona, that is designed to overcome the three main barriers to ACP adoption:85

- 1. Lack of awareness of and trust in the ACP;
- 2. The ACP's complicated enrollment process. particularly for disconnected households;
- 3. Lack of digital skills among the ACP's target population.

The campaign uses traditional marketing (e.g., TV, radio, digital, physical) to raise awareness in high-eligibility areas. The marketing highlights the potential for free internet and/or cost savings. The marketing is co-branded with trusted local organizations to differentiate the ACP from similar sounding but less trusted ISP offers. It also emphasizes the ACP's status as a new federally guaranteed benefit and highlights the potential to get free internet service.

Interested individuals are offered two methods to enroll: a website and a phone hotline. The website allows individuals to quickly and easily enroll themselves. But, being an online website, it requires an internet connection and digital skills to access, which the ACP's target population may not have. The hotline is designed to provide an offline alternative. It allows callers—both those without connectivity and those who simply need extra help-to get customized, one-on-one guidance from an ACP enrollment specialist. This level of support can be critical to overcoming the myriad issues that can arise during the enrollment process. Finally, both the website and the hotline offer users digital inclusion resources, which help newly connected individuals successfully use the internet. In this way, the ACP can be used to attract disconnected and low-income households into the digital inclusion ecosystem.

The California Emerging Technology Fund (CETF) is leading a similar campaign in California. 86 CETF's goal is to achieve 90% enrollment, and they are tracking their progress through a partnership with the University of Southern California (USC). CETF and USC have built a data dashboard that calculates ACP eligibility and enrollment at the county and ZIP code level, 87 which allows CETF to precisely target its outreach and better coordinate with local partners.

<sup>84.</sup> Kalmus, M., Hill, H., Lee, J., Goodchild, C. & Webb, D. (2022). A human approach to closing the digital divide. Boston Consulting Group. https://www.bcg.com/publications/2022/how-to-close-digital-divide-with-human-approach.

<sup>85.</sup> Common Sense Media. (2022). Common Sense Media launches campaign in Arizona to help families apply for free internet. https://www.commonsensemedia.org/press-releases/common-sense-media-launches-campaign-in-arizona-to-help-families-apply-for-free-internet.

<sup>86.</sup> Walters, S. (2022). How Los Angeles county is boosting broadband subsidy enrollment. California Emerging Technology Fund. https://www.cetfund.org/how-los-angeles-county-is-boosting-broadband-subsidy-enrollment/.

<sup>87.</sup> California Affordable Connectivity Program (ACP) Enrollment dashboard. https://www.arcgis.com/apps/dashboards/8c0249a9de8d404a9b49966fb824b728.

These campaigns demonstrate how institutions can play a key role in promoting the ACP. ASU is using its tech support center as a hotline to provide the community with digital navigator services, and USC is using its capacity for data analysis to monitor and refine ACP outreach. By promoting enrollment in the ACP, states and institutions can help connect lowincome communities and potentially incentivize deployment in the areas that need it most.

## 5. Create Sustainable Funding and Policy

To ensure the current broadband opportunity results in lasting progress, states should create policy ecosystems that incentivize competition, sustainable funding, and consumer protections.

States can encourage competition by making nontraditional broadband providers (e.g., community broadband providers, electric cooperatives, and public-private partnerships) eligible for current and future broadband programs.88 While their eligibility will not guarantee that communities build their own networks, it will allow the possibility where communities are interested. And often, the simple act of allowing robust competition and new market entrants is enough to result in higher-quality projects from existing providers.

States should also ensure that they have sustainable sources of funding for local broadband initiatives. To date, funding for such initiatives has been insufficient to close the digital divide. 89 One reason is that funding opportunities, including recent federal programs, are often time limited. While the upcoming funds provide an unprecedented amount of support, states should also identify and/or create more longterm sources that are not reliant on stimulus or short-term grants. In addition, states should seek to maximize available funding. For example, combine Capital Project Funds with BEAD funds to achieve more comprehensive projects.

One example is the Connect Illinois program, which is making an over \$400 million investment to bring universal broadband access to the state by 2024. It is doing this by leveraging a combination of public, private, nonprofit, and philanthropic funding opportunities. Similarly, the California Department of Education raised over \$18 million from 138 donors, enabling the state to distribute 1.1 million devices and 100,000 hotspots to students across 97% of counties. 90 Finally, the New York Digital Inclusion Fund, which is funded by Schmidt Futures and managed by NDIA, will support digital inclusion coalitions and innovative partnerships to increase connectivity.91

States should also expand digital consumer protections to ensure that, as broadband expands and online activities become increasingly common, individuals' data and welfare is protected. To do this, states should empower existing consumer protection agencies, such as public utility commissions (PUCs) and offices of the attorney general (AG), to track and audit broadband service offered by ISPs. This will help states consider future broadband projects and identify ISPs that fail to meet promised service obligations. Similarly, states should pass and enforce measures to prevent ISPs from exploiting market dominance. For example, the California Public Utilities Commission (CPUC) mandated, by way of executive order, the elimination of data caps and overage charges by ISPs. Additionally, to ensure privacy-protective practices for data, state policymakers should provide clear guidance to ISPs, schools, and other institutions as to how they should collect and share data for government purposes (e.g., mapping, DNAs). 92 Examples include privacy protections such as those found in the California Consumer Privacy Act 93 and the Illinois Biometric Information Privacy Act, 94 and platform accountability legislation like the California Age Appropriate Design Code Act, 95 which will protect vulnerable new users from predatory online practices.

<sup>88.</sup> Weng, S. (2022). Could investments in community broadband bridge the digital divide? Urban Institute. https://www.urban.org/urban-wire/could-investments-community-broadband-bridge-digital-divide.

<sup>89.</sup> Ali, T., Chandra, S., Cherukumilli, S., Fazlullah, A., Galicia, E., Hill, H., McAlpine, N., McBride, L., Vaduganathan, N., Weiss, D. & Wu, M. (2021). Looking back, looking forward: What it will take to permanently close the K-12 digital divide. Common Sense Media. https://www.commonsensemedia.  $org/sites/default/files/featured-content/files/final\_-what\_it\_will\_take\_to\_permanently\_close\_the\_k-12\_digital\_divide\_vfeb3.pdf.$ 

<sup>90.</sup> CDE Foundation. (n.d.). CA digital divide fund. https://cdefoundation.org/digitaldividesupport/.

<sup>91.</sup> Benjamin, G.C. (2021). New York Digital Inclusion Fund opens requests for proposals. National Digital Inclusion Alliance. https://www.digitalinclusion.org/blog/2021/09/16/new-york-digital-inclusion-fund-opens-requests-for-proposals/.

<sup>92.</sup> Common Sense Media. (2022). Maximizing federal funding to close the K-12 digital divide. https://www.commonsensemedia.org/sites/default/files/ featured-content/files/homework\_gap\_state\_policy\_primer.pdf.

<sup>93.</sup> California Consumer Privacy Act. https://ccpa-info.com/california-consumer-privacy-act-full-text/.

<sup>94.</sup> Illinois Biometric Information Privacy Act. https://www.ilga.gov/legislation/fulltext.asp?DocName=09500SB2400&GA=95&SessionId=51& DocTypeId=SB&LegID=&DocNum=2400&GAID=9&SpecSess=&Session=.

<sup>95.</sup> California Age Appropriate Design Code Act. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\_id=202120220AB2273.

# Conclusion

For decades, leaders in education, health care, workforce development, and government have been cautious about integrating internet-based technologies into institutional services, in part because the benefit of these technologies cost savings, service improvement, expanded access—cannot be fully realized without causing harm to those caught in the digital divide. Now, by making it possible to close the divide, the IIJA and ARPA could unlock innovation within these institutions for the benefit of all.

To take advantage of this opportunity, state leaders should:

- Ensure that populations served by institutions are fully connected. This means universal home access to fast, reliable, and affordable internet service and high-quality devices as well as training in the skills to use them. If these conditions are not met, then institutions will not be able to comprehensively integrate internet-based technologies into their services, and the entire public will suffer from the missed opportunity.
- Include institutions responsible for essential services in the planning process for BEAD and the Digital Equity Act. To ensure these plans meet the requirements of institutional services, states should specifically include schools, health care providers, local governments, business, and related community organizations in their broadband planning processes. These institutions can help define the technical specifications (e.g., speeds, reliability, cost, device capabilities) and technical skills needed to use their services.
- Consider both online and offline services when drafting plans. Plans that enable and encourage institutions to shift to online services should also ensure that offline services remain accessible, have similar functionality, and are specialized for the needs of offline users. Moreover, consider designing offline and low-bandwidth services so that they can be used during emergencies and major internet disruptions.

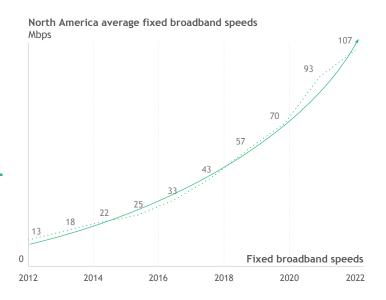
- Prioritize fiber. The largest downside of fiber networks their cost—can be offset by current federal funding programs. Leverage this opportunity to build fiber networks that will last for generations. Fiber networks provide the fastest and most reliable service of any technology available; they have the lowest operating costs; they are simpler and relatively inexpensive to upgrade; and they are the most resilient to usage increases, signal interference, weather, and natural disasters.
- Create broadband and digital equity funding programs at the state level. Many current sources of funding are temporary. Programs tied to emergency designations, like the ECF, may end, and when they do, the connectivity they established could be lost. Similarly, the recent federal funding programs, big as they are, are scheduled to end after five years. To maintain universal connectivity in the absence of federal funding, states will need to create their own sources of state-level funding. The CPF and ECF provide good models for such funding programs. By funding devices, affordable service, flexible deployment, and digital inclusion, these programs cover the main ongoing costs of universal service.
- Implement digital needs assessments through existing institutional networks. Many institutions already collect data on their community. By adding DNAs to these existing surveys, states can easily collect data on connectivity, which can be used to challenge FCC maps, target broadband deployment, and measure the effectiveness of connectivity initiatives.
- · Use the ACP to incentivize deployment and competition. High rates of ACP enrollment can make lower-income communities more attractive to ISPs, driving deployment and new market entrants. By promoting ACP enrollment, states can help to bring service to historically underserved communities, creating more service options and driving down prices for the whole community.

- Use the ACP to drive high-quality, inclusive, and effective use of connectivity. Use ACP awareness and enrollment campaigns as a way to encourage lowerincome households to adopt high-quality internet service and connect them to relevant digital inclusion resources.
- Update consumer protections as more people and services move online. Consumer protections should encompass data privacy and protect against abusive online practices. Empower existing consumer protection agencies (e.g., public utility commissions and the offices of the attorney general) to monitor, audit, and respond to unfair or deceptive practices undertaken by providers and other technology companies.

# **Appendix A: Support Analysis**

FIGURE A1. Growth in average broadband speed over time

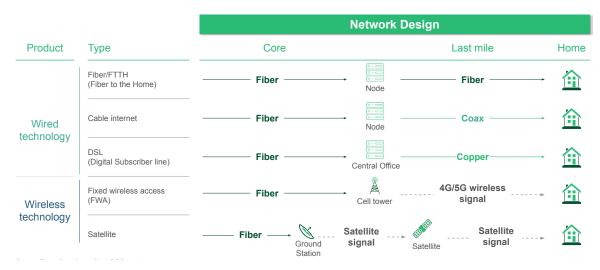
Average speeds have grown by over 8x since 2012



Sources: Cisco; BCG analysis

FIGURE A2. Types of network design

# Infrastructure Technologies | Technologies split across wired and wireless



Sources: Texas Broadband Plan; BCG analysis

# **Appendix B: Case Studies**

#### FIGURE B1. Insure the Uninsured Project (ITUP):

Connecting and providing education to stakeholders is critical in bridging the digital divide

#### Objective: Educate and connect stakeholders

Overview I ITUP is a health policy organization working to promote innovative and workable policy solutions that expand health care access in California

**Problem I** Public and private entities are unaware of best practices to improve telehealth access and communities are unaware of resources

Objective I Improve virtual telehealth access through education, delivered through trusted messengers, that uses actionable messaging and addresses the entire stakeholder funnel

#### **Activities:** Policy advocacy enabled by education

ITUP has pursued an array of initiatives, including:



Annual conference for elected officials, policy experts, researchers, providers, health plans, etc. to discuss policies and actions that help bridge the digital telehealth divide



Fact sheets that speak to telehealth policy, broadband 101,



Targeted presentations & workshops about policies, funding & etc. for stakeholder entities & digital access for

#### **Impact**: Train and inform with program and policy

#### PROGRAM (2021)

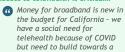
- · Virtual conference with over 700 attendees
- 10 regional workgroups and listening sessions across the state on telehealth, digital equity, etc.
- 2 policy forums on health information exchange and broadband and connectivity policy with over 200 perspectives shared
- 2 LA health collaboratives

#### **POLICY (2021)**

- Regional geographic profiles highlighting key coverage facts for all counties in CA
- 6 quick read fact sheets on key healthcare topics
- 8 ITUP blogs spotlighting legislative bills and budget summaries

#### Takeaways: Health entities have a key role in broadband conversations

#### Access to telehealth is critical...



social expectation and desire.

Executive Director, ITUP

#### Key stakeholder knowledge gaps present challenges:

- Lack of understanding around anchor institution qualifications
- Entities unaware of existing funds available (i.e., ACP, CA \$6B Middle-Mile funding), often due to eligibility knowledge gap Policymakers do not understand
- potential local level impact (i.e. existing need, individuals affected), preventing action

Sources: Market participant interviews, BCG analysis

## FIGURE B2. Oregon's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC):

Survey to WIC community shows need for devices and connectivity in telehealth delivery; internally, IT lacks training and funding

#### Objective: Assessed telehealth visit feasibility

Overview I Oregon WIC provides wellness screenings for children <5 years old, pregnant and postpartum women, and lactation consultations

- Local agencies: 32
- Individuals served: 80k
- Avg. visits / year: 4

Need I Lack of existing video infrastructure drove consultations to move from office visits to mobile calls in response to COVID, leading to:
• Less comprehensive visits

- · Poorer health tracking

Response I Survey designed in partnership with Portland State University for WIC participants and IT staff to assess the feasibility and equitability of creating infrastructure for video visits

#### Activities: Deployed survey to gauge reach and equity

Separate online surveys delivered to WIC participants and Local Agency IT staff who support the WIC program:



#### Survey designed to assess.

- Participant feasibility
   Comfort with video
  - Device availability
  - Access to stable
- · Internal IT resources



Rollout: January 2021

Text with survey link sent to participants in English, Russian, and Spanish



#### Survey collected across WIC participants: 9,503 - 350 completed via call

· IT Staff: 22 dept. reps

#### Impact: Data shows tech equity and IT support gaps



#### EXTERNAL: PARTICIPANTS



Interested in engaging in video visits



Spanish speaking participants lack email



Lack monthly internet



Run out of mobile data used for internet >1x annually

# INTERNAL: IT SUPPORT Dedicating existing, fragmented IT resources represents roadblock

- 7 out of 22 offices support all
- county IT support, not just WIC ~70% of respondents expect competing priorities for funds and time to challenge adoption

#### Takeaways: Lack of feasible near-term path forward

#### Telehealth offers critical benefits

- · Flexibility for participants in isolated geos and with irregular work schedules Visibility of patients creates more
- comprehensive visit (can physically see lactation, child behavior, etc.)
- More traceability of health metrics via online systems vs. cellular calls
  - Expanded program access, i.e., virtual new mom support services (dieticians, parenting support, etc.)

#### State execution is complex & requires

- Adoption across participants incl.
- those lacking dig. literacy and devices State-level infrastructure to support and develop technology
- Agency-level IT access to use and
- support for tech., including IT staff Stakeholder coordination across local Stakeholder coordination across local entities (i.e., WIC, County health

Sources: Market participant interviews, BCG analysis

#### FIGURE B3. Washoe County School District:

Tech standardization creates student learning and administrative efficiencies, narrowing the homework gap

#### Objective: Close the homework gap

Overview I Washoe County School District (WCSD) serves 62k students across ~100 schools in Nevada

Problem I COVID left students that had insufficient devices and internet service unable to engage in remote learning

Initial paper packet program response was complex and inefficient

Objective I Close the home amid an increasingly virtual environment by:



Standardizing student devices across schools



families via hotspots and Comcast Internet Essentials participation



Enabling teacher access to equitable tools for program delivery and student comms.

#### Activities: Standardize student technology

WCSD pursued a multi-pronged approach to assess connectivity gaps and implement sustainable programs:



Identified funds Received \$2M in FCC ECF funding and reallocated internal general funds



Distributed tech readiness surve Deployed to families in 2020 to assess device and service gaps amid remote environment



Administered devices Delivered hotspots (in partnership with T-Mobile) and laptops to families in need

......



Implemented long-term program
Installed 'Laptop Refresh Program' offering ~15k students new laptops annually

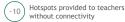
#### Impact: Measure students connected



Hotspots provided to families with insufficient internet service



Laptops acquired and distributed to students lacking devices





Of student laptops replaced annually via Refresh Program



#### IMPACT OF STANDARDIZATION

Equitable device and service access across schools; 50% underserved (no Title One funding, or obsolete tech.)

- Increases ease of use at home: device and app consistency most important in non-English homes
- Implementation efficiency for district admin. (regulations, etc.)
- Bulk purchasing across districts creates pricing advantages

#### Takeaways: Digital inclusion critical long term

# Districts are becoming increas digital in a post-COVID environ

- Standardization of tech in the classroom will increase with digital textbooks, and online comms
- Tech support is critical in enabling students and admin
  - WCSD leveraged grant funds
  - for dedicated IT st support rep. through 2024 WCSD lacks tech. support
  - resources for admin., with a 1:1,000 staff to IT tech. ratio

#### To ensure digital program feasibility, states must offer expanded resources.

- Continued funds beyond time horizon of existing FCC, ECF availability
- Broadband infrastructure to students without access to internet service
- Grants that assist districts in scaling IT support services (internally and student-facing) and IT security

Sources: Market participant interviews, BCG analysis

#### FIGURE B4. New York University (NYU) Langone Health, Together Growing Strong Initiative:

Residents are connected, but data demonstrates extensive digital literacy and service quality gaps

#### Objective: Improve digital literacy and connectivity

Overview I Together Growing Strong is an NYU Langone initiative that assists families with children in Sunset Park, Brooklyn, from pregnancy through age 5 via health care and education services

Problem I COVID left participants that did not have devices or that had low internet



speeds without:

Telehealth access for standard care
and postpartum support



Digital literacy necessary for parents to help children in virtual classrooms Ability to apply for or renew social services benefits

Objective I Close the connectivity and digital literacy gap in Sunset Park, Brooklyn, through direct program assistance and policy advocacy

#### Activities: Policy advocacy enabled by data collection

Together Growing Strong has pursued an array of initiatives, including:



#### Digital literacy workshops

- Support ACP enrollment and tech training via events in partnership with Sunset Spark
- Tech training through postpartum prevention group



#### Deploy community surveys

- Tech Literacy Survey distributed across 49 citizens in English, Spanish, and Mandarin
- School Survey across 9 schools on student connectivity

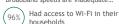


Digital equity working group Group of NYU faculty, teachers, and Sunset Spark reps. advocating for free Wi-Fi access and dig. literacy • Position statement on Wi-Fi

- access to policy makers Meetings with local and state reps.

#### **Impact**: Survey data illustrates proof of gap

#### TECH LITERACY SURVEY Broadband speeds are inadequate...



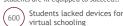


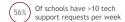




#### SCHOOL SURVEY

Students are ill equipped to succeed...





Schools have families who live in Wi-Fi dead zones

#### Takeaways: Service must be available, sufficient, and usable

#### Data is critical to actionably shape policy:

- Survey data included in position statement shows that while Sunset Park citizens have internet access, current service has insufficient speed
- and signal and digital literacy is low
  Access to data collected is offered to other entities starting digital equity initiatives to support grant funding efforts, etc.

#### State governments can increase access to resources through: Continued funding to make digital access

- a utility
- More equitable solutions, i.e., ACP
- applications in expanded languages nt free Wi-Fi programs, i.e., Wi-Fi kiosks in lower-income neighborhoods with poor connection

Sources: Market participant interviews, BCG analysis

#### FIGURE B5. Institute for Local Self-Reliance:

Funding and infrastructure access limit digital equity for tribal nations, but bootcamps facilitate network builds

#### Objective: Empower tribal broadband networks

Overview I Institute for Local Self-Reliance is a national research and advocacy organization that conducts studies on tribal broadband issues across the U.S.

Problem I Tribal lands lack access to broadband infrastructure, and communities do not have technical knowledge or economic resources to build independent networks

- · Federally recognized tribes: 530
- Telcos established: 12

Objective I Increase awareness of broadband solutions to assist tribal nations in scaling broadband deployment and conduct research to shape more equitable policies

#### Activities: Inform with research, train in workshops

ILSR promotes tribal broadband access through two core initiatives:



- Research on broadband efforts Interviews conducted across eight tribes with mix of
- broadband expertise conducted Website under construction will showcase challenges, investment opportunities, etc. based on case studies



#### Offer tribal broadband bootcamps

- Series of three-day intensive events across ~50 participants offering hands-on support and instruction for broadband network development
- Funded by Google, Connect Humanity, Tribal Research Center, etc.

#### Impact: Raise awareness, inspire action

#### RESEARCH PROVES CHALLENGES

- Tribal lands cannot be collateralized. making even low CAPEX builds prohibitive
- ragmentation of native lands across U.S. and historically poor data collection prevent accurate mapping
- Middle mile infrastructure is limited Physically complex (i.e., not on electric grid, weather, terrain) and reservations are bifurcated

#### BOOTCAMP EMPOWERS ADOPTION

- Knowledge sharing on technical buildout requirements
- Long-term relationships established (Discord channels, etc.), driven by trust
- Infrastructure collaboration has occured across tribal communities in geographic proximity

#### Takeaways: Adoption requires gov't engagement

Investment is critical, but increasingly limited and prohibitive to tribal nations:

- Governments received requests for five times the amount of Funding that was available.
  Funding is oversubscribed."
  - ACLS Leading Edge Fellow,
  - ILSR
- There needs to be more flexibility in how grant funding is structured. Tribes can't connect to middle mile, so you can't penalize them when they don't get 100[Mbps] download speeds."
  - ACLS Leading Edge Fellow

Sources: Market participant interviews, BCG analysis

#### FIGURE B6. McLaughlin School District:

Offline use case is limited, and should only be viewed as supplemental option if students attend in-person classes

#### MSD drove infrastructure deployment to address student connectivity gaps

Overview I McLaughlin School District serves 470 rural students, 98% of which are Native American, over 800 square miles of South Dakota

Problem I Broadband infrastructure gaps prevented students from accessing internet service amid a remote learning

Activities I Partnered with local ISP, West River Telecommunications (WRT), to deploy fiber edge-outs that covered the student population, while assisting families with low-cost internet enrollment (EBB, ACP, etc.)



Partnered with WRT and covered 2 years of payments, making fiber buildout to remaining homes viable



Created physical site for ACP enrollment; assistance from in-person representative made signups easier than when done independently, driving ~100 new enrollments



Broadband accessibility achieved across student population, from 60% prior to infrastructure build

Sources: Market participant interviews, BCG analysis

#### Broadband is strongly preferred, as offline solutions only allow for unidirectional communication between students and teachers

Broadband allows for back-and-forth interaction between students and teachers unlike unidirectional offline communications; offline solutions can be helpful where affordable infrastructure does not exist, and students attend classes in-person, daily:



Unidirectional communication  Offline content is static, and does not allow students to communicate back with their teachers or submit work online, meaning students must be in-person daily to submit work



Wireless tech expansion

 While coverage is less stable and more expensive than wired tech. satellite and FWA will continue to become more readily available; this limits infrastructure gaps that necessitate supplemental



Low-cost service availability

Broadband affordability issues continue to be abated by low-cost programs (i.e., EBB and ACP), reducing the value-add of affordable offline solutions, particularly when considering the tech advantages of broadband



For a school district, [offline] is not best practice for serving our customers. There is no back and forth... It is a great supplemental piece as long as you are in class with the teacher Monday through Friday.

Superintendent, McLaughlin School District

#### FIGURE B7. Information Equity Initiative (IEI):

Offline datacasting offers digital content delivery alternative where infrastructure and affordability prohibit broadband

#### Objective: Inform the structurally unconnected

Overview I Founded in 2021, IEI is a nonprofit partnership of 3 PBS member entities that delivers offline digital content to unconnected homes via PBS broadcast

- spectrum typically used for TVPBS stations engaged: >12
- Coverage / station (sq. mi.): 10,000

Problem I Education is limited in school districts, health agencies, etc. where affordability and infrastructure gaps prohibit broadband access

Objective I Disseminate educational



Datacasting, or transmitting videos, HTML files, and other digital resources to Wi-Fi enabled devices through TV airwaves



#### Activities: Provide offline tech for information access

IEI delivers offline content via datacasting tech as follows for a school scenario:



#### User content creation

- Educator curates tailored content, customizable by home IEI offers cloud library of
- educational materials for use



- Content is uploaded to PBS station at click of a button Integrated with Schoology,
- Google Classroom, and Canva .. 🔷 .



#### nsmission PBS station unidirectionally transmits data via TV airwaves

- Home receives content through IEI-provided antenna and device
- . 📀 . Materials received

Students receive homework packets and educational videos

#### **Impact:** Share information with unconnected end users

Datacasting services are being provided to various end users, including:



School districts in PA and SC as of June 2022



Federally qualified health care centers by October 2022



Incarceration facilities by year end 2022



- Infrastructure gaps are abated, as 97% of U.S. homes are already covered by broadcast spectrum
- Cost barriers are reduced, as IEI can deliver content at ~\$200 per end user over a -10-year lifetime
- Unidirectional transmission prevents reciprocal exchange
- Content remains limited to information provided by educator

#### Takeaways: Offer secondary alternative to broadband

Today, datacasting is most impactful in communities that have no affordable wired or wireless infrastructure access:

What it comes down to at the moment is the ubiquitous nature of what IEI has versus what everyone else has. It costs very little for us to provide infrastructure to offer information."

CEO, IEI

As broadband infrastructure is developed over the next 10 years, datacasting can offer support where cost remains the leading barrier:

Long-term, it's a consideration of cost. Once fiber is put in ground in 10 years, the question of affordability will remain and broadband subsidies become a political football."

CEO, IEI

Sources: Market participant interviews, BCG analysis

# **Appendix C: Interviewees**

Arizona State University **Baltimore Public Schools** California Labor Federation Workforce and Economic Development Program Charlotte Regional Business Alliance City of Portland Comcast Connect Waukegan EducationSuperHighway Harvard Business School—Managing the Future of Work Project HCS EdConnect & The Enterprise Center Information Equity Initiative Institute for Local Self-Reliance Insure the Uninsured Project Land O'Lakes McLaughlin School District New York University Langone Health Oregon Employment Department Oregon Health Authority Purdue Center for Regional Development University of North Carolina at Chapel Hill School of Medicine Washoe County School District

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